# International Conference CHALLENGES OF EUROPE: INNOVATIVE RESPONSES FOR RESILIENT GROWTH AND COMPETITIVENESS



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# CHALLENGES OF EUROPE: INNOVATIVE RESPONSES FOR RESILIENT GROWTH AND COMPETITIVENESS

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## CONTENTS

Foreword	IX
Sponsors	XI
CONFERENCE PROCEEDINGS	
<b>Dodig, Domagoj:</b> EFFICIENCY ASSESSMENT OF PRIVATE SECTOR PARTICIPATION IN CONSTRUCTION AND MAINTENANCE OF PUBLIC INFRASTRUCTURE PROJECTS USING DATA ENVELOPMENT ANALYSIS	3
<b>Bejaković, Predrag; Mrnjavac, Željko:</b> IS PERSONAL OVER-INDEBTEDNESS AN IMPORTANT FACTOR ON THE LABOUR MARKET?	21
Grodzicki, Tomasz: ECONOMIC PAST AND FUTURE OF COMMON AGRICULTURAL POLICY	41
<b>Castiello, Mauro; Mosca, Michele; Villani, Salvatore:</b> HOW THE RESILIENCE ANALYSIS OF CRIMINAL NETWORKS MAY HELP TO IMPROVE THE EFFECTIVENESS OF PUBLIC POLICIES TO CONTRAST ORGANIZED CRIME	61
<b>Đogo, Marko; Prorok, Vesna:</b> INFLUENCE OF FREE TRADE WITH GERMANY ON ECONOMIC STRUCTURE OF SMALL COUNTRIES IN EASTERN EUROPE	
<b>Bilas, Vlatka; Bošnjak, Mile; Novak, Ivan:</b> THE LINKAGE BETWEEN EXTENSIVE LENDING TO PRIVATE INDIVIDUALS AND INTERNATIONAL TRADE IN SMALL OPEN ECONOMIES	117
<b>Dražić Lutilsky, Ivana; Jovanović, Tatjana; Vašiček, Davor:</b> INTERNAL REPORTING IN PUBLIC HOSPITALS – A CASE STUDY IN CROATIA AND SLOVENIA	127
<b>Turečková, Kamila:</b> POTENTIAL OF DEVELOPMENT OF ICT FIRMS BASED ON LOCAL SECTORAL CONCENTRATION	143
<b>Erceg, Aleksandar; Perić, Julia:</b> MONEY OR SKILLS – WHAT IS MORE IMPORTANT – STORIES FROM CROATIAN FRANCHISEES.	155
<b>Chaaben, Nahla; Mansouri, Faysal:</b> QUADRUPLE INNOVATION HELIX MODEL: AN ENGINE FOR A SMART GROWTH	175
Aljinović, Zdravka; Pivac, Snježana; Škrabić Perić, Blanka: European transition countries' risk classification and ranking: ten years lati	er 193
<b>Delić, Anamarija:</b> IS EXPERIENCE OF THE OWNER A DETERMINANT OF SME'S CAPITAL STRUCTURE?	207
Šinko, Simona; Knez, Matjaž; Obrecht, Matevž: ANALYSIS OF PUBLIC OPINION ON AUTONOMOUS VEHICLES	219

Strojek-Filus, Marzena; Sulik-Górecka, Aleksandra:	
THE INFLUENCE OF LEGAL REGULATION ON THE PERCEPTION OF THE ACCOUNTING CAREER -	221
POLISH STUDENTS OPINION	231
Suchánek, Petr; Štěrba, Martin:	
AN ANALYSIS OF VALUE CREATION IN CZECH FOOD COMPANIES	245
Alfinović Nilvša, Dotković Soča,	
E-SCHOOL DEVELOPMENT AND QUALITY OF MANAGEMENT AND LEADERSHIP IN	
EDUCATIONAL SYSTEMS IN CROATIA AND BOSNIA & HERZEGOVINA	261
Mastink Dmytro.	
PROCEDURE OF THE CAPITAL STRUCTURE MANAGEMENT STRATEGIES DEVELOPMENT:	
PRACTICE FROM UKRAINIAN LISTED POWER-PRODUCING COMPANIES	275
Dylawski Marak	
DEBT AS ELEMENT DETERMINING FINANCIAL POTENTIAL OF LOCAL GOVERNMENT ENTITIES	
IN POLAND	289
Jordan Cožnov Vukovič Coven Merič Miher	
EFFECT OF MEANING OF WORK ON JOB SATISFACTION: CASE OF LECTURERS IN HIGHER	
EDUCATION IN SIX CEE COUNTRIES	301
I (zel I ubomír: Schwarz Jiří:	
FOREIGN EXCHANGE INTERVENTIONS AS AN (UN)CONVENTIONAL MONETARY POLICY TOOL:	
PRELIMINARY ASSESMENT	319
Čatar Tomaž: Čatar Barbara:	
DECISION FOR THE ENVIRONMENTAL STRATEGY: POLITICAL OR ECONOMIC?	343
THE EFFICIENCY OF VARIOUS METHODOLOGIES FOR VENDOR SELECTION AND SUPPLY	
QUOTAS DETERMINATION	361
Cavoski, Sava; Markovic, Aleksandar; Zornic, Nikola: FRAMEWORK FOR ANALYSES OF CONSUMERS' BEHAVIOUR IN B2C F-COMMERCE	381
TRAVE WORK TOR ARVE TILLS OF CONSUMERS' DEMAYTOOR IN D2C E-COMMERCE	501
Šimić, Vladimir; Ćorić, Bruno; Malešević Perović, Lena:	
MACROECONOMIC EFFECTS OF OIL PRICE SHOCKS: EMPIRICAL EVIDENCE FOR SELECTED	402
CENTRAL AND EASTERN EUROPEAN ECONOMIES	403
Kordić, Lana; Šimundić, Blanka:	
HEALTH TOURISM IN CROATIA – QUESTIONING THE EFFICIENCY OF SPECIAL HOSPITALS AND	
NATURAL SPAS	417
Bučar, Maja; Udovič, Boštjan Arbeiter, Jana:	
SMART SPECIALISATION STRATEGY - THE CASE OF SMALL COUNTRY	433
Dragnić Daša: Najav Čačija I jiljana: Pivčavić Smiljana.	
BALANCING EFFICIENCY AND EFFICACY BY SEGMENTATION: THE CASE OF TOURISM	
DESTINATION SPLIT	451

## FOREWORD

Dear Colleagues,

The proceedings you are holding in your hands contains the papers presented at the 12th International conference "Challenges of Europe: Innovative Responses for Resilient Growth and Competiveness", held in May, 2017 in Bol on the island of Brač. The proceedings actually contain only a selected subset of papers which, in this way, seek to be scientifically evaluated by scholars.

This is an occasion to recall that the first conference was held in 1995 under the name "Enterprise in Transition". It was launched with the aim to primarily help the economies of Central and Eastern Europe, former socialist countries, in their efforts to adapt to the requirements of business operations in a market economy.

In terms of adjustment of the post-socialist countries' economies of Central and Eastern Europe transition topics have lost their meaning over time. In 2009 the conference name was changed from "Enterprise in Transition" to "Challenges of Europe" in order to emphasize the need to investigate various economic topics and issues that the global and integrated European economy faces.

In doing so, we had in mind the need and the possibility to link business entities in order to achieve synergy effects. Such an idea has in no way excluded the possibility of addressing observing the economic problems from the position of other economies or the need of expanding achieving universal economic knowledge. This was thus the basis of our conference which was focused on innovative responses for resilient growth and competiveness. The 2017 conference was in no way limited to the European context which is confirmed by the fact it was attended by scientists from all over the world. As conference organizers, we are particularly proud of our distinguished guests. After we were hosts to prof. Joseph Stiglitz, Nobel Prize winner and world renowned scientist, in 2015, we had the privilege to host another Nobel Prize winner prof. Jean Tirole from Toulouse School of Economics. Prof. Tirole, together with other distinguished keynote speakers prof. Dražen Prelec, MIT Sloan School of Management, Prof. Jan Smits, European Commission, Prof. Andrés Rodríguez-Pose, London School of Economics and Prof. Cars Hommes, University of Amsterdam have helped to raise the quality and visibility of the conference, as well as of the papers of the authors who participated at the conference. We thank them for the honour that they have shown us and we are especially thankful for their excellent speeches. Their presentations were impressive for all participants, especially for younger scientists and a group of PhD students who during the conference held their presentations as a part of their doctoral workshops. Besides, PhD students were able to meet all the distinguished professors at the informal breakfast meeting.

The "Challenges of Europe" conference, as well as the proceedings in your hands, would not be possible without the many volunteers who gave their time and energy into organizing the conference. In this sense, we are especially thankful to the members of the international programme committee and the organizing committee who took large burden. We would like to extend our sincere gratitude to all the reviewers who participated in a double-blind procedure process that has enabled us to present here the selected papers for this conference. We would like to thank all others who have contributed in any way to the conference and the publication of the proceedings without which scientific and professional public would be deprived of new cognitions presented in these papers.

Split, December, 2017

Programme Committee Chairperson Professor Ivan Pavić

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# XII

## **CONFERENCE PROCEEDINGS**

#### EFFICIENCY ASSESSMENT OF PRIVATE SECTOR PARTICIPATION IN CONSTRUCTION AND MAINTENANCE OF PUBLIC INFRASTRUCTURE PROJECTS USING DATA ENVELOPMENT ANALYSIS

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Key words:Private sector participation, Data Envelopment Analysis, Efficiency,<br/>Public Infrastructure, HighwaysJEL codes:H41, H54, L32, L33, O18

#### ABSTRACT

Over the past 30 years private sector participation in infrastructure projects has become a trend and a way of delivering public services. It may involve financing, design, construction, operation and/or maintenance of infrastructure - which is traditionally procured and provided by the public sector - such as transport infrastructure (roads, airports), social infrastructure (schools, hospitals), government offices, etc. It is due to this fact that many decision makers in the public sector (ministers, mayors, etc.) are looking to answer the question: "Does involvement of the private capital add value for taxpayers?"

The main objective of this paper is the measuring and evaluation of the efficiency of the private sector participation using *Data Envelopment Analysis* in the case of mutually comparable decision making units (DMU-Operators), which are involved in public infrastructure projects (highways) in Croatia and selected EU countries.

The results of the analysis of the basic models of DEA, the CCR and the BCC model showed the relevance of the CCR model with the input-oriented model chosen for the analysis. The results of the analysis have identified efficient DMUs and the average sources and levels of inefficiency in each variable, as well as the guidelines for necessary improvements.

#### 1. INTRODUCTION

Private sector participation in construction and maintenance of public infrastructure projects (in some countries known as public-private partnerships or concession projects) presents a form of cooperation between the private and the public sector in the provision of public infrastructure (Yescombe, 2007). In the dynamic time when public debt and deficit of state budget raised maximum levels of payment capability, many decision makers in the public sector (such as ministers, county prefects, mayors, etc.) are looking for alternative *delivery* models for public infrastructure provision. These models contain participation of the private sector in the provision of public services. They may involve financing, design, construction, operation and/or maintenance of infrastructure - which is traditionally procured and provided by the public sector - such as transport infrastructure (roads, airports), social infrastructure (schools), government offices, etc. (EC Papers, 2009). The main aim of such cooperation is risk and reward principle. Both the public and the private sectors retain their own identity and responsibility while the cooperation is based on clearly defined divisions of tasks and risks. The private sector has a new opportunity to raise maximum *value-for-money* while the public sector can deliver better quality of infrastructure at a lower price or the same quality but with significant savings (AIK Publications, 2016).

The main objective of this paper is measuring and evaluation of the efficiency of private sector participation using *Data Envelopment Analysis*, in the case of mutually comparable decision making units (DMU-Operators), which are involved in public infrastructure projects (highways) in Croatia and selected EU countries. The basic hypothesis which leads to such projects is based on the assumption that "the private sector is a better lord than the public sector" (Friedman & Boorstin, 1996), and that it can manage complex projects better.

According to the European Investment Bank data (EIB-EPEC Market Update, 2015.), for 2005-2015 period, the aggregate value of the private sector participation in construction and maintenance of public infrastructure projects that reached financial closure in the European market was over 15 billion EUR of capital investments. The EIB data for Croatia show that the private sector participation in infrastructure projects was over 1.5 billion EUR<sup>1</sup> (EIB-EPEC, 2014). Therefore, with the aim of achieving greater efficiency in the public sector, it is logical to seek an answer to the question: "Is the private sector really more efficient than the public sector in provision of infrastructure projects and why?"

According to Fu-Lai Yu (2000) there are two basic approaches to measuring efficiency in infrastructure projects. The first approach is based on a statistical approach to estimate the efficiency and the other approach is based on the process of nonlinear programming efficiency. According to Cantarelli (2015), the effectiveness of public and private sector groups in each comparable unit is being increasingly assessed by way of comparing the efficiency between different operators, for example - airports, highways, harbors, etc.

The self-assessment method, the quality management method, the interviewing method and other relevant methods for the efficiency evaluation of one subject cannot give a true picture of efficiency if the results cannot be put in relation to the results achieved by other organizations or subjects from the same environment. According to Nixon, et al. (2012) the efficiency measures must therefore refer to a certain required standard or Key Performance Indicator (KPI).

<sup>&</sup>lt;sup>1</sup> The data present only the projects that are in operational phase (reached financial closure) form period 1998-2013.

Although, according to Ozcan (2008) the terms "*efficiency*" and "*effectiveness*", have a different meaning, both terms affect to the performance of the *Operators*. Since their *effectiveness* is most often measured by examining if necessary inputs are being used in order to produce the best possible outputs, while *efficiency* refers to using the minimum number of inputs for a given number outputs. Due to the fact that outputs in our case do not depend on the capabilities of highway operators, but exclusively on the state's economic development, so the performance of the operators will be measured in a form of "*efficiency*" rather than "*effectiveness*".

The main purpose of the public sector projects and in particular public infrastructure projects is not gaining profits, their aim is to meet the public needs. Therefore, the performance evaluation is mainly based on conformity assessment of fiscal policy with the strategic objectives of the development of certain areas and the application of the analysis of financial indicators in financial statements. However, the differences in the success of certain entities within the same sector are unexplained and different business models unrecognized. Because of this, more and more decision makers in the public sector seek a scientific tool which could evaluate the efficiency of public infrastructure projects in an impartial and objective manner.

The efficiency assessment analysis of the private sector participation in the construction and maintenance of the public infrastructure projects in Croatia has not been the subject of scientific research particularly in data comparison with other relevant projects from different EU member states. The reason for this is the limited data availability and the relatively short time period of project operation. As indicated in EIB data for Croatia, the majority of infrastructure projects that include the participation of the private sector in Croatia were realized after 2007, while the full operational functions of these projects were carried out after a year or two (at the end of the construction period). Given that, according to the EIB Reports, the transport infrastructure sector is the only sector in which there is data available for a period of more than 10 years, and due the fact that the Republic of Croatia and other EU countries (France, Poland, Slovenia, Czech Republic, Slovakia, Italy, Austria and Hungary), as public partners in private sector participation projects, invested significant public funds just in the transport infrastructure projects is a good choice.

By applying traditional (statistical) assessment efficiency techniques such as regression analysis, the dependent variable is averaged, and then the standard is computed and based on that - performance. This approach will not yield satisfactory results. Therefore, selection of deterministic non-parametric methods such as Data envelopment analysis (DEA) is a good choice. DEA solves mathematical linear programming problems for each unit of input and output, in contrast to the regression analysis that optimizes the problem through the entire observed units. According to Petrov (2002) regression analysis is used when we focus on general features of all the variables, and the DEA is used when we focus on each individual variable, where the best value represent the benchmark.

In order to provide a clearer insight into the results of the study, in the text below gives an overview of research relevant for the proposed hypothesis. The third chapter describes the methodology applied in detail and the results of the analysis are described in chapter five. The paper concludes with chapter 6.

#### 2. REVIEW OF PAST RESEARCH

Data envelopment analysis (DEA) is a relatively mature area of operations research. The first paper on this topic was published less than 40 years ago. Although initially focused on non - profit organizations (such as schools), it was quickly introduced in the profit sector (Charles, Cooper, Rhodes, 1978). According to Emrouznajed (2008), up to 2001 more than a thousand of scientific papers and more than one hundred doctoral dissertations have been written on the topic. Today, DEA is applied in the sectors of education, health, banking and finance, transport, etc. The application of DEA in the efficiency assessment of public infrastructure projects is found in several dozen papers. Gok (2012), applied DEA to examine the efficiency of 23 Turkish airports. Efficiency is defined so that it takes into consideration; the annual number of passengers, the number of airport operations and cargo transport. In conclusion, Gok pointed out that international airports are more efficient than regional. Welde and Odeck (2011) used DEA and SFA (Stochastic frontier analysis) and tested the effectiveness of 20 companies in the public transport infrastructure in Norway. The variables that were taken into considerations were operational and administrative expenses.

DEA method is also used also Croatia; Rabar (2010) evaluated the efficiency of Croatian hospitals, Šporčić et. al (2008) - in forestry, Neralić (1996), Hunjak and Jakovčević (2003) applied DEA in banking, etc.

Since the DEA method has been proven as relevant for assessing the efficiency of the public infrastructure projects, and since it has not yet been used in efficiency evaluation of the private sector participation model in the Republic of Croatia and in comparison with other EU countries, the following paper is presented the analyses of time series (10 years) of transport infrastructure data.

#### **3. METHODOLOGY**

DEA, according to Charles, Cooper, Rhodes (1978) measures the relative efficiency DMU (decision making units) creating a production efficiency frontier on the basis of data on expenditure inputs and the achieved objective functions (outputs) of all units, so that the most successful or the best units that determine the efficiency frontier, will receive a mark "one" and inefficiency of other units is computed according to them. It is therefore extremely important to choose quality input and output variables, since the relative efficiency of certain units represents the total amount ratio of weight factors of input and output variables.

The aim of this paper is the relative efficiency evaluation of the private sector participation model in transport infrastructure projects using selected case studies –projects, using DEA method. These projects present mutually comparable DMU managed by the public and private sector.

According to Charles, Cooper, Rhodes (1978) the first step in applying the DEA approach is to select a model for assessing the efficiency which is focused towards achieving results. We can therefore distinguish between the CCR (Charnes-Cooper-Rhodes) model which assumes constant returns and the BCC (Banker-Charnes-Cooper) model that assumes variable returns. Due to the specifics of the processes of project management of transport infrastructure, both the CCR model and BCC model will be used. Although both models can be input-oriented or output-oriented (Cook, Tone and Zhu, 2014), this study was conducted using the input-oriented model direction and therefore the efficiency of the private sector will be assessed on the basis of minimization of inputs.

#### 3.1. Charnes-Cooper-Rhodes (CCR) model

According to Cooper et al. (1984), CCR model is based on the assumption of constant returns. It is the most widely known and used DEA model. It was named after its authors Charnes-Cooper-Rhodes, who had first published it in the *European Journal of Operational Research (1978)*. The model is based on the fact that any feasibility activity (xy) causes feasibility activities  $(x_ty_t)$  for every positive number  $t \in R$ , and seeks to maximize each observed  $h_k$  DMU (efficiency "k" unit of DMU). Each variable is assigned weight ratio that provides the virtual inputs and virtual outputs, which present the mathematical problem and can be written as (Cooper et. al., 2006):

Virtual input =  $v_1 x_{1o} + \dots + v_m x_{mo}$ Virtual output =  $u_1 y_{1o} + \dots + u_s y_{so}$ 

After defining the virtual inputs and outputs, the goal is to determine the weight in order to maximize their ratio. This assessment of the relative efficiency of DMU is achieved by computing the following linear programming problems (Cooper et. al., 2006:23.):

$$\max \theta = \frac{u_1 y_{10} + u_2 y_{20} + \dots + u_s y_{s0}}{v_1 x_{10} + v_2 x_{20} + \dots + v_m x_{m0}}$$
  
subject to: 
$$\frac{u_1 y_{1j} + \dots + u_s y_{sj}}{v_1 x_{1j} + \dots + v_m x_{mj}} \le (j = 1, 2, \dots, n)$$
$$v_1, v_2, \dots, v_m \ge 0$$
$$u_1 u_2, \dots, u_s \ge 0$$

Such fractional linear mathematical program can be replaced with an exact linear program in the form of multipliers:

$$\max \theta = \mu_{1} y_{10} + \dots + \mu_{s} y_{s0}$$
  
subject to:  $v_{1} x_{10} + \dots + v_{m} x_{m0} = 1$   
 $\mu_{1} y_{1j} + \dots + \mu_{s} y_{sj} \le v_{1} x_{1j} + \dots + v_{m} x_{mj}$   
 $v_{1}, v_{2}, \dots, v_{m} \ge 0$   
 $\mu_{1}, \mu_{2}, \dots, \mu_{s} \ge 0$ 

The optimal solution of mathematical linear programming is presented with ( $\theta^* v^* u^*$ ), where *v* and *u* represent weight vectors of inputs and outputs.

CCR model efficiency definition (Cooper et al., 2006:24):

- (1) DMU is efficient if  $\theta^* = 1$  and there exisit at least one optimal  $(v^*u^*)$ , such that  $v^* > 0$  i  $u^* > 0$
- (2) Otherwise, DMU is inefficient

The efficient DMUs define the efficiency frontier, which is shown in the form of straight line in the CCR model due to assumptions of constant returns. The CCR model can be graphically explained using the example with one input and one output variable. *Figure 1* shows an example of efficiency analysis of 6 DMUs. Efficiency frontier defines DMU "M" indicated by the straight line (due to the fact that we have only two variables, one input and one output). Inefficient DMUs (X, O, Z, E, S) are shown below the efficiency frontier. Their projection on the efficiency frontier is achieved by reducing the inputs and/or by increasing the outputs. For DMU "E" point "P" is the projection on the efficiency frontier according to the input-oriented CCR model and point "L" to the output-oriented CCR model (Rabar, 2010).

Figure 1: CCR-efficiency production frontier with one input and one output variable with 6 DMUs



Source: Author

#### 3.2. Banker-Charnes-Cooper (BCC) model

Named as it authors, Banker, Charnes and Cooper, the model was first published in 1984. Unlike the CCR model, BCC represents variable returns. It is based on the theory of proportionality, i.e., when a proportional increase or decrease of the variable inputs results in a more or less proportional increase / decrease in the variable output. According to Yu-Chen (2010), it can be defined by the following expression:

$$(Max)h_{k} = \sum_{j=1}^{n} \mu_{j}y_{jk} + u_{*}$$

$$\sum_{i=1}^{m} v_{i} x_{ik} = 1$$

$$\sum_{j=1}^{n} \mu_{j} y_{jk} - \sum_{i=1}^{m} v_{i} x_{ik} + u_{*} \le 0, \quad k = 1, 2, ..., n$$

$$\mu_{i} \ge \epsilon, \qquad j = 1, 2, ..., n \ i \ v_{i} \ge \epsilon, i = 1, 2, ..., m$$

Where it is:

*h<sub>k</sub>*: efficiency *k*-unit DMUs result, *y<sub>j</sub>*: represent *j*- *output* of the *k*-DMU's, *x<sub>i</sub>*: weight ratio of the *i-input*, μ<sub>j</sub>: weight ration of the *j*-output, *n*: number of outputs, *m*: number of inputs, a *u<sub>\*</sub>*: an additional variable that defines the impact of volume.

Unlike the CCR model, BCC-efficiency represents a variable return in relation to the scope while graphical efficiency frontier has a form of a convex curve. The output oriented BCC model is a different from of the identical CCR model with an additional restriction, which can be expressed as:

$$\sum_{j=1}^n \mu_j = 1$$

Subject to:  $\mu_j \ge 0$ , for  $\forall j$ 

Because of the additional restrictions the BCC efficiency frontier is significantly different form the CCR efficiency frontier. If we consider the example with one input and one output as shown in *Figure 2*, in which we analyze the efficiency of 6 units, the effectiveness of the CCR model defines the direction p, while the efficiency of the BCC model defines the direction p'. Since each inefficient DMU is closer to its BCC than its CCR projection, the BCC efficiency is more easily achievable and the BCC efficiency model is never lower than the CCR model, regardless of the selected direction.

Figure 2: Frontier of BCC and CCR model efficiency with one input and one output



Source: Author

#### 4. EFFICIENCY ANALYSIS

The efficiency assessments of the private sector participation model in the sector of transport infrastructure (highways), include the selected indicators analysis of transport infrastructure projects, i.e. DMUs that implement projects in Croatia and selected EU countries. The restriction of the model was placed exclusively to those groups of samples which are currently in implementation and for which there is a time series of data for more than 10 years, due to significant objectivity assessment. Two basic groups of samples were established from the selected DMUs variables. The first group of samples was related to those transport infrastructure projects where the public sector is the contractor and the implementer, while the

second group of samples is related to projects where the public sector is exclusively the contractor or the regulator, while the implementer is the private sector. In such projects, we selected only those where the private sector bears the operational risks, i.e. besides the construction risks, the private sector bears at least the availability risk (maintenance, management). Taking into account the model restrictions, this study identified 20 DMUs, i.e., *Operators* that are owned by the public and private sector and they are listed in *Table 1*.

DMU	Operator (DMU)	Country	Investment model	Operational risks	
DMU <sub>1</sub>	Autocesta Rijeka-Zagreb	Croatia	Public company	Public	
DMU <sub>2</sub>	HAC	Croatia	Public company	Public	
DMU <sub>3</sub>	Bina Istra	Croatia	Concession/PPP	Private	
DMU <sub>4</sub>	Autocesta Zagreb-Macelj	Croatia	Concession	Private	
DMU <sub>5</sub>	DARS	Slovenia	Public company	Public	
DMU <sub>6</sub>	Autostrada per Italia	Italy	Public company	Public	
DMU <sub>7</sub>	BSPD (Brescia-Padova)	Italy	Concession	Private	
DMU <sub>8</sub>	Autostrada del Brennero	Italy	Public company	Public	
DMU <sub>9</sub>	Torino-Milano (TOMI)	Italy	Concession	Private	
DMU <sub>10</sub>	Hungarian public road company	Hungary	Public company	Public	
DMU <sub>11</sub>	DAK	Hungary	Public private partnership	Private	
DMU <sub>12</sub>	Czech Highways	Czech Republic	Public company	Public	
DMU <sub>13</sub>	Národná diaľničná spoločnosť (NDS)	Slovakia	Public company	Public	
DMU <sub>14</sub>	AWSA	Poland	Public private partnership	Private	
DMU <sub>15</sub>	Stalexport autostrady	Stalexport autostrady Poland P		Private	
DMU <sub>16</sub>	SANEF group	France	Concession	Private	
DMU <sub>17</sub>	APRR group	France	Concession	Private	
DMU <sub>18</sub>	ASF	France	Concession	Private	
DMU <sub>19</sub>	ESCOTA	France	Concession	Private	
DMU <sub>20</sub>	ASFINAG	Austria	Concession	Public	

Table 1. Highway Operators in Croatia and selected EU countries

Source: Author

#### 4.1. Inputs and outputs variables selection

The right selection of input and output variables is the key step in assessing the efficiency of the private sector participation model using DEA method. Although the transport infrastructure sector has a large variety of data, such as costs (construction, maintenance), trends, structure of employees, etc. it is necessary to adjust them to a common denominator and convert them into useful resources in the form of *inputs* and cover the main results in the form of *outputs*. According to Charles, Cooper and Rhodes (1978), this represents an element of model subjectivity and one of its basic limitations. One of the requirements is for all the variables to be positive (nonnegative) and that the connection between them leads to positive changes in the output, without a decrease in the value. Taking all this into consideration, for this research we selected two input and two output variables:

Inputs variables:

- (X1) Operational cost per kilometer
- (X2) Number of employees per kilometer

Output variables:

- (Y1) Annual average daily traffic (AADT) per kilometer
- (Y2) Total revenues per kilometer

The main reason for choosing these input variables is that the  $(X_1)$  O&M costs represent a significant item in all highway projects; it is measurable, it can be identified from secondary data sources and represents a significant indicator in determining the efficiency of the DMU. The number of employees  $(X_2)$  gives us a useful resource that demonstrates the efficiency of DMU in performing everyday operations. On the other hand, selection of the output variables points to the essential part of DMU operations and the main purpose of existing transport infrastructure (highways), which is the amount of transport (variable  $Y_1$ ) and total revenue (variable  $Y_2$ ), which is used to pay off the whole life costs (WLC), that result from use of the infrastructure.

By comparing the results, the goal is to demonstrate the efficiency of DMUs, i.e. the application of the private sector participation in the transport infrastructure projects in Croatia and selected EU countries (France, Poland, Slovenia, Czech Republic, Slovakia, Italy, Austria and Hungary) respectively.

#### 4.2. Empirical data

In the private sector participation model, the contract between the public and the private sector usually exceeds 30 years; it is thus necessary to observe the data over a longer period. For the purpose of efficiency assessment, the empirical values of input and output variables have been collected over the period of 10 years, which allows us to determine the trend and provide a more objective assessment. All of the data was obtained from DMUs annual financial statements, National statistical reports and other sources (such as  $ASECAP^2$ ) for the period 2005-2015. The data from each report will not be presented separately, but it is displayed in *Table 2* in the form of descriptive statistics of all inputs and outputs included in analysis. For the purpose of mutual comparability, all variables are denominated by the number of kilometers.

<sup>&</sup>lt;sup>2</sup> ASECAP – The European Association of Operators of Toll Road Infrastructure

	Input va	riables	Output	variables
	X1	X2	¥1	Y2
Minimum	48.844,73	1,04	10,35	140.312,36
Maximum	2.314.940,48	5,32	790,43	3.111.445,99
Mean	435.243,86	2,43	137,11	779.385,18
Standard Error	23.000,59	0,07	11,93	35.885,52
Median	367.162,33	2,18	36,24	745.056,48
Standard Deviation	327.707,99	0,99	169,97	511.289,89
Kurtosis	8,73	- 0,38	1,40	5,72
Skewness	2,24	0,69	1,45	1,89

Table 2: Descriptive statistics data of input and output variables

Source: Author's calculations

#### 4.3. Model selection and model orientation

Although the research can be carried out using the CCR model or the BCC model, at this stage we do not have enough information to select a specific model, thus the research will be conducted with the use of both the CCR model and the BCC model. In the second step, it is necessary to choose the orientation of the model, i.e. input-oriented or output-oriented. Usually, the model orientation depends of the DMUs strategy plan, but in the public infrastructure projects, where the main goal is providing public services, the relevant public authority is responsible for defining the strategy, while the DMU (public or private company operator) is only responsible for bearing and managing operational risks of the specific project or contract. (i) The objective of the input-oriented model in assessing efficiency is to reduce the resources (inputs) while satisfying at least the current level of results (outputs), while on the other hand, (ii) the objective of the output-oriented model is to maximize the results (outputs) while satisfying at least the current level of resources (inputs). Depending on the specifics of the transport infrastructure and due to the fact that DMUs could only influence the available resources (input), the input-oriented model was selected for further research.

#### 5. RESEARCH RESULTS

The efficiency analysis of the private sector participation model was conducted on the basis of data from *Table 2* using computer software *Frontier Analyst Banxia Software*. The analysis was carried out using the input-oriented CCR and BCC model. Although the software allows input and output coefficient limitation weights, such restrictions were not applied. The software allows complete flexibility in the choice of input and output weights (for both models), that allow each unit of DMU to achieve maximum efficiency, avoiding subjectivity analysis involvement, in such a manner that weight coefficients are added by inadequate indicators. Consequently, any operator included in the efficiency analysis, will be determined by such input-output orientation, which will be expressed as maximum efficiency, according to the conditions and restrictions set forth in the text for the CCR and the BCC model.

The analysis of relative efficiency was conducted in three steps. In the first step the goal is to calculate relative efficiency based on 10-years average data of two input and two output indicators for each DMU. The analysis is performed using the basic CCR and BCC models with input-orientation model. In the second step, the main aim is to provide CCR or BCC analysis over the time through longitudinal (panel) DEA analysis using "Windows analysis",

and finally in the third step statistical significance test between efficiency score of private and public sector was conducted.

#### 5.1. Relative efficiency results

Based on 10-years averaged data, the relative efficiency analysis was conducted using inputoriented CCR and BCC model. The *Table 3*, presents the relative efficiency results for each DMU included in the analysis.

	CCR model	BCC model
No	Relative	Relative
	efficiency	efficiency
DMU <sub>1</sub>	30,84%	40,50%
DMU <sub>2</sub>	26,03%	84,34%
$DMU_3$	100%	100,00%
$DMU_4$	100%	100,00%
DMU <sub>5</sub>	45,41%	59,50%
DMU <sub>6</sub>	99,25%	100,00%
DMU <sub>7</sub>	73,04%	73,24%
$DMU_8$	61,42%	61,46%
DMU <sub>9</sub>	99,54%	100,00%
DMU <sub>10</sub>	31,09%	100,00%
$DMU_{11}$	100,00%	100,00%
DMU <sub>12</sub>	39,28%	61,28%
DMU <sub>13</sub>	68,07%	80,91%
DMU <sub>14</sub>	74,73%	75,95%
DMU <sub>15</sub>	56,34%	78,07%
DMU <sub>16</sub>	90,82%	90,85%
DMU <sub>17</sub>	100,00%	100,00%
DMU <sub>18</sub>	77,31%	77,41%
DMU <sub>19</sub>	81,15%	83,79%
DMU <sub>20</sub>	100,00%	100,00%

Table 3: Relative efficiency results of CCR and BCC models

Source: Author's calculation (using Frontier Analyst Banxia Software)

As indicated in the first step, presented in *Table 3*, using the CCR model (constant returns) and the BCC model (variable returns), the maximum efficiency is achieved by DMUs where the operational risks is mainly borne by the private sector. By comparing the average of the CCR relative efficiency of all DMUs, the result is 72.72%. This means that the average *Operator*, in order to achieve the same output, must use 72.72% inputs on average. However, it is indicated that in order to be more efficient or competitive the average Operator must produce more outputs with the same amount of resources (inputs), i.e. 37.52%<sup>3</sup> more outputs. On the other hand the results from the BCC model calculation show a very high relative efficiency of 83.7% which is contributed to the variable returns assumptions. This means that if the average *Operator* wants to achieve the same outputs, it must use 83.7% inputs, on average. i.e., 19.48% better results (outputs) with the same amount of resources (inputs). The standard deviation of the CCR model is 0,266 while the standard deviation of the BCC model is 0,175. The analysis also showed that CCR model is more restrictive in the evaluation

<sup>&</sup>lt;sup>3</sup> According to:  $\frac{1-0.7272}{0.7272} \times 100 = 37.52\%$ 

efficiency than the BCC model, and therefore further analysis will be carried out using the CCR model.

The analysis of input and output variables using the CCR and BCC models showed that the majority DMUs managed by the private sector are more efficient, so the question remains - which of them represent a benchmark or an example that others should follow. It is known that efficient *Operators* appear in the reference groups of inefficient *Operators* (Cooper, et. al., 1978). Therefore, the *frequency set* of efficient DMUs or Operators and a *peer contribution set* can be considered as indicators which tell us whether the efficient DMU is a benchmark that all inefficient DMUs need to reach. As the frequency in the selected reference group is higher, it is likely that this is an example to follow. On the other hand, *Peer contribution set* indicators show us the number of efficient DMUs that make the projections of inefficient DMUs efficiency frontier. With the software support of *Frontier Analyst Banxia Software*, *Table 4* presents *Frequency set* and total *Peer contribution set* for every DMU (in accordance with the CCR input-oriented model).

No	CCR efficiency model						
INO	Frequency set	Peer contribution set					
DMU <sub>1</sub>	0	3					
DMU <sub>2</sub>	0	1					
DMU <sub>3</sub>	6	0					
DMU <sub>4</sub>	2	0					
DMU <sub>5</sub>	0	3					
DMU <sub>6</sub>	0	2					
DMU <sub>7</sub>	0	3					
DMU <sub>8</sub>	0	3					
DMU <sub>9</sub>	0	3					
DMU <sub>10</sub>	0	2					
DMU <sub>11</sub>	11	0					
DMU <sub>12</sub>	0	2					
DMU <sub>13</sub>	0	2					
DMU <sub>14</sub>	0	2					
DMU <sub>15</sub>	0	2					
DMU <sub>16</sub>	0	2					
DMU <sub>17</sub>	10	0					
DMU <sub>18</sub>	0	2					
DMU <sub>19</sub>	0	2					
DMU <sub>20</sub>	10	0					

Table 4: Frequency and Peer contribution set of all DMU's in CCR efficiency model

Source: Author's calculation (using Frontier Analyst Banxia Software)

Thus according to the analysis 5 efficient DMUs were identified. Four of them are from the private sector while one of them is from the public sector. The most efficient Operator is  $DMU_{11}$  and could be considered as a benchmark to all other DMUs. Furthermore,  $DMU_{17}$  and  $DMU_{20}$  have a relatively high frequency set and with the most successful  $DMU_{11}$  appear in reference groups (peer contribution) in the most inefficient operators that are included in sample.

#### 5.1.1. Analysis of sources of relative inefficiency

With the empirical data analysis and their projection on the efficiency frontier of the efficient DMUs, it is possible to identify the sources of inefficiency and their values in input and output variables. Since the efficient DMUs have the same *empirical* and *projected* values in input and output variables, inefficient DMUs have expressed projections (contribution) which tend to reach the efficiency frontier. *Table 5* displays the average empirical data and the average projection data which inefficient DMUs should achieve in order to reach the same level of output as efficient DMUs.

Variables (per kilometer)	Empirical data	Projection data	Difference in %
Operational costs	432.504,27€	339.916,08€	-27,38%
Number of employees	2,46	1,73	-27,73%
Average annual daily traffic	139,00	144,32	15,55%
Total Revenues	801.419,25 €	801.419,25 €	0,00%

Table 5: Average Empirical data and Projection data of inputs and outputs variables

Source: Author's calculation (using Frontier Analyst Banxia Software)

According to the analysis displayed in *Table 5*, if an inefficient Operator aims to achieve the efficiency frontier of an efficient Operator in the input-oriented model (preselected), it is necessary to reduce all inputs to the average of 27.55%. If an average inefficient Operator aims to achieve efficiency frontier of the average efficient Operator, he must reduce the *Operational costs per kilometer* by 27.38% on average, the *Number of employees per kilometer* by 27.73% on average and increase the *Average annual daily traffic per kilometer* by 15.55%. *Table 6* displays the 6 most inefficient operators according to the CCR-input oriented model.

Variables	Average difference in % of the projection on the efficiency frontier (6 most inefficient Operators)						
(per knometer)	$(DMU_1)$	$(DMU_2)$	$(DMU_5)$	$(DMU_{10})$	$(DMU_{12})$	$(DMU_{13})$	
Operational costs	-69,16%	-73,97%	-54,59%	-68,91%	-60,72%	-31,93%	
Number of employees	-69,05%	-82,24%	-54,55%	-69,09%	-60,98%	-31,76%	
Average annual daily traffic	0,00%	92,50%	0,00%	26,92%	23,25%	60,80%	
Total revenues	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	

Table 6: Six most inefficient operators according to CCR-input oriented model

Source: Author's calculation (using Frontier Analyst Banxia Software)

The 6 most inefficient operators are those whose operational risks are borne by the public sector. From all the samples included in the analysis we can conclude that public sector Operators in the Central and South-east Europe are the most inefficient, according to the selected input and output variables.

#### 5.2. Windows analysis

Analysis of relatively efficiency based on averaged empirical data (10 years average), conducted in the first step, does not show a deep picture of efficiency through time and some incorrect explanation can be considered. Due to that reason, the main aim in second step of this analysis is to include a time frame and conducted evaluation over the time through longitudinal (panel) DEA analysis, using "windows analysis". According to (Charnes et. al, 1987) window analysis calculates efficiency over the time and is useful for detecting trends of DMU's on the principle of moving averages. It establishes efficiency measures by treating each DMU in different periods as a separate unit. According to Charnes et. al. (1987), one

*window* present one year. *Table 7.*, presents the relative efficiency results from *window analysis* of each DMU from 2005-2015.

DMU	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
DMU1	40,99%	37,82%	40,58%	33,94%	37,25%	38,44%	49,50%	34,79%	46,78%	39,47%	44,10%
DMU2	46,50%	43,45%	38,83%	29,89%	25,99%	22,70%	25,93%	21,48%	25,44%	25,93%	28,14%
DMU3	100%	100%	100%	100%	100%	100%	100%	83,59%	100%	100%	100%
DMU4	100%	100%	90,70%	92,96%	93,74%	100%	100%	100%	100%	100%	100%
DMU5	43,16%	40,84%	44,12%	42,39%	42,00%	32,80%	48,41%	46,30%	40,04%	47,66%	45,30%
DMU6	83,04%	82,80%	100%	100%	99,59%	69,48%	98,77%	89,16%	91,59%	88,35%	88,12%
DMU7	64,49%	100,00%	75%	69,83%	63,83%	41,89%	62,40%	66,37%	69,30%	68,63%	69,82%
DMU8	63,87%	70,33%	66,34%	67,32%	64,79%	41,29%	59,97%	50,66%	43,36%	53,49%	51,82%
DMU9	82,18%	82,22%	87,56%	83,11%	86,47%	72,88%	100%	100%	100,00%	100%	100%
DMU10	35,66%	33,42%	35,94%	31,62%	32,39%	18,79%	25,91%	30%	28,40%	26,03%	27,02%
DMU11	n/a	n/a	n/a	100%	100%	100%	100%	100,00%	100%	100%	100%
DMU12	47,46%	44,30%	43,83%	38,15%	39,00%	22,69%	29,40%	37,46%	39,04%	35,01%	30,31%
DMU13	84,57%	81,51%	78,89%	75,14%	76,35%	40,79%	72,29%	73,79%	42,84%	42,77%	44,33%
DMU14	100%	100%	100%	98,87%	84,39%	57,40%	49,58%	56,33%	61,89%	58,09%	59,37%
DMU15	58,57%	48,57%	44,80%	47,77%	49,80%	88,29%	87,96%	56,36%	73,66%	64,35%	63,64%
DMU16	100%	100%	94,55%	89,21%	89,00%	69,02%	90,76%	72,22%	74,16%	75,21%	68,87%
DMU17	94,79%	99%	100%	97,61%	89,59%	66,29%	97,53%	87,86%	92,75%	90,39%	86,86%
DMU18	80,71%	79,70%	79,07%	77,85%	72,73%	56,43%	75,32%	62,14%	65,47%	66,11%	65,66%
DMU19	81,98%	81,89%	80,33%	78,77%	74,10%	59,85%	78,66%	75,18%	70,59%	70,72%	74,42%
DMU20	88,38%	79,21%	83,63%	100%	100%	100%	100%	100%	100%	100%	100%

Table 7: Windows analysis - Relative efficiency results of input oriented CCR model

Source: Author's calculation (using Frontier Analyst Banxia Software)

According to the windows analysis results displayed in *Table 7.*, it can be seen that the most successful year was 2006., where the average efficiency level of all DMU's was at 75,25%, while the lowest relative efficiency results of all DMU's was in the year 2010., when the average efficiency level was at 59,95%. These indicators can be observed in the context of economic growth and development, in which the increase of GDP is directly correlated with the level of traffic of the operators (Banister, Berechman, 2001). According to the results from windows analysis, it is interesting to compare the efficiency results from the analysis that was made from two different approaches. However, I have to point out that *window analysis* is much more objective than analysis based on average values. In the *Table 8*, it is presented comparative analysis of 6 most inefficient DMU's from two different approaches.

6 most inefficient operators					
Analysis based on averaged data	Windows analysis				
DMU <sub>1</sub>	DMU <sub>1</sub>				
DMU <sub>2</sub>	DMU <sub>2</sub>				
DMU <sub>5</sub>	DMU <sub>5</sub>				
DMU <sub>10</sub>	DMU <sub>8</sub>				
DMU <sub>12</sub>	$DMU_{10}$				
DMU <sub>13</sub>	DMU <sub>12</sub>				

Table 8: Comparative analysis of 6 most inefficient DMU's from two different approaches

Source: Author's calculation

As reported in the both analysis, almost all inefficient operators are the same in (i) *windows analysis* and in the (ii) analysis based on averaged data. The only difference is in identification of the most inefficient operator. In the first analysis, it was identified as  $DMU_2$  while in the *windows analysis* is  $DMU_{10}$  ( $DMU_2$  is on the second place).

Although these data are limited by the number of input-output variables that are taken into consideration, in both approaches the most inefficient operators are those whose operational risks are borne by public sector. For that reason, in the third step of this research is presented the test of statistical significance between efficiency score of public and private sector operators based on efficiency results from *Table 3*. The analysis was conducted using statistical t-test with program support of Microsoft excel.

Operators	Public sector operators	Private sector operators			
Mean	0,5571	0,8663			
Variance	0,08155385	0,022599268			
Observations	9	11			
<b>Pooled Variance</b>	0,048801304				
df	18				
t-Stat	-3,11405565				
P(T<=t) one-tail	0,002996078				
t Critical one-tail	1,734063607				
P(T<=t) two-tail	0,005992155				
t Critical two-tail	2,10092204				

*Table 9: Statistics t-test of public and private sector operators with*  $\alpha$ =0,05

Source: Author's calculation (with support of Microsoft excel)

According to the analysis displayed in *Table 10*, there is a statistical significance between public and private sector operators. Although the results from this paper shows the maximum efficiency from the private sector operators, analysis of relative efficiency, as well as sources of relative inefficiency, can provide general guidance for decision makers and enable them to deeper understanding of the problems and take measures to eliminate inefficient conditions.

#### 6. CONCLUSION

The efficiency of the private sector participation model in construction and maintenance of transport infrastructure (highways) in Republic of Croatia and selected EU countries, mainly

from Central, East and South-East Europe was evaluated through the application of DEA method. The main objective of this analysis is the assumption that "the private sector is a better manager of complex investment projects than the public sector" (Friedman & Boorstin, 1996). The analysis was carried out by firstly identifying he decision making units (DMU) that represent highway Operators in Croatia and selected EU Countries. Secondly, it was determined which Operators in the private sector born operational risk which enabled to determine the projects that have one of the characteristics of the Private sector participation models (such as concessions, public-private partnerships, etc.).

Due to the fact that decisions about transport infrastructure projects (such as highways) cannot be exclusively made on the basis of direct financial assumptions such as revenues, costs, yield, etc. for the purpose of the analysis, we have selected two input and two output variables, whose selection represents a decisive qualitative and quantitative factors in decision making. As the set objective of the analysis is to increase efficiency through the reduction of the resources or inputs the analysis was carried out using the input-oriented CCR and BCC models. Due to the differences in the observed results further analysis was carried out using the input-oriented CCR model which is considered more restrictive and credible.

The efficient and inefficient DMUs were identified by the research and results of the relative efficiency of both models were presented. Further analysis determined the amounts of inefficiency and the projection on efficiency frontier was displayed for inefficient DMUs. Additionally, we computed the sources of inefficiency in all variables for inefficient DMUs, which serves as the basic tool for decision-makers in further actions in order to increase the efficiency of transport infrastructure projects. Also, for deeper understanding and providing a wider picture of the efficiency results, a *windows analysis* was carried out.

Using the DEA method on the selected groups of samples in the Republic of Croatia and selected EU countries with the corresponding input and output variables supports the assumption that the use one of the models that include *private sector participation in construction and maintenance* in the sector of transport infrastructure (highways) is more efficient than traditional forms of delivery in which the public sector bears operational risks.

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# IS PERSONAL OVER-INDEBTEDNESS AN IMPORTANT FACTOR ON THE LABOUR MARKET?

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### ABSTRACT

People with serious debt problems suffer on the labour market and/or often suffer some of the same characteristics as the working poor. Their financial problems reinforce socioeconomic dependency, jeopardizing their employability, which further contributes to a decrease in employment perspectives for the unemployed to enter or return into the labour market. Over-indebtedness increases social exclusion and poverty and causes vulnerability. Many of the developed European and post-transitional countries have witnessed significant increases in personal over-indebtedness in the last few decades. This causes concern about the economic and social impact of the phenomenon, primarily because such a situation leads to a deterioration in households' social and economic well-being. While there were relatively abundant resources on personal over-indebtedness and employability, the linker between these two factors have been largely neglected. According to the available resources, the idea of the authors is to provide an overview about the situation in various countries regarding the link between personal over-indebtedness and the labour market.

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### 1. INTRODUCTION

There is relative abundance of information and an extended analysis on the scope and importance of personal over-indebtedness in the literature, but this phenomenon has not been linked to the labour market very often. Personal over-indebtedness can cause nonparticipation and/or limited access to the labour market, which leads to poverty, vulnerability and social isolation. Although there is a lack of reliable data on the relationship between exclusion from social processes caused from the lack of access to the labour market and overindebtedness, one can argue that these are two separate issues with relatively strong links. The aim of this paper is to examine whether over-indebtedness interacts with weak access to the labour market, and what are the consequences of such relationships.

Firstly, it is necessary to define the phenomena in question. While there is no single official definition, according to the conventional definitions, over-indebtedness is the inability of people to meet their household's financial obligations (i.e. to pay their bills including mortgage and rent) and fulfil the repayments on any consumer credit they have. The actual number of over-indebted people can be assessed, but due to the lack of a single official definition of over-indebtedness, it is difficult to carry out the precise assessment.

On the other hand, social exclusion is a multi-dimensional phenomenon, which weakens the relationship between the individual and the community. This relationship can have an economic, political, socio-cultural and even spatial dimension. The higher the number of dimensions an individual is exposed to, the more vulnerable he or she becomes. Exclusion is most commonly spotted in the access to the labour market, but it is also related to the inability to use most of the essential social services, lack of adequate human rights and similar. Social exclusion is often linked to unemployment and poverty, but these are not its only causes. The modern concept of social exclusion clearly accepts that over-indebtedness is one of the most important reasons for social exclusion that can also aggravate other causes of social exclusion, primarily through lower self-esteem, limiting self-reliance capacity, negative effects on person's health, his or her ability for education and up-skilling and so on (Steward et al, 2017).

Over-indebtedness can have grave consequences on the health of affected people. It can endanger their psychological stability and cause the feeling of fear, crisis, anxiousness, stress and frustration. Over-indebted persons often have significantly worse health conditions; they suffer from continuous feelings of exhaustion, and endure more physical pain in comparison to the total population (Mossakowski, 2008, European Commission, 2013.). These factors also negatively impact their position on the labour market, which as a backlash and can further propel them into personal over-indebtedness.

The best exit from debt and unemployment is to encourage people to become financially and mentally empowered to make well-considered choices. Thus, leading to success with finances and an improved position on the labour market for the short and long term. Financial education could help to increase someone's financial competence, while up-skilling, training and further specialisation improve their position on the labour market. The best results are achieved if users are reached at an early age although adequate results are possible during the adulthood as a part of lifelong learning process.

After this Introduction, Section 1 is devoted to the relationship between personal overindebtedness and human capital. Section 2 describes the situation in and relation of overindebtedness and employment in various EU countries. The third section discusses the measures regarding reducing over-indebtedness and improving the position of such persons on the labour market. The final section is comprised of the conclusions and recommendations.

# 2. PERSONAL OVER-INDEBTEDNESS AND HUMAN CAPITAL

The concept of human capital is broader than just the formal education of the labour force, because it includes all knowledge and skills acquired formally, informally and investment in health under the broadest definition. The level of human capital does not need to be the same as the average level of formal education, because there should be a focus of attention dedicated to the health situation of the population. The text begins with an explanation of employability, where adequate attention is given to the skills and characteristics of successful employability.

The lack of or weak access to the labour market is closely related to the low level of employability. Employability can be defined as the extent to which employees have skills, personal characteristics and attitudes that employers deem as attractive and of economic value. Although the concept of employability is slightly ambiguous, all definitions seem to converge to employability being more than the capacity for *getting a job*. It also involves the effectiveness at work and the ability to adapt to the changing working environment. According to the Dearing Report (UK) (Her Majesty's Stationery Office, 1997), *employability skills* is a term commonly used to cover a group of key basic and transferable skills. The main areas that are highlighted as being beneficial to employers and, therefore, to current and future workers include: communication skills, problem solving skills, analytical skills, data analysis, critical appraisal, time management, and team working.

The ILO (2002) defines employability as a key outcome of education and training of high quality, as well as a range of other policies. It encompasses the skills, knowledge and competencies that enhance a worker's ability to secure and retain a job, progress at work and cope with change, secure another job if she/he so wishes or has been laid off, and enter more easily into the labour market at different periods of the life cycle. Individuals are most employable when they have broad-based education and training, basic and portable high-level skills, including teamwork, problem solving, information and communications technology (ICT) and communication and language skills, learning to learn skills, and competencies to protect themselves and their colleagues against occupational hazards and diseases. This combination of skills enables them to adapt to changes in the world of work. Employability also covers multiple skills that are essential to secure and retain decent work.

The Conference Board of Canada's Employability Skills Forum and the Business and Education Forum on Science, Technology and Mathematics (2015) define that employability skills include communication, problem solving, positive attitudes and behaviours, adaptability, working with others, and science, technology and mathematics skills. They divide employability skills into fundamental employability skills, personal management skills and teamwork skills. However, employers appraised differently various characteristics of employability (Table 1).

Characteristic	Explanation				
	Able to express one's ideas clearly and confidently in speech, speak so others				
Verbal communication	pay attention and understand, listen and ask questions, to understand and share				
	information using a range of information and communications technologies				
Teamwork	Work confidently within a group, appreciate the points of view of others				
Commercial awareness	Understand the commercial realities affecting the organisation				
	Capability to gather information systematically to establish facts, principles				
	and rules, assess situations and identify problems, seek different points of				
Analysing investigating	view and evaluate them based on facts, recognize the human, interpersonal,				
Analysing, investigating,	technical, scientific and mathematical dimensions of a problem, identify the				
problem solving	root cause of a problem, be creative and innovative in exploring possible				
	solutions, readily use science, technology and mathematics as ways to think,				
	gain and share knowledge				
Initiative and colf	Ability to secure and retain a job, progress at work, capability to act on				
mutative and sen-	initiative, identify opportunities and proactive in putting forward ideas				
motivation	solutions				
	Determination to get things done, make things happen and constantly looking				
Drive	for better ways of doing things, competencies to protect themselves and their				
	colleagues against occupational hazards and diseases				
	Able to express yourself clearly in writing, locate, gather and organize				
Written communication	information using appropriate technology and information systems; access,				
	analyse and apply knowledge and skills from various disciplines				
Planning and organising	Ability to plan activities and perform them through effectively				
Flexibility	Adapt successfully to changing situations and environments				
Time management	Ability to manage time effectively, prioritising tasks and able to work to				
	deadlines				

Table 1a: 10 most important skills that are characteristics of successful employability

Table 1b: Other skills that are also important of successful employability

Global skills	Knowledge and ability to speak and understand other languages. Appreciation					
	of other cultures					
Negotiating & persuading	Ability to influence and convince others, to discuss and reach agreement					
Leadership	Capacity to motivate and lead others					
Numeracy	Decide what needs to be measured or calculated observe and record data using					
	appropriate methods, tools and technology make estimates and verify					
	calculations, understanding and working with numerical and graphical					
	information, drawing conclusions, explaining findings, making deductions and					
	detecting suspect deductions by others					
Computing skills	Word-processing, using databases, spreadsheets, the Internet and email,					
	designing web pages etc.					
Self-awareness	Awareness of achievements, abilities, values and weaknesses					
Personal impact and	Having a strong, professional, positive image to others which inspires					
confidence	confidence and commands respect					
Lifelong learning	Willingness to learn throughout life and readiness to develop the					
	competencies needed for current and future jobs and social roles					
Stress tolerance	Resistance to stress and ability to maintain effective performance under					
	pressure					
Integrity	Respects of and adheres to standards and procedures, maintains confidentiality					
	and questions inappropriate behaviour					

Independence	Accepts responsibility for views and actions and able to work under their own
	direction and initiative
Developing	Pays care and attention to quality in all their work. Supports and empowers
professionalism	others
Action planning	Able to decide what steps are needed to achieve particular goals and then
	implement these
Decision-making	Determines the best course of action. Evaluates options based on logic on fact
	and presents solutions
Interpersonal sensitivity	Recognition and respect to different perspectives, openness to the ideas and
	views of others
Creativity	Generates and applying new ideas and solutions

Source: Various sources, mostly adjusted from ILO (2002), University of Kent (2016), The Conference Board of Canada (2015)

Brown and Lauder (2009) underline that educational systems – particularly high education – around the world are evolving in conjunction with wider structural transformations in advanced, post-industrial economies. This causes concerns around the distribution and equity of students' professional and economic opportunities, as well as the traditional role of education system in facilitating access to desired forms of employment (Scott, 2005).

If we analyse the human capital in the broader context, including employability and personal health situation, private over-indebtedness can also be a significant factor that seriously influences a person's health and thus reduces the employment possibilities and one's competitiveness on the labour market (European Commission, 2013). Bad health or serious illness in a family can cause personal over-indebtedness - due to the need to cover health costs. In these circumstances, it is necessary to spend a significant part of limited financial resources for health protection. On the other side, it can also be the consequences of personal over-indebtedness, while such persons are often in permanent stress and they worry for the future of their family.

In the EU, there is no standard definition of over-indebtedness and therefore, no set of standardised, and harmonised, statistics on it (European Commission, 2008). In Germany for example, personal indebtedness has been defined as a situation where household income 'in spite of a reduction of the living standard, is insufficient to discharge all payment obligations over a long period of time (Haas, 2005). In the UK, the focus is on arrears in paying regular bills. Thus, over-indebtedness is defined as a situation where households or individuals are in arrears on a structural basis, or at a significant risk of getting into arrears in a structural basis (OXERA, 2004). A study carried out for the European Commission (2008) to develop a common definition across the EU put forward a set of criteria to be applied. Among others, over-indebtedness implies an inability to meet recurring expenses and, therefore, it is as an ongoing rather than a temporary, or one-off, state of affairs. Such an adverse situation is not possible to resolve simply by borrowing more. For a household to meet its commitments, it requires it to reduce its expenditures substantially or find ways of increasing its income. Accordingly, an over-indebted household is, defined as one whose existing and foreseeable resources are insufficient to meet its financial commitments without lowering its living standards, which has both social and policy implications if this means reducing them below what is regarded as the minimum acceptable in the country concerned (European Commission, 2010). Thus, due to the lack of an internationally accepted definition, all possible direct comparisons of personal indebtedness in various countries can be misleading (European Commission, 2010).

The most reliable source for eventual international comparisons are the RU-SILC data. In the EU-SILC, the forms of debt distinguished arise from:

- being overdrawn on a bank account due to financial difficulties, with interest being charged on the amount concerned but with no fixed schedule of payments;
- having an un-cleared balance on a credit or store card at the end of the month for at least the last 3 months specifically because of financial difficulties rather than because of using the credit as a means of smoothing expenditure in relation to income;
- being in arrears in meeting the payment due on credit or loans for non-housing purposes for financial reasons;
- being in arrears in paying the costs of servicing housing loans or utility and other bills relating to housing; and
- being in arrears in paying other, non-housing related bills.

According to the EU-SILC 2008, the proportion of people living in households with outstanding debts and/or arrears of over 100% of disposable income for different categories of household. It was in Belgium 2.1%, Czech Republic 1.9%, Denmark 2.0%, Germany 10.2%, Estonia 0.7%, Ireland 3.9%, Greece 5.3%, Spain 1.1%, France 2.3%, Italy 3.5%, Cyprus 7.8%; Latvia 1.8%; Lithuania 0.1%; Luxembourg 0.7%, Hungary 2.5%; Malta 0.9%, Netherlands 1.8%, Austria 6.7%, Poland 0.0%, Portugal 1.0%, Romania 1.7%, Slovenia 4.4%, Slovakia 1.9%, Finland 1.0%, Sweden 0.6% and UK 11.8%. The EU average was 4.6%.

Many studies have confirmed that personal indebtedness has the undesirable and dangerous effects on health, such as rapid weight loss, frequent headaches, nervous distress and excessive use of drugs, especially painkillers. For Finland, Hintakka et al. (1999) concluded that the use of sleeping pills and other sedatives is approximately four times higher by people with problems of over-indebtedness in comparison to the overall population. Aldwin and Revenson (1986) found a significant correlation between the impossibility of the debt repayment and the adverse effects on the psychological stability of people. Kavanagh (2000) lists the adverse effects on the mental state of affected people: a sense of crisis, anxiety, fear, frustration and tension, conflicts with spouses and children, increased domestic violence, stress and depression and suicidal tendencies. Such allegations are confirmed by the research of Nykänen et al. (1995) where it was shown that over 70% of the target group of over-indebted people suffer from a mental disability, which is three times more than the total Finnish population. Every third person thinks about suicide, while it is only recorded at 3% of respondents of the total population.

Using the panel data on individuals for the United Kingdom from 1991 to 2008, Gathergood (2012) concluded that people who have difficulty paying off their financial obligations and debts, suffer twice as much from mental health problems or suffer from serious problems of anxiety compared to the entire population. Furthermore, people who have difficulty paying utility bills or repayment of mortgages are three times more likely to be ill with mental health problems than the average population. Ahlström (1998) investigating the health and quality of life of indebted Swedes, found that such persons had a very poor quality of health, especially in terms of mental health, vitality, social and physical functioning. Additionally, this group had suffered from physical pain much more than the entire population. Keese and Schmitz

(2011) for Germany reckoned that indebtedness is strongly correlated with physical and mental illness and obesity. It is particularly worrying, that according to the findings of Fitch and al. (2007) even psychiatric treatments are not very effective in dealing with mental health problems caused by over-indebtedness. A deteriorated health situation causes the increase of expenditures related to the preservation of health, which in turn probably increases indebtedness and social exclusion.

Blázquez Cuesta and Budría (2015) using Spanish data concluded that over-indebtedness, as measured by the debt-to-income ratios, is negatively associated with health. However, they find that this effect is driven by non-mortgage debts. The interplay between debt and health is not merely driven by less disposable income and resources, but depends also on the *social norm effects* in the debt-health relationship. The adverse psychological effects that burden over-indebted individuals might arise in a large part due to stigma effects. Even though financial problems hurt, people may feel relatively better once they know that a large part of the population is also affected by financial strain and debts. If household over-indebtedness is prevalent in society, households are likely to improve their perceived financial safety.

In many countries, while the over-indebted person in principle could receive health care if she or he were registered as unemployed, her or his debt probably prohibits this. If the person cannot pay debts, she or he avoids legal work (the income would be registered and state authorities would enforce payment of the debt). Furthermore, she or he cannot open a bank account (it would be registered and the state authorities would claim the money in the account). The individual cannot own property, nor inherit it from her or his parents because this would be taken as compensation towards their debt repayment (Polese, 2016). Thus, due to over-indebtedness, such people can easily worsen their already weak links to the labour market and are pushed deeper into a marginal position in society. In that way, it seems close to impossible for such people to get back into the mainstream and to be regularly accepted by society.

Because of the aggravated health condition of affected individuals caused by overindebtedness, significant social costs arise which can be classified in direct terms (the medical treatment, recuperating in hospital, medicines etc.) and indirect costs (reduction of productivity, absence because of sick leave, the costs of long-lasting medical treatment, prolonged unemployment, rehabilitation and the early retirement of affected individuals). There are also further social costs, such as increased probabilities of criminal behaviours, or children dropping-out of education. In that way, personal over-indebtedness, low levels of education, (long-term) unemployment and related poverty can be transferred to new generations (Bejaković, 2016).

Succinctly, bad mental health or serious illness caused by over-indebtedness can imperil employment possibilities, professional promotion and limit the exit from poverty and unfavourable financial situation. In addition, unfavourable position on the labour market - linked primarily with long-term unemployment and/or insufficient or irregular revenue - can force an individual into over-indebtedness and thus leading them towards health-related problems. Of course, the situation differs in various EU countries, which will be presented in the following text.

#### 3. THE SITUATION AND RELATION OF OVER-INDEBTEDNESS, EMPLOYMENT AND EMPLOYABILITY

There is a based assumption that over-indebtedness of the population is one of the most important determinants of social exclusion. Indebted people often feel isolated, which can easily lead to depression and disruption of mental health. This can further limit their employability and competence on the labour market, which keeps them in the vicious circle of unemployment, over-indebtedness and marginalization.

Davydoff et al (2008) confirm the strong links between unemployment and experiencing financial difficulty, so not being in employment causes an increased likelihood of overindebtedness in Great Britain, Belgium, and the former East Germany. The study by the Banque de France in 2004 showed that three in ten people became over-indebted through redundancy or unemployment (Gloukoviezoff, 2006). Analysis in Ireland and the UK found that unemployment status has been associated with an increased likelihood of overindebtedness (Kearns 2003; Kempson et al., 2004, Russell et al., 2011.). Similarly, unemployment was mentioned as a cause by a quarter (23%) of those in the former West Germany who were having problems with over-indebtedness, and 46% of those in the former East Germany (Hass, 2005). The particular problem is with long-term unemployment that was found to be predictive of over-indebtedness in the Great Britain (Berthoud and Kempson, 1992) and Norway even when controlled for income (Poppe, 1999). When other factors were taken into account, households where the head of household was unemployed were most likely to report arrears and problems with the over-indebtedness (Davydoff et al, 2008).

Over-indebtedness may affect an individual's health status, and thus employability, for several reasons. First, debt problems are related to lowered self-esteem, an increasingly pessimistic outlook on life, and reduced mental health due to depression, fear of the future, severe anxiety and hostility (Fitch et al., 2007; Bridges and Disney, 2010). Second, debt can cause a decline in physical health. To the extent that high repayment burdens may tighten the financial situation of families, they may be forced to save on costly medical care utilization and health protection such as, for example, healthy food, that is usually more expensive than junk food (Drentea and Lavrakas, 2000). Third, serious financial problems impede rational thinking and very often are associated with non-healthy behaviours such as addiction to alcohol, excessive drinking, smoking and excess food intake (Grafova, 2007; Wardle et al., 2012; Averett and Smith, 2014). Fourth, there is a link between financial stress and suicide. Specifically, financial problems have been found to lead to more suicide attempts than nearly all other psychological conditions, except depression (Wang et al., 2012).

In most countries where over-indebtedness has been analysed (for example, Austria, Belgium, France, Germany, Ireland, Netherland, Norway, Great Britain), it looks like the main reasons for personal over-indebtedness are life changes, particularly those related to the labour market (e.g. unemployment and/or job loss), followed by separation or divorce, sickness and similar problems. Overall access difficulties are often mentioned as a cause of income poverty and present problems in obtaining a job and contribute to the wider problem of social exclusion. Access difficulties also thwart people from participating in society. An examination of over-indebtedness shows that the consequences are very similar.

In relation to poverty, it is clear that someone who is unable to repay his/her debt faces poverty. Even if his/her income is above the poverty line, his/her disposable income (i.e. the income available for household expenditure) is insufficient to make ends meet. Of course, those different situations are not exactly the same; nevertheless, due to unemployment and/or

insufficient income people face the same process of impoverishment and social exclusion (European Commission, 2013). For better insight into the situation in various countries, in the following short text situations in three old EU members - Austria, Belgium and Netherland, and three post-transitional countries - Bulgaria, Croatia and Poland, is presented.

Austria - Compared to the other European countries, Austria has two adverse specificities: on the one hand, as a rule, full bankruptcy discharge is granted only after seven years of repayment, and on the other hand, a minimum of 10% of the debt has to be repaid. This means that it is almost impossible for people with a low income or people who are long-term unemployed and/or at risk of poverty to get the chance to make a fresh start. According to official data debt sums (average debt expressed in Euro) decreased from € 72.5 thousand in 2012, to € 70.6 thousand in 2013 and € 66.9 thousand in 2014. Reasons for over-indebtedness is unemployment or an income decrease (40.6%), failure of former entrepreneurship (19.1%), budgeting problems (15.2%), divorce / separation (12.1%) and high housing costs (11.1%) (Schuldenberatung, 2016).

**Belgium** – Very exposed to over-indebtedness and poverty are one person households of unemployed people. Especially single parents are having difficulties because they have only one income, very often from welfare benefit and not from work. According to European Commission (2013) long-term unemployment, that has increased during the crisis, in particular is a problem. In the first few months, the income is of course reduced, but not so dramatically due to the existence of unemployment benefit. After a certain period, the amount of the unemployment benefits reduces. Especially if both household members are unemployed, this can be a major problem.

**Bulgaria** – Among the causes of private over-indebtedness, Gurov (2014) emphasises extremely low financial culture of the population and distinct information deficit regarding the use of financial products as well as the combination of a strong consumer-oriented attitude in the backdrop of low income and forced indebtedness. The reason for late payments are almost completely financial and could be grouped into two main categories: around two thirds of the mentioned low income and constant lack of financial resources, while the remaining one third have mentioned negative events in formation of their household budget - loss of job, late salary payment, death of main household breadwinner, unexpected medical expenditures, etc. According to the statistics of the Bulgarian National Bank, there is an increase of the share of bad and restructured loans in the banks' portfolio, mostly due to the deteriorating labour market situation and rising unemployment.

**Croatia** - In approximately the last 14 years, the credit indebtedness of the population in Croatia first increased from 25.0% of GDP at the end of 2003 to 30.6% at the end of 2005 and reached the peak of 40.7% at the end of 2010. Since then the debt of the household sector 2011 stagnated. Weaker household demand for loans was largely due to adverse trends in the domestic labour market and increased tax burden that led to the stagnation in real disposable income. The decreasing indebtedness intensified during 2012, so the household debt dropped below the level of 40% GDP. The debt-service burdens continued to plague lower-income families disproportionately primarily because the income of the poor does not allow them to save. Only 13% of the poor have had access to borrowing (from either the banking system or intermediaries other than relatives) during the last 12 months. The poor do not save much and barely borrow in formal credit markets - which exposes them more to loan-sharking and higher interest rates. The combination of a low capacity to save with limited access to borrowing leads to the situation that the poor - most of them are unemployed or inactive - are also vulnerable to shocks and hence to income fluctuations. Although the percentage of

indebted households in the lowest income groups is relatively small, relative indicators show that their debt and loan repayment burdens are significant. Sugawara and Zalduendo (2011) using the Household Budget Survey, conclude that very few households in Croatia are at risk as a result of the shocks experienced over the past few years. New vulnerable households represent about 2 percent of all households, 6 percent of households are with debt and 2–3 percent of aggregate banking system assets. The low levels of vulnerable households, as well as the low levels of debt incidence, suggest that household debt is unlikely to become a drag on aggregate economic activity and that financial stability risks remain manageable. According to the data by the Financial Agency, on 31 November 2016, in Croatia there were 330,297 citizens with blockade banking accounts. The debt of the citizens amounted to HRK 41.08 billion ( $\in$  5.5 billion). According to the research of Croatian National Bank and HANFA (Hrvatska narodna banka i HANFA, 2016), around 20% of the citizens have problems with regular payment of their financial liabilities.

Netherland - A least once during the year, nearly half of all Dutch households failed to pay a bill on time, were unable to withdraw money from a bank account, had earnings attached or had power cut off. Failure to pay the occasional bill on time is not a serious matter, but if arrears of payment accumulate and people can no longer meet their financial obligations, not only affect them but also those around them – and ultimately the rest of society – will suffer. The European Commission (2013) reports that 40% of respondents to its survey had been late with payments during the past 12 months, and 26% had been in arrears or overdrawn more than once during the past 12 months. As an important cause of over-indebtedness in 7 out of 10 interviewed people mentioned unemployment, particularly because of the current government policy offers incentives for people to stay unemployed. According to Nibud (2012) one in ten of Dutch household is at risk of getting into debt problems. It is therefore important to tackle financial problems as early as possible, and ideally to prevent them from arising in the first place. People with financial problems give various explanations for their debts, but seldom blame themselves. Instead, they often mention external factors such as unemployment, divorce or poor financial advice. Many respondents in arrears of payment state that the arrears are due to specific events - 35% of them mention unexpected (or unexpectedly high) expenditure, and a quarter of them a decrease in income - but some of them do acknowledge that their own behaviour is a contributing factor.

**Poland** – The global financial crisis has had a very negative influence on consumer loans risk in banks, which was aggravated by worsening Polish labour market and jobless economic growth (Slazak, 2014). Even though people are using more credit and debit cards, there are no specific cultural changes. Financial services are becoming more and more popular and people use them more often. The number of over-indebted people has increased significantly, but overall there have not been any cultural changes as to how debts are generally perceived (European Commission, 2013). In terms of the European context, the percentage of the Polish population with arrears in 2011 was 14.2%, which is almost three percentage points higher than the EU average (11.4%). The most common types of households in Poland that are overindebted and/or have on-going difficulties meeting their financial commitment are households with two unemployed persons and households where the education level is elementary (primary) school or less. In Poland, poor money management or a decrease in income due to unemployment and/or self-employment business failure are the most important causes of household over-indebtedness. The most important consequences of over-indebtedness for affected households are financial exclusion, reduced standard of living, endangered health situation, deteriorating well-being and utility (water, electricity, gas, etc.) disconnection (Majkut and Kaxira, 2012).

Although the situation differs in various countries, households affected by unemployment were more likely to be over-indebted, and over-indebtedness can cause person's unemployment or aggravate his or her position on the labour market. Various countries provide a scope of measures for reducing over-indebtedness and improving the position of vulnerable persons on the labour market, which is presented in the further text.

#### 4. REALISED MEASURES REGARDING REDUCING OVER-INDEBTEDNESS AND IMPROVING THE POSITION OF VULNERABLE PERSONS ON THE LABOUR MARKET

The reasons for over-indebtedness are many and differ in various countries or during the time, but there are some common and permanent causes. One is related to the unjustified optimism and unexpected gain(s), from lotteries, hereditary sources and similar (European Commission, 2013). Furthermore, there is widespread underestimation of financial risks during the build-up and booming cycle.

Reduced labour market activity caused by over-indebtedness can be tied to deteriorating physical or mental health. It is quite obvious that many people do not know what or whom to ask for advice and help because they are not informed. People with debts can be taught financial skills by those around them, or by professionals specialising in debt prevention, and so reduce their likelihood of getting into financial difficulties. Education and information, and an active attitude in solving this problem are the most important factors that should be taken as early as possible in order to master the knowledge and skills in management of personal finances and avoidance of captivation in over-indebtedness and a lack of access to the labour market. The access to the labour market can be improved through measures of an active labour market policy as well as through lifelong learning and education (ALE).

Usually, measures to prevent over-indebtedness are needed in three broad areas: (1) Responsible lending; (2) Responsible borrowing and money management; and (3) Responsible arrears management and debt recovery. A comprehensive approach to tackling over-indebtedness also requires three groups of measures to assist people who have serious problems with over-indebtedness and to rehabilitate them: (1) Debt advice and counselling services; (2) Judicial processes, including bankruptcy; and (3) Non-judicial (or amicable) procedures for debt settlement (for details see European Commission, 2009, 2013, Eurofound, 2012, 2013). Most of the countries do not pay adequate attention towards the link between a position on the labour market and financial problems. As examples, one can mention Belgium and Germany where debt counselling is provided through centres of social welfare and public employment services (De Muynck, 2012; Fertig, 2016). Our six selected countries have different approaches towards measures and advices for over-indebted persons and those with unfavourable positions on the labour market.

**Austria** - The ASB Schuldnerberatungen GmbH, a limited company, is a private non-profit making organisation (NPO) and the umbrella organisation of all debt advice services. Members of the ABS need to be established as non-profit organisations and to satisfy certain quality criteria in order to be officially acknowledged by the Austrian Ministry of Justice. The ASB acts as an interface between debt advice services and creditors as well as the ministries political decision makers and institutions and research institutes. The main activities are -beside the exchange of information - training of debt advisers, development of quality management, coordination of PR-work and lobbying as well as data collection and research on debt-related matters. The ASB also acts as a trustee in legal private bankruptcy proceedings. The 10 state-approved debt advice organisations (with 20 additional regional

offices) provide free services, they are granted public subsidies and they are officially recognised. There are also a few private, profit-oriented debt regulation centres that advertise their services in various forms. Officially recognised debt advice centres are entitled to use a specific debt advice label. They are recognised by public authorities and receive public funding from the provinces and the public employment service. People who turn to an officially recognised debt advice centre never have to pay for the services provided. The share of unemployed clients of debt advice centres is more than 8 times as high as in the general population. Over the past ten years, there was an increase in the participation of the workforce in ALE, while a closer look at the purpose of training shows that the two groups with a relatively low participation rate focused more strongly on private purposes and less on occupational needs in training. On average, the majority of all people participating in formal or non-formal training do so predominantly for vocational purposes. However, participation is relatively low for people with lower education attainment (ISCED level 1-2) and for persons in the age group of 55-59. There are also significant gender differences: women's training is linked far more often to private purposes than men's. In general, it appears that a strong integration in the labour market and higher level of qualifications tend to result in higher participation in training programmes, especially in training for vocational purposes. More detailed data, which are available for gainfully employed persons participating in non-formal vocational training, are in line with this general trend. One of the main problems is a general lack of information on offers on lifelong learning and services. This is true irrespective of multiple sources of information available in Austria, e.g. information centres, websites. Furthermore, other important aspects to be taken into consideration are the costs of training, limited financial resources and a lack of information regarding existing subsidies. These are all considerable obstacles to an increased participation in further education and training. Moreover, the design of training measures must reflect the time resources of the individuals, since flexible working time arrangements and care responsibilities are factors that limit their possibilities to take part in the training measures.

Belgium - There is the problem of consumers feeling ashamed about their debts that results in their reluctance to seek help. Furthermore, insufficient public awareness of the risks of becoming over-indebted constitutes a major barrier in an individuals' search for debt advice. The country has a relatively mixed system of debt advice. Personalised debt advice is provided free-of-charge mainly by NGOs and public authorities (such as social welfare services and/or employment offices). The availability of face-to-face advice can be variable, often concentrated in urban areas with larger populations. The major funds for official debt counsellors come from credit providers and the way they provide the money is linked to the default rate considering the market share. So the more arrears and defaults they have, the more they will contribute to this fund which should lead to more responsible practices by the lenders. The law on collective debt settlement had a great impact and its main idea is that consumers with debts with different lenders can go to a debt mediator, who gets in contact with all the lenders and tries to reach an agreement with all of them, based on an estimation of the real possibilities of the person who took the loan for repayment. There are various courses, on-the-job training, programmes of knowledge updating primarily focused on the improvement of employability and skilling, that include also improvement of financial literacy. Face-to-face personalised debt advice is widely available in Belgium, mostly offered by public centres of social welfare at the municipal level as well as by recognised debt mediators (lawyers, public officers and notaries). Whereas debt advice from social welfare centres is generally (at least partly) free of charge, private debt mediators charge consumers for their services.

**Bulgaria** – The entrance to personal indebtedness in Bulgaria is very easy, simple and short lasting, while the exit is complicated, painful and complex. There is widespread belief that the procedures for obtaining and servicing credit are lacking needed transparency as well as that creditors are not correct in communicating information about the loans they offer. In a similar way, people often state that creditors and debtors are not equal in rights and that banks dictate unilaterally the terms of the interaction. Bulgaria has a very low rate of participation in ALE. The lack of sufficient financial resources is the most important reason for weak interest for training and skilling for the labour market, so there is even more limited possibility for other forms of education, like improving financial literacy. In terms of availability, face-to-face advice is partly or rarely available, while advice given over the phone, email, web-based tools or printed information are insufficiently available and accessible. Face-to face debt advice is generally a paid or partly paid service. Funding of debt service advice is insufficient. Gurov (2014) underlines some degree of financial maturation and improvement in the financial literacy of the Bulgarian population. In the future there is a need to increase financing for nongovernmental organisations; concert efforts by various stakeholders (the government, credit institutions, non-profit organisations, etc.); and to develop programme at the EU level for funding information centres where indebted consumers may ask for help and advice.

Croatia - The government in March 2015 endorsed a consumer bankruptcy bill in an attempt to give over-indebted citizens a chance for a fresh start. The law entered into the force 1 January 2016, but during the first six months of its implementation, 619 case requests to initiate extrajudicial procedures were received. A small number of demands for personal bankruptcy is a sign that new legislation is unknown to many. Within its Personal Finance Management project entitled "How to Harmonise Income and Costs?" (Free of charge workshops for citizens and available on its website www.hub.hr), the HUB and its member banks have informed the participants that it is generally more favourable to take on some other type of credit and to repay a "persistent" overdraft. The financial literacy of citizens seems to be rather poor, as citizens - particularly those with lower levels of education, that are often unemployed - are insufficiently and/or inadequately informed about the rights and obligations in dealing with banks and other financial institutions. Within its Personal Finance Management project entitled "How to Harmonize Income and Costs?" (Free of charge workshops for citizens has been realised since 2006 and still available on its website www.hub.hr). During the workshop the participants are informed that it is generally more favourable to take on some other type of credit and to repay a "persistent" overdraft. The Croatian Employment Service (CES) uses several models to implement educational activities, primarily measures of active employment policy: They include among others the co-financing of professional improvement for a known employer and the financing of education for an unknown employer, for which the funds are ensured from the state budget. The coverage rate (the number of newly included participants in measures of active employment policy divided by the average number of the unemployed people registered by the CES increased from 2.49% in 2009 to 12.76% in 2013 (The Croatian Employment Service, 2016). However, through the Croatian Employment Service and social welfare centres there are still no special information and education courses and counselling services regarding the prevention of overindebtedness and needed measures establishing what to do in the case of financial problems. In all 21 Croatian counties, Financial Agency (FINA) is in the process of establishing counselling services.

**Netherland** - The general, traditional Dutch attitude and culture are favourable to saving and are debt-adverse. However, this has changed over the last few decades with the increased availability of credits and loans, but the financial crisis in itself may lead to a reversal of this

trend (European Commission, 2013). The affected households suffer from a reduced standard of living, deteriorating well-being, and deteriorating mental health, which often leads to social exclusion, mostly to the feelings of shame). In recent years, there has been an increasing focus on people's motivation and attitudes when faced with financial problems. Various counselling services with attention to early-warning measures have begun to focus more closely on behaviour and how to change it, especially in training courses. Requirements for starting consumer insolvency procedures usually include debt restructuring efforts mediated by debt counsellors. Face-to-face debt advice is available while relatively recently were introduced personalised debt advice by telephone. Printed brochures and Internet websites offering free information and possibly generic advice are also widespread. Local authorities and other bodies are showing interest and support of such activities. Several municipalities have piloted initiatives involving volunteers and holistic debt counselling (including psycho-social attention) and prevention practices at a municipal, district and neighbourhood level. Volunteers are mostly helping households in administering their financial accounts and situation. In recent years, debt relief efforts have increasingly focused on the person's own capabilities, character and behaviour. The idea is to motivate clients to change, particularly working on their intrinsic motivation, behaviour and skills. research available shows that debt advice has a positive impact. A cost-benefit calculation from 2011 based on the data from five average sized municipalities shows that each Euro spent on debt counselling activities returns from 2 to 3 Euro in reduced public expenditures for social benefits (Kruis et al, 2011).

Poland - The debt advice sector in Poland is not particularly well developed. This means that most over-indebted households have to rely on non-governmental organisations or public authorities working in the general field of consumer protection, such as the Federacja Konsumentów. Debt advice services is not widely available, but where they do exist, they are usually free of charge. They are mostly provided by few non-profit organisations, which offer legal advice to over-indebted consumers. One positive example of debt advice provision is the National Network of Financial and Consumer Counselling Centres Project. It was established by a nongovernmental organisation with the help of public funding. The network of nine financial advice centres in different Polish cities provides financial education and advice to over-indebted households. In the last few years in addition to the development of debt advice services, there has been some preventative action taken against over-indebtedness, specifically against fraudulent lending. A public awareness campaign called "Before you sign" has been launched, which encourages the use of free advice (by telephone, mail or chat) on legal aspects concerning loan contracts. Demand for debt advice had increased in the last five years. Some possible reasons for this are a growing number of over-indebted households, higher levels of awareness regarding the existence of debt advice services, as the result of education and media campaigns. However, awareness of debt advice was still fairly low and still most people would not know where to look for help. The participation of adults (25+) in ALE is relatively low and it is impossible to assess employer engagement in organising training because of the lack of systematic data. Generally, training in most of the firms is for specific knowledge, updating practical or vocational skills, or developing skills essential to a firm's market position, but systematic education regarding financial literacy is lacking.

Obviously, there are various approaches regarding the prevention of over-indebtedness and improvement the position on the labour market, but from various sources (Fondeville et al, 2010, Eurofound, 2012, 2013, European Commission, 2013, Borbély Pecze and Hutchinson, 2014) there are some possible conclusions. People who feel little or no need or inclination to save and improve their employability, and do not recognise the importance of doing so, are at greater risk of financial problems and unemployment than those who do. Their behaviour

towards debt can be very easily seen also regarding their attitude towards education, improving employability and activation on the labour market.

Two attitudinal factors play a part. People who are easily tempted, or are short-term thinkers, are more likely to get into difficulties regarding debt and/or unemployment. People *easily tempted* are those who themselves admit that they often feel tempted, regularly buy things they do not really need and find it hard to make choices. *Short-term thinkers* are those who say they 'live for the present' and 'don't worry about future. They will probably behave in the same way - relatively recklessly - regarding their employment and job, and thus can be easily unemployed. Such attitudes are often deeply rooted in a person's character, and hence harder to change. However, they can be changed, if only in the long term and with adequate persistency. This is an area in which efforts to prevent people from getting into debt and/or unemployment may prove particularly successful.

In such a work there are three possible approaches: a) provide the right information and support as soon as a life event occurs, whether this is negative (unemployment, divorce) or positive (having children, moving away from home); b) show the users the long-term effect of the choices they make now; and c) motivate and help people start thinking of savings and regular employment as something attractive and important. In principle, two major instruments are available for managing or preventing over-indebtedness. First, the ex-ante instruments aimed at preventing the building up of unbearable risks into the system, while the second set of instruments are the ex-post ones, which are aimed at easing the burdens of the indebted households in order to maintain their ability to repay their financial obligations. The best approach tries to achieve a balance between the two groups of instruments in order to prevent much deeper problems.

### 5. CONCLUSIONS AND RECOMMENDATIONS

Personal (or household) over-indebtedness is a complex, multi-faceted, social phenomenon, caused and compounded by a combination of factors. Considerable drops in income caused by unemployment or business failure are among the most important causes of household over-indebtedness. Such indebtedness is a private and social problem, and if over-indebted persons are not able to meet their liabilities due to altered macroeconomic conditions (like unemployment growth or diminishing income), this might lead to a financial crisis. To avoid a situation in which creditors are losing their funds, and debtors often lose their proper place in society and become excluded, the EU developed counselling services for solving the problem of over-indebtedness and measures for debt repayment. These activities enable over-indebted people a new start in society and adequate economic participation.

A number of studies shows that approaches to money management and financial decisions can be important factors in regarding the extent to which individuals or households experience financial difficulties. For adequate measures, there is a need for more timely and robust data collection to facilitate and provide necessary information for optimal policymaking process within EU Member States. A range of public and private bodies could play a bigger and more cohesive role in data gathering, and there is a particular role for academia community both regarding specific research and independent evaluation of policy measures.

There are significant positive social and economic effects to Member States of adequate measures regarding prevention and reduction of over-indebtedness. For success of such

measures there is a need for a multidimensional and integrated government policy response aimed to prevent and resolve over-indebtedness, not just to alleviate or manage it.

To prevent multiple borrowing turning into over-indebtedness, financial institutions should use adequate and comprehensive risk management tools. They need to assess not only the individual's credit risk but also include also all other forms of risk, primarily the possible labour market risks. Indeed, credit risk management must analyse clients' repayment capacity in the context of the market in which the loan is being disbursed, as much at the family and/or business level as the community and/or the regional level.

The Governments should systematically organise consumer education and enforcement actions to enhance public awareness. The Governments can also help in organising free of charge, independent and reliable services on financial planning. Such activities are particularly important in providing advices and helping citizens who have financial problems and do not have sufficient knowledge to deal with the complex range of financial products.

It is a crucial to encourage and/or enhance the involvement of target groups in the planning and implementation of activities of advisory bodies to ensure effective fulfilment of their needs, Finally, it is crucial to ensure that the target groups are informed of its existence and have equal access to it and availability of the advisory bodies.

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# ECONOMIC PAST AND FUTURE OF COMMON AGRICULTURAL POLICY

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#### ABSTRACT

This paper presents economic past and future of the CAP. European agricultural sector has noticed a significant enlargement starting from 2004 when ten countries joined the EU, the so-called New Member States (the Czech Republic, Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia). For the European agriculture this enlargement basically meant: 55 million hectares more, which was a 40% increase in total EU agricultural land, as well as 7 million farmers more, while Old Member States had at this time 6 million farmers. However, since its existence, CAP has been constantly subjected to reforms. and concluding with the Common Agricultural Policy agreement reform in 2013 for the period 2014-2020. The CAP can be undoubtedly perceived as a big success for the New Member States. Over that period, the New Member States has received  $\in$  68 billion from the CAP funding, which contributed to investments in farms and rural areas. On the other hand, CAP is a real challenge for Europe as it is not only the expensive policy but also too bureaucratic one. Therefore, there is a need of cooperation between policy makers and EU farmers in order to develop a simplified CAP that better suits its purpose.

### 1. INTRODUCTION

The EU's Common Agricultural Policy (CAP) was introduced in 1962. It is a common policy designed for all the EU Member States. It is managed at the European level and funded from its annual budget. The general objectives of CAP were defined when the Common Market was established in the Treaty of Rome in 1957. Over ten years after World War II, Europe still suffered from severe food shortages. As a response to this, at that time the main objectives of the CAP were:

- "to increase agricultural productivity by promoting technical progress and ensuring the optimum use of the factors of production, in particular labour;
- to ensure a fair standard of living for farmers;
- to stabilise markets;
- to ensure the availability of supplies;
- to ensure reasonable prices for consumers" (Massot, 2015c, p.2).

Now, more than 50 years later, according to European Commission (2014a, p.3) European Union has to address more challenges: (1) "food security — at the global level, food production will have to double in order to feed a world population of 9 billion people in 2050; (2) climate change and sustainable management of natural resources; (3) looking after the countryside across the EU and keeping the rural economy alive";

In other words, as a result of the latest CAP reform, new objectives were set, which are: economic – to ensure food security and increase competitiveness and distribution of value within the food chain; environmental – to enhance sustainable use of natural resources and address climate change issues; territorial – to ensure social and economic diversity in rural regions (Massot, 2015c).





Source: DG Agriculture and Rural Development, Overview of CAP Reform 2014-2020, 2013a, p. 3.

There are numerous CAP's functions in the EU society, and the first one is certainly to produce food. Farmers are responsible for providing the European market with food of good

quality at affordable prices. Thanks to the CAP, consumers may get what they want as farmers are driven by the common policy that provides European market with good quality products and at affordable prices. In the majority of EU Member States today, the average family needs to spend approximately 15% of their monthly income on food, while in 1962 it was twice such a proportion. Moreover, the EU is also in charge of ensuring the World food security. This is because of the fact that the EU has a lot of agricultural resources.

Furthermore, the CAP is about the countryside where a great amount of money is spent on Rural Development Programmes. They are created in order to enable modernisation and development process of rural areas and food production. Apart from this, farmers are the ones who mainly manage and maintain countryside. Therefore, thanks to supporting farmers, the EU supports rural areas. It should be noted that there are numerous jobs linked to farming, namely veterinary medicine, building, machinery maintenance and many more. According to the European Commission (2013), there are over 12 million farmers and 4 million people employed in the food sector what in total gives 7% of all jobs and generates 6% of the EU's GDP.

Last but not least, the CAP helps farmers protecting the environment. The European financial assistance goes to farmers in order to help them adjusting farming methods to cope better with the results of a climate change. The EU needs farmers that comply with environmentally sustainable concept because there is a need to care about the quality of food and the conditions for future generations. It can be undoubtedly taken for granted that the CAP is a driving factor for the rural economy in order to become more productive and innovative.

# 2. RECENT REFORMS OF THE CAP

There have been numerous CAP reform (figure 5) throughout its existence. In this section, the focused is placed on the recent ones starting from the early 2000s. The CAP reforms aimed at reducing market distortions and making them more acceptable at the international scale.

### 2.1. Two major reforms in 2000 and 2003

After the MacSharry reform in 1992, there were two particular CAP reforms that pushed the basic logic of MacSharry reform further on. They introduced price cuts that were remunerated by direct payments to EEC landowners. The first one was agreed at the European Council meeting in Berlin in 1999. This reform was to prepare the CAP for the up-coming EU enlargement and to get the CAP ready for 2000-2006 Financial Perspective with the falling budget share. The second reform, the so-called CAP reform 2003 was encouraged by the recent WTO trade talks that were also called as Doha Development Agenda. The developing countries did not want to start new WTO talks and the only possible way to convince them was the promise of the EU members and other rich nations to liberalise agricultural market as a part of Doha Round in November 2001. Then, in 2003, there was an important midterm meeting of ministers in Cancun, Mexico where EU ministers had to think up of CAP reform that would meet its liberalisation declaration. Unfortunately, in the end this meeting in Cancun was a failure.

### 2.1.1. 'AGENDA 2000'

'Agenda 2000' aimed at deepening the process of the 1992 reform and rural development. In this period, there was a strong focus on the sustainability cohesion. 'Agenda 2000' included the following areas: food safety and quality, increased competitiveness mainly through more

market orientation, stabilisation of incomes, environmental awareness into agricultural policy, simplification, decentralisation and rural areas development. This reform set out the new rural development policy that was implemented as a second pillar of the CAP (pillar 1 being income subsidies and other market interventions). This policy was introduced in order to foster rural development by encouraging rural initiatives, supporting young farmers, helping farmers with both diversification and setting up producer groups, or alternatively restructuring their businesses. From this time on, the CAP has been divided into two pillars: pillar 1 which is income support and pillar 2 which is rural development (DG AGRI, 2015a).





Source: European Communities, *The EU Rural Development Policy 2007-2013 Factsheet* Government, 2006, p. 5.

# 2.1.2. CAP reform 2003

The next step of the CAP was the 2003 reform that was said to be a 'radical rebuilding of the CAP' or 'towards a CAP based on decoupled aid' (Massot, 2015a). The emphasis of this reform was put on the policy efficiency issues. This reform was mainly based on significant innovations such as the introduction of the 'cross-compliance', 'decoupling' or 'modulation'.

Hitherto, a great deal of agricultural support has been paid indirectly through prices or directly by area payments and headage. Area payments and headage were perceived as the main way of supporting after the CAP reforms in the early 1990s at the time when the majority of the current subsidy schemes were implemented. At present, such support schemes have been strongly criticised since they are thought to be too bureaucratic for farmers. Moreover, they also enhance overproduction of low-quality products and encourage non-sustainable farming in some areas. Therefore, the CAP 2003 reform came up with three main concepts in which two of them are extensions of previous reforms, and one is an entirely new concept. This new element is called 'decoupling', and the remaining two are modulation and changes to market measures that include cuts in price support. Both headage and area payments known as direct payments are linked (coupled) directly to production. As a rule, farmers get payments on the basis of what has been claimed, e.g. numbers of hectares of crops or livestock.

In the following years, the reforms were also conducted in the sugar, wine, fruit and vegetables sectors. In line with these reforms, a new rural development policy was designed for the financial period 2007 - 2013. There was also a debate on how to reduce the regulatory burden and cut red tape. Therefore, in autumn 2005 the European Commission (EC) proposed a simplification of the CAP with the primary objective to cut red-tape for administration and farmers as well. With 2004 EU enlargement, there is an increase in the agricultural potential

that well-managed can lead the EU to become a significant and strong player in the World's agricultural industry.

# 2.2. CAP Health Check 2008

'CAP Health Check 2008' was the next step taken by the European Commission in order to modernise, simplify and help farmers to better respond to market signals and deal with new challenges of contemporary World, like the climate change, bio-energy and water management.

The 'Health Check' was launched by the Council in November 2008, and it revised a list of measures of CAP reform 2003. CAP Health Check was to enhance complete decoupling of aid through progressive elimination of the remaining payments that were coupled to production thanks to moving them into single farm payment. Moreover, this reform was introduced in order to partially reorient pillar 1 funds to rural development actions by increasing the rate of modulation for direct aid (Massot, 2015a).

Therefore, the 'Health Check' reform implemented some adjustments in EU regulations that tackled the following issues:

- End of milk quotas: milk quotas expired by April 2015,
- Decoupling of support: decoupled payments were moved to Single Payment Scheme (hereinafter: SPS),
- Assistance to sectors with special problems: disadvantaged regions, supporting risk management measures,
- Using money that was not spent before: EU countries applying the SPS were allowed to use unspent money from their national quota for some particular measures or to include them into the Rural Development Fund,
- Transferring money from direct aid to rural development,
- Suppressing of the set-aside rule: farmers were not obligated to follow the rule of leaving 10% of their land fallow. It may help them to maximise their production output,
- Cross compliance measure in order to protect environment,
- Intervention mechanisms: farmers should be able to respond to market signals, thus intervention were suppressed for pig meat and set at zero for sorghum and barley,
- Support aid for young farmers to encourage them to invest under rural development will be raised from €55,000 to €70,000 (Cantore, Kennan, & Page, 2011).

Moreover, as a response to 2008 economic crisis, European Commission implemented European Economic Recovery Plan (EERP) which was to support innovation, foster structural reforms and build a knowledge-based economy and accelerate the shift to a low-carbon economy (European Commission, 2010). Therefore, the CAP Health Check and the EERP contributed an additional amount of EUR 4.95 billion to the European Agricultural Guarantee

Fund (EAGF) total budget for the 2007-2013 period, increasing the total amount from EUR 91 to 96 billion.



*Figure 3. Breakdown of CAP € 4.95 Health-Check and EERP additional funds for new challenges (in %)* 

Source: European Commission, Overview of the CAP Health Check and the European Economic Recovery Plan Modification of the RDPs, 2010, p. 3.

#### 2.3. CAP reform Post-2013

The most recent reform was implemented in 2013 as 'CAP reform Post-2013' and it concerns the period from 2014-2020. The main points of this reform were: greening, redistribution, food chain, more focus on research and innovation, targeting, end of production constraints (e.g. end of milk quotas in 2015) and further simplification of the CAP.

The CAP reform Post-2013 is designed for the period 2014-2020, but the evolution of this reform has its starting point in 2010 when there was a public debate on the CAP's future and its contribution to 'Europe 2020 strategy'. As a result, the EC published a Communication on 'The CAP towards 2020' that underlined the key challenges for EU agriculture and rural areas.

The Europe 2020 strategy was aimed at delivering growth which is:

(1) 'smart' thanks to more effective investments in innovation, education, research and development; (2) 'sustainable' by moving towards a low-carbon economy; (3) 'inclusive' through putting an emphasis on reducing poverty and creating jobs. This strategy is based on five ambitious goals in the sphere of employment, education, innovation, climate/energy and poverty reduction (European Commission, 2014b).

As a result of Europe 2020 and the overall CAP objectives, there are three important and strategic objectives for European Rural Development Policy for the 2014-2020 period:

- "fostering the competitiveness of agriculture;
- ensuring the sustainable management of natural resources, and climate action; and
- achieving a balanced territorial development of rural economies and communities including the creation and maintenance of employment" (DG AGRI, 2015b).

In an essence, the main objective of this reform was to develop a 'fairer, greener and simpler CAP'. The following elements were included in the reform proposal:

- Focusing on greening measures: 30% of direct payments were allocated to three environmental measures as addition to cross-compliance requirements
- Greater convergence of payments by ensuring that levels of payments across the Member States move towards the average of EU by 2019:
- Introducing a new scheme for rural development funding: moving from 4 axes structure to a bunch of new priorities in order to foster rural development: mainly employment and entrepreneurship.
- New means for farmers to manage risks attached to increased price volatility and to promote the idea of cooperation by helping them to organise themselves in a more competitive food chain that is also balanced.
- New schemes in order to support small and young farmers
- CAP simplification and increase in CAP efficiency mainly by cutting red tape
- More focus on investing in research and innovation (Knops & Swinnen, 2014; Keijzer & Klavert, 2012).

Figure 4. Actions targeted under both CAP Pillars in CAP post 2013



Source: DG Agriculture and Rural Development, Overview of CAP Reform 2014-2020, 2013a, p. 9.

Summarising post-2013 CAP reform and its approaches to direct payments, market measures and rural development, the below table was constructed.

Direct payments	Market measures	Rural development		
Convergence of direct payments	Confirmation of the ending of milk	New rural development priorities		
across member states	quotas, of sugar quotas (with one- year delay) and of vine planting	to replace current axes		
New basic payment to replace the	band	Better coordination with other EU		
SPS and the Single Area Payment		funds		
Scheme	Extension of the market			
	disturbance clause to all	New criteria to allocate Pillar 2		
New 'green' component of direct payments	commodities under the CMO	funds across Member States		
	Measures aiming at improving	Simplification of supported		
Greater targeting of beneficiaries	functioning of the food chain	measures		
New rules for coupled payments	Measures to support quality production	Enhanced risk management toolkit European Innovation Partnership		
Changed cross-compliance rules		· ·		
		Proposals on monitoring and		
		evaluation		

Table 1. Proposed post-2013 CAP changes

Source: Keijzer, N. & Klavert, H., A review of stakeholders' views on CAP reform: What they say and what they have achieved, 2012, p. 4.

Over the CAP history there were four main themes following one after another: (1) Food security (2) Competitiveness (3) Sustainability (4) Policy Efficiency. As a conclusion figure 5 summarises the changing CAP priorities and instruments over time.

Figure 5. Historical development of the CAP



Source: DG AGRI, The history of the CAP, 2015.

### **3. CAP BUDGET AND EXPENDITURE**

CAP was initially financed through the EAGGF when it was implemented in 1962. Then in 1964, the EAGGF was divided into two separate sections:

- The Guarantee Section which was the larger one and it was implemented in order to fund expenditure of market applications and price policies. The EAGGF Guarantee Section fully financed measures of market intervention in.
- The Guidance Section was intended to help financing operations involving the development of rural areas and structural policy. The EAGGF Guidance Section was based on the co-financing approach.

Then in 1988, the funds started to be under strict budgetary discipline because of implementing a multiannual agricultural guideline in order to stop the increase in CAP spending. Following, the Maastricht Treaty and the Edinburgh Council, the financial framework was re-organised and in the 1988 Interinstitutional Agreement was replaced by budgetary discipline agreement for the period 1993-1999. After that, Agenda 2000 was introduced to extend the guideline for agriculture under the financial perspective for 2000-2006. In 2006, as a next step, the multiannual financial framework for 2007-2013 was agreed and approved. As a next step, two new European agricultural funds were created: the EAGF and the European Agricultural Fund for Rural Development (EAFRD). The EAGF is responsible for financing or co-financing together with the Member States: CMO expenditure, direct support to farms, providing information about and promoting agricultural products on the internal market as well as in third countries, the cost of veterinary measures and collection and use of genetic resources. The EAFRD fund is in charge of rural development (pillar 2) by co-financing measures to improve competitiveness in the agricultural and forestry sectors, measures to improve life quality in rural regions, measures to enhance diversification of the rural economy and local capacity-building and agri-environmental measures. Then, in 2013, the new multiannual framework was introduced for 2014-2020 with regulation on the financing, management and monitoring of the CAP (Massot, 2015b).

CAP expenditure is clearly connected with its reforms path. In the graph below, the evolution of CAP expenditure is presented with the following order along with policy change:

- In the 1980s CAP expenditure dealt with price support through market measures (intervention and export subsidies) that increased by the end of the decade because of agricultural surpluses.
- Thanks to the 1992 CAP reform, market price support was diminished and superseded by producer support in the form of direct payments. Rural development measures were also supported simply by allocating more money to them.
- Agenda 2000 kept continuing reform path with an important change the second pillar of the CAP was created that aimed at serving rural development policy.
- Then, the 2003 reform with its decoupling measures influenced the CAP expenditure in a way that most direct payments were decoupled from current production due to the fact that they were based on the historical receipts of farmers. Spending on Rural development measures kept continuing to increase.

• The 2008 CAP Health Check aimed at continuing the reform by further reducing market support. Spending on the CAP has been stabilized and despite successive EU enlargements total CAP expenditure as a share of GDP actually dropped from 0.65% in the 90s to 0.40% in 2014.



Figure 6. CAP expenditure for the period of 1980-2014

Source: DG Agriculture and Rural Development, Overview of CAP Reform 2014-2020, 2013a, p. 4.

The amounts for CAP budget 2014-2020 were agreed and included in the new EU multiannual financial framework for 2014-2020, what is outlined in tables 2 and 3.

Table 2. CAP budget 2014-2020 for the EU-28

CAP BUDGET 2014-2020 (EU-28)	Total 2014-2020 (EUR billion at current prices)	% CAP
MARKET MEASURES (CMO)	19 002	
(a) Assigned revenue	(4 704)	
(b) Crisis reserve	+3 155	
(A) TOTAL CMO [ (a) + (b) ]	17 453	4.3
DIRECT PAYMENTS (DP)	298 438	
(c) Transfers to pillar 2	(7 369)	
(d) Transfers to DP	+3 359	
(e) NET TRANSFERS [ (c) + (d) ]	(4 010)	
(b) Crisis reserve	(3 155)	
(B) TOTAL DP [ (e) + (b) ]	291 273	71.3
TOTAL PILLAR 1 [ (A) + (B) ]	308 726	75.6
RURAL DEVELOPMENT MEASURES (RD)	95 577	
(e) Net balance in favour of pillar 2	+4 010	
(C) TOTAL PILLAR 2 (RD)	99 587	24.4
TOTAL CAP 2014-2020 [ (A)+(B)+(C) ]	408 313	100.0

Source: Massot, A., Financing of the CAP, 2015b.

	2014-2020 Ceiling (Current Prices)	2014-2020 Ceiling (2011 Prices)
Pillar 1	308,726	277,85
Pillar 2	99,587	84,94
Total CAP	408,313	362,79

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Source: Massot, A., Financing of the CAP, 2015b.

The EC proposed that the amounts for CAP pillars for the 2014-2020 period should be frozen at the level of 2013 (in nominal terms). In real terms, however, it means that the amount of CAP funding will decrease in comparison to the current period: the amount for pillar 1 was decreased by 1.8% and for pillar 2, it was cut by 7.6% (in prices from 2011). It gives a sum in total  $\in$  362.787 billion for the 2014-2020 period, of which  $\in$  277.851 billion is to be spent on direct payments and market-related expenditure from Pillar 1 and an amount of  $\in$  84.936 billion for rural development (which corresponds to Pillar 2) in prices from 2011. Undoubtedly, these amounts from the Multiannual Financial Framework 2014-2020 mean continued and strong support for ambitious CAP, which represents 37.8% of the entire ceiling for the period 2014-2020.

### 4. CAP'S PROBLEMS AND POTENTIAL SOLUTION

Since its existence, the CAP has been under constant critique due to the fact that no matter how many reforms were implemented, CAP has still failed to successfully cope with the following issues:

- Expensive policy for the EU budget
- Over-production resulting in e.g. butter mountains, wine and milk lakes
- Large, northern European farms have benefited disproportionately
- Expensive from the consumers' perspective
- Costly for taxpayers
- With a negative detrimental effect for the environment

There is also a problem of Economic convergence in the agricultural sector. According to Oleszko-Kurzyna, B. (2012) there is unequal distribution of funds which then results in the need of costly adjustments. This situation takes place in the New Member States that are still behind the Old Member States, although their catching-up process have started, the pace is limited due to not equal chances like direct payments.

Although, there are some debates and talks in the European Institutions on the ongoing work on simplification of the CAP, there is still a room for improvement. For this purpose, below there is SWOT and TOWS analysis conducted.

#### Strengths of the CAP:

• Pillar 2 Rural Development Programme:

It is important not only to focus on the agricultural sector of the economy but also on the regions themselves. Therefore, the second pillar was created that has helped in boosting development in Rural Areas and contributed to the growth of overall EU economy. Pillar 2 does not only focuses on rural function like sustainability and cohesion in rural areas, but it does also address environmental issues.

• Supports modernization and restructuring:

Thanks to numerous of EU funding schemes and programmes the EU agricultural actors can be stimulated to invest more. The investment brings development not only in agricultural sector but also in rural regions and it can also increase the efficiency and productivity what positively influences income. It is especially important for 'newcomers', so in this case New Member States to provide them with funding from the very beginning so they can catch up with the Old Member States. Thus, CAP seems to play its role well, since it does have different programmes that support modernisation and restructuring, like SAPARD, ISPA or PHARE.

• Emphasis on innovation and environmental concerns:

Since the quality of life has increased and people live longer on average so there is a need to keep the environment clean and safe. Since CAP's first goal was reached, which is food security, now it is time to be environmentally-conscious. Thanks to investing more and more money into research, development and innovation, there are innovative solutions that help to better take care of the environment. There is also a strong emphasis on greening measures in the recent CAP reform,

#### Weaknesses of the CAP:

• Not tailored to individual needs of each MS and Inequality between EU-N10 and EU-15:

The article of Zaharia, Tudorescu and Zaharia (n.d.) presents the New Member States when joining the EU in 2004 (EU-N10) as a set of opportunities and threats for the New Member States (on the example of Poland) that for the CAP are its strengths and weaknesses. The main cost of the CAP in the EU-N10 is its huge spending on adaptation and modernisation of the agricultural sector. It has to be done in order to meet the conditions and requirements for operation in the EU and at the same time to minimise the gap in development level between e.g. Polish agriculture and the more developed and modernised agricultural sector in the Old Member States. There is also a saying that there are two 'Polands' (urban and rural), but in fact, there are even more than two since the countryside is also divided. It is the case for the EU-N10 and, therefore, there is still an enormous disparity between New and Old Member States.

There are many examples that show the mismatch between the Member States like the one in article EU enlargement: A driver of or obstacle to CAP reforms? by Henning (2008, p. 52):

"Poland and Slovenia are 'preference outliers' with respect to farm support, favouring support clearly above the level provided by the current CAP. Hungary, Estonia, Slovakia and the Czech Republic are 'preference outliers' with respect to multifunctionality, i.e. they strongly prefer a productivist approach to agricultural policy."

In the paper prepared by Kiss J. (2011), the differences between the New and Old Member States are seen from different perspective. The New Member States have 'added' 55 million hectares to EU agricultural economy that was an increase of 40% for total EU agricultural land, albeit this enormous potential, the productivity, however, rose only from 10 to 20% on average for most products. In addition to this,, the number of farmers in the EU-15 was 6 million while the New Member States added around 7 million farmers so that a total number of farmers in the EU was around 13 million.

• Too much bureaucracy:

DG Agriculture and Rural Development. (2011) in its 'Study on administrative burden reduction associated with the implementation of certain Rural Development measures' clearly states that there is too much red-tape in the CAP and simplifying certain procedures and measures could improve CAP efficiency. Therefore, now, there is an ongoing debate on simplification of CAP which aims to decrease the level of administrative burden in CAP what will result in clear, simpler rules that apply to farmers. In this case, all farmers would have the same chance to access information and apply for some funds, whereas, now it is sometimes impossible for small farmers to deal with CAP bureaucracy so at the end they give up. Thus, it very often leads to a scenario where big farmers are recipients of CAP funding since they can afford to have their advisers and lawyer who manage to go through complicated CAP regulations.

• Helps rich farmers get richer:

The farms are getting bigger and bigger because small farms are being sold since they are not sustainable anymore. There is a strong need to keep the small farms 'alive' and to find their place in the CAP so that they can play an important role in the overall economy. Matthews (2009) argues that small farms are claimed to be environmentally-friendly for three reasons: (1) they more likely have more patches, hedgerows and uncultivated land, (2) they tend not to use so much fertilisers and (3) they, in most of the cases, are more bounded with their land so they form a sort of 'relationship' with the nature. Moreover Matthews (2015), points out the advantages of small farms presented by European Parliament's resolution (European Parliament (2014), small farms are:

- better for animal welfare,
- more environmentally friendly,
- better at helping to limit depopulation in rural regions
- are more flexible and adapt more easily to market crises.
- better at preserving non-material heritage, cultural traditions, and local handicrafts and manufactures.

### **Opportunities for the CAP:**

• Growing number of well-educated people:

There are more and more people who are well-educated and thanks to the knowledge that they have gained they might implement the radical new thinking in agricultural industry which can boost EU agricultural economy to be more efficient and competitive. Well-educated farmers are very important for agricultural sector, which is getting more and more competitive. In past, in Central and Eastern European countries, in most of the cases only young people who were not well-educated stayed on the farm and now the situation is opposite. In order to sustain in the tough agricultural market, only the best can survive and sustain in the market.

• Increasing importance of other sectors than primary:

The EU-N10 has become better and better in decreasing the share of primary sector in agriculture. Therefore, there is less demand for people working in production sector because they are replaced by machinery thanks to high value-added products and technological advancement. There is a need to make use of well-educated people by creating new jobs that will be sustainable in the long-term and could bring an increase in the employment rate.

• Natural resources and environmental quality:

In general, the EU-N10 rural regions have a number of agricultural lands and the quality of the environment is of increasing importance to them. That is why there is a growing number of agri-touristic holdings since people tend to avoid crowded places during their leaves from work. There is also a growing importance of renewable energy, and its production contributes to farm income. In some cases, there are regions that use renewable energy mix and generate on-farm jobs that relate to biogas, solar thermal and wind sectors (Alterra – Stichting DLO, 2011).

#### Threats for the CAP:

• Declining number of EU population and ageing society problem:

The EU population has been decreasing and today the EU needs to face the problem of ageing society. CAP as every other policy needs people, and especially who work in agricultural sector in order to sustain EU agricultural competitiveness. Therefore, it is crucial to come up with clear strategy that can encourage families to have more children. Moreover, it is of great importance to attract young people to stay on the farms so the situation for farmers should be improved. In line with declining population, the level of technological development should be increasing, so that machines can replace workers, if possible.

• Migration of people from rural to urban regions and from East to West:

There are more jobs in urban than rural regions and more well-payed jobs in Western rather than Eastern Europe. People tend to migrate in order to either gain more or even make a living. It again should be underline that CAP needs to come up with a solution to a problem of attracting young people to become farmers. Therefore, farmers should have better conditions, so instead of them quitting their jobs, there should be an incentive for young generation to cultivate the farm. • Unstable geopolitical situation:

In the concrete example: as the Russian food embargo shows it is a real challenge to the EU unity in order to help those countries that are particularly touched by the negative consequences of imposing embargo European Commission. (2014c). There needs to be a proper understanding of this complex problem, and thus, there might be a decision to 'open' a reserve fund for those farms that are harmed the most. In this sense, every sanction has negative consequences and therefore there are certain costs to be dealt with and in the case of the EU where there is EU market: banning EU food is banning food of all Member States.

After pointing out CAP's strengths, weaknesses, opportunities and threats there is a need to think of some ideas on how the CAP might be further developing and improving policy. Therefore, TOWS framework analysis is to be used and below, in table 4 TOWS analysis is presented. External boxes present selected highlights from SWOT analysis, and internal boxes present TOWS analysis that is conducted to answer the following questions: how to use strengths to maximise opportunities, how to use strengths to minimise threats, how to minimise weaknesses by taking advantage of opportunities and how to minimise weaknesses and avoid threats.

		STRENGTHS – S	WEAKNESSES – W
		1. Pillar 2 Rural Development	1. Not tailored to individual needs
	TOWS	Programme	of each MS
		2. Supports modernization and	2. Inequality between EU-N10
		restructuring	and EU-15
		3. Emphasis on innovation and	3. Too much bureaucracy
		environmental concerns	4. Helps rich farmers get richer
0	PPORTUNITIES – O	SO STRATEGIES	WO STRATEGIES
1.	Growing number of	1. Promoting and fostering	1. Ongoing simplification of the
	well-educated	development in rural areas by	CAP (W3,W4 O1,O2)
	people	activation of young people	2. Implementing progressive
2.	Increasing	(\$1,\$2,\$3 01,02,03)	support for different CAP actors
	importance of other	2. Offering more money on	(W2,W4 O1,O2)
	sectors than primary	processing in rural areas	
3.	Natural resources	(\$1,\$2,\$3 01,02,03)	
	and environmental		
	quality		
	THREATS – T	ST STRATEGIES	WT STRATEGIES
1.	Declining number of	1. Offering help for farmers	1. CAP cooperation with family
	EU population and	touched by unstable geo-political	policy (W4 T1)
	ageing society	situation (S1 T3)	2. Strengthening EU export of
	problem	2. Employing people with loyalty	agricultural products by negotiating
2.	Migration of people	agreement (S2,S3 T2)	tariffs (W3 T2,T3)
	from rural to urban		
	regions and from		
	East to West		
3.	Unstable geopolitical		
	situation		

Table 4.	TOWS	analysis	of the CAP	in the	EU-N10	and it	s implice	ations f	or the	CAP in	general
		~	0				1				0

Starting with SO strategies, so-called 'maxi-maxi' are those that use strengths to maximise opportunities. Both strategies are prepared in line with all three strengths and opportunities selected from SWOT analysis. The first one which is 'Promoting and fostering development in rural areas by activation of young people' intends to attract young generation to stay in rural areas by offering them possibilities of working not only in the agricultural sector but also in the non-agricultural sector. The main objective is to foster development in the rural areas. Along with financial aids for young farmers, there should also be some aids or preferential loans to set up companies and start-ups in rural regions by young people. Moreover, already existing companies should also have an incentive to relocate and come to rural regions by being encouraged by some form of financial aids, preferential loans or tax exemptions. In this way, instead of migrating (to go abroad but also domestically to urban areas) from rural regions, there will be more and more young people willing to work in rural regions. The second strategy seems to be similar since its objective is also to revive rural regions but in this case, it needs to be done by offering more money on processing in rural areas. It needs be conducted for the whole society; the aim should be not only to produce food but also to prepare the final products. In this way, there should be more employees needed to process the farm goods to produce the end product. The EU's task should be enhance such local production initiatives

Next strategies are ST ones that are called 'Maxi-Mini' since their aim is to use strengths to minimise threats. In this case, two strategies seem to be dealing with the majority of threats using all three strengths. The first one uses 'Pillar 2 Rural Development Programme' in order to minimise the potential results of 'Unstable geopolitical situation'. This strategy has its aim to help farmers touched by the outcome of the unstable geopolitical situation by offering them aids or other sort of help. EU economy with its four main pillars acts as one body so when Russia announced an embargo on the EU agricultural goods, it was implemented in all the EU countries. It means that being outside the EU, some of the countries would not have been touched by the Russian embargo. Nevertheless, it should be noted that acting together more can be achieved that is why the EU needs to cope with this problem and cooperate in order to minimise farmers' loss. That could be done by offering them some financial aids, preferential loans or finding them a new market for their products by intensifying negotiation with countries outside the EU. The second strategy is to support modernization and restructuring, and put an emphasis on innovation, simply by recruiting employees with loyalty agreement. It is important that money invested by the company in order to educate and train its employees is spent in a way that will bring returns in the future. It happens very often that having finished all required courses and training employees leave the company in order to take better paid jobs in Western Europe by using qualifications gained at a previous job.

WO Strategies are also called 'Mini-Maxi'. The first one is to simplify the CAP as a response to its weaknesses like too much administrative burden and the fact that the CAP helps rich farmers get richer. Therefore, the CAP should use its opportunities such as growing number of well-educated people or increasing importance of other sectors than primary in order to deal with its challenges. Due to bureaucratic nature of the CAP, it is common that only big farms that employ specialists can actively participate in programmes offered by the CAP and apply for different types of aids. The procedures should be fair and manageable for every EU farmer. CAP's aids should also be easily accessible and what is crucial all farmers should be informed about these aids well in advance, so they apply for them in due time. The second strategy is devoted to a problem of a lack of equality between EU-N10 and the Old Member States and partially to the fact that the CAP indirectly supports richer. The opportunities remain the same as in the first strategy, and the idea is to implement progressive support for
different CAP actors. It basically means that the CAP should equal the changes for its every actor, meaning that those who are smaller should be provided an additional care. This is because they very often cannot even sustain alone. Therefore, it seems to be a good solution to help them setting up some co-operations or cooperatives or maybe reduce some administrative procedures. While big farms should be encouraged to help smaller ones not by buying them but by diversifying their production and buying their products to produce for example slow food.

Last but not least, WT Strategies that are called 'Mini-Mini' are designed to minimise weaknesses and avoid threats. As the CAP indirectly supports richer, and there is a decreasing number of EU population and ageing society, those who are poorer are in the majority and their situation can be enhanced by the proper policy to increase rural population. However, there has to be a clear cooperation within different policies; mainly CAP with social (family) policy. It is clear that the main obstacles for young people today are job insecurity and low salaries. These conditions are not in favour of deciding about having children. Another important measure that needs to be implemented is to strengthen EU export of agricultural products by negotiating tariffs on agricultural commodities. With the good quality of EU food and the current growing trend of slow-food; European food market seems to be competitive and, therefore, the EU-exports should be encouraged by better tariffs. It could also mitigate the unstable geopolitical situation. For instance, in the case when the embargo is introduced on the EU food in one country, the EU can try to simply transfer agri-exports to other countries.

### 5. CONCLUSION

The EU's CAP as a policy has been reformed numerous time. Instruments that were carefully designed to target specific problems in most of the cases failed. The CAP still has numerous problems that are coming back repeatedly. Despite all these problems, CAP is perceived to be too expensive.

Actually, it is difficult to predict what will be the CAP future but one thing is clear: without starting from farmers, any possible reforms would probably fail. Now, it is the time to join forces and build a better policy that better serve its purpose and only farmers know what they need. Those are the main strategies that should guide the CAP simplification: better focus on small farms, encouraging young people, in particular, to stay in rural areas by putting more emphasis on entrepreneurship in rural regions, and last but not least, helping those farmers who are in need and, in particular, those who are touched by geopolitical implications. Proposed ideas are designed in order to re-think the CAP and make it more equal in order to gain a synergy effect. It is also crucial to speed up the process of economic convergence between the New Member States and the Old Member States.

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## HOW THE RESILIENCE ANALYSIS OF CRIMINAL NETWORKS MAY HELP TO IMPROVE THE EFFECTIVENESS OF PUBLIC POLICIES TO CONTRAST ORGANIZED CRIME<sup>1</sup>

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### ABSTRACT

This paper aims to show in which way the joint use of analysis techniques of the complex networks and the economic theory of human capital might lead to the implementation of new and more effective policies to contrast organized crime. For this purpose, it employs an interdisciplinary approach and utilises the techniques and concepts of Social Network Analysis to identify the essential properties differentiating criminal networks from other social networks and develop a reliable indicator of their robustness and resilience to law enforcement activities. This theoretical premise will serve, therefore, to set up the empirical analysis of the structure of existing interpersonal relationships inside two criminal networks engaged respectively in international drug trafficking and in the local providing of social welfare services to the person.

The study of the above mentioned networks is based on the analysis of judicial acts issued in the context of two recent police operations successfully completed. The results highlight the remarkable ability of networking and the resilience to law enforcement activities of the examined criminal organizations, suggesting the adoption of new and diversified repressive policies based on the analysis of human capital which these organizations can use for their own purposes.

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#### **1. INTRODUCTION AND SUMMARY**

Criminal networks arise and develop, to pursue illegal aims, disguising the shady activities performed and maximizing the profits. The members of such networks trust one another and look for protection or for a privileged access to certain social as well as economic resources (Skaperdas, 2001; Sciarrone, 2009), often through the mediation of individuals who offer their services in a "non-transparent" or irregular way (Barucci, 2008). Therefore, we cannot consider them as simple networks of interpersonal relationships among individuals operating "in the shadow", or anyway in a criminal contest (Ozgul and Erdem, 2015)<sup>2</sup>. In fact, criminal networks have peculiar characteristics which cannot be underestimated or ignored in trying to develop effective preventive and contrastive measures and policies. Several studies highlighted how criminal and terrorist organizations carry out their activities in dynamic contexts, in which the competitive pressure and repressive intervention by the governments constantly test their existence<sup>3</sup>. This is the reason why, in order to survive and keep on growing up, they had to develop high resistance ability<sup>4</sup> as well as a high adaptability to the changing conditions of the environment they operate in. The new waves of Islamic terrorism worrying the whole Western world, the proliferation of criminal organizations trafficking organs and human beings, as well as the expansion and reproduction abilities of the traditional Mafia factions (clans) dramatically show how organized crime is able to progressively improve communication tools and/or recruitment methods to reproduce itself and grow up in the globalization era as well.

All this is strictly related to peculiar resistance abilities and a particular adaptability, which is generally referred to the term and, at the same time, the concept of "resilience", "borrowed" from other sciences and implying the elasticity and adaptability of bodies, passions, systems and even territories (Schoon, 2006). The nature and source of such abilities, as far as criminal and terrorist organizations have been deeply analysed in several researches. In fact, such organizations, due to their topological characteristics, are considered as an extreme and very interesting case of *failure resilient networks*, i.e. networks which are resilient towards the so-called "cascade failures"<sup>5</sup>, and therefore they will also be analysed in this paper, with particular reference to the structure and resilience ability of two criminal networks, the first one set up for international drug and psychotropic substance trafficking and the second one operating in the field of public services in some Social and Healthcare Territorial Institutions of the province of Caserta.

The analysis is carried out using an interdisciplinary approach as well as the typical techniques and concepts of the *Social Network Analysis* (SNA) in order to develop a reliable indicator of *Criminal Network Resilience* (CNR). The techniques offered by the analysis of social networks have rapidly widespread in the last years, even in the study of criminal

<sup>&</sup>lt;sup>2</sup> Scholars are still debating on this issue. They are trying to determine if criminal networks may be assimilated to other type of social networks (Pedahzur and Perliger, 2006; Eberle, 2012) and if, in particular, the several organized crime forms set up to commit crimes and to obtain, directly or indirectly, financial or material benefits, have the same topological and solidity characteristics of the other real networks, such as the Internet, biological networks or the networks of bibliographical quotes and scientific cooperation (Albert et al., 2000; Watts et al., 1998). However, the most recent empirical studies show that, due to their typical characteristics (secrecy, decentralization), this kind of organizations cannot be in any way assimilated to other social networks (Lindelauf *et al.* (2009), Natarajan (2006) and Ozgul and Erdem (2015)).

<sup>&</sup>lt;sup>3</sup>See, among other things, Skaperdas (2001), pp. 184 and ff., and Ayling (2009), p. 182.

<sup>&</sup>lt;sup>4</sup> See Agreste at al. (2016).

<sup>&</sup>lt;sup>5</sup> See above all Gutfraind, who carried out some researches (Gutfraind, 2010 and 2011) on different kinds of criminal networks in order to identify a topology which, for itself, could guarantee a good resistance level towards cascade failures. See also Callahan, Shakarian *et al.* (2012) and McGuire (2014).

networks, and their results convinced the institutions and law enforcement agencies to use them more and more frequently. In fact, the concept of social network was applied to the study of crime and to the several forms in which it operates and organizes, but above all to the analysis of transnational crime and terrorist networks (Sparrow, 1991; Waring, 1993; Klerks, 2001; Morselli, 2009; Krebs, 2001; Calderoni, 2014; Strang, 2014).

The network approach widespread in a contagious way among researchers, the law enforcement agencies and the authorities charged with the application of law in each country because it is considered as a more efficient and effective tool to combat organized crime than the traditional investigative methods (like wiretapping: see Agreste et al., 2016) and the traditional criminal intelligence techniques (Castiello, 2015). In fact, there is the conviction that it is an inestimable instrument able to put together and to interpret different information and several observations by detecting an understandable model of behaviour and social action able to show the logic, or the "rules of the game", ruling the relationships among individuals (Ianni A. and Ianni R.E., 1990). Moreover, the use of this technique to the study of criminal organizations could be very useful to understand how they exchange information, weave relationships and partnerships with affiliates and other types of partner in crime, taking "new productive forces", organize their relationships interpersonal and alliances with members of the cd. "gray area" in which lurk the relationships of complicity and collusion of the professional, economic, political and cultural worlds with the criminal world. The application of the SNA may be helpful even in the legal field, in order to better define the areas of contiguity to the mafia groups (in particular, in all cases of external collaboration and support of criminal organizations<sup>6</sup>, including those of complicity in the mafia-related criminal conspiracy, typical of the common law systems<sup>7</sup>) and to develop more effective legal instruments of prevention and repression of organized crime.

This paper is structured as follows: in the second paragraph we will try to identify the key concepts and some methodological criteria to define a reliable indicator of *criminal networks resilience* in an appropriate way; in the third paragraph it will analyses the structure and the characteristics of the concerned *networks*, highlighting how the combined use of the analysis techniques of complex networks and of the economy of human capital as well may bring to the development of new and more effective policies able to contrast organized crime; finally, in the fourth paragraph it will tries to draw some conclusions and to propose some *policies* to combat the organized crime.

# 2. CRIMINAL NETWORKS RESILIENCE: KEY CONCEPTS AND METHODOLOGICAL CRITERIA

Before developing a reliable indicator of *Criminal Network Resilience* (CNR), it is necessary to define some key concepts identifying the fundamental characteristics of a criminal network and differentiating it from the other social networks.

First of all, a criminal network is characterized by the secrecy and covering (or protection) level it is able to guarantee to its members. Usually, such a characteristic does not belong to other social organizations and implies the existence of firm trust relationships among the members. In fact, studies on social capital show that trust is often a necessary condition, even

<sup>&</sup>lt;sup>6</sup> For an in-depth analysis of common trends and differences in the ways in which, in civil law countries, jurisprudence and doctrine deal with the phenomenon of the proximity to criminal organizations, see Visconti (2010).

<sup>&</sup>lt;sup>7</sup> For a detailed description of the differences between conspiracy and complicity, see Brody, Acker and Logan (2001), McSorley (2003) and Sergi (2015).

if not sufficient, to set up cooperation for any kind of purposes. However, the huge literature on the Mafia phenomenon highlights how criminal organizations are "interested in maintaining a low and impersonal level of general trust, as in this way the demand in the personalised trust they are able to offer and guarantee increases" (Sciarrone, 2009).

Another fundamental characteristic of such organizations is their *networking* ability, i.e. their ability to build relationships, to make alliances, to establish exchanges, as well as to promote mutual obligations and favours. Not only they are interested in integrating in their network a certain individual, but also in accessing to and maybe activating the *network* the individual already belongs to. This allows the several members of those networks to act, according to the circumstances, as mediators, patrons, protectors, in relationship structures of different forms and nature they are able to exploit in order to reach their illegal aims.

The SNA shows that a high clustering coefficient and a low average path length among the nodes of a network promote the communication and relationships of the individuals in the network, thus making this latter more "effective". However, these characteristics of the network can threaten its security, as a wider sharing of the information inside it may substantially help the *intelligence* activity carried out by the police, reducing the secrecy and covering level of the network itself. This is the reason why we think (see Enders and Su, 2007; Lindelauf *et al.*, 2009 and 2011) that criminal organizations have to address a clear *trade-off* between effectiveness and security of the *network*, between the aims concerning security and those concerning the uncontrolled flow of information every day. Therefore, the fundamental dilemma of each criminal organization is balancing its need for strategic initiatives resulting from a wide access to certain resources (goods, services, information), gained by using weak links, with the need for consolidated and trusted collaborations, promoting secrecy, protection as well as repression of those behaviours which do not comply with the aims of the organization and implemented through the application of rules and sanctions (Ozgul and Erdem, 2015).

Another characteristic which is essential in determining (or in increasing) the resilience of a criminal *network* is represented, as already underlined (see § 3.1), by its topology (Xu and Chen, 2008; Ayling 2009). A "mixed-star" structure guarantees, without any doubt, a particular resistance to *random* attacks while the redundancy in connections and a minimum low average distance guarantee the continuity of the illegal activities on the one side, in case one or more nodes are removed, and a better communication system on the other side (*time to task*). On the contrary, a decentralized and widespread structure allows a higher confidentiality in communication. Nonetheless, a highly decentralized network makes it more difficult to manage the trafficking activities (for instance drugs and money) and to move resources<sup>8</sup>.

Some criminal networks may have important dimensions and act at international level. In order to detect their structure and measure their organizational dimension, we use the centrality and centralization indexes. While the first ones identify the position of each nodes in the network, the second ones measure the level of hierarchization of the first one as the whole. Low values in the centralization level indicate a low level of hierarchization, while high values indicate a high level of hierarchization. If centralization is based on the control of the information flows (*rush* or *betweenness*), it indicates, in case of high values, that some

<sup>&</sup>lt;sup>8</sup> In-depth studies carried out on this topic (Everton, 2006; Locke, 1995) show different *performance* levels related to the kind of structure. *Networks* with too much centralized or decentralized structures tend to have lower *performance* levels in comparison with networks with an intermediate centralization degree.

members of the *network* are in a position of *brokerage* and that the network, in order to function, needs intermediaries connecting its various subgroups.

Finally, another distinctive characteristic of some criminal brotherhoods is the robustness. In SNA this term usually indicates the ability of a network to maintain its own connectivity characteristics even after a fraction f of its nodes has been removed. Of course, such a characteristic has some immediate practical effects and concerns those processes which can be carried out through a network. Therefore, it is not by chance that this was one of the first characteristics of the *networks* to be analysed in literature, especially with reference to complex networks, such as the Internet, the transportation or energy networks. However, such characteristic also distinguishes some kinds of criminal networks, such as the Mafia organizations, in which the redundancy in connections, typical of the family *clusters*, allows to immediately substitute any arrested or killed members.

According to these observations, part of the literature (Ozgul and Erdem, 2015) tried to propose a very simple way to define a reliable CNR indicator envisaging that the resilience of a criminal network results from the following elements:

- the level of secrecy or coverage of the criminal network, which can be defined through the analysis of transitive triple calculating, the so-called Clustering Coefficient (CC);
- the level of spreading of the knowledge and information inside the network, measured by the average geodesic distance (*Average Path Length*, APL) separating all pairs of its nodes;
- the *leaders* average centrality (*Average Centrality of Leaders*, ACL), which in a criminal network shows how much authority is actually in the hands of those who act like leaders;
- the total number of the members and connections of the network, which gives an approximate measure of the robustness of the *network* (*Robustness*, R).

In this way we can identify a first simple algorithm able to estimate the resilience of a criminal network, or its resistance ability and adaptability to the changing conditions of the environment in which it operates:

$$[1]\phi = \log\left(\frac{ACL \cdot CC \cdot R}{APL}\right)$$

However, as already highlighted (see § 3.1), the previously listed characteristics are not the only elements able to affect the level of resilience of a given criminal *network*. In order to define an effective direct attack strategy able to disjoint criminal networks, it is also necessary to take into account the great amount of the available social and human capital. The Ozgul and Erdem algorithm showed at [1] represents a valid instrument to measure the CNR as well as a valid basis to develop new and more effective policies to contrast organized crime. However, it does not take into account that the resilience of criminal networks often depends on personal training and qualities, as well as on the skills of their members. The above-mentioned indicator should be integrated as follows:

[2]  $\phi = \log\left(\frac{ACL \cdot CC \cdot R \cdot NIM}{APL}\right)$ 

where NIM (*Number of Irreplaceable Members*) is a variable indicating the total amount of the members of the network that cannot be replaced and gives an approximate measure of the available human capital to carry out the activities and reach the common illegal aims.

# 3. ANALYSIS OF THE RESILIENCE OF THE OBSERVED CRIMINAL NETWORKS

The analysis of resilience of the observed criminal networks is based on several type of judicial documents (depositions, interrogations, warrants of arrest and verdicts) issued by the judicial authority during recent police operations aimed at dismantling two dangerous criminal networks engaged in international drug trafficking and in supplying health and social services at a local level. In particular, the first operation was named "Freccia Sarda"<sup>9</sup> (*Sardinian Arrow*) and allowed to identify a group of Nigerian and Italian criminals engaged in international drug trafficking among Sardinia, Campania, South America and Holland. The second operation was named "Il principe e la scheda ballerina"<sup>10</sup> (*The prince and the dancing card*) and allowed to arrest several members and flankers of a *clan* belonging to the Casalesi family, a famous Camorra cartel, composed of 10 clans, operating in the sector of social and healthcare services in some Municipalities and Territorial Districts of the province of Caserta<sup>11</sup>.

#### 3.1. "Freccia Sarda" Operation

3.1.1. Topological analysis of the observed criminal network

The observed criminal network is made up of three different criminal organizations tracing back to some Italian and non-EU citizens (coming from Nigeria, Kenya and Ghana). The network has, as shown later, a cellular structure, which is typical of several complex networks. The organization had two operating bases, one in Castel Volturno, in the province of Caserta; the other in Cagliari, Sardinia. Drug trafficking, above all heroin and cocaine, involved Italy, South America, the United Kingdom and Holland.

The network was made up of 70 actors and 125 connections. The connections among the members of the network came from information or resource exchanges (drug, money) and this is the reason why we chose to analyse this kind of relationships by symmetrizing its connections.

The level of cohesion measured thought the "density" of the network shows a very low value (0,052) that means almost 5% of all possible connections is present. This value highlights a very low level of cohesion of the group. The average degree level is 3,50 degree for each node, i.e. each individual activated, on average, almost 3,5 edges, a value confirming the reduced level of cohesion of the group. As there are not many direct connections among the several members of the network, we can assume that the communications or the exchanges of

<sup>&</sup>lt;sup>9</sup> The investigation has been coordinated by the D.D.A. (Local Anti-Mafia Investigation Department) of Cagliari and carried out by the Oristano Police Department.

<sup>&</sup>lt;sup>10</sup> The investigation has been coordinated by the D.D.A. (Local Anti-Mafia Investigation Department) of Naples and carried out by the Comando Provinciale dei Carabinieri of Caserta.

<sup>&</sup>lt;sup>11</sup> For further details about Casalesi cartel, see Italian Minister of the Interior (2010 and 2016).

resources and information were guaranteed by indirect connections, i.e. by individuals acting as intermediaries.

The structure of the *network* shows a distribution of degree which follows a power law, a high clustering coefficient and a low minimum average distance among all pairs of nodes inside the network ("small world" effect). The Alpha value of the level distribution (2,48), the p-value (0,81) and the value of the *goodness of fit* (GOF = 0,051) confirm the characteristics of a scale-free network. The 62% of the connections is distributed on 4 main *hubs* which can be referred to four actors N19, N18, N63 and N47, controlling the whole drug trafficking process, from the import of the substances produced in South America to the distribution in Sardinia. The highest values of *degree* and *betweenness* are mainly distributed on three actors (N63, N18 and N19) and less on actor N47 (see Fig.1).

Figure 1. "Freccia Sarda" Operation. Distribution of the degree and betweenness centrality



Source: Our processing of the data supplied by the D.D.A. (Local Anti-Mafia Investigation Department) of Cagliari.

Moreover, the analysed network shows a quite hierarchized structure, the *degree centralization index* is 35,93%, while the *betweenness* has a value of 60,93% and this supports the idea that that most of the relationship activity of the *network* is carried out by mediators or *brokers*. In fact, the analysis of the "brokerage" (see Fig. 2) highlights how most of the intermediation activity refers to nodes N18, N19 and N63, which actually connect one another the several parts of the network. They have a structural position of *gatekeepers*, i.e. they can act like "guardians", as they control the information and resources of people outside the group they belong.



Figure 2. "Freccia Sarda" Operation. Analysis of the brokerage activity

Source: Our processing of the data supplied by the D.D.A. (Local Anti-Mafia Investigation Department) of Cagliari.

The average path length among the nodes of the network is 2,932, while the average clustering coefficient is 0,673. If we compare these two values with those resulting from a *random* network of the same size and average degree, it results in the following:

- as far as the clustering coefficient is concerned, a great difference, i.e. 0,673 for the real network and 0,054 for the random network;
- as far as average path length is concerned, a more moderate difference, i.e. 2,932 for the observed network and 3,374 for the *random* network.

Such values confirm the "small world" characteristic of the criminal organization taken into account. The reduced average path length among the nodes and the high level of local cohesion guarantee the network a high level of effectiveness, which is functional to the success of the activities related to drug import and distribution.

As far as the nature of the connections among the actors of the main *hubs* of the network is concerned, the prevalence of family or emotional connections was highlighted (strong ties), strengthened by an ethnic bond (the organization is mainly made up of non-EU people, with the participation of some Italian individuals), while in minor roles (ovule-eating carriers, small pushers) the prevalence of weak connections (weak ties) simply based on acquaintances or role similarities was highlighted (Granovetter, 1973).

The relationship dynamics show a tendency of the minor actors (carriers and medium-level pushers) to connect with those showing a high *degree* (preferential attachment), as they have particular abilities or *fitness* (Mosca and Villani, 2012; Barabàsi, 2002) in managing drug trafficking, because they are able to develop and maintain contacts with higher level suppliers (international traffickers) and the ability to earn money from the drug sale.

#### 3.1.2. Analysis of the resilience level of the observed criminal network

We can assume that the observed network shows the typical characteristics of scale-free networks and the "small world" as well. Such characteristics give it, as noticed, a high level of effectiveness in managing illegal trafficking and, in general, a good level of robustness towards *random* attacks. Nonetheless, we wished to check the robustness of the observed *network* and its characteristics by simulating two kinds of attack.

The first kind of network attack ("random attack 1") aimed at randomly removing all nodes with a low level of degree, between 1 and 3, i.e. ovule-eating couriers or low-level pushers; the second attack ("random attack 2"), the one which was actually carried out by the police thanks to the information acquired by the investigating bodies, aimed at neutralizing all couriers and pushers recruited by clan leaders or by those acting like mediators for drug transportation (specifically affecting actors, in this case, are N34, N9, N1, N24, N45 and N31)<sup>12</sup>.

The results of the two attacks are listed in Table 1 and showed in Figure 3 here below.

*Table 1. "Freccia Sarda" Operation. Analysis of the network topology and of the effects of simulated random attacks* 

	Original network	Random attack 1	Random attack 2
Size	70	34	63
Alpha	2,48	2,75	2,31
P-value	0,81	0,71	0,84
GOF	0,051	0,058	0,04
Clustering coefficient	0,67	0,72	0,61
Average path length	2,93	2,75	2,93

Source: Our processing of the data supplied by the D.D.A. (Local Anti-Mafia Investigation Department) of Cagliari.

<sup>&</sup>lt;sup>12</sup> We considered this second attack random, because the police forces ignored the whole network and they arrested, by a parallel operations, only drug dealers less connected (drug couriers). On the contrary, for an assessment of the effectiveness of sequential police attacks, see Agreste *et al.* (2016).

Figure 3. "Freccia Sarda" Operation. Representation of the original network and of the simulated random attacks

3.A. Original network.



3.B. Network after random attack 1.



3.C. Network after random attack 2.



Source: Our processing of the data supplied by the D.D.A. (Local Anti-Mafia Investigation Department) of Cagliari.

It is easy to notice that, despite some actors of the network were removed, its structure remains intact (see Table 1). In fact, it maintains the same characteristics of the original graph (Fig. 3.A.), both by just removing 7 nodes (Fig. 3.B.) and by removing 36 nodes (Fig. 3.C.), i.e. more than the half of the members of the network.

As far as the topological characteristics are concerned, the observed network is resilient to the *random* attacks towards the nodes with a low *degree*. On the contrary, if the contrasting (repressive) activity concerns the *hubs* characterized by a high value of *betweenness*, the results are diametrically opposed: by removing N18, N19 and N63, which represent the heads of the criminal organization, the network breaks up in 21 components, of which two are made up of 24 and 18 nodes respectively (Fig. 4.B). This brings to the loss of leading figures in the organization and to serious damages to the drug trafficking process.

Therefore, the obtained results show, how it was possible to notice, that the attacks carried out following the social capital approach bring to an important breaking up of the *network*, even if it is necessary to underline that the observed network is still alive and operating, thanks to the preservation of some members with particular skills and able to guarantee its survival and "regular functioning": N58, close to N47 and N63, called "'o professore" (the professor), who dealt with the recruitment and legal assistance for the arrested carriers; N62, brother of N63, who was substituted by the first one, after his arrest, in the management of illegal trafficking, thanks to the skills of N30; N11, wife of N19, who revealed a woman able to manage drug trafficking on behalf of her husband; N41, partner of N18, who maintained the contacts with carriers and customers; N47, head of that part of the organization located abroad, who, thanks to two inside men living in the Netherlands and in the United Kingdom, N8 and N21, dealt with the import and distribution of drugs from South America to Italy.

If we really wish to weaken the *network*, we need to implement a different strategy aiming at affecting those individuals who have the above-mentioned particular skills. In other words, we need to adopt a contrasting (repressive) strategy based not only on social capital, but also on the available human capital inside the *network*. Later in this paragraph we try to estimate the effectiveness of a similar strategy by simulating an attack aimed at removing all nodes which cannot be easily substituted, as they have special skills and are connected with the *hubs* of the network by strong connections.

Table 2 and Figure 4 show the obtained results. The attack carried out following the human capital strategy breaks the *network* up in two components: the first one made up of 2 nodes; the second one made up of 60 nodes and 88 edges (connections). However, even if the network preserves its characteristics of scale-free and "small world", the latter seems to be in this case much less resilient, because it lost the highly professional skilled elements able to guarantee the regular functioning of the *network* even when it was under attack.

	Original network	Random attack	Human capital attack
Arrested or killed criminals	0	7	9
Size	70	63	61
Alpha	2,48	2,31	2,52
P-value	0,81	0,84	0,33
GOF	0,05	0,05	0,79
Clustering coefficient	0,67	0,61	0,67
Average Centrality leader	0,33	0,28	0,27
Average Path Lenght	2,93	2,94	2,98
Average Human Capital*	1,71	1,71	1,00
Ozgul-Edmer algorithm	1,67	1,31	1,30
Our algorithm	2,20	1,85	1,30

Table 2. "Freccia Sarda" Operation. Social capital and human capital strategies

Notes: \* The minimum value of the Average Human Capital is 1 (no individual with special skills).

Source: Our processing of the data supplied by the D.D.A. (Local Anti-Mafia Investigation Department) of Cagliari.

The use of the resilience indexes we have previously described (see § 3.2) clearly confirms the greater effectiveness which distinguishes the attacks carried out following the human capital strategy than the random attacks based on the social capital approach (see Table 2). In fact, if we compare the resilience level of the *network* before and after the attacks, we can see how these latter significantly broke the criminal network. After the attack it appears much more weakened. But while random attacks only brought to a net reduction in the average centrality level of *leaders* (from 0,33 to 0,28), significantly reducing the power they can exert inside the *network*, the attacks based on human capital caused a significant reduction in the spreading of the knowledge and information inside the network. In fact, in this last case the average geodesic distance has significantly increased (from 2,93 to 2,98). Ozgul's and Edmer's algorithm does not clearly detect this difference. In fact, it has only slightly decreased – precisely by 0.8% – in the case of the attacks based on the human capital strategy. On the contrary, the resilience index proposed by this research is much more sensitive and able to measure the effects caused by such attacks. In the concerned case it has significantly decreased: by 16%, as far as *random* attacks are concerned, to 30%, as far as human capital attacks are concerned.

The graph shown in Fig. 4.C. allows us to make an important observation. Even after the attack based on human capital, the criminal network remains intact and functioning. Even if it loses 10 nodes, it keeps on enjoying a high level of robustness (as highlighted by the values *Alpha*, *Goodness of fit* and p-value) and effectiveness (measured by the *Clustering Coefficient* and by the *Average Path Lenght*). Actually, removing or seizing those individuals having particular professional skills and competences that it is difficult to substitute, at least in a short term, paralyses the organization activities. Identifying such a paradox is essential and suggests the adoption of new and more effective repression policies, able to combine the benefits brought by the adoption of attack strategies based on social capital with the benefits resulting from the application of strategies based on human capital.

*Figure 4. "Freccia Sarda" Operation. Representation of the original network and of the effects caused by the simulated attacks* 

4.A. Original network.



4.B. Network after selected attack based on the social capital approach.



4.C. Network after attack based on the human capital approach.



Source: Our processing of the data supplied by the D.D.A. (Local Anti-Mafia Investigation Department) of Cagliari.

#### 3.2. "Il principe e la scheda ballerina" Operation

#### 3.2.1. General analysis of the observed criminal network

The second criminal network analysed in this research is made up of a clan operating in a wide area in the province of Caserta and known with the unappropriate nickname of "clan dei casalesi" (Casalesi clan)<sup>13</sup>. It is – as reported in the data taken from the warrant of arrest named "The prince and the dancing card" – a federate criminal group, which dominates in the province of Caserta. From the '70s of the last century until today it has exerted a great political and economic power, collecting a significant quantity of wealth and assets, that were re-invested in several activities through a wide network of relationships and the support of the population living in the area where the organization had most of its influence<sup>14</sup>.

The interest of this organization in the public services field is related to the conquering logic of this dangerous criminal group. In fact, this field may not seem so profitable at first sight, or anyway not so lucrative as the fields of cement, agriculture, tourism and waste. However, at a deeper analysis, if we carefully look at the data supplied by the D.D.A. (Local Anti-Mafia Investigation Department) of Naples, we can see how the concerned field was used as a social legitimation instrument, i.e. as a means to increase its authority as well as the quantity of social capital available for the members of the organization. The reason for this activity has to be searched for in its ability to produce and grow the thick network of relationships connecting Mafia with politics, *business* and civil society in general and which represents the so-called "grey area" allowing the Mafia business to hide and to expand.

For this reason, the analysed *network* shows a high level of complexity, determined above all by the extreme variety of the individuals belonging to it (see Fig. 5). Among them there are not only the supporters of the Camorra group taken into account, but also Public organs, politicians, entrepreneurs, social cooperatives, public administrators and even people with no previous convictions. Among the several offences listed in the warrant of arrest, a dense network of relationships aimed at controlling the contracts and direct assignations in the field of public services is described. Moreover, illegal behaviours aimed at controlling the votes by some candidates to the political elections in Public bodies were illustrated. In particular, votes were influenced by paying amounts of money, through Mafia intimidations, illegal behaviours in the dynamics of the election committee and, finally, by promising the recruitment in some social cooperatives providing health and social services, whose reference partner, 1LL, was a local entrepreneur deemed to be close to some apical members of the Schiavone family *clan*.

If we look at the morphology of the *network* we can identify three main cores: two of them are mainly *polycentric* but, while the central core is mainly made up of entrepreneurs, local politicians and civil servants, the one located above on the right side of the network is mostly made up of criminals, in particular of members close to the Casalesi cartel. Instead, the core located on the left side of the network is strongly *polarized* and above all made up of local bodies and individuals operating in the *non-profit* sector, in particular of social cooperatives, close to N1LL, supplying health and social services in several Municipalities. The three above-mentioned cores are connected one another through less stable and consolidated

<sup>&</sup>lt;sup>13</sup> The use of the term "casalesi" (Casalesi clan) determined the assimilation of an entire population living in the Caserta area, in particular, in the city of Casal di Principe, to the criminal organization operating in such territories, seriously damaging the reputation and negatively affecting (stigma) social and economic relationships.

<sup>&</sup>lt;sup>14</sup> See Parliamentary Investigation Committee on the Mafia phenomenon and on the other similar criminal associations (1994).

connections, but are more widespread and branched, which makes the network more dynamic and open to relationships with other sectors and environments of the civil society.

However, the criminal organization in itself (see Fig. 6) was mainly made up of the Schiavone family (whose prominent members are N5Boss, N25Boss and N19 area leader) and of the Bidognetti family (N8, N9), that since the half of the '90s has shared the undisputed domain of the *clan*. In carrying out the illegal activities of the organization an entrepreneur (N1LL) had a leading role: this was the legal representative of an Association of social cooperatives (33Agac) and, at the same time, also controlling other cooperatives indicated in the graph showed in Fig. 5 under numbers 32, 34 and 35. Such cooperatives recruited people "indicated" by local political candidates (N2, N3 and N16), who exploited N1LL for various activities to build and make their own election success grow. Moreover, the above-mentioned entrepreneur, thanks to his close relationships with the Schiavone family *clan* (N5Boss), used the protection and intimidation power of the criminal group as well as other "services" offered by its dangerous members, thus preserving an important market position in the field of the contracts for public services in the provinces of Naples and Caserta.

Figure 5. "Il Principe e la scheda ballerina" Operation. The connection network of the criminal organization (link analysis).



Source: Our processing of the data supplied by the D.D.A. (Local Anti-Mafia Investigation Department) of Naples.





Source: Our processing of the data supplied by the D.D.A. (Local Anti-Mafia Investigation Department) of Naples.

N1LL contributed to the clan by paying it a part of its profits according to the managed turnover (protection money), by actually recruiting or by promising to recruit individuals close to the *clan* and, finally, by laundering money and other assets of illegal origin. In exchange for that, N1LL obtained contracts or assignments by several Municipalities in the province of Caserta, thus significantly increasing its turnover as well as the turnover of the companies belonging to the Association 33Agac (to which around 100 subsidiary cooperatives belonged for a total of 1,000 employees) and reaching an almost monopoly position in the field of public services.

Also the following people had a leading role in the organization:

- N26, *ex* director of the technical office of a Municipalities in the province of Caserta that, thanks to the support of N16, set up a company in the name of his wife N27 (nominee) to financially support the construction of a great shopping centre;
- N28, bank employee in contact with N16, national politician, who from the outside took part in the activities of the criminal group by affecting the evaluation of the requests submitted to obtain the authorization to open the above-mentioned shopping centre;
- N2 and N3, politicians, connected with the criminals 5Boss (clan S), N8 and N9 (clan B), who exploited for various activities the cooperatives controlled by N1LL for "manipulated" recruitments aimed at building their own election success.

The above-mentioned relationship network generated a criminal system for the management of public services which actually did not supply the services planned by the qualified offices, but rather recruited health and social operators – under the supervision of individuals trusted by the *clan* or the local and national politicians themselves – in order to meet the above-mentioned individual needs of political and commercial exchange. A similar way of *recruitment* of the staff engaged in social policies highlighted the lack of professionalism of

the operators in the concerned areas, thus causing situations of clear inefficacy towards the aimed public objectives as well as a general mistrust climate towards institutions, which still today helps slow down the growth and local development processes through the reconversion of the social capital used by the Mafia.

3.2.2. Topological analysis of the observed criminal network

Analysing the characteristics of the above-mentioned network we can detect (see Table 3) how it shows the structure of a network with a-scale-free properties (identified by an *Alpha* value of 2,03, a *p*-value of 0,68 and a goodness of fit of 0,11), combined with the typical characteristics of the "small world" networks (in fact, the average path length is 2,22, while the clustering coefficient is 0,66).

The analysis of the centrality and brokerage measures (see Figures 7 and 8) further explains the characteristics and influence of the single actors inside the analysed network.



Figure 7. "Il Principe e la scheda ballerina" Operation. Distribution of the degree and betweenness centrality

Source: Our processing of the data supplied by the D.D.A. (Local Anti-Mafia Investigation Department) of Naples.



Figure 8. "Il Principe e la scheda ballerina" Operation. Analysis of the brokerage activity

Source: Our processing of the data supplied by the D.D.A. (Local Anti-Mafia Investigation Department) of Naples.

In the 4 categories of individuals involved in the investigation (public employees; private individuals; politicians; clan leaders) it is easy to detect those who carried out a more intense intermediation activity. The analysis shows that the "strongest" *brokers* inside the network are, without any doubt, those who belong to the *clan* (N5Boss and N25), followed by politicians (N2 and N3) and private individuals (N1LL), while the intermediation activity of public employees, most of them working in the offices of the municipal districts involved in the activities carried out by the organization, is virtually irrelevant.

If we take into account the role of the several individuals inside the *network*<sup>15</sup>, it is easy to understand how the actors representing the main source of interconnection among the several areas of the network are N1LL, N5 and N2. The centralization degree (*degree*), describing how the network depends on one of its leaders, also shows a good level of hierarchization (40,16%), determined by the presence of focal actors (*hubs*), while an intermediate value of the centralization index based on *betweenness* (37%) it shows the presence of actors who control the flows of information related to illegal activities (N2, N3, N1LL).

3.2.3. Analysis of the resilience level of the observed criminal network

Also in this case, in order to check the robustness level of the network, we carried out two attack simulations. The first attack ("random attack") aims at randomly removing only the nodes with a low *degree*, while the second attack ("*hub* selective attack") is based on the social capital approach and, therefore, aims at mainly neutralizing the actors characterized by a high value of *betweenness* (N1LL, N5, N2 and N3).

<sup>&</sup>lt;sup>15</sup> Some actors also cover more than one role, sometimes carrying out the important function of "guardians" (or *Gatekeepers*), i.e. those who are on the borders of a group of individuals and able to control the "access" by those belonging to other groups, sometimes carrying out the function of "liason", when the intermediation activity concerns different areas of the *network*.

The results of the two attacks are listed in Table 3 and Figure 9. They show how (see Figures 9.B. and 9.C.), despite removing the 10 nodes with a degree between 2 and 3, the network maintains the original small-world and scale-free properties<sup>16</sup>. These characteristics potentially guarantee the operating continuity and regular functioning of the organization. Instead, the second attack, by removing at least 5 main *hubs* (N1LL, N5Boss, N25Boss, N2 and N3), makes the network break up in 7 components (see Fig. 9.C.). Therefore, at first sight the observed network seems significantly weakened, but as for various aspects it keeps on "enjoying a very good health". In fact, it is still possible to identify indicators of such excellent wellness status of the *network*:

- a) removing the main *hubs* does not bring to the loss of the abetment of the institutions in the Municipalities concerned by the illegal activities of the clan; actually the network can still trust the civil servants working in the technical offices of the municipal districts who can push the administrative business to the benefit of the clan;
- b) the network can still count on the representative-sponsor, at the national level, of the interests of the clan, a politician closely connected with the *Schiavone family clan*;
- c) two influential individuals belonging to the *Bidognetti family clan* are still present inside the network (N8 and N9);
- d) the redundancy in connections, typical of the family *clusters*, which guarantees that each area leader of the Schiavone family *clan* can be substituted and his/her businesses, knowledge and power can be transferred;
- e) the rooting on the territory of all individuals involved in the criminal network (clan members, politicians, entrepreneurs, public officers).

	Original network	Random attack	Hub selective attack
Size	32	22	27
Alpha	2,03	2,52	7 (components)
P-value	0,68	0,23	(··· r·····)
Gof	0,11	0,12	-
Clustering coefficient	0,66	0,63	-
Average path length	2,22	2,13	-

 Table 3. "Il Principe e la scheda ballerina" Operation. Analysis of the network topology and of the effects produced by simulated random attacks

Source: Our processing of the data supplied by the D.D.A. (Local Anti-Mafia Investigation Department) of Naples.

It is clear that identifying and affecting only the most connected actors (the so-called "key players") of the criminal *network* and/or the nodes connecting the several groups and subgroups inside the network (the so-called "bridge connections" or "bridges") is not enough to break up its relationships structure. In order to be really effective, an attack strategy should identify and remove the minimum set of connections and nodes (*minimum cut-set*) having the

<sup>&</sup>lt;sup>16</sup> The degree distribution indexes have the following values: Alpha = 2,51; positive *P-value* = 0,23; *Gof* = 0,12, while the "small world" indexes are: *Clustering Coefficient* = 0,63; *Average Path Lenght* = 2,13.

precious knowledge, skills and technical abilities – or, in other words, human capital – of the criminal network.

Besides the removed *hubs*, which had a high "endowment" of human capital (in particular, we are referring to actors N1LL, N2 and N3), there are individuals who do not connect the various parts of the *network* one another, but significantly contribute to reach the criminal aims of the organization. Among these N16, the politician representative and sponsor of the Casalesi clan; the civil servants working in the technical offices of the several Municipalities interested in the illegal business of the organization (in particular, N30 close to the Schiavone family *clan*, N29 and N31); the engineer and entrepreneur N26, close to the politicians N2 and N3 due to family ties and, at the same time, with a close business relationship with the Casalesi *clan* for the development of a great shopping centre; N28, *ex* bank employee, able to find abetments and connivances inside the bank sector, and representative of the company to which was subcontracted the construction of the above-mentioned shopping centre.

It is easy to notice (see Figures 10.A. and 10.B.) that removing such nodes (through an attack based on the human capital approach) does not imply significant changes in the structure of the network. This remains integral and characterized by the same topology (see Table 4), preserving its initial features of robustness (as highlighted by the *Alpha* value, the *Goodness of fit* value and the p-value) and effectiveness (measured by the *Cluster Coefficient* and the *Average Path Length*). However, removing the above-mentioned actors, who identify individuals with particular competences, professional skills and relationships (for instance, think about the connections of N28 in the bank, the coverage of N16 or the services supplied by the public officers employed in the technical offices of the municipal districts) and who are difficult to replace for this reason, actually paralyzes the activities of the organization, at least in the short term, in an irreparable way.

Figure 9. "Il Principe e la scheda ballerina" Operation. Representation of the original network and of the simulated random attacks

9.A. Original network.



#### 9.B. Network after random attack 1.



9.C. Network after selective attack.



Source: Our processing of the data supplied by the D.D.A. (Local Anti-Mafia Investigation Department) of Naples.

The Ozgul and Edmer's algorithm once again does not allow us to have a clear perception of this situation (see Table 4). In fact, it just reduces by 13,07%, while the resilience index proposed in this research is much more effective, when it comes to measuring the damages caused by attacks based on the human capital strategy. In the concerned case, in particular, it even reduces by 39%, while we realize that the *random* attack aimed at only removing those nodes with a low *degree* made the resilience level of the criminal network increase. In fact, the resilience level increased by 3,19%, according to our algorithm, and by 4,6%, if calculated with the Ozgul-Edmer's algorithm.

	Original network	Random attack	Human capital attack
Arrested or killed criminals	0	6	6
Size	32,00	26,00	26,00
Alpha	2,03	2,52	2,10
P-value	0,68	0,23	0,82
GOF	0,11	0,12	0,11
Clustering coefficient	0,66	0,75	0,68
Average Centrality leader	0,45	0,50	0,46
Average Path Lenght	2,22	2,10	2,15
Average Human Capital*	1,91	1,91	1,00
<b>Ozgul-Edmer's algorithm</b>	1,46	1,53	1,33
Our algorithm	2,11	2,17	1,33

Table 4. "Il Principe e la scheda ballerina" Operation. Social capital and human capital strategies

Notes: \* The minimum value of the Average Human Capital is 1 (no individuals with special skills).

Source: Our processing of the data supplied by the D.D.A. (Local Anti-Mafia Investigation Department) of Naples.

Figure 10. "Il Principe e la scheda ballerina" Operation. Representation of the effects produced by attacks based on the human capital strategy

10.A. Original network.



10.B. Network after attack based on the human capital approach.



Source: Our processing of the data supplied by the D.D.A. (Local Anti-Mafia Investigation Department) of Naples.

#### 4. CONCLUSIONS

The analysis carried out in this research highlighted the high resistance and adaptation abilities usually characterizing criminal networks. In particular, the topological structure of two dangerous criminal organizations, employed in international drug trafficking and in supplying Municipalities with public services respectively, was analysed. The adopted techniques are the typical tools of the Social Economics and of the *Social Network Analysis*, which in the last years aroused a growing interest and rapidly spread even in the analysis of the public policies aimed at reducing criminality and enhancing *welfare* systems<sup>17</sup>. The data we used were taken from the investigational documents of the police as well as from the judgements issued by the ordinary judicial authority within two important crime-prevention operations which have been recently carried out.

Particular attention was dedicated to the concept of resilience and to the development of an appropriate *set* of indicators allowing us to measure the resilience level in an objective way and with reference to the structure of the interpersonal relationships inside criminal networks.

The aim of this research was to explore the potentials, the operating benefits as well as the limits of an extension of the application of the SNA and of the analysis of complex networks to the study and development of public policies aimed at contrasting and repress Mafia-related phenomena. In particular, we tried to check if and to which extent contrasting strategies based on human capital may be used in combination with the strategies based on social capital to reduce or neutralize the resistance and adaptation abilities of criminal organizations.

The results of the analysis showed how the elements able to influence the resilience level of a certain criminal *network* are multi-faceted. In the last years crime literature tried to identify some of those elements, but there are further and several aspects whose importance is often underestimated, or even ignored, like the level of mutual trust as well as the knowledge, skills and technical abilities – or, in other words, human capital – available inside criminal networks. The analysis of such elements is fundamental in our opinion to develop a valid resilience index of criminal networks, but above all new and more effective policies contrasting organized crime. For example, the resilience analysis of criminal networks and the

<sup>&</sup>lt;sup>17</sup> See Raiteri (2010).

measuring of the contribution of each of their affiliates or partners to strengthening of it could help significantly to prove with factual evidence their participation in the criminal organization or even simple their closeness to it. The SNA and the economic theory of human capital could provide the appropriate tools to develop a set of indicators to measure in an objective way the degree to which each node contributes to the strengthening of the operational capacity of the criminal network or its resilience capacity<sup>18</sup>. In this sense the adoption of new and diversified repression policies based on the analysis both of human and of social capital could be profitable, as shown in this research.

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<sup>&</sup>lt;sup>18</sup> These indicators would act as "factual indicators" ("indicatori fattuali", o *facta concludentia*), or as juridical evidence of the criminal conduct, such as those ones used by the Italian jurisprudence to infer the stable interpenetration of a person in the organizational network of a criminal group or its simple "external collaboration" in the affairs and to the purposes pursued by a Mafia-type association. For further details on the notion of "factual indicator" and the fellony of "external support/collaboration with a Mafia-type criminal association" ("concorso esterno in associazione mafiosa") developed by the Italian jurisprudence, see Visconti (2000, 2005, and 2015).

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### INFLUENCE OF FREE TRADE WITH GERMANY ON ECONOMIC STRUCTURE OF SMALL COUNTRIES IN EASTERN EUROPE

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#### ABSTRACT

What the citizens of small Eastern Europe countries can expect from the free<sup>1</sup> trade with an economic giant such as Germany? Will this trade inevitably make them exporters of agricultural products and raw materials and importers of industrial products, or maybe a different scenario is possible? What is the long term effect of somewhat higher economic growth rates of the developing countries on the trade structure and economic structure?

The answers to these questions are of crucial importance for all of us who live in any of the small Eastern Europe countries.

<sup>&</sup>lt;sup>1</sup> Free trade is an abstract term. There are no examples in history that the countries have practiced a fully free trade, even though according to Chang (2007: 80) Great Britain in the second part of XIX century aspired to have its practice close to this ideal. Moreover, according to Willy de Clercq (1996: 196) the Great Britain in this period imposed the free trade also to the rest of the world (in reference to the entire known history before the fact), so because of that this entire period is called the first wave of globalization. With much less success, from the beginning of the '80s to the middle of the second decade of the XXI century. United States of America has been the global force which promoted the free trade. However, the practice of the USA (Voluntary export limitations, etc.) was much further from this ideal than the practice of the Great Britain at the end of the XIX century. However, when we in this paper use the term free trade, it should be taken into consideration that the term does not refer to total global trade, but solely to the trade between limited number of countries in East Europe (13 of them) with the EU, and that we do not think of this as the absolutely free trade (ideally), but of a relatively free trade (compared to trade of these countries with other countries in the world, and compared to earlier historical experiences-especially compared to period before 1990). Specifically, out of the 13 observed countries, 8 are already EU members, i.e. their trade with Germany is fully liberalized, and 4 have signed the Stabilization and Association Agreement (SAA) with the EU, while only one country does not have trade relations contractually regulated with the EU. Considering that SAA implies asymmetric liberalization with limited period for implementation of the symmetric trade liberalization (in case of the BiH, SAA was signed in 2008, and the period for gradual liberalization of trade with EU for around 90% of goods which represented the subject of import/export has expired in 2015) it can be concluded that the trade of the observed countries with Germany is in general highly liberalized (the SAA foresees trade protection for only a few branches of economy such as fishing industry, and a possibility for temporary introduction of trade limitations in the event of disturbances on the market) and it enables the transfer of all those effects suggested by the Endogenous economic growth theory by Romer and Lucas.

Our hypothesis is that income convergence<sup>2</sup> among countries in Europe in conditions of free trade and free movement of labour and capital will lead to convergence of economic structures of the EU member countries. This hypothesis could not be considered as a priori proved because even in "old" EU member countries (EU 15), this convergence is still far away from over.

#### 1. INTRODUCTION

The economic structure represents a very significant point of reference for a way of life of citizens in a country. Living in the pre-industrial, industrial or post-industrial society is certainly not the same. The skills requested on the labour market, competition to which you are exposed or even work hours and conditions of work are significantly different depending on the economic structure and level of development of the society. This can be confirmed by all of those who, same as we did, spent the early childhood in communism, adolescence in conditions of war economy and post-war in rebuilding of the country, and adult life in transition, whose main characteristics are trade liberalization and deindustrialization.

Therefore, for contemporary (macro) economists the most important task is to try and predict the fluctuations of the economic structure of their country. In this process, to make the models of the economic structure changes based on empirical experience is not easy at all, and it is entirely justified to doubt their reliability. This is primarily because today, much more than few years ago, the opinions are divided if it is inevitable that the deindustrialization comes with the development of the society. Even though the deindustrialization is one of the most important matters of the modern economic science, in this paper we will refer to it only in accordance with the needs of our analysis. Namely, any kind of deeper treatment of this matter would require a completely separate paper whose subject would be wider than the subject of research in this paper. Therefore, we will deal only with main courses of thought of the modern economists about the matter of deindustrialization. In the part of the paper which refers to referencing relevant literature, we will show that until recently predominant opinion was that process of the transition of countries from industrial to post-industrial stage of development is inevitable, but also we will show the opinions of the authors who claim the opposite - that the developed countries have to keep the dominant share of industry in their economic structure if they want to preserve the competitiveness of their economies and quality of life of their citizens. So, one of the problems is that this is a "moving target", i.e. even the developed countries are not quite sure if the post-industrial society is the end of the history or a side-track.

The other problem is that the deindustrialization in the Eastern Europe countries occurred much earlier than in the Western Europe countries. The World Band data show that deindustrialization in the Eastern Europe countries started on the level of per capita income which in mid 1990s was between 620\$ (Albania) and 6.500\$ (Czech Republic). Because of this, even if the deindustrialization is inevitability coming along with the development of the countries, the question arises if in the insufficiently developed, but de-industrialized countries, it is in fact inevitable to return to industrial stage, before once again they get out of it?

The third problem is that there is no general consensus about the direction in which the economic structure is changing with liberalization of the global trade and flows of capital, i.e.

 $<sup>^2</sup>$  Below in the text, income convergence by East-European countries to the Germany income level shall be designated with the term catch-up rate, and the methodology itself for calculation is explained in details in the part of the paper under title Empirical analysis.

with economic integrations in the EU. On one side there is the Heckscher-Ohlin theory which, in despite to certain digressions of the modern liberals which, for example, were presented by Salvadore (2009: 182) still suggests that the integrations should lead to having the developed countries produce more complex capital factor intensive products (physical, investments in R&D, or in quality of the workforce), while the less developed countries should specialize in production of simpler products, factor intensive with inferiorly trained workforce and raw materials. Even if we disregard the matter of different development level of the "old" and "new" EU member countries, according to Krugman (1994) the economic integration even of the countries in the same development level, shall lead to further specialization, so it can be expected that the industrial countries within EU shall become even more industrialized, while the countries with services (e.g. tourism) as the main source of new value, could depend even more on the services in the future, and producers of the agriculture products could specialize even more in their production.

As opposed to this theory, there is an idea of convergence of the economic structures<sup>3</sup> with income convergence, on which the European politicians are insisting for decades now. In fact, successful convergence of economic structures<sup>4</sup> is for decades now deemed as "condition sine qua non" of the success of the project of one currency, and this is in accordance with the expanded optimal currency area theory. Therefore, various indexes were developed in order to track the success of European cohesion policy, both directly– thru GDP per capita measures PPP in relation to EU average as used by Djuric (2009: 59), and indirectly –thru "index of trade differences" used by Horvath (2005). According to this index there would be a convergence of economic structures if all the EU member countries would trade with the same types of products. This would than mean that their mutual trade is predominantly intra-industrial trade, but also in form of inter-industrial trade (with less developed countries).

In purpose of better understanding of the structure of this paper, it is important to point out another moment, and that is time schedule. It would be relatively easy to statically catch-up rate compare the structures of economies of all members and potential members of the EU today, just like to attribute all possible differences in the economic structure to differences in level of development. However, introducing the time schedule to this process, to make the models which could predict, for example, changes in economic structure of member countries and potential members of the EU from Eastern Europe in medium to long term, this would be much harder.

In our case, the concrete goal is to examine if the trade liberalization and somewhat higher rates of economic development in developing countries inevitably lead to convergence of economic structures. Our hypothesis is based on presumption that it does.

Therefore, our hypothesis officially reads: Income Convergence among countries in Europe in conditions of free trade and free movement of labour and capital will lead to convergence of

<sup>&</sup>lt;sup>3</sup> We will measure the economic structure convergence by dividing the entire economy to three sectors: industry, agriculture and services, and measure: 1. share (%) of each of these sectors in the total GDP, 2. change of differences in the shares of each of these sectors in the total GDP of Germany. In accordance with this, higher level of economic structure convergence will mark the change which leads to the increase of share of those economic sectors of the observed countries which have higher share in creating the new value in Germany, and decrease of differences in contributions of different sectors to creation of the GDP compared to the situation in Germany. More about this will be mentioned in the part Empirical analysis.

<sup>&</sup>lt;sup>4</sup> Known also as the Kenen's condition of the optimal currency area.

economic structures of the EU member countries (present and future), while the factor availability will have lower and lower importance.

#### 2. THE REVIEW OF RELEVANT LITERATURE

The literature relevant to our paper notes three terms: income convergence, economic structure, and deindustrialization.

So, we will start with the most general thing – with the presentation of positions on inevitability/destructiveness of the deindustrialization<sup>5</sup>, and then we will move to more concrete things – presentation of papers dealing with relations between economic structure and income level.

In the economic literature, income level convergence is a subject which is treated quite a lot, while the economic structure convergence is something that is not mentioned so often. However, as we will show in the continuation, there are papers which, same as this one, start from the presumption or prove that those are two mutually connected occurrences.

Considering that this is a very complex subject, we have decided to state only the most important sources and to group them around the idea/position which those sources support.

So, the idea of deindustrialization as inevitability we can see, among other, in the famous book *The Competitive Advantage of Nation*, by Michael E. Porter (1998: 543) which also represented the theoretical base for today well known and frequently used *The Global Competitiveness Report*. In this book, in the chapter with title The Competitive Development of National Economies, Porter is not speaking directly about deindustrialization, but his classification "Four Stages of National Competitiveness" suggests that deindustrialization has to occur, and this can be seen in the inevitability of transition from "investment-driven" development stage to "innovation-driven" development stage with income growth.

Deindustrialization as an inevitable process was also considered by Piketty in the book *Capital in the Twenty-First Century* (2015: 100). His analyses of the long term tendencies, however, in this case, refer only to France and USA, but in the continuation of the text it is clear that he considers deindustrialization as an inevitable process which will be accomplished with development in all countries. Moreover, there is a resemblance in ideas of Piketty and Porter, where both of them point to the importance of health and education as determinant which will lead to further development of already post-industrial societies. This can be seen in the fourth stage of development according to Porter which he named "wealth-driven", while Piketty in the continuation of text says how health and education "account for over 20% of GDP and employment in most advanced countries, and in future certainly even more" (2015: 101).

Deindustrialization is inevitable also according to the Dominick Salvatore, writer of the wellknown textbook of International economics which is the main literature at over 700 colleges only in USA and Canada, which he infused with number of researches and studies. The thing which is especially interesting, in context of our research, is that Salvatore claims how deindustrialization is not the result of free foreign trade, but primarily of productivity growth of the workforce in developed countries (2009: 82). He based this opinion on MMF research

<sup>&</sup>lt;sup>5</sup> If reaching the certain income level unavoidably leads to deindustrialization (which is generally accepted premise today), then that would be an argument that the income growth also leads to economic structure convergence.
under the title *Staff Studies for the World Economic Outlook (Washington, D.C., December 1997).* However, in context of our analysis, it is interesting to observe that the deindustrialization perfectly coincides with the liberalization of foreign trade in the Eastern Europe countries. Also, in the second half of 1990s and at beginning of 2000s, deindustrialization occurred in countries which managed to attract significant FDI (what could in certain extent explain the workforce productivity growth), but also in the countries where the level of FDI was negligent.

On the other side, there is a group of economists who question the necessity of deindustrialization or even if it should be allowed, in the context of social and development needs. This is a highly heterogeneous group which we could generally divide to three subgroups. A good representative of the first subgroup would be, for example, Ha Joon Chang from Cambridge. He directly questions the claim that the most developed countries have reached the post-industrial stage of development. So, in his book Bad Samaritans he stated the claim that, for example, Switzerland<sup>6</sup> and Singapore, which are usually attributed with prosperity thru services sector such as financial sector and trade, are in fact most industrialized countries in the world. So, according to the Chang's calculations, the value of industrial production per capita in Switzerland in 2002 was 24% higher than in Japan, 2.2 times higher than in USA, 34 times higher than in China and 156 times higher than in India. Concerning Singapore, its industrial production per capita was 35% higher than in South Korea and 18% higher than in the USA. Even a number of institutes in EU today declare in benefit of (re)industrialization, and this can be seen in, for example, the report: A 'Manufacturing Imperative' in the EU – Europe's Position in Global Manufacturing and the Role of Industrial Policy prepared by the Vienna Institute for International Economic Studies (2013).

The second group of economists who dispute the deindustrialization are those who fight for the rights of workers in the developed countries. Today this group is led by Stiglitz. Their theoretic background is not new. It is based on a simple chart which can be found in all economics and international finance textbooks for decades and which usually bears the title Effects of capital flow. This chart can be found today in the textbooks of Baldwin and Wyplosz (2009: 555), Eicher, Mutti and Turnovsky (2009: 225), in already mentioned textbook of Salvatore (2009: 513), in Pugel's (2009: 513), in Kovcevic's (2016: 505). The oldest instance of this chart we could find was with Kovac (1994: 268). In any case, this chart clearly shows that while the world as a whole is profiting from liberalization of capital flows, the interests of capital and labour in developed and undeveloped countries are divided. To be more accurate, the workers (as a whole) are in loss in the developed countries, while the capital is profiting. On the other side, the workers in undeveloped countries are profiting from the liberalization of capital flows, and owners of "scanty" capital in those countries are in loss. These are the conclusions which can be drawn from the mentioned chart which have been empirically conformed by some research. For example, Branko Milanovic in the book Global inequality- new approach for the age of globalization, on basis of research conducted in period 1998-2008, claims that 1% of the richest population of developed countries are profiting from globalization, and the working class in some of the developing countries, with China as one with the most profiting countries. On the other side, the losers are "working class" in USA, especially workers with low qualifications. Exactly because of such trends, Stiglitz in his book Rewriting the rules of American Economy argues against further trade liberalization, especially against the TTIP and TPP, and as opposed to the book Globalization

<sup>&</sup>lt;sup>6</sup>Which in The Global Competitiveness Report for 2015/16 is on first place among most competitive countries and it is taken as an example of country in "innovation-driven" stage.

*and Its Discontents,* when he spoke about suffering of the workers in the transition countries, in this last book of his, he focuses on suffering of American workers. Even though the politics have no place in the scientific papers, we still think it is important to mention that generally accepted opinion is that Donald Trump has won the US presidential elections in 2016 thanks to his promises to impose trade limitations to China and to improve the position of less qualified workers in the USA, so, exactly of those who are directly affected by the globalization and deindustrialization.

The third group of the opponents of deindustrialization is economists from the Eastern Europe countries who advocate for reindustrialization as a method for solving piled up economic and social problems. There are plenty of authors of this provenance, and just for example we will mention the paper of Lojpur (2016) which bears an interesting title *Industrialization In Response To Question – Is Recovery of Countries In Transition Possible and How.* 

In the introduction we have pointed out the relevance of the theory of optimum currency area for this paper in context of economic structure convergence as a precondition for functioning of a monetary union. Here we would like just to point out that this is so called Kenen criteria which this author defined back in 1969. in the paper "*The Theory of Optimal Currency Area*" which he wrote together with Mundell.

As we already pointed out, research on income level convergence and its influence in the economic structure have great importance for our paper. Because of that, we find as necessary to mention the papers dealing with this matter. We will start with the paper of Dani Rodrik (2011) where he emphasizes the importance of the change of the economic structure in direction of tradable goods - mainly industrial products and modern services, which according to him leads to decrease of the convergence gap. Also, even though somewhat older, the paper of Sukkoo Kim (1997) is also interesting, which while researching the economic trends in the USA in period 1840-1987 came to conclusion that even though the economic structure cannot explain all differences. It is interesting to notice that in these two papers the relation of the economic structure and income level is observed differently compared to us, i.e. they are taking the changes in the income level as a dependent variable, and changes in economic structure as an independent.

However, a series of papers analysing the influence of other variables on the decrease of risk in income level show that the change of economic structure does not have to be the only variable which explains the change to the income level. So, for example, Sachs and Andrew (1995) show that respecting the private property right and commitment to free trade exchange are main determinants which lead to the decrease of the convergence gap. This in certain extent matches the findings in the paper of Khan and Kumar (1993), which prove that greater openness of the country, stock capital, and direct foreign investments are determinants which lead to a decrease of differences in income level between the undeveloped and developed countries. This conclusion was made on basis of analysis of 95 countries in the world in period 1970-1990. On the other side, Abiad, Leigh and Mody (2007) are putting emphasis on capital flows and prove that, at least in case of European countries - new EU members, capital flows are moving downhill (from developed towards less developed members) and that they are contributing to the development of those countries. When we speak about the convergence of the income level in the countries of Central Europe and EU, we should also mention the paper of Doyle, Kuijs and Jiang (2001) who have researched the influence of privatization, budget constraints, bank restructuring, investment climate and shareholder and creditor rights on growth of GDP per capita. However, we could say that all of these papers

indirectly examine the influence of the changes to the economic structure on the decrease of the convergence gap.

Out of the recent papers dealing with this matter, we certainly need to mention the paper of Vamvakidis (2008) which shows that the positive experience of income level convergence in EU can be jeopardized due to large external imbalance, and soon this was confirmed by the example of his country (Greece).

When we talk about the relevant researches on the income level convergence (convergence gap), in respect of specific countries, we certainly need to mention the paper of Barro (2016) which questions if there are limitations (middle-income trap) for transition of China from a country which achieved the middle-income convergence to a country which will achieve the upper-income convergence.

Mitra and Pouvelle (2012) are proving on the example of Bulgaria the importance of productivity for catching-up to the income level of developed countries of the EU, while Bruha, Podpiera and Palak (2007) examine the presumptions of the macro economy of a new open economy on the example of Czech Republic.

A common thing for all these papers is the optimism which suggests that the majority of the developing countries can continue to develop faster than the developed countries.

Also, we would like to point out that taking the German economy as the base to observe the economic trends in other European countries, the thing we are doing in this paper, is not a new thing. So, for example, Horvath in the paper *Exchange rate variability, pressures and optimum currency area criteria: some empirical evidence from 1990s*, used the index of trade differences which measures how much the trade structure of each country is different from the German structure. Taking into consideration that these are the countries of Eastern Europe out of which the great majority are already EU members, while the remaining countries are aspiring to the full membership, we think that this Horvat's approach is adequate also for these countries, at least to the same extent in which it was adequate for "old" EU members.

# 3. EMPIRICAL ANALYSIS

The objective of the analysis was to determine whether and to what extent the share of total trade with the leading economic power in Europe in total trade of a country and the catch-up rate for economic development contribute to changes in economic structure of transition countries. In other words, we tried to answer the question of whether economic structure of transition countries of Eastern and South-eastern Europe, as seen in the long-run period, converges to economic structure of the developed countries of Western Europe, primarily of Germany, which undoubtedly represents a pillar of European economic development. For the purpose of this research we analysed the value of the sector participation rate in GDP, as well as changes in the difference between the rate of industrial, service and agrarian sector of Germany and transition countries in the period from 1995 to 2014. For each sector individually, we tried to develop a model by which to explain the sectors' changes and eventual convergence towards economic structure of most economically developed country in Europe. We tried to explain variations in changes of economic structure with the share of trade with Germany in the total trade of a country and the catch-up rate for economic development. The analysis was based on the application of panel data series of annual values

of these variables for 13<sup>7</sup> transition countries of Eastern and South-eastern Europe (Albania, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Estonia, Hungary, Latvia, Lithuania, Macedonia, Moldova, Slovakia, Slovenia) in the period from 1995 to 2014. Data on trade with Germany, as well as on total trade for all analyses countries was collected from the Observatory of Economic Complexity site (OEC) (http://atlas.media.mit.edu/en/ ), while the data on individual value of the sector participation rate in GDP and GDP per capita were taken from World Bank sources, provided that all data were processed in accordance with the aim of this research.

For the purpose of co-integration analysis we will primarily verify the level of stationary of panel time series of observed variables by applying panel unit root tests of the first generation, and then, depending on the results of panel unit root tests, we will access the appropriate methodology to establish the existence of co-integration relation between on the one hand, the rate of the sector participation in GDP for each sector individually, the share of trade with Germany in the total trade of a country and the catch-up rate for economic development, and on the other hand, the difference between the economic structure of Germany and transition countries, the share of trade with Germany in the total trade of a country and the total trade of a country and the catch-up rate for economic development.

### 3.1. Panel unit root tests

The earliest tests, in financial literature known as the first generation of tests of the existence of a unit root in panel date series were based on the assumption of cross-sectional independency. Despite the fact that such assumption is often unrealistic, the authors of the first generation of panel unit root tests in most cases their researches oriented toward the analysis of autoregressive processes with a set of appropriate restrictions on observation units or variables in panel.

If we compare time series and panel unit root tests we notice that the main difference occurs in terms of the heterogeneity of the model parameters. Given that the time series analysis is performed on the data of one unit of observation in a certain period of time, it is logical that it does not question the existence of homogeneity of the model parameters. However, when it comes to panel data that include a larger number of observation units, the question arises whether, when testing the existence of a unit root, we could use the same autoregressive model for all observation units, or it is required for each unit of observation to form a different autoregressive model in order to describe the dynamics of the dependent variable. In accordance with this, the model restrictions for the first generation tests mainly referred to whether the autocorrelation coefficients are identical or different for each unit of observation. Into the first group of tests which imply homogeneity of autocorrelation coefficients belong Lavin, Lin and Chu (LLC), Breitung, Harris-Tzavalis (TH) and Hadri test, while the second group of tests based on the heterogeneity of autocorrelation coefficients include tests such as Im, Pesaran and Shin (IPS), and Maddala Wu and Choi test. One of the most commonly used tests is the first generation LLC (Levin, Lin and Chu) test which implies a homogeneous structure among cross-sections, but also allows heterogeneity of individual deterministic components (constant and trend). Testing the existence of a unit root is based on a common

<sup>&</sup>lt;sup>7</sup> These thirteen countries were not selected randomly. They are in fact small countries of Eastern Europe, where the criterion for a small country was the population. So, our sample included all countries of Eastern Europe with the population of fewer than 10 million. Previously we have conducted a research on what is considered as a small country and a small economy and determined that there is no universal criterion, not according to economic power or according to the population.

approach to the application of the Augmented Dickey-Fuller test that assesses the model of the following form:

$$\Delta y_{it} = \alpha_i + \delta_i t + \rho^* y_{i,t-1} + \sum_{l=1}^{p_i} \theta_{il} \Delta y_{i,l-1} + \varepsilon_{it}$$
(3.1)

where  $\rho^* = \rho - 1$ , assuming that  $\rho = \rho_i$ , by which the assumption of a homogeneous structure among cross-sections is fulfilled.

The null hypothesis of LLC test implies the existence of a unit root for all units of observation, while alternative refers to their stationarity. So, the null and alternative hypotheses can be expressed as follows:

$$H_0: \rho^* = 0$$
  
 $H_1: \rho^* < 0$ 

In their paper, Levin, Lin and Chu (2002) applying Monte Carlo simulation techniques proved that LLC test provides the best results on samples that include between 10 and 250 observation units, where each unit is represented by time series of a length from 25 to 250 time instances.

Although the LLC test is often used in different studies, we need to point out that its main disadvantage refers to restrictive assumption that the time series of absolutely all observation units have or do not have a unit root, and to the assumption of homogeneity of autocorrelation coefficients.

A similar, but simpler test was proposed by Harris and Tzavalis (1999). Their test, unlike the LLC test, was based on the assumption of variance homogeneity and was intended to provide efficient results for observation units that have a relatively small number of time series instances.

One of the tests from this group is the Hadri test as well, whose null hypothesis is defined opposite the aforementioned tests. In other words, the null hypothesis assumes that each individual time series is stationary, as opposed to the alternative hypothesis that each time series has a unit root. Hadri test is similar to the KPSS unit root test in time series analysis (Kwiatkowski, Phillips, Schmidt and Shin (1992)) and is based on the LM test of the residuals of the regression model of dependent variable on constant, or on constant and trend. Regression models used for Hadri test are of the following form:

1) Model of random walk (that includes only constant)

$$y_{it} = \alpha_{it} + \varepsilon_{it}$$
, and

2) Model that include constant and trend

$$y_{it} = \alpha_{it} + \beta_i t + \varepsilon_{it}$$
,  $i = 1, \dots, n, t = 1, \dots, T$ 

where  $\alpha_{it} = \alpha_{i,t-1} + u_{it}$  is random walk.  $\varepsilon_{it} \sim IIN(0, \sigma_{\varepsilon}^2)$  and  $u_{it} \sim IIN(0, \sigma_{u}^2)$  are mutually independent.

Hadri test statistics is given by:

$$LM = \frac{1}{NT^2} \sum_{i=1}^{N} \sum_{t=1}^{T} \frac{S_{it}^2}{\hat{\sigma}_{ei}^2}$$

where  $S_{it} = \sum_{j=1}^{t} \hat{e}_{ij}$  and  $\hat{\sigma}_{ei}^2 = \frac{1}{T} \sum_{t=1}^{T} \hat{e}_{it}^2$ . Based on LM statistics, we get z-statistics which under

certain conditions tends to standardized normal distribution. According to some researches, Hadri test provides good results in the case when panel series has a moderate number of observation units N, where each unit has a relatively large number of time series data.

The first who tried to overcome the aforementioned drawbacks of the first generation of tests which imply homogeneity of autocorrelation coefficients, and also to increase the power of panel unit root tests were Im, Pesaran and Shin (2003). They proposed and formed the test (IPS test) based on the average value of individual unit root statistics. The initial model of IPS test contains heterogeneous autocorrelation coefficients, meaning that coefficients of lagged dependent variable are not the same among cross-sections. IPS  $\bar{t}$ -statistics is obtained as the average value of *t*-statistics of Augmented Dickey-Fuller test calculated for each unit of observation individually:

$$\bar{t} = \frac{1}{N} \sum_{i=1}^{N} t_{\rho_i}$$

The null and alternative hypotheses of IPS test are defined as follows:

$$H_{0}: \rho_{i} < 1 \quad or \quad \rho_{i}^{*} = 0$$

$$H_{1}: \rho_{i} < 1 \quad or \quad \rho_{i}^{*} < 0 \quad for \quad i = 1, 2, ..., N_{1};$$

$$\rho_{i} = 1 \quad or \quad \rho_{i}^{*} = 0 \quad for \quad i = N_{1} + 1, ..., N.$$

The null hypothesis of IPS test assumes the existence of a unit root in time series of all observation units, as opposed to alternative that assumes that at least one time series of all observation units does not contain a unit root, meaning that it is stationary at the level of data for which the testing is done.

Applying Monte Carlo simulation techniques, the authors of IPS test proved that the test provides satisfactory results even in the case of small samples, i.e. the small number of both observation units and time intervals. Although IPS test provides better results compared to the LCC test, such results with restrictions concerning its use exclusively in the balanced panel data, the use of the same number of lags in individual regressions in the implementation of Augmented Dickey-Fuller test can, however, in certain situations lead a user to wrong conclusions.

The tests that provided further improvements in respect of testing of a unit root in panel data are tests of Fisher type, which are known in the literature as combined unit root tests. There are two of such tests proposed by Madalla and Wu (1999) and Choi (2001) and their advantage lies primarily in the fact that they can be used even when available data is of unequal time-series length over cross-sections and can enable as well different values of stochastic and non-stochastic components for each individual test. These tests are based on

the use of nonparametric tests to ensure the removal of autocorrelation, but without introducing additional lags in the model. Maddala and Wu test requires predetermined number of lags in the model, while Choi test in addition to specification of exogenous variables (constant or constant and trend) requires the specification of method for the evaluation of spectral analysis (Gligoric, 2015).

With proposed tests, Madalla and Wu (1999) and Choi (2001) sought to overcome the deficiency of existing tests in view of the request that each observation unit must contain the same number of time instances. It is achieved by defining the tests based on combination of p-values of independent time series tests for each observation unit individually.

Madalla and Wu proposed the application of the inverse  $\chi^2$  test of the form:  $P = -2\sum_{i=1}^{N} \ln(p_i)$ , while Chio proved that the best properties has the inverse test of normal distribution:  $Z = \frac{1}{\sqrt{N}} \sum_{i=1}^{N} \Phi^{-1}(p_i)$ , in which  $\Phi$  represents the standardized cumulative normal distribution function (Glavaški, 2016).

The null and alternative hypothesis of two previously mentioned tests is defined in the same way as hypothesis of IPS test.

Given the fact that in the context of our analysis we dispose with annual data on the rates of sector shares in GDP, the differences in the rates of share of economic sectors in GDP between Germany and transition countries, the share of trade with Germany in total trade of a country and the catch-up rate for economic development for the period from 1995 to 2014, and taking into consideration the fact that the power of the tests can be violated in the case of shorter time series, we decided to make decision on the existence of a unit root using a number of different tests. The results of tests applied to data at the level for all variables are shown in Table 3.1, where for appropriate tests we used as well the results of tests for models that include constant or constant and trend. In testing the existence of a unit root, we determined that the optimal number of lags of autoregressive model in series of panel date is equal to 2. Also, for appropriate tests we used both the Newey-West bandwidth selection method and the Bartlett kernel spectral estimation method.

Table 3.1. The results of unit root tests for series of panel data at the level of the variables: "Catchingup"coefficient, Trade coefficient, Industry (% of GDP), Industry divergence, Agriculture (% of GDP), Agriculture divergence, Services (% of GDP) and Service divergence

	"Catching	Trade	Industry	Industry divergence	Agriculture	Agriculture	Service	Service divergence
	up coen.	coen.	GDP)	uivergenee		uivergenee	GDP)	uivergenee
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic
LLC -intercept	-3.54665**	3.80509	-6.03399**	-2.73973**	-5.85956**	-5.87464**	- 4.99802**	-1.56270
LLC – intercept and trend	4.05477	13.1258	1.01532	2.22631	2.09015	1.24927	0.78724	3.22890
LLC - none	2.01889	-4.10023**	-2.63502**	-1.76283**	-6.68304**	-6.74596**	4.33299	-3.45725**
Breitung t-stat – intercept and trend	3.55881	-0.30973	-0.99676	-1.72009**	-1.61663	-1.42437	0.73920	-1.46504
IPS – intercept	1.07326	-0.81265	-4.14728**	-2.39219**	-3.40375**	-3.59597**	- 3.87317**	-1.71426**
IPS – intercept and trend	3.19357	-1.02705	-1.06732	-0.02888	0.73463	0.06575	- 1.70448 <sup>**</sup>	-1.48755
Fisher ADF – intercept (Maddala & Wu)	18.3059	29.5604	60.7429**	40.3260**	53.5579**	56.2260**	57.1303**	37.5172
Fisher ADF – intercept and trend (Maddala & Wu)	11.0274	39.5715**	30.5971	26.2467	28.8798	31.2996	38.2101	31.5905
Fisher ADF – none (Maddala & Wu)	5.15433	42.9932**	34.0018	37.7964	82.0715**	83.0176**	4.74094	53.9504**
Fisher PP – intercept (Choi)	21.4082	398.440**	37.0879	30.7275	78.0172**	85.4461**	100.970**	52.8869**
Fisher PP – intercept and trend (Choi)	7.25507	111.380**	29.4482	29.8927	44.5286**	47.7214**	61.0253**	62.1280**
Fisher PP – none (Choi)	1.00993	79.1813**	42.1728**	32.8758	98.8961**	110.859**	2.97213	53.0780**
Hadri – intercept	9.58760**	6.41959**	6.54981**	6.48112**	9.06677**	9.00843**	7.63956**	7.53911**
Hadri – intercept and trend	5.90335**	6.81674**	4.52107**	5.04358**	8.41576**	8.38125**	7.22842**	5.19246**

Source: Author's calculations

\*\* Denotes significance at the level of 5%

As we can see from Table 3.1, the results of applied unit root tests for all analysed variables at the level are not uniform, and for this reason for none of them it's possible to reject the null hypothesis of the existence of a unit root. For this reason, we will approach testing for stationarity of series of panel data at the first difference for all variables. In should be noted that we used Schwartz criteria with maximum 2 lags in determining the optimal number of lags in autoregressive models. Results of panel unit root tests for data at the first difference are shown in Table 3.2.

	"Catching up" coeff.	Trade coeff.	Industry (% of GDP)	Industry divergence	Agriculture (% of GDP)	Agriculture divergence	Service (% of GDP)	Service divergence
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic
LLC -intercept	-7.88948**	-14.1958**	-12.4515**	-12.0480**	-10.8814**	-11.1518**	-14.3397**	-11.1518**
LLC - intercept	-9.43368**	-10.6288**	-11.0969**	-8.66007**	-16.4907**	-16.0375**	-8.71465**	-16.0375**
and trend								
LLC - none	-6.84461**	-22.3567**	-15.8640**	-16.0399**	-12.8999**	-13.3743**	-18.4256**	-13.3743**
Breitung t-stat –	-5.04320**	-6.23651**	-5.55265**	-5.81127**	-4.34980**	-4.24041**	-6.75788**	-4.24041**
intercept and trend	**	**	**	**	**	**	**	**
IPS – intercept	-6.19802	-15.0744	-11.2222	-11/7850	-11.9811	-12.1191	-12.9874	-12.1191
IPS - intercept and	-6.12153**	-13.1470**	-9.36584**	-9.37697**	-14.8133**	-14.4224**	-10.2971**	-14.4224**
trend	**				**	**	**	**
Fisher ADF –	86.5073	333.747	155.031	158.993	162.032	164.188	188.178	164.188
Intercept (Maddala								
Eisher ADF –	80.9510**	138 089**	113 211**	117 206**	156 447**	152 203**	129 106**	152 203**
intercent and trend	00.7510	150.007	115.211	117.200	150.447	152.205	129.100	152.205
(Maddala & Wu)								
Fisher ADF – none	85.6588	221.270**	198.011**	222.976**	199.297**	206.714**	198.709	206.714**
(Maddala & Wu)								
Fisher PP –	78.2948**	967.742**	176.765**	162.999**	218.624**	239.877**	498.081**	239.877**
intercept (Choi)	**	**	**	**	**	**	**	**
Fisher PP –	67.1307	187.030	125.254	134.189	197.071	192.862	150.227	192.862
intercept and trend								
(CII0I) Fisher PP none	102 001**	220 210**	210.022**	222 064**	211.002**	214.002**	202 524**	214.002**
(Choi)	105.081	238.318	219.922	223.804	211.805	214.995	202.334	214.995
Hadri – intercept	2.98001**	3 08578**	-0 55478	-0 64854	6.08085**	5 98593**	2.67684**	5 98593**
Hadri – intercent	3 38094**	4 58613**	3 91428**	2 70517**	5 74412**	5 75282**	4 95019**	5 7582**
and trend	5.50074	1.50015	5.71720	2.70317	5./7712	5.75262	1.75017	5.7562

Table 3.2. The results of unit root tests for series of panel data at the first difference of the variables: "Catchingup"coefficient, Trade coefficient, Industry (% of GDP), Industry divergence, Agriculture (% of GDP), Agriculture divergence, Services (% of GDP) and Service divergence

Source: Author's calculations

\*\* Denotes significance at the level of 5%

Results of panel unit root tests for data at the first difference of all analysed variables have shown that all variables are I(1) processes, meaning that they are integrated of the first order. This allows us to use standard co-integration tests when determining the co-integration between the variables, since the standard tests are based on the assumption of the same order of integration. In the following, we will present two widely used co-integration tests that belong to the first generation of tests. These are Kao and Pedroni tests. In continuation, the conclusion about the existence of co-integration relation between the variables will be made on the basis of results of Pedroni test, while Kao test will be used as an additional test for the verification of the robustness of the results on the existence of co-integration relation.

### 3.2. Panel co-integration tests

Once we have established that all analysed variables are of the first order of integration I(1), we will try to examine whether it is possible to form a linear combination of the variables which would be stationary for the data at the level. For this, as we have already stated above, it will be necessary to apply the tests by which we could determine the existence of long-term relation between the variables.

The existence of co-integration relation between the variables implies that their movement, viewed over the long period of time, is determined by their long-term equilibrium relation. However, this does not exclude the possibility that in the short-term the system deviates from its equilibrium, but inevitably, in the long-term, with the appropriate corrections, it always returns to the equilibrium path.

Co-integration tests can be divided into two groups. The first group consists of the tests based on the residual analysis and in the literature they are also known as single equation tests by which it is only possible to determine the existence of co-integration relation between variables, but not the number of co-integration relations. The second group consists of tests based on maximum likelihood, which, unlike the first group start from the system of equations and their advantage over the first group lies in the fact that they can provide information on the number of co-integration relations between variables. The first group of tests that start from the single equation approach includes tests developed by Kao (1999) and Pedroni (1995, 1999, 2004), where the null hypothesis implies the absence of co-integration, as well as tests suggested by McKoskey and Kao (1998), whose null hypothesis is opposite to the null hypothesis of two previously mentioned co-integration tests, and refers to the existence of co-integration relation between variables. From the second group of tests the most commonly used is Larsson, Lyhagen and Lothgren (2001) co-integration test which starts from the system of equations on the basis of which is determined the co-integration rank in heterogeneous panel.

In continuation, we will test the existence of co-integration relation between the observed variables on the basis of three models by applying Kao and Pedroni tests, and then, in the case that tests indicate the existence of co-integration relation between the variables, we will access the model creation using the Fully Modified Ordinary Least Square method (FMOLS), which clearly points directions and the number of co-integration relations between the variables.

The approach of testing the existence of co-integration relation proposed by Kao (1999) involves the use of extended versions of Dickey-Fuller and Augmented Dickey-Fullet test, and is similar to Engle-Granger two-stage approach. Test starts from a spurious regression model that includes two variables and only one regressor:

$$y_{it} = \alpha_i + x_{it}\beta + e_{it}$$
  $i = 1, ..., N;$   $t = 1, ..., T$  (3.2)

where  $e_{ii}$  is I(1) process. Also, the model assumes that the coefficient  $\beta$  is homogeneous, meaning that it is the same for all observation units, while the value of the parameter  $\alpha$  varies depending on the observation unit.

Kao's test is based on verification of the stationarity of residuals of estimated regression model from the expression 3.2. The test of residuals starts from autoregressive model of the first order AR(1):

$$e_{i,t} = \rho e_{i,t-1} + \mathcal{E}_{i,t},$$

Or from extended form of autoregressive model of the order p, AR(p):

$$e_{i,t} = \rho e_{it-1} + \sum_{j=1}^{p} \rho_i \Delta e_{i,t-1} + \varepsilon_{i,t}$$

For the assessment of stationarity Kao proposed extended versions of DF and ADF test applicable to the panel series, whose null hypothesis is as follows:

$$H_0: \rho = 1,$$

Against the alternative hypothesis:

$$H_0: \rho < 1.$$

On the one hand, the null hypothesis of Kao's test implies the absence of co-integration between variables, which means that the model residuals have a unit root for data at the level, while on the other hand, the alternative hypothesis implies that there is a co-integration between variables, meaning that the residuals are stationary at the level.

Unlike Kao's test, whose main drawback is the assumption of homogeneity of co-integration parameters, Pedroni's test represents a significant improvement in terms of introducing the possibility of heterogeneous parameters, with one or more non-stationary regressors. Pedroni defined a total of seven statistics that can be grouped into two categories: the "group" statistics and "panel" statistics. Group statistics are statistics "between "dimensions" that are based on the average of autoregressive coefficients estimated individually for each unit of observation. This category includes two non-parametric statistics *group rho* and *group t*, as well as one parametric *group ADF* test statistics. The second category involves calculation of statistics "within dimensions" and this category includes two non-parametric statistics: *Panel rho* and *Panel t*, and two parametric statistics: *Panel v* and *Panel ADF*.

Pedroni's test is based on the analysis of residuals of regression model of the following form (Neal, 2014):

$$y_{i,t} = \alpha_i + \beta_{1i} x_{1i,t} + \beta_{2i} x_{2i,t} + \dots + \beta_{Mi} x_{Mi,t} + e_{i,t}$$
$$\Delta y_{i,t} = \sum_{m=1}^{M} \beta_{mi} \Delta x_{mi,t} + \eta_{i,t}$$
$$e_{i,t} = \gamma_i e_{i,t-1} + \mu_{i,t}$$
$$e_{i,t} = \gamma_i e_{i,t-1} + \sum_{k=1}^{K} \gamma_{i,k} \Delta e_{i,t-k} + \mu_{i,t}^*$$

where i = 1, 2, ..., N represents the number of observation units in the panel, t = 1, 2, ..., T is he number of periods, m = 1, 2, ..., M is the number of independent variables in the model, and k = 1, 2, ..., K is the number of lags in the ADF regression.

The null hypothesis of no co-integration relation between variables can be rejected in the case when the value of v statistics tends to plus infinity, while the other statistics tends to minus infinity.

Below we will give the results of Pedroni's co-integration test for the three analysed sectors, based on which we will determine whether the rate of "catching up" and the share of trade with Germany in total trade of a country affect the economic structure changes, as observed in the long-term period.

 Table 3.3. Results of Pedroni's co-integration test between the industrial sector, the catch-up rate for economic development and the share of trade with Germany in the total trade of transition countries

Dependent variable	Industry (% of GDP)							
Independent variables			"Catching	up" coeff, Trade coeff.				
	Individu	al intercept	Individual inte	Individual intercept and individual trend		rcept or trend		
	Statistics	Weighted statistics	Statistics	Weighted statistics	Statistics	Weighted statistics		
Panel v	0.758267	0.188788	-0.122947	-1.069430	-1.951983	-2.216083		
Panel rho	0.256653	0.235812	1.520719	1.732407	-1.583677*	-1.067135		
Panel t	-0.486606	-0.754248	0.266845	-0.336062	-2.659267**	-2.395062***		
Panel ADF	-1.291906*	-2.272911**	-0.755999	-3.089652***	-1.874078**	-2.061709**		
Group rho	1.824825		2.803842		-0.682303			
Group t	0.060674		0.023527		-4.319048***			
Group ADF	-2.075971**		-1.682864		-3.542732***			
Dependent variable	Industry divergence							
Independent variables			"Catching	up" coeff, Trade coeff	•			
	Individua	al intercept	Individual inte	rcept and individual	No intercept or trend			
				trend		-		
	Statistics	Weighted statistics	Statistics	Weighted statistics	Statistics	Weighted statistics		
Panel v	1.035847	0.760610	-0.433877	-0.759438	1.553164*	0.979056		
Panel rho	0.077054	0.293114	1.449371	1.456521	-1.840094**	-1.604008*		
Panel t	-0.566466	-0.370615	0.096584	-0.325339	-2.672788***	-2.433015***		
Panel ADF	-1.859375**	-0.640474	-1.131931	-0.860414	-2.717802***	-2.160739**		
Group rho	1.601861		2.294534		0.084710			
Group t	0.104512		-0.296577		-1.927789**			
Course ADE	0.955500		1 441453*		-2 201224**			

Source: Author's calculations

\*\*\* Denotes significance at the level of 1%

\*\* Denotes significance at the level of 5%

\* Denotes significance at the level of 10%

Dependent variable			Agric	culture (% of GDP)			
Independent variables			"Catching u	ıp" coeff, Trade coeff.			
	Individua	al intercept	Individual inte	rcept and individual	No intercept or trend		
				trend			
	Statistics	Weighted statistics	Statistics	Weighted statistics	Statistics	Weighted statistics	
Panel v	0.167444	0.582965	-1.508653	-1.094352	-1.505176	-1.482611	
Panel rho	0.222243	-0.462037	1.300709	0.967404	-3.735442***	-1.858109**	
Panel t	-1.837438**	-2.485865***	-1.601672 <sup>*</sup>	-2.516830***	-5.709440***	-3.035327***	
Panel ADF	-2.313476**	-4.179127***	-2.115789**	-4.696612***	-5.970848***	-2.712976***	
Group rho	0.857112		2.104335		-0.734693		
Group t	-2.455693***		-2.218828**		-4.547003***		
Group ADF	-5.937618***		-5.356496***		-5.596126***		
Dependent variable	Agriculture divergence						
Independent variables			"Catching u	ıp" coeff, Trade coeff.			
	Individua	al intercept	Individual inte	rcept and individual	No intercept or trend		
				trend			
	Statistics	Weighted statistics	Statistics	Weighted statistics	Statistics	Weighted statistics	
Panel v	0.161717	0.410394	-1.553198	-1.440877	-1.436433	-1.410798	
Panel rho	0.215310	-0.501234	1.298760	0.969120	-3.784041***	-1.934392**	
Panel t	-1.847607**	-2.590436***	-1.605644*	-2.408738***	-5.807377***	-3.191448***	
Panel ADF	-2.349563***	-4.659320***	-2.178867**	-5.020625***	-6,126253***	-2.888916***	
Group rho	0.734656		2.086492		-0.909392		
Group t	-2.582042***		-1.961257**		-4.891668***		
Croup ADE	6 120520***		5 606714***		5 865557***		

 Table 3.4. Results of Pedroni's co-integration test between the agricultural sector, the catch-up rate for economic development and the share of trade with Germany in the total trade of transition countries

Source: Author's calculations

\*\*\* Denotes significance at the level of 1%

\*\* Denotes significance at the level of 5%

 $\ast$  Denotes significance at the level of 10%

Dependent variable				Services (% of GDP)			
Independent variables			"Catching u	ıp" coeff, Trade coeff.			
	Individu	al intercept	Individual inte	rcept and individual	No inte	rcept or trend	
			trend				
	Statistics	Weighted statistics	Statistics	Weighted statistics	Statistics	Weighted statistics	
Panel v	0.509345	0.509315	-0.315917	-0.173860	-1.797746	-2.444855	
Panel rho	0.507348	0.059264	1.662120	1.231790	-2.015845**	-1.387507*	
Panel t	-1.105301	-1.674993**	-0.611165	-2.185444**	-3.942201***	-3.150430***	
Panel ADF	-1.329757*	-2.422538***	-1.076459	-3.816433***	-1.751086***	-1.190998**	
Group rho	1.564637		2.487565		-0.701194		
Group t	-1.471651*		-2.680125***		-4.495308***		
Group ADF	-2.919836***		-3.210032***		-3.467946***		
Dependent variable	Services divergence						
Independent variables			"Catching u	ıp" coeff, Trade coeff.			
	Individu	al intercept	Individual inte	rcept and individual	No intercept or trend		
		_		trend			
	Statistics	Weighted statistics	Statistics	Weighted statistics	Statistics	Weighted statistics	
Panel v	0.812129	0.559306	-0.299150	-0.243573	-0.107419	-0.325071	
Panel rho	0.22969	-0.417240	1.367073	0.193637	-2.873844***	-1.926821**	
Panel t	-1.368317*	-2.534455***	-0.951072	-4.292373***	-4.604630***	-3.072283***	
Panel ADF	-1.668268**	-3.274113***	-1.573118*	-5.611878***	-4.880327***	-2.822441***	
Group rho	1.027474		1.983723		-0.970540		
Group t	-4.118625***		-4.604598***		-4.687184***		
Group ADF	-3 033715***		-4 011226***		-5 592931***		

 Table 3.5. Results of Pedroni's co-integration test between the service sector, the catch-up rate for economic development and the share of trade with Germany in the total trade of transition countries

Source: Author's calculations

\*\*\* Denotes significance at the level of 1%

\*\* Denotes significance at the level of 5%

\* Denotes significance at the level of 10%

The conclusion on the existence of co-integration relation on the basis of Pedroni's test will be derived from the significance of the majority of 11 statistics obtained. If the majority of 11 statistics shows to be statistically significant at the significance level of 1%, 5% and 10, the null hypothesis of no co-integration relation between the variables will be rejected, what means that we could accept the alternative hypothesis on the co-integration existence.

From the table 3.4 we see that for the three analysed models (with intercept, with intercept and trend, with no intercept or trend) only model with no intercept or trend pointed to the existence of a long-term co-integration between, on the one hand, the rate of industrialization, the share of trade with Germany in the total trade of observed countries and the catch-up rates for economic development, and on the other hand, the difference between the rate of industrialization in Germany and countries in transition, the share of trade with Germany in the total trade of observed countries for economic development. However, taking into consideration the number of statistics, we can notice that most of the test statistics for models both with intercept and with intercept and trend, have not indicated to the existence of co-integration test results, we cannot determine with certainty whether there is co-integration relation between the variables. Therefore, in order to verify the robustness of the results of Pedroni's test and reach a conclusion about the existence of co-integration when Pedroni's test, the results of which are shown in the table 3.6. As we can see from the table

3.6 for two models that refer to the industry sector, expressed through the rate of industrialization and the difference in the rate of industrialization between Germany and countries in transition, Kao's test indicated the existence of co-integration relation between the analysed variables, since in both cases the test results are statistically significant.

Similar to the industrial sector, the agriculture sector is also expressed through the share of agriculture in GDP of a country, as well as through the differences in rates of the agriculture share in GDP of Germany and observed countries in transition. By this, we tried to determine the speed at which the percentage of share of agriculture in the economic structure of countries in transition approaches the percentage of share of agriculture in the economic structure of structure of Germany and whether and to what extent the catch-up rate for economic development and share of trade with Germany in the total trade of a country contribute to these changes.

For both cases we examined the existence of co-integration relation between the variables using the Pedroni's test and as we can see from the results shown in the table 3.5, all models indicated the existence of co-integration relation between the variables, since for a total of 11 test statistics for each model, most of them have shown to be significant, allowing us to reject the null hypothesis and accept the alternative hypothesis of the existence of co-integration relation between the observed variables. Robustness of test results are confirmed by applying the Kao's co-integration test, which in both cases proved to be statistically significant. Thus, once again we confirmed the long-term effect of the catch-up rate for economic development and the share of trade with Germany in the total trade of a country on the changes of the share of agriculture in GDP of transition countries. The results of Kao's test for the agricultural sector are shown in the table 3.6.

When speaking of the long-term impact of the catch-up rate for economic development and the share of trade with Germany in total trade of observed transition countries, on the changes in share of service sector in GDP of transition countries, the results of co-integration tests have shown to be similar to the results of the industrial sector. Namely, for the service sector, which is, like the other two sectors, expressed through the share of services in GDP and the difference in rates of services in GDP between Germany and observed transition countries, the Pedroni's test, in both cases, indicated the existence of co-integration relation between the observed variables by applying the model with no intercept or trend. Model with intercept also indicated the existence of co-integration relation between the variables, but only in the case of testing for the existence of long-term effect of the catch-up rate for economic development and the share of trade with Germany in total trade of observed countries on the difference in rates of the service share in GDP between Germany and countries of transition, at the significance level of 10%. In all other cases the Pedroni's test pointed to an absence of co-integration between the observed variables. Given the disparity of results of the Pedroni's test, as an additional test to verify the existence of co-integration we used Kao's cointegration test, whose results for the service sector are presented in the table 3.6. The results of Kao's test for both models by which we defined the service sector, indicated the existence of cointegration relation between the variables, since the test results in both cases are statistically significant.

Table 3.6. The results of Kao's co-integration test between indicators of economic structure,	the catch-up rate
for economic development and the share of trade with Germany in the total trade of	<i>transition</i>
countries	

		Kao ADF			
Dependent variable	Independent variables	t-statistics	p-value		
Industry (% of GDP)	"Catching up" coeff, Trade coeff.	-3.306599***	0.0005		
Industry divergence	"Catching up" coeff, Trade coeff.	-1.919221***	0.0275		
Agriculture (% of GDP)	"Catching up" coeff, Trade coeff.	-2.870933***	0.0020		
Agriculture divergence	"Catching up" coeff, Trade coeff.	-2.951348***	0.0016		
Services (% of GDP)	"Catching up" coeff, Trade coeff.	-4.987437***	0.0000		
Services divergence	"Catching up" coeff, Trade coeff.	-4.729474***	0.0000		

Source: Author's calculations

\*\*\* Denotes significance at the level of 1%

Having established the existence of co-integration relation between observed variables for each sector individually, in continuation we will try to estimate models on the basis of which we will define the number of co-integration relations, intensity and line of action of the catchup rate for economic development and the share of trade with Germany on the changes in the country's economic structure. This is for the reason to determine to what extent the economic structure of transition countries approaches the economic structure of most economically developed countries in West Europe.

In estimating the model parameters, instead of the standard ordinary least square method, which in this case gives inconsistent and biased estimations, we will use the Fully Modified Ordinary Least Square method (FMOLS) whose basic application condition is requirement that all data series the level of integration of the first order I(1). The advantage of FMOLS method is that it provides consistent estimations of model parameters even in the case when it has a relatively small sample of data, and additionally controls endogenous regressors, heteroscedasticity and serial correlation (Ramirez, 2006).

#### 3.3. Estimation of panel co-integration model using FMOLS method

When estimating the existence of co-integration relation between variables, the standard least square method mainly provides biased results due to the problem of endogeneity of variables. Furthermore, the conclusion on the statistical significance of co-integration relation between variables cannot be made due to the fact that the corresponding statistics t does not follow normal distribution.

For elimination of mentioned drawbacks, Pedroni proposed the method of co-integration vector estimation. It is a word about Fully Modified Ordinary Least Square method (FMOLS) which represents a non-parametric method of autocorrelation correction and which takes into account the possible correlation between the error model and the first differences of regressors, as well as the presence of constants in the model. Estimation of co-integration vector with the use of FMOLS method is represented by the following expression:

$$\hat{\beta}_{FMOLS} = N^{-1} \sum_{i=1}^{N} \left( \sum_{t=1}^{T} (x_{it} - \overline{x})^2 \right)^{-1} \left( \sum_{t=1}^{T} (x_{it} - \overline{x}_i) y_{it}^* - T \hat{y}_i \right)$$
(3.3)

where  $y_{it}^*$  is the adjusted dependent variable,  $\hat{y}_i$  is parameter of autocorrelation correction and *T* is the number of time periods.

In the tables 3.7, 3.8. and 3.9. we have provided the assessments of long term parameters which are used for measuring the influence of the catch-up rate for economic development and share of trade with Germany in total trade of the country on changes in sector structure of the observed countries in transition, where each of the sectors is represented as a share in GDP of the country, as well as a difference of the sector share in the GDP of Germany and the observed countries in transition. In the assessment of the long term parameters with application of the FMOLS method we have used the pooled and weighted pooled panel model. It should be mentioned that in consideration of the results we will be oriented primarily on models with highest values of adjusted coefficient of determination, under condition that the co-integration coefficients are statistically significant.

		FMO	LS		FMOLS			
Dependen t variable	Industry (% of GDP)				Industry o	livergence		
Independ	Poo	oled	Pooled (	weighted)	Pooled		Pooled (	weighted)
ent variables	Homogene ous first- stage long-	Heterogene ous first- stage long-						
	run coefficients	run coefficients	run coefficients	run coefficients	run coefficients	run coefficients	run coefficients	run coefficients
"Catching up" coefficient	0.022402	0.025178	0.019777	-0.269425***	-0.079572	-0.087912***	-0.07280***	0.155329***
Trade coefficient	0.197137	0.217095***	0.054233	-1.611757***	-0.160581	-0.209334**	-0.069326	0.471195***
R- squared	0.793400	0.793297	0.792950	0.505223	0.793013	0.793567	0.793687	0.532885
Adjusted R- squared	0.780933	0.780824	0.780456	0.475366	0.780522	0.781110	0.781237	0.504697

3.7. The industrial sector – estimated parameters of co-integration vector using the method of FMOLS

Source: Author's calculations

\*\*\* Denotes significance at the level of 1%

\*\* Denotes significance at the level of 5%

Out of the models where the industrial sector is presented with share of industry in GDP of the country we will select the model whose value of the adjusted coefficient of determination is 0.780824 and within which the value of at least one co-integration coefficient is statistically significant. The results of the analysed model indicate that the trade exchange of the countries in transition with Germany has the positive and significant influence on share of industry in the GDP, i.e. that the increase in trade of all countries in transition with Germany by 1% would lead to increase in share of industrial production in GDP of the countries in transition by approximately 0.217095%.

We have reached the similar results by applying models based on examination of difference in share of industry in GDP of Germany and observed countries in transition. Pooled panel model with long-run coefficient has proved to be the best one, as well as the weighted pooled panel homogenous long-run coefficients, whose adjusted coefficient of determination amount to 0.781110 and 0.781237, respectively. Taking into account the fact that for the most countries a difference between industrialization rate in Germany and observed transition countries is positive, results of mentioned models lead us to a similar conclusion, same as the model presented with the share of industry in GDP. Specifically, the first model shows that the change in catch-up rate by 1% leads to decrease of the industry share in GDP between

Germany and transitional countries by approximately 0.087912%. Also, with growth of share of trade with Germany in total trade of observed country by 1%, this difference decreases by approximately 0.209334%. This would mean that in long term the share of industrial sector in GDP of countries in transition approaches the share of industry in GDP of Germany. As opposed to the first model, the second model indicated only statistical significance of the co-integration coefficient of the catch-up rate, with negative line of action and intensity approximately equal to intensity of the first model, meaning that the growth of the catch-up rate by 1% leads to decrease of difference in industrialization rate between Germany and observed countries in transition by approximately 0.07280%.

r		EMO	L C			EMO	IC	
	FMOLS FMOLS					LS		
Dependent variable	Agriculture (% of GDP)				Agriculture divergence			
Independent	Poo	led	Pooled (	weighted)	Poo	oled	Pooled (v	weighted)
variables	Homogeneo us first- stage long-	Heterogene ous first- stage long-	Homogene ous first- stage long-	Heterogeneo us first- stage long-	Homogene ous first- stage long-	Heterogene ous first- stage long-	Homogene ous first- stage long-	Heterogene ous first- stage long-
	run	run	run	run	run	run	run	run
	coefficients	coefficients	coefficients	coefficients	coefficients	coefficients	coefficients	coefficients
"Catching	-0.190609***	-0.21267***	-0.20526***	-0.933308***	0.176103***	0.198275***	0.190045***	0.900967***
up" coefficient								
Trade coefficient	0.180836	0.066225	0.057357	-1.116829***	-0.174320	-0.058721	-0.057353	1.094113***
R-squared	0.8253004	0.828119	0.828404	0.583279	0.828537	0.831335	0.831538	0.595805
Adjusted R- squared	0.814762	0817747	0.818049	0.558131	0.818190	0.821157	0.821372	0.571414

3.8. The agricultural sector – estimated parameters of co-integration vector using the method of FMOLS

Source: Author's calculations

\*\*\* Denotes significance at the level of 1%

Speaking of the agriculture sector, results of models expressed with the agriculture share in GDP of a country are quite balanced. Out of total of four models (Table 3.8), where each of them has statistically significant co-integration coefficients, we shall analyse three models with relatively high adjusted coefficient of determination, which amounts to 0.814762, 0.817747 and 0.818049. All three models indicated existence of negative and statistically significant co-integration link between the economic development catch-up rate and agriculture share in GDP. Values of co-integration coefficients vary within the interval from - 0.1906094 to -0.212675. In other words, this would mean that growth of the catch-up rate by 1% leads to decrease of the agriculture share in creation of GDP by approximately 0.1906094% to 0.212675%.

Also, models based on differences in rates of the agriculture share in GDP of Germany and observed countries in transition (Table 3.8), indicated that absolute value of difference in long-term time period is decreasing, i.e. the share of agriculture in GDP of countries in transition is approaching the share of agriculture in GDP of Germany. In the interpretation of the results we took into consideration the absolute value of differences since that the difference in agriculture share in GDP of Germany and all countries in transition is negative, which is logical if we consider the fact that analysed countries in transition had been predominantly oriented on agriculture. Out of the total of four analysed models, where each has statistically significant coefficients of co-integration among variables, we shall focus to three models which, due to relatively high values of adjusted coefficient of determination; 0.818190, 0.821157 and 0.821372. All three models indicated approximately the same results, i.e. that

the coefficient of the economic development catch-up rate is statistically significant at the significance level of 1% and it varies within the interval from 0.176103 to 0.198275. This would mean that the growth of the economic development catch-up rate by 1% leads to decrease of absolute value of agriculture share in GDP of Germany and observed countries in transition by 0.176103%-0.198275%.

		FMOLS FMOLS							
Dependen t variable	Services (% of GDP)				Services of	livergence			
Independ	Po	oled	Pooled (	weighted)	Pooled		Pooled (	weighted)	
ent variables	Homogene ous first- stage long-	Heterogene ous first- stage long-							
	run coefficients	run coefficients	run coefficients	run coefficients	run coefficients	run coefficients	run coefficients	run coefficients	
"Catching up" coefficient	0.168472**	0.187501***	0.190374***	1.225255***	-0.097473	-0.111036**	0.111277***	-1.076361***	
Trade coefficient	-0.378538	-0.284672*	-0.16461***	2.672476***	0.335325	0.270008*	0.173829***	-2.537162***	
R- squared	0.657559	0.660498	0.662633	0.042799	0.677265	0.678948	0.680510	0.089742	
Adjusted R- squared	0.636895	0.640010	0.642274	-0.014963	0.657790	0.659574	0.661231	0.034812	

3.9. The service sector – estimated parameters of co-integration vector using the method of FMOLS

Source: Author's calculations

- \*\*\* Denotes significance at the level of 1%
- \*\* Denotes significance at the level of 5%
- \* Denotes significance at the level of 10%

Finally, as it can be observed in the Table 3.9, neither the service sector remained immune to globalization flows. Out of the four models in which the service sector is expressed through the share in GDP, we shall separate three models with positive and relatively high values of adjusted coefficient of determination which amount to 0.636895, 0.640010 and 0.6642274. Each of these models pointed out positive and statistically significant influence of the economic development catch-up rate to share of service sector in GDP of countries in transition. According to the results of these three models, the economic development catch-up rate is ahead by 1% of growth in share of service sector in GDP of countries in transition by amount which fluctuates within interval from 0.168472% to 0.190374%. Also, two out of three mentioned models, indicated negative and statistically significant influence of the trade share with Germany in total trade of the country, to the service sector share in GDP of countries in transition. This is pooled panel model with heterogeneous long-run coefficients, as well as weighted panel model with homogenous long-run coefficients, where the values of co-integration coefficients are -0.284672 and 0.164609, respectively. This would mean that, according two mentioned models, the growth of trade share with Germany in total trade of the country by 1% leads to decrease of the services sector share in GDP by 0.284672% or 0.164609%, respectively.

Similar results have been provided by models where the services sector was expressed through difference share of services in GDP of Germany and observed countries in transition. In the Table 3.9 it can be seen that out of the three models with relatively high value of adjusted coefficient of determination, two have statistically significant co-integration

coefficients on basis of which we are going to draw conclusion on changes in the services sector originating as the result of influence of the economic development catch-up rate and share of trade with Germany in total trade of observed countries in transition. These are models with value of adjusted coefficient of determination of 0.659574 and 0.661231. Considering that for the most countries in transition, the difference in the services share in GDP of Germany and observed countries is positive, results of mentioned two models indicate that in long-term time period, the growth of catch-up rate in economic development of 1%, leads to decrease of such difference and this decrease amounts to approximately 0.111036% and 0.111277%, respectively. In other words, this would mean that the growth of the catch-up rate will bring to convergence of the service share in GDP of countries in transition to the share of services sector in GDP of Germany. However, completely opposite and statistically significant effect to this difference is with share of total trade with Germany in total trade of observed countries, which can be clearly seen in Table 3.9. Specifically, the results of co-integration coefficients of the trade share with Germany in total trade of countries in transition at the level of significance 10% and 1%, have shown that growth of the trade share with Germany by 1% leads to increase of already existing positive difference between share of the services sector in GDP of Germany and observed countries in transition by approximately 0.270008% and 0.173829%, respectively.

### 4. CONCLUSION

Results of our analysis seem moderately optimistic for all those economists from Eastern Europe who believe that their countries should increase the share of industry in creation of GDP. The optimism originates from the results indicating that even a free trade with Germany and catching-up the level of economic development lead to increase of the industry share in GDP of East European small countries which trade with Germany. At the same time, under influence of these factors, the share of agriculture declines in creation of GDP while the share of services, also, increases moderately.

Moderateness of this optimism comes from the fact that influence of trade and economic catch-up effect are quite mild. Actually, according to the results of our analysis, in order to achieve the increase of the industry share in creation of GDP by only 1%, or, in other words, to decrease a difference in industrialization rates between Germany and observed countries in transition by approximately 1%, it is necessary to have the increase the trade volume with Germany in total trade of the country by approximately 5%. Also, the same effect could be achieved if the GDP ratio per capita between countries in transition and Germany would increase by approximately 11-13%, which, for sure, observed from the perspective of current economic development of the countries in transition, is not easy to achieve. However, it should be mentioned that a difference in industrialization level of Germany and small countries of Eastern Europe is not unreachable, if the keep in mind that that share of industry in GDP of Germany is just slightly over 30%.

It is certain that these results should definitely be taken with certain reserve, because they are based on series of presumptions which leave a room for some future researches. It primarily refers to fundamental presumption that convergence of economic structures is unilateral, i.e. that the economic structure of small countries in Eastern Europe is approaching the economic structure of Germany. However, in practice it is impossible to exclude possibility that the trade with great number of the small countries in Eastern Europe has a certain effect to the economic structure of Germany itself, since that summary value of economies of these countries is not so small to be without any influence. Also, the catch-up rate taken as an independent variable could be considered as a shortcoming in this paper. However, the economic growth rate (on which the catch-up rate depends) could be also observed as a dependent variable under influence of economic structures. For example, some papers suggest that larger share of industry in creation of GDP in countries with low and mid-sized income has higher economic growth rates as a consequence.

Still, with all these issues, we believe that this paper provides strong arguments in favour of European integration of the Eastern Europe countries.

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# THE LINKAGE BETWEEN EXTENSIVE LENDING TO PRIVATE INDIVIDUALS AND INTERNATIONAL TRADE IN SMALL OPEN ECONOMIES

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### ABSTRACT

This paper examines the relationship between international trade and extensive lending to private individuals in a five European post-socialist countries. The study uses panel data for the period 1996 - 2014. The results of Panel ARDL show that increase in banking loans to private individuals over banking loans to corporate increase imports over exports in a short ran. In a long run the exports of the economies outperforms its imports and so the opposite direction was confirmed. The research results indicate that lending to private individuals might be a source of comparative advantages for international trade of small open economies and therefore improve its exports competitiveness.

## 1. INTRODUCTION

International trade theories do not take the role of finance into consideration as a source of comparative advantage. A vast empirical literature in finance has indicated the importance of financial development for industries which need more external finance. Nevertheless, the effects of finance in international trade theory are still unexplored (Ju and Wei, 2011). The complexity of financial environment and economic history are different for different countries, so the relationship between international trade and financial development should be examined on a single country basis or on a group of similar countries. In a last two decades, post-socialist economies have experienced financial and trade liberalization resulted in increase of financial inflow from abroad and in increase of trade volumes as well. The greatest portion of FDI has been directed towards financial intermediation sector (mainly foreign owned credit institutions). The banking system has been rapidly turned into one of the most dynamic sectors of the post-socialist economies. At the very beginning of transition period banks were more oriented toward lending to the corporate clients, but by the time lending to private individuals became a dominant. At the same time, trade liberalization has been prominent phenomenon as well and banks are often criticized in public as ones supporting excessive consumption, imports and consequently imbalances in international trade of post-socialist economies. Bilas and Bošnjak (2015) found empirical evidence for debt-financed consumption in Croatia for the period of fifteen years. The literature for this topic is scarce, but more or less the similar phenomenon could be present in other European post socialist economies. The aim of the present research is to examine the relationship between banking loans to private individuals and international trade in small open economies. So, in this paper the research hypothesis states: banking lending to private individuals might be a source of comparative advantage for a small open economy. Small and open economy in this paper is considered as an economy with no significant influence on the world price of product or service.

The rest of the paper is organized as follows: section 2 briefly summarizes existing literature on the research topic. Section 3 presents empirical strategy and corresponding methodology, while section 4 empirical results and discussion. The final section provides an overview of the main findings of the research and conclusions.

# 2. LITERATURE OVERVIEW

Kletzer and Bardhan (1987) showed that countries with a relatively well-developed financial sector have a comparative advantage in industries and sectors that rely on external finance. Developed domestic financial sector is also helpful to increase the foreign firm's borrowing to broaden their innovative activities in the domestic economy (Omran and Bolbol, 2003). The more developed domestic financial system will be able to mobilize savings, and screen and monitor investment projects, which will contribute to speed up economic growth (Hermes and Lensink, 2003). Manova (2013) points out that more developed financial markets support industries with higher dependence on external finance to export more. Amiti and Weinstein (2011) confirmed the link between access to external finance and international trade at the firm level. But following Kim, Lin and Suen (2010) the relationship between international trade and financial development may be country-specific. According to Goksel (2012), there are negative effects of financial constraints in a country to its exporting performance and the differences in financial structures between countries affect the bilateral trade. Empirical findings in his study show that financial development encourages the amounts of countries exports since firms need credits to cover their costs. Therefore, trade volume between countries that have relatively healthier financial markets will be higher. Following Feng and

Lin (2013), export oriented firms face larger fixed costs in production and they rely more on external finance. Therefore, worsening financial conditions affect export oriented firms more adversely than domestic oriented ones. Following Mishkin (2009), international trade will stimulate the financial development. An economy with more developed financial markets and institutions tends to have significantly higher economic growth rate (Shahbaz and Rahman, 2012). Chimobi (2010) examined the causal relationship among financial development, trade openness and economic growth in Nigeria using data for 1970-2005; the Johansen multivariate approach to cointegration was applied, but found no cointegrating relations between growth, trade openness and financial development. Shaheen et al. (2011) also confirmed a long run relationship between financial development, international trade and economic growth in case of Pakistan. Yucel (2009) found negative effect of financial development but positive effect of trade openness on growth. Conclusively, the existing literature does not point on a consistent conclusion in regard to relationship between financial development and international trade relationship. Nonetheless, financial market significantly differs in different countries. Vast majority of financial intermediation in European postsocialist economies goes through banking system (bank - centric), while more developed financial systems offer developed financial products and relies more on a financial market (market – centric). So, when examining the role of financial system and its development in international trade for European post-socialist economies the research needs to be directed towards banks. Furthermore, banking loans to private individuals may influence demand side of the economy and afterwards supply may respond by increase in production and eventually by increase in exports.

Following the last global financial crisis, the importance of the relationship between finance and international trade has been highlighted (Manova and Foley, 2015; Contessi and de Nicola, 2012). The sample countries in this paper are selected in line with data availablility. So by testing the role of banks in international trade for European post-socialist economies this research will contribute to growing literature in this area.

# 3. EMPIRICAL STRATEGY AND CORRESPONDING METHODOLOGY

The dataset used in this research consists of annual data on imports (M), exports (X), banking loans to private individuals (PI) and banking loans to corporate clients (CC) for five European countries, namely: Croatia, Serbia, Hungary, Czech Republic and Latvia. The study uses panel data for the period 1996 - 2014. The data on imports and exports were taken from national bureaus of statistics and data on banking loans to private individuals as well as banking loans to corporate clients were taken from national central banks. So the observed series are denoted as follow:

 $PI_i$  – loans to private individuals in country *i*,

 $CC_i$  - loans to corporate clients in country *i*,

 $M_i$  - imports in country *i* and

 $X_i$  - exports from country *i*.

Out of the observed series, the new variables were defined and econometric model was proposed to test the suggested theory. Dependent variable in the proposed econometric model is defined as imports to exports ratio (TB) and independent one as ratio of loans to private

individuals over loans to corporate clients (BL). So the suggested econometric model can be expressed by equation (1):

$$TB_i = f(BL_i) \tag{1}$$

Where the variables are:

$$TB_i = \frac{M_i}{X_i}$$
;  $BL_i = \frac{PI_i}{CC_i}$  and *i* represent cross-sectional unit or a county in the selected sample.

Following well known concept of comparative advantage, when  $BL_i > BL_j$  country *i* has comparative advantage in loans to private individuals over country *j* and when  $TB_i < TB_{ji}$  better trade performance of country *i* is assumed. So, to test the potential influence of banking lending to private individuals on trade performance and the suggested baseline theory equation (1) was used.

Testing for unit roots in heterogeneous panels has attracted a great attention due to problem cross-sectional dependency (see for example Im, Pesaran and Shin (1995); Levin, Lin, and Chu (2002)). Baltagi and Kao (2000) provided a review. The problem of cross-sectional dependency might be explained as in case when individuals forming a panel are affected by a shock then other individuals of the panel are affected as well. In terms of mathematics, the problem can be represented by equation (2) and inequality (3):

$$y_{it} = \alpha_{0i} + \alpha_{1i} \cdot x_{it} + \varepsilon_{it} \tag{2}$$

$$\operatorname{Cov}(\varepsilon_{\mathrm{it}},\varepsilon_{\mathrm{ij}}) \neq 0$$
 (3)

So to account for cross-sectional dependency, beside Levin Lin Chu (2002) tests, Im, Pesaranand Y. Shin (2003) test is employed.

Afterwards, the panel cointegration test based on residual cointegration (Pedroni, 2004) and Johansen fisher panel cointegration test (Maddala and Wu, 1999) were used to test for cointegration among the variables in panel data. After cointegration tests have been performed, causality among the observed variables was tested.

Panel causality test developed by Dumitrescu and Hurlin (2012) can return successful results even under the conditions of cross-sectional dependence. So, to test the causality in this research Dumitrescu-Hurlin test was used.

To address the issue of short run heterogeneity as well as long run homogeneity of the estimated coefficients in a panel framework, the pooled mean group (PMG) estimator (Pesaran *et al.* 1999) has gained popularity. Pesaran *et al.* (1999) argue that GMM estimation procedure for dynamic panel model can produce inconsistent and misleading coefficients of the long-run coefficients unless they are truly identical. This problem is bigger when the time dimension of the panel is large. Furthermore, here are some other advantages of the PMG estimator. It is an estimator which allows the intercepts, short-run coefficients, and error variances to be different across groups, but the long-run coefficients are constrained to be homogeneous. Additionally, PMG estimator is less sensitive to outliers and can simultaneously correct the serial autocorrelation problem as well as the problem of endogenous regressors by choosing appropriate lag structure for dependent and independent variables (Pesaran *et al.* 1999).

There are some reasons to believe that the long-run equilibrium relationship amongst variables should be identical across groups, while the short-run dynamics are heterogeneous. This dynamic estimator is more likely to capture the true nature of the data. Finally, the null hypothesis of long-run slope homogeneity in the coefficients is tested using the Hausman test.

$$TB_{i,t} = \gamma_{0,i} + \gamma_{1,i} \cdot BL_{i,t} + \varepsilon_{i,t}, \quad i = 1, ..., N; \ t = 1, ..., T$$
(4)

The first necessary step of the empirical analysis was to choose the lag order of ARDL model by applying the Schwarz information criterion. Even though there was no clear evidence for a most common representation, after choosing a trading partner specific lag order of the ARDL model by applying the SBC information criterion, the preferred specification for the whole sample of analyzed countries was an autoregressive distributed lag ARDL (1,1) model:

$$TB_{i,t} = \delta_i + \gamma_i \cdot TB_{i,t-1} + \beta_{1,0,i} \cdot XBL_{i,t} + \beta_{1,1,i} \cdot BL_{i,t-1} + \varepsilon_{i,t}$$
(5)

According to Engle and Granger (1987) if the variables are I(1) and co-integrated, the error term is an I(0) process for all trading partners (i). Furthermore, co-integrated variables show great responsiveness to any deviation from long-run equilibrium, so this feature implies an error correction parameterization of equation (4) such as:

$$\Delta TB_{i,t} = \varphi_i (TB_{i,t-1} - \alpha_{0,i} - \alpha_{1,i} \cdot BL) + \beta_{1,1,i} \cdot \Delta BL_{i,t} + \varepsilon_{i,t}, \tag{6}$$

Where:

$$\varphi_i = -(1 - \gamma_i), \qquad \alpha_{0,i} = \frac{\delta_i}{1 - \gamma_i}, \qquad \alpha_{0,i} = \frac{\beta_{1,0,i} + \beta_{1,1,i}}{1 - \gamma_i}$$

Equation (6) represents the preferred specification to be estimated using the PMG estimator. Parameter  $\varphi_i$  represents the error-correcting speed of adjustment and we expect it to be negative and significant under the assumption that the variables of interest show a return to long-run equilibrium.

Eventually, dynamic ordinary least square (DOLS) estimator and fully modified least square (FMOLS) estimator were used to find the long-run relationship and check for robustness. Finally, all of the variables within this research are expressed in logarithms.

#### 4. EMPIRICAL RESULTS AND DISCUSSIONS

Following the PMG procedure, statistical properties for the observed variables were tested at the first place. Taking into account empirical strategy and methodology of the research i.e. PMG and ARDL, the observed variables may be stationary at levels or integrate of order one, but not integrated of order two. Panel unit root test results are presented in Table 1.

VADIADIE	<b>Banal</b> analitications	Unit waat toota	p - values				
VANIADLE	Panel specifications	Unit root tests	Levels First difference				
BL	Individual intersent and trand	LLC 0.0116		0.0059			
	marviduar intercept and trend	IPS(2003)	0.2048	0.0044			
ТВ	Individual intersent and trand	LLC	0.0000	0.0014			
	marviauar intercept and trend	IPS(2003)	0.0340	0.0000			

 Table 1. Panel unit root test results

Source: Author.

Following the results in Table 1, one can see that all of the variables are integrated of order one, so not integrated of order two and preferred estimation procedure may be continued. After the order of stationary for series is analyzed, it is also analyzed to see whether a long-term relationship exists among the variables. Cointegration between the variables in panel data was tested and test results are summarized in Table2.

Table 2	Panel	cointegration	test	results
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Test	Null hypothesis	Alternative hypothesis	Name of the statistics	p-values
Pedroni	No cointegration	Homogenous cointegration	Panel ADF	0.0000
		Heterogeneous cointegration	Group ADF	0.0000
Johanson Fisher	No cointegration	At most one cointegration	Fisher trace	0.0000
Jonansen Fisher		relationship	Fisher max	0.0004

Note: All tests include constant and trend. Source: Author.

Following the panel cointegration test results in Table 2, one can see that the variables are cointegrated. After analysing whether a long-term relationship exists among the variables, the potential for a causal relationship among the variables was also analysed and the results are summarized in Table 3.

Table 3. Panel Granger causality test results for the variables of interest

Null hypothesis	W-Statistic	Zbar-statistic	p-values
BL does not homogeneously cause TB	3.83544	2.72775	0.0064
TB does not homogeneously cause BL	0.94035	-0.29900	0.7649

Source: Author.

According to the results shown in Table 3, an unidirectional causal relationship was found from banking loans structure to trade balance.

Table 4 presents the results of the baseline model specified by equation (6). If the slope coefficients are homogeneous, then the PMG estimator is consistent and efficient. However, homogeneity restriction is not rejected by the data. According to Table 4, the adjustment coefficient for the analyzed panel has the correct negative sign and is statistically significant at the 1% significance level, which implies that an error-correction mechanism is in place. The average value of the error-correction coefficient is -0.34, implying that equilibrium is reached in about three years. Furthermore, the estimates suggest the presence of the long-run effect that is properly signed and significant at the 1% significance level. The long-run coefficient that amounts -0.06 and it can be concluded that in the long-run banks' lending to private individuals over corporate sector decreases imports over exports. The short-run coefficient and constant do not achieve significance at 1% or 5% significance level even though short- run coefficient achieves significance at 10% significance level.

Table 4. Pooled mean	group estimates	for panel	of five south	eastern European	countries
	0 T	) - <b>F</b> · · · · ·		$r \sim r \sim r$	

speed of adjustment $(\varphi_i)$	-0.341777*** (0.065226)
Long –run coefficient ( $\alpha_{1,i}$ )	-0.057457*** (0.014632)
Short-run coefficient ( $\beta_{1,1,i}$ )	0.0161893* (0.098295)
Constant	0.024606 (0.018002)
Hausman test for poolability of countries	0.2618

Notes: Estimations are performed using the PMG estimator; all equations include a constant term; standard errors are in brackets; \*\*\*, \*\*, \* denote significance at the 1%, 5% and 10% significance level, respectively. Source: Author.

Since the PMG procedure allows for short-run heterogeneity, it is possible to estimate separate short-run coefficients for each sample country in the panel (see Table 5).

Table 5. Short – run, country specific estimates

Country	Speed of adjustment ( $\varphi_i$ )	Short – run coefficient ( $\beta_{1,1,i}$ )	Constant
Croatia	-0.446637***	0.279540***	0.029036***
	(0.035616)	(0.020253)	(0.001005)
Serbia	-0,269410***	0.165722***	0.084309***
	(0.032213)	(0.014897)	(0.007058)
Hungary	-0.160170 ***	-0.113248***	0.020320***
	(0.006801)	(0.001817)	(3.55E-05)
Czech Republic	-0.527597*** (0.044016)	0.024398*** (0.002251)	-0.028646*** (0.000169)
Latvia	-0.305071***	0.453052***	0.018008***
	(0.038645)	(0.075563)	(0.002613)

Notes: \*, \*\*, \*\*\* indicates significance at 10%, 5% and 1% significance level, respectively; numbers in the brackets are standard errors for full PMG. Source: Author.

The results in Table 5 indicate significant at 1% and properly signed speed of adjustment for each one country out of the sample. Short – run coefficient and constant are significant at 1% significance level as well. However, the speed of adjustment is the most prominent in Check Republic followed by the speed of adjustment in Croatia while the low amount for speed of adjustment is found in Hungary. Furthermore, and contrary to other countries out of this sample, short–run effect in Hungary is negative.

Eventually, to test whether the estimated results are robust dynamic ordinary least square and fully modified least square method have been employed. The results are summarized in Table 6.

Table 6. Robustness	check result
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Long –run coefficient ( $\alpha_{1,i}$ )	-0.059167**
Panel dynamic least square (DOLS)	(0.028449)
Short-run coefficient ( $\beta_{1,1,i}$ )	-0.0606000***
Panel fully modified least squares (FMOLS)	(0.044963)

Notes: Standard errors are in brackets; \*\*\*, \*\*, \* denote significance at the 1%, 5% and 10% significance level, respectively.

Source: Author.

The results in Table 6 indicate robust estimates and research results are illustrated in Figure 1. *Figure 1 International trade and banking loans in a small open economy* 



Source: Author

Assuming initial demand curve (D) and initial supply curve (S) in a small open economy, an increase in banking loans to private individuals over corporate clients in a short-run moves demand curve and the new demand curve is D1. Since we assume small open economy, the small economy cannot influence the world price (Pw). Since the supply curve cannot respond in a short-run with the same intensity the country experiences an increase in imports and potential deficit in trade balance. But in a long-run supply curve (S) moves as well and new supply curve is S1 resulting in increase of exports over imports. Eventually, in a long run small open economy experience an increase in export over imports as a result of banking loans to private individuals over corporate clients. Weber (2011) suggested an export-strengthening strategy as the one that would have merit in reducing international macroeconomic imbalances and growth of Eastern Europe countries. However, the loans to private individuals are not the only component to determine trade balance. The results call for replication of the study in other economies out of the sample under consideration.

### 5. CONCLUDING REMARKS

There are several conclusions that can be drawn out of the research presented in this paper. Firstly, the relationship between financial development and international trade has been established and empirically tested for small open post-socialist economies. Furthermore, the focal point in financial sector of small open economy is a banking sector and its lending. Secondly, excessive banking lending to private individuals in a short-run can cause an increase in import demand and consequently a deficit in international trade, but in a long-run banking lending to private individuals over corporate clients improves trade performance of the small open economy. Eventually, the results of Panel ARDL on a sample of five European

post-socialist economies point out on banking lending to private individuals over corporate clients as a potential source of comparative advantage for its trade performance. Additionally, the effects from the demand side need to be examined for other potential effects on the economy that may appear simultaneously like indebtedness of private individuals and corresponding consequences.

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# INTERNAL REPORTING IN PUBLIC HOSPITALS – A CASE STUDY IN CROATIA AND SLOVENIA

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# ABSTRACT

This paper explores the usage of internal reports at public hospitals in Croatia and Slovenia. It also highlights the importance of internal reports for public hospitals and the development of cost accounting as a preamble for internal reports. The research based on the two questionnaires was conducted in the end of the year 2015 and beginning of 2016 in Croatian and Slovenian public hospitals.

The questionnaires were sent to all accountants and financial officers in public hospitals in both countries. The authors have set research question to examine does public hospitals prepare internal reports and for what purposes internal reports are mainly used in Croatian and Slovenian public hospitals.

Statistical analysis of conducted empirical research has shown that internal reporting is insufficiently developed in Croatia due to the accounting framework. At the end of the paper, authors gave some recommendations regarding future development and usage of internal reports at public hospitals for both countries.

# 1. INTRODUCTION

In the first years of independence after the dissolution of the former common state and changes in the socio-political order, following the political and economic priorities both countries brought their own laws and builds its legal state infrastructure. In the meantime, with certain adjustments, provisions taken from the former common state were applied. It was the same with regulations that are regulating the area of governmental accounting and public health sector as the part of general government. In the beginning of the formation both of the countries had similar development of accounting in the public health system.

This paper analyses current differences between Croatia and Slovenia in the accounting system of public healthcare system. A current system of financial reporting of public health institutions is complex due to its extensiveness formal, frequent periodicals, tight deadlines, but also because health institutions are specific business entities in the public sector. This specificity stems from the fact that health activities that are predominantly funded on the basis of individualized public spending is based on the contractual relationship and the actual execution of its services with National Health Insurance Found (hereinafter NHIF). For the purpose of objective assessment of business performance and financial position, it indicates the necessity of matching revenues with expenses incurred for their realization.

It is necessary that these fundamental economic categories are recognized and measured on the same accounting principles, specifically the accrual accounting basis. In order to successfully manage public hospitals, it is crucial that true, timely and valid information is obtained as a base for the decision making process. The cost accounting methodology is essential to the management of public hospitals. It must provide information about the type and amount of resources spent, and thus enable the prerequisites for: control, management and potential reduction of costs. In addition to the aforementioned preconditions, it is important to have the political will or the awareness of individuals regarding the need for internal cost accounting, with the aim of providing the best possible healthcare service with the optimal mobilization of costs. Through information obtained, one can monitor the accomplishment of various set goals and objectives for the NHIF and for healthcare institutions itself. Thus, the goal of achieving more effective and more efficient management and raising the awareness of responsibility in administration of public hospitals and their employees could be fulfilled.

This paper is primarily intended to show the usage of internal reports at public hospitals in Croatia and Slovenia through empirical research results. It also highlights the importance of internal reports for public hospitals through conducted empirical research. Through the description, this paper will also show the similarities and differences in the current legal definition of accounting procedures in healthcare sector in Croatia and in Slovenia.

# 2. THEORETICAL BACKGROUND

How accounting is not a purpose to itself, but the entire accounting activity is directed in the creation of necessary information to users in the process of business decision-making, it is necessary to present the information in a form understandable to intended users. This indicates the need for drawing up external (basic) financial statements - primary financial statements that comply with common needs of most users and internal reports - specific financial (accounting) reports that provide additional information to meet the specific information needs of specific, primarily internal user (Vašiček et all, 2016). Internal users for public healthcare institutions could be divided on stakeholders (like Ministry of Health and
Health Insurance Fund) and on management of healthcare institution but also on heads of organizational units.

Cost accounting and internal reporting objectives are subordinated to the demands of internal users. Creating the internal reporting for the internal users is not standardized and is not prescribed. Such approach to creating content and structure of the internal reporting gives a lot of flexibility and options to meet individual and specific requirements of internal users. On the other hand, the lack of standardization requires more effort, work and knowledge to create internal reports. However, the methodological basis is known, scientifically justified and practically tested. It is the instrumentation of management accounting and cost accounting implemented in the Accounting Information System (Vašiček, V., Dragija, M., ed. 2011). The methodological basis for preparation of internal calculation and selection of a suitable system and method of cost accounting, which should take into account the specifics of the business process, management information requirements and development of business, and must ensure quality and comprehensive reporting results at all hierarchical levels of management (Vašiček, V., Dragija, M., ed., 2011).

Given the fact that the healthcare institutions are constantly pushed to conduct their activities under "market" principles, and highlight the economical and efficient use of resources without a doubt that it is necessary to develop instruments of cost accounting and management accounting (Christensen, T. et all, 2004). For greater efficiency and cost controls is moving healthcare administration more towards a management – driven regime (Dent, M. et all, 2004).

The development of internal reporting enables the provision of additional information, often more analytical character, partially non-financial nature, which is due to the computerization of the health sector, providing a standardized form of internal reports specifically for National Health Fund. The underlying internal report contains information from the accounting information system, as well as information from other hospital system through which non-financial information are provided such as data on the structure of employees, the number of beds, information on overtimes and preparations, patient data, and similar. Internal reporting can provide information and use of resources according to sources if the healthcare institution has accounting information system with all three essential parts: financial accounting, cost accounting and managerial accounting (Vašiček et all, 2016).

Internal reports become with the prescribed external financial statements indispensable part of periodic and annual reports on the operations of healthcare institutions and so become a good foundation for more effective planning, decision-making and governance of the healthcare institution. All of that is connected with the term New Public Management and it includes different techniques like cost – improvement programs, performance indicators, financial management information systems, financial targets, delegated budgets, resource allocation rules, different methods of per – case payment and the general tendency is to replace governmental funding through fixed grants by different reforms implying such accounting information system (Pettersen, 1999).

According to Hassan (2005) cost accounting and managerial accounting reform in Egyptian hospitals triggered public hospitals to change. Costing system together with an internal reporting mechanism showed that the hospital offers most of health services at high cost and that some clinics had little profit while others had big losses (Hassan, 2005). Costing reports

also gave some explanation in money regarding type of medical materials used, profitable services and duration of process (Hassan, 2005). According to Naranjo – Gil (2004) there is an indirect effect of sophisticated accounting information system on performance of public hospitals through a prospector strategy. The research was made on 112 public hospitals out of 218 in Spain.

Regarding the development of the application of cost accounting and management accounting research results show that the cost accounting is used to a limited extent and with limited information effect applies to the activities of public health in Greece (Stamatiadis, 2009). Undoubtedly, it is necessary significantly to improve internal accounting in the public health system, and the application of the costing methods to improve the degree of convergence of internal and external reporting. According to Ellwood (2009) reporting for public interest and stakeholders seems to be particularly out of alignment with public service reforms in UK. In this paper Ellwood (2009) argued that financial reporting is wrongly focused and misleading and in that manner they are the basis for resource and performance measurement of public healthcare institutions. It is necessary to develop analysis reporting about cost structure in public healthcare institutions (Ellwood, 2009) which is not possible without cost and managerial accounting. According to Azoulay et all. (2007) internal reports coming from cost accounting system can not only be used by management for decision – making but also to stakeholders in formulating major policies and strategic plans for future activities and for conducting cost of illness studies and health service research.

#### 3. CURRENT LEGAL DEFINITION OF ACCOUNTING PROCEDURES FOR PUBLIC HOSPITALS IN CROATIA AND SLOVENIA

## 3.1. Accounting framework for public hospitals in Croatia

The gap between the ever-present trend of increasing demand for healthcare services and limited resources within which healthcare institutions operate resulted in a number of reforms in the Croatian healthcare system. Public healthcare system is financed through Croatian Health Insurance Fund (CHIF) who had the status of an extra-budgetary fund, which until 2002 was not integrated into the budget. One of the most significant financial reform of the healthcare system dates back to mid-2001 and early 2002, when the process of decentralization it started and where healthcare institutions changed status, and CHIF through a way of paying contributions for health insurance to the state budget on single treasury account. Institutions in the health sector are financed through contributions, but as part of the central budget and the budgets of local and regional governments and becoming budget users through budget accounting. By early 2015, payment of contributions for health insurance is again aimed through CHIF as it exits the State Treasury account, but it does not change the status of healthcare institutions depending on who is the founder and continue to act as budget users. That status is relevant for the application of the mandatory accounting framework and financial reporting - budget accounting based on the provisions of the Budget Act. Budget accounting is an accounting system that relates to the accounting and monitoring, analysis and reporting of business events, of budgetary and extra-budgetary users (Official Gazette 2008). The rules of budget accounting and financial reporting are defined by the implementing regulations adopted on the basis of the Budget Act. The budgetary accounting system in the Republic of Croatia has recognized characteristics which can be summarized as follows (Vašiček, V., 2007):

• Mandatory application of budget accounting and financial reporting for the budgets, budget users and extra-budgetary users,

- Using the mandatory chart of accounts and consistent application of binding rules, records transactions and events (prescribed scheme posting and account),
- Mandatory application of budget classification: organizational, economic, functional, location and program in the area of budget planning, budget execution, accounting and financial reporting,
- Basics of budget accounting based on International Accounting Standards for the public sector,
- The application of modified accounting basis,
- Consistent application of internationally recognized and comparable analytical framework of the financial and statistical reporting,
- The obligation of periodic and annual reporting, mandatory preparation of the consolidated semi-annual and annual account of the state budget.

Selection of the accounting basis (accounting concepts) determines the range of information provided by the accounting system. Basis of accounting presentation of business events defining moment of recognition of revenues, receipts, expenditures, expenses, assets and liabilities in the financial statements, determines the accounting period in which they will be presented. In budget accounting basis of accounting is a modified accrual basis.

The definition of modified accrual means that (Official Gazette 2014):

- expenses of depreciation of fixed assets are not recognized,
- income and expenses due to changes in the value of non-financial assets are not recognized,
- revenues are recognized in the reporting period in which they are collected (money received),
- expenses recognized on the basis of the transaction (commitments) and in the reporting period to which they relate, regardless of the payment,
- expenses for short-term consumption of non-financial assets are recognized at the time of purchase. Exceptionally, in health activities and in the conduct of trade and manufacturing activities expenses for short-term non-financial assets are recorded at the time of actual consumption or sale,
- donations of non-financial assets are included as revenues and expenses.

The system of budget accounting and external financial reporting due to its characteristics of comprehensiveness, a large number of different users and tight deadlines reporting is not entirely appropriate for reporting on the specifics of healthcare institutions. Healthcare is not funded as a typical budget beneficiary and it is the only activity in the budget system, which is funded by contractual relationship on the implementation of specific programs and services provided by healthcare institutions. The specificity of the accounting and financial reporting

of healthcare institutions stems from the complexity of the scope of those economic and financial categories that are subject to accounting records.

It should be noted that since the beginning of 2015, the CHIF as the dominant "buyer" of public health services, after 13 years of functioning in the framework of the State Treasury, regained its financial independence. This fact, however, did not cause any change in the budget and the accounting status of public health institutions as was the case when the Health Fund was included in the State Treasury. For public health institutions which are fully owned by the central government, this change has resulted in additional reporting requirements.

As for the other entities in the budget system, the system of external financial reporting for public health institutions is regulated by the Regulation on Financial Reporting in Budget Accounting (Official Gazette 3/2015). It includes a general obligation composing basic financial statements like Balance Sheet, Reports on the operations (revenues and expenditures, receipts and expenses), Statement of changes in value of assets and liabilities and Notes to the financial statements. These financial statements give a synthesized data on the whole business expressed in monetary indicators on the basis of strictly regulated rules and meet the requirements of reporting to external users (mainly the Ministry of Finance). In addition to these basic financial statements that are prepared and submitted to the Financial Agency on the use of the Ministry of Finance, the Ministry of Health and the CHF, the local and regional (regional) governments (for institutions that are financed from the decentralized funds) and the State Auditing, health institutions are under the contract to periodically and continuously report on the elements of financial operations to the CHIF.

Additional reports healthcare institutions are obliged to deliver monthly, quarterly and annually. The reports cover all revenues and expenditures, receipts and expenses as well as in the financial statements, with the difference that the grouping of accounting data is not comparable with other comparative data (for example from the basic financial statements) for various methodological basis and approaches to selection of data. The reports also contain non-financial information that is relevant for monitoring the implementation of the contracted health institutions with CHIF. Reporting to CHIF contains the following records (reports) (CHIF, http://www.hzzo.hr/hzzo-za-partnere/prikupljanje-financijskih-izvjesca-ustanova-uzdravstvu/):

- General information: name of the institution, the reporting period,
- Information on employees (change in the number of medical and non-medical staff, trainees, emergency services and standby staff), assets (cash, stocks) and especially expensive drugs,
- Information about revenues (receipts) and expenses (expenditure),
- Information about expenditures,
- Information about due liabilities (maturity),
- Information about due receivables (maturity),
- Information about staff and hospital care (number of employees, number of beds and patients),

- Information about the daily hospital and polyclinic-consultative healthcare (the number of beds, chairs, and service cases),
- Information about employee expenditure (Gross salaries, other staff costs),
- Information about revenues (realized and invoiced revenues by type of healthcare and payer),
- Information about the number of employees on an annual and quarterly basis (number of employees at the beginning and end of the period, the average number of employees.

The position of healthcare institutions external reporting is divided in accordance with the external reporting rules of budget accounting and reporting according to CHIF.

From all of the above it can be concluded that the current accounting model and system of financial reporting of public health institutions in the Republic of Croatia is not able to provide fully relevant and reliable information basis needed for making economic decisions at the micro level, and economic, social and political decisions at the macro level. It is also not able to provide complete information which will enable effective control over healthcare institutions because of the modified accrual basis.

#### 3.2. Accounting framework for public hospitals in Slovenia

The basic legal act concerning public sector accounting is the Public Finance Act (Official Journal RS 79/99-109/08), which was adopted in year 2000. It defines the procedural and material matters concerning public finance generally, but it focuses on accounting in public sector within the specific chapter (Chapter 8, article 89. - 95.) as well. The article 91 of the Public Finance Act specifies that accounting handles payments, it records and transmits data, prepares statutory accounting statements, implements accounting controls and control on fulfillment of receivables and payment of liabilities and it archives the original bookkeeping documents. What is most important, the Public Finance Act stipulates the use of the Accounting Act (Official Journal RS 23/99 in 30/02-1253), which also was enacted in 2000 after several years of preparation and coordination. The adoption of it meant a radical reform of public finances and accounting in Slovenia after almost 10 years of Slovenian independence from Yugoslavia. Apart from the Public Finance Act and the Accounting Act, there are several executive legal acts. Apart from those, it should be noted, that laws and regulations in the public finance and accounting field, are based on the Code of accounting principles as well as international and Slovenian Accounting Standards. In addition to the Law on Public Finance and Accounting Act, there are several executive legal acts (Jovanović, 2013).

According to the Public Finance Act (Article 9), the records and the reports have to provide a separate monitoring of management and show economic outturn of public funds and other resources for the provision of public services and operations with funds raised from the sale of goods and services in the market. There is no legal obligation for separate bookkeeping of the income and expenses within public funds and the income and the expenses related to other (market) resources, but the public sector entities are obligated to provide the basic data needed for the preparation of financial statements, annual reports and reports on objectives and results. The accounting records and reports of the public sector entities should also provide the evaluation of the purpose, efficiency and effectiveness of public finances spending. The

reason for such strict separation of financial categories during bookkeeping and reporting originates from the Public Finance Act (Article 67), which determinates that the government (state) or the municipality may organize the public services and activities in public interest using the government or municipal assets. The performance of those is possible in the form of public institutions, public enterprises, public funds and agencies with special emphasis on public interest throughout enabling and carrying out the public service. Therefore, the founding acts of those entities formulate the general activity of the entity that meets public interest. In some cases, the funding acts enable the implementation of the so-called market activities (the sale of goods and services on the market), which is not a public service. Nevertheless, the resources for public service performing are not just budgetary ones, but also the payment (money) from the users of the services. The founder (the government or the municipality) decides whether users will receive public service without payment or they will need to pay for it. It the last case the price is also determined without the possibility of free pricing based on supply and demand. Thus, those revenues are not market reached one, while they present the payment for the public service. The management of the surpluses (the expenditure over the revenues or the revenues over the expenses) is a matter of a founder.

The revenues and expenses are recorded on a cash principle (Article 15 of the Accounting Act, Article 3 of the Regulation of classifying and measuring revenues and expenses in the Common Chart of Accounts). This means that the revenues or the expenses should be registered when these two conditions are filled:

- the transfer resulting as the revenues or the expenses has occurred and,
- the payment has happened although the claims or the liabilities were settled by nonmoney payment.

This general principle of cash accounting is implemented in government, municipality, the Health Insurance Institute of Slovenia, the Institute for Pension and Disability Insurance of Slovenia and public funds set up by the state or a municipality, while all other public sector entities (governed by public law) are bookkeeping on the accrual basis (Article 15 of the Accounting Act). As already mentioned, all public sector entities are obligated to use a Common Chart of Accounts regulated by The Regulation of the Common Chart of Accounts for the budget, budgetary users and other public entities. According to this Regulation Slovenian public sector entities are divided into two groups. The first one are so called "certain users of Common Chart of Accounts", to which all legal entities recording (bookkeeping) the income and the expenses according to accrual accounting principle. In general, these are institutions and agencies having activities in public services. Another (second) group are so called "other users of Common Chart of Accounts", whose bookkeeping is based on cash principle. The accrual based accounting is mandatory for all entities (public institutions, agencies, institutes, chambers and others) that derive revenues from the sale of goods and services on the market and from other non-budgetary sources. The main difference in bookkeeping between those two groups (principles) appears in moment of accrual and of payment (liabilities and receivable). In order to provide consolidated statements of government and municipalities budgets, the accounting categories should be registered according to the unique system. That is the reason that the certain users of Common Chart of Accounts are required to keep book respecting both principles; primarily accrual, but also on cash base principle as for the evidence. In the disclosure to the financial statements of the other users all the revenues and other income but also all the expenses and other expenses should be registered to the appropriate accounts (Jovanović, 2014).

According to the Accounting Act (Article 51), the Public Finance Act (Article 99), the Regulations on the preparation of annual reports for the budget, the budget and other public entities, public health authorities must prepare an annual report. The annual report consists of financial statements and business reports. The financial report comprises the balance sheet, statement of income and expenses and notes to the financial statements. It should be noted that these reports are forwarded to AJPES, Agency for Public Legal Records and Related Services (they collect statements and made them public), the relevant ministry and the mayor (depending on who is the founder of public health institutions).

The required contributions to the balance sheet are: state and movement of intangible assets and tangible fixed assets and review of the status and trends of long-term investments and loans.

Financial data must be disclosed in the notes to the financial statements. They are publishing the criteria that were used for the demarcation of income and expense in a public service activity and the activity of selling goods and services on the market. In addition to the basic financial reporting healthcare institutions are required to submit certain forms such as, for hospitals:

- The form of realization of the program of work,
- The form of income and expenditure,
- The form of monitoring staff,
- The form of investment,
- The form of maintenance,
- The form of the tertiary sector and
- The form of performance indicators.

Budget Act from 2000 states that the budget of the Republic of Slovenia is composed of the state budget, the budget of local government units and two separate cash registers - the Slovenian Health Insurance Institute (SHII) and the Institute for Pension and Disability Insurance. According to Article 9 of the same Act states that budget users prepared books and balance sheets separately for public revenue, other revenue for the provision of public services and the revenues generated in the market (own revenues). In addition, it was stated that the accounts and the annual accounts must allow assessment of the dedicated and efficient spending of public revenue. This does not mean that they have to prepare different business books but through integrated business books separately showing income and expenses according to various sources of financing or business. In order to facilitate the separation of expenditures on these sources is required for key or base for the allocation. However, the keys are not fixed at the national level but healthcare institutions must determine themselves. Therefore, some healthcare institutions use revenue share of some activities as a key to calculate expenses. It is important to note that this was probably coming to "overflow part" expenses on their own income because health institutions are obliged to pay income tax on those revenues that are generated in the market in the amount of 19%. According to Article 51 of the Law on Budget Execution of the Republic of Slovenia in 2013 introduced semi-annual reporting obligation. This means that healthcare institutions under the auspices of the state or a municipality to August 15 must present semi-annual reports for the year in which the display data in the financial plan, on the execution of the period January - June (comparison planned - achieved) and assessment of implementation of the financial plan by the end of year. If from assessment of the financial plan by the end of the year is resulting excess expenditure over income at the end of the year, the responsible person is obliged by the semi-annual report to present remedial proposal that shows activity against which to equalize expenditures with revenues at the end of the year. It is important to point out that the semi-annual report are prepared on a cash basis which means that records business events on the accrual basis in healthcare institutions has no information value (Zafred, Jovanović, 2013).

The system of financing healthcare in Slovenia is based on the fact that public health institutions for services rendered are issuing invoices, payment applications and reports to the Slovenian Health Insurance Institute (hereinafter SHII). Invoices, payment requests and reports must be submitted to the Institute no later than the 10th of the month for the previous month. The calculation of the service performed works on a contract basis for one year, and on the basis of reports on implementation of the agreed program. These report healthcare institutions prepare for the first and second quarter of the year and for the second half as the definitive annual accounts. With this report (on the performed number and volume of services), healthcare institutions are obliged to prepare and business performance indicators used for the evaluation of the business and investment activities of healthcare institutions.

#### 4. RESEARCH METHODOLOGY AND RESULTS

#### 4.1. Research methodology

The principal area of research is the usage of internal reports at public hospitals in Croatia and Slovenia and their importance for public hospitals. From the theoretical part of the paper about accounting framework in researched countries, it is obvious that Slovenia has a better starting point for cost accounting system and internal reporting in public hospitals since they are using accrual accounting basis for recording business events then Croatia.

Based on the research done it has been concluded that even though they are using modified accrual basis in Croatian public hospitals and that they do not have developed cost accounting system they still allocate direct and indirect costs. The allocation is done mainly on the organizational units and only a negligible number of accountants and financial officers calculate costs per type of provided service and per patient. That is the first level of cost allocation under traditional costing methods. The second level of cost allocation, i.e., allocation to patient and to provided service, is not done in Croatian public hospitals. In Slovenia the research results are slightly better since they have all the necessary data from financial accounting about costs and they have developed cost accounting system and they allocate costs to organizational units (84,62%) and per patient and per provided services (69,23%). Regarding to the literature review and based on research results about cost accounting methodology in Croatian and Slovenian public hospitals authors wanted to examine do they prepare internal reports and for what purposes internal reports are mainly used in Croatian and Slovenian public hospitals. To examine all of the above, an empirical survey using questionnaires was done in December 2015 and January 2016 in all Croatian public hospitals in order to gather the necessary data and in Slovenia in March, April and May 2016. The questionnaires were sent by e-mail in an online form to accountant and financial officers in 57 Croatian public hospitals. Out of 57 public hospitals 34 (59.65%) responded to the questionnaire. In Slovenia out of 22 public hospitals 13 (59.09%) responded to the questionnaire. The survey was conducted as a part of the project 8509 "Accounting and financial reporting reform as a means for strengthening the development of efficient public sector financial management in Croatia", financed by the Croatian Science Foundation. The limitations of this research and research results could be seen through different sample size that are not comparable through statistical tests. That is the reason that Wilcoxon Signed Rank Test results were used to express some difference between both countries.

#### 4.2. Research results

Out of 34 respondent public hospitals in Croatia 94% of them expressed that they are preparing internal reports mainly on management demands but also on demand of stakeholders like the Ministry or the CHIF. In Slovenia, all of the respondents expressed that they prepare internal reports mainly on management demands but also on demand of Heads of clinics and organizational units and on demand of stakeholders like the Ministry of health and SHII. Therefore, we can say that the awareness regarding benefits of internal reports is higher since Heads of clinics and organizational units are demanding the preparation of internal reports. In both countries, those internal reports are mainly prepared on a monthly basis.

In order to get the answer on research question, the authors asked the respondents for what purposes does the management use internal reports and to rank the usage from 1 to 5, 1 being the lowest and 5 being the highest grade of use. Sign tests for median and Wilcoxon Signed Rank Test were done for both countries.

Management usage of internal reports	Statistical hypotheses	Statistical test	p-value	Decision, significance level 1%
As an important source of	$H_0 \dots \eta \ge 4$	Sign Test for Median	1.000	H0
information for decision making and governance	$H_{1}\eta < 4$	Wilcoxon Signed Rank Test	0.999	H0
For compliance with a legal	$H_{0}\eta \geq 4$	Sign Test for Median	0.798	H0
reporting obligations	$H_{1}\eta < 4$	Wilcoxon Signed Rank Test	0.488	H0
To monitor the execution of	$H_{\circ} \dots n \geq 4$	Sign Test for Median	1.000	H0
the financial plan	$H_1 \eta < 4$	Wilcoxon Signed Rank Test	0.999	H0
For a comparison with other	$H_{0}\eta = 3$	Sign Test for Median	0.388	H0
similar institutions and organizations	$H_1 \dots \eta \neq 3$	Wilcoxon Signed Rank Test	0.108	H0
In order to inform the general	$H_{0}\eta = 3$	Sign Test for Median	1.000	H0
public and promoting	$H_1\eta \neq 3$	Wilcoxon Signed Rank Test	1.000	H0
For the purposes of internal	$H_{0}\eta = 4$	Sign Test for Median	0.359	H0
and external audit and control	$H_1\eta \neq 4$	Wilcoxon Signed Rank Test	0.457	H0

 Table 1. Sign tests for median and Wilcoxon Signed Rank Test results based on survey results for or usage of internal reports - CROATIA

Source: empirical research

At the significance level of 1% it can be concluded that the median score in the category of "As an important source of information for decision-making and governance" is greater than or equal to 4. That conclusion is the same for "For compliance with a legal reporting obligation" and "To monitor the execution of the financial plan". On the other hand, one cannot reject the hypothesis that the median score in the category "For a comparison with

other similar organizations and institutions" is equal to 3 or that level of use for this category is moderate. This indicates that 50% of institutions is using internal reports for that purposes but the other half of institutions do not pay that much attention for that use. An identical conclusion can be reached for the category "In order to inform the general public and the promotion of healthcare institution". Unlike the previous two observed categories, category "For the purposes of internal and external audit and control" is used more than the previous two and the median score in this category is equal to 4. From the conducted tests, it can be concluded that management of public hospitals in Croatia are using mostly internal reports for decision - making and governance and for compliance with a legal reporting obligation and to monitor the execution of the financial plan and then for the purposes of internal and external audit and control. Since Croatian hospitals do not have developed cost accounting information system with which they could actually measure performance of organizational units or provided services, the objectivity of those reports for decision - making purposes is questionable. Usage of internal reports for compliance with a legal reporting obligation and to monitor the execution of the financial plan and then for the purposes of internal and external audit and control is connected with legal requirement by the Ministry of Health and by the CHIF.

Management usage of internal reports	Statistical hypotheses	Statistical test	p-value	Decision, significance level 1%
As an important source of	$H_{0}\eta = 5$	Sign Test for Median	1.000	H0
information for decision making and governance	$H_1\eta \neq 5$	Wilcoxon Signed Rank Test	1.000	H0
For compliance with a legal	$H_0 \dots \eta = 5$	Sign Test for Median	0.016	H0
reporting obligations	$H_1\eta \neq 5$	Wilcoxon Signed Rank Test	0.022	H0
To monitor the execution of	$H_{0}\eta = 5$	Sign Test for Median	1.000	H0
the financial plan	$H_1\eta \neq 5$	Wilcoxon Signed Rank Test	1.000	H0
For a comparison with other	$H_{0}\eta = 5$	Sign Test for Median	0.063	H0
similar institutions and organizations	$H_1\eta \neq 5$	Wilcoxon Signed Rank Test	0.059	H0
In order to inform the general	$H_{0}\eta = 4$	Sign Test for Median	0.375	H0
public and promoting	$H_1\eta \neq 4$	Wilcoxon Signed Rank Test	0.138	H0
For the purposes of internal	$H_{0}\eta = 5$	Sign Test for Median	0.031	H0
and external audit and control	$H_1\eta \neq 5$	Wilcoxon Signed Rank Test	0.036	H0

 Table 2. Sign tests for median and Wilcoxon Signed Rank Test results based on survey results for usage of internal reports - SLOVENIA

Source: empirical research

At the significance level of 1% it can be concluded that the median score in the category of "As an important source of information for decision-making and governance" is equal to 5. That conclusion is the same for "For compliance with a legal reporting obligation" and "To monitor the execution of the financial plan". On the other hand, one cannot reject the hypothesis that the median score in the category "For a comparison with other similar organizations and institutions" is equal to 5 or that level of use for this category is also very significant. An identical conclusion can be reached for the category "For the purposes of internal and external audit and control". Unlike the previous observed category, categories "In order to inform the general public and the promotion of healthcare institution" is used less than the previous categories and the median score in this category is equal to 4. From the

conducted tests it can be concluded that the usage of internal reports by management in Slovenian public hospitals got higher ranking then in Croatia. The lowest grade equal to 4 was given to category *In order to inform the general public and promoting*.

In next question we wanted to test the ranking of different decisions for which they use internal reports. In table 3 visible are test results for Croatia and in table 4 for Slovenia.

 Table 3. Sign tests for median and Wilcoxon Signed Rank Test results based on survey results for usage of internal reports for different decisions- CROATIA

Usage of internal reports for different decisions	Statistical hypotheses	Statistical test	p-value	Decision, significance level 1%
For the award and allocation	$H_0 \dots \eta = 4$	Sign Test for Median	1.000	H0
of budget funds	$H_1\eta \neq 4$	Wilcoxon Signed Rank Test	0.505	H0
For the approval of the	$H_0 \dots \eta = 4$	Sign Test for Median	0.481	HO
implementation of individual programs	$H_1\eta \neq 4$	Wilcoxon Signed Rank Test	0.913	H0
To determine the price of	$H_{\alpha}$ , $n = 3$	Sign Test for Median	0.839	H0
public health services	$H_1 \dots \eta \neq 3$	Wilcoxon Signed Rank Test	0.700	H0
For the purchase of asset	$H_{a}n=4$	Sign Test for Median	0.824	H0
	$H_1\eta \neq 4$	Wilcoxon Signed Rank Test	0.837	H0
For planning and cost control	$H_{\alpha}$ $n = 4$	Sign Test for Median	0.021	H0
	$H_1\eta \neq 4$	Wilcoxon Signed Rank Test	0.030	H0
For employment decisions	$H_{\alpha}$ $n = 4$	Sign Test for Median	0.263	H0
	$H_1\eta \neq 4$	Wilcoxon Signed Rank Test	0.028	H0
To measure the effectiveness	$H_{0}\eta = 4$	Sign Test for Median	0.455	H0
of the services provided	$H_1\eta \neq 4$	Wilcoxon Signed Rank Test	0.141	H0
To monitor the effectiveness	$H_0 \dots \eta = 4$	Sign Test for Median	0.359	HO
of the services provided and fiscal responsibility	$H_1\eta \neq 4$	Wilcoxon Signed Rank Test	0.324	H0

Source: empirical research

From the conducted tests for Croatian public hospitals, it can be concluded that at the significance level of 1% the median score in the category of "To determine the price of public health services " is equal to 3. That is the lowest ranking and for the decision - making purposes it should be the most important category for the management. All other categories got the median score equal to 4 at the significance level of 1%. From the position of healthcare institutions, external reporting is divided in accordance with the reporting rules of budget accounting and reporting according to CHIF. However, with such a complex and challenging external reporting the fact is that they are missing information needed to make business decisions, and governing hospitals in the short and long term. Accounting Information Systems in Croatian hospitals has emphasis on assembling external financial statements, while the internal reports that are operational are not prepared trough cost accounting system based on accrual accounting. Management is using occasionally internal reports and the internal reports are mainly result of the current administration, and not because of the quality and developed instruments of cost accounting and management accounting. Research conducted to evaluate the quality of accounting information for management purposes in public hospitals suggest that the current accounting system is not

appropriate for the needs of objective monitoring of operations and disclosure of the results of health institutions.

Usage of internal reports for different decisions	Statistical hypotheses	Statistical test	p-value	Decision, significance level 1%
For the award and allocation	$H_0 \dots \eta = 4$	Sign Test for Median	0.500	H0
of budget funds	$H_1\eta \neq 4$	Wilcoxon Signed Rank Test	0.371	H0
For the approval of the	$H_0 \dots \eta = 4$	Sign Test for Median	0.500	HO
implementation of individual programs	$H_1\eta \neq 4$	Wilcoxon Signed Rank Test	0.371	H0
To determine the price of	$H_{0}\eta = 4$	Sign Test for Median	0.375	H0
public health services	$H_1\eta \neq 4$	Wilcoxon Signed Rank Test	0.225	H0
For the purchase of asset	$H_{0}n = 4$	Sign Test for Median	0.250	H0
	$H_1\eta \neq 4$	Wilcoxon Signed Rank Test	0.181	H0
For planning and cost control	$H_{0}\eta = 4$	Sign Test for Median	0.031	H0
	$H_1\eta \neq 4$	Wilcoxon Signed Rank Test	0.036	H0
For employment decisions	$H_0 \dots \eta = 4$	Sign Test for Median	1.000	H0
	$H_1\eta \neq 4$	Wilcoxon Signed Rank Test	0.789	H0
To measure the effectiveness	$H_0 \dots \eta = 4$	Sign Test for Median	1.000	HO
of the services provided	$H_1\eta \neq 4$	Wilcoxon Signed Rank Test	0.789	H0
To monitor the effectiveness	$H_0 \dots \eta = 4$	Sign Test for Median	1.000	H0
of the services provided and fiscal responsibility	$H_1\eta \neq 4$	Wilcoxon Signed Rank Test	0.789	H0

Table 4.	Sign tests for median and Wilcoxon Signed Rank Test results based on survey results for usage of
	internal reports for different decisions - SLOVENIA

Source: empirical research

From the conducted tests for Slovenian public hospitals, it can be concluded that at the significance level of 1% that the median score in all categories is equal to 4. In Slovenian public hospitals, the usage of internal reporting is ranked with the same grade in all different type of decisions. Since they are recording business events based on accrual accounting basis it can be concluded that internal reports are consistent of more accurate and objective information for decision making purposes. From the conducted research it is concluded that Croatian and Slovenian public hospitals prepare internal reports as an important source of information for decision making and governance, for compliance with a legal reporting obligations, to monitor the execution of the financial plan, for a comparison with other similar institutions and organizations, in order to inform the general public and promoting and for the purposes of internal audit and control.

## 5. CONCLUSION

According to conducted research of legal accounting frameworks in Croatia and Slovenia it can be concluded that in Slovenia healthcare institutions are recording business events on accrual basis. Reporting to the relevant ministries and the founders of healthcare institutions is carried out on the cash basis. It can be concluded that Slovenian public hospitals have a predisposition to provide fully relevant and reliable information basis needed for making economic decisions at the micro level, as well as economic, social and political decisions at

the macro level. They can also provide comprehensive information that will enable effective control of disposal of public goods and help the development of financial management by introducing standards of accountability. It can be concluded that in the Croatian public hospitals recording of business events and reporting is carried out according to the modified accrual basis which greatly complicates monitoring the efficiency and financial sustainability of public hospitals. From the research results, it can be concluded that management of public hospitals in both countries are using mostly internal reports for decision - making and governance and for compliance with a legal reporting obligation and to monitor the execution of the financial plan and then for the purposes of internal and external audit and control. Since Croatian hospitals do not have developed cost accounting information system based on accrual with which they could actually measure performance of organizational units or provided services, the objectivity of those reports for decision - making purposes is questionable. Usage of internal reports for compliance with a legal reporting obligation and to monitor the execution of the financial plan and then for the purposes of internal and external audit and control is connected with legal requirement by the Ministry of Health and by the NHIF. Internal reports are used in both countries for different decisions and the ranking is similar in both countries. The lowest grade was given to the category of "To determine the price of public health services "in Croatian public hospitals. That is the lowest ranking and for the decision - making purposes it should be the most important category for the management of public hospital. The limitations of this research and research results could be seen through different sample size that are not comparable through statistical tests due to the fact that they are both considered small samples.

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## POTENTIAL OF DEVELOPMENT OF ICT FIRMS BASED ON LOCAL SECTORAL CONCENTRATION

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## ABSTRACT

Information and communication technology sector and Information and communication technology companies are considered in general level as a highly potential for contemporary and future development for each economy with significant positive impact on labour productivity, economic growth and standard of living.

The article deals with determination of factors and the economic-societal benefits, respectively costs that are resulting from this ICT sectoral specialization for the region in the context of next - potential development of this region. These factors, usually in the form of "soft externalities" help all stakeholders and other interested subjects to their positive (qualitative and quantitative) growth and welfare.

Deepening sectoral specialization of ICT companies not only contributes to increasing the competitiveness and success of their own companies operating in this economical sector, but contributes also to regional sectoral competitiveness, which is further from the micro level transforming the competitiveness of the sector and subsequently into the competitiveness of the economy as a whole (Benes, 2006). Agglomerating process of territorial concentration of the ICT industry would be interested to ICT firms themselves and should be actively supported by their leadership and management as well as by the national economic authorities.

## 1. INTRODUSTION

According to general definition, the sectoral industrial agglomerations are established on firms and other allied institutions concentrating in a particular area because of advantage of externalities and economies of scale. First sectoral industrial agglomeration, financial district, can be considered in the 14th–15th century in Florence, Italy. There were banks clustered in the same place in order to maximize the flow of information and expertise. It did so because of the deepening of network externalities, where banks benefited for example from the deepening of knowledge and information. Other sectoral cluster (agglomeration) was created in the City of London with the local goldsmiths and marine experts. The northern Shasi province (China) had become the leading financial center in the early 18th century (Autorský kolektiv, 2014). Today, the phenomenon of concentration of industries and their impact on specific companies, industry, economy and society, is the subject of growing interest to all stakeholders and other interested subjects and entities (Turečková, 2015).

If we connect advantage of sectoral concentration with economic branch of Informational and communication technology (ICT) which is recently one of the most potential branches of economic activities, we can gain a solid foundation for further dynamic, not only economic, growth and development. ICT sector generates weighty gross value added which is an important source of economic development and ICT production contribute to stable qualitative economic growth of all economies at present and also in the future. ICT sector is characterized by multiplier economic effects when the activities and operations in this sector directly or indirectly affect performance in other sectors, contribute to significant savings and productivity growth, to increase of intellectual capital, especially human capital, growth of social value created by the synergy of knowledge, information and technology that are being created in this economical sector, developed and supported. All of these aforementioned positive effects associated with the activities of companies in the ICT sector, improve the competitiveness of the regions in which they operate and contribute to improving in quality of life and growth of standard of living (Turečková, 2014). Figure 1 show via simple schema the impact of the ICT sector<sup>1</sup> on the macroeconomic level of the economy.

ICT sector<sup>2</sup> is focused on the production, trade and services related to information and communication technologies. The ICT sector is the defined as a combination of economic activities producing goods and providing services, which are primarily intended for processing, communication and distribution of information via electronical way, including the capture, storage, transmission and display (OECD, 2007). ICT includes computer and network hardware, as well as their software (Turečková & Gajdová, 2014). Modern information and communication technologies have significantly changed both the accessibility as well as the method and ways how to work with information in the course of time. ICT have been influencing to a great extent the way how a lot of company activities have changed, such as manufacturing, distribution, buying, marketing, management etc., together with an increase in the workforce productivity (Czech Statistical Office, 2011). An

<sup>&</sup>lt;sup>1</sup> If there are concentrated a lot of firms (produced the same types of products or services) in particular area, we can talk about a "firm agglomeration" or "corporate agglomeration". in other words "agglomeration" especially represent the strong concentration of firms/companies operating in the same industry in a particular defined area.

<sup>&</sup>lt;sup>2</sup> Economic sector of ICT is also defined by the NACE Rev. 2 (Nomenclature générale des Activités économiques dans les Communautés Européennes), which defines the complete system of classifications of economic activities and products used by the European Union. The ICT sector is defined in the NACE Rev. 2 in Section J - Information and communication activities (services); (Information and Communication) (CSO, 2014).

ICT sector has a big potential for the future development of the society and its economies due to its high added value that it generates, and it is one of the most stable sources of the qualitative economic increase today and also for the future (Voříšek, Novotný et al., 2010, Dedrick, Gurbaxani & Kraemer, 2003, Kitson, Martin & Tyler, 2004). The influence of ICT in the form of capital goods proved to be significantly important for its contribution to the economic growth (Schreyer, 2000). Atkinson and Castro (2008) believe that the economic activities related to the ICT sector are the principal innovative driving force of individual economies and the investments put into the ICT sector are important for creating new job opportunities, particularly in the services sector. According to the European Commission (European Commission, 2010) an ICT sector significantly contributes to the gross national product (5 % in the USA, 4 % in Japan and approximately 3 % in the European Union countries), and at the same time it has been proved that during the last twenty years every increase in the ICT sector by 10 % was reflected in the increase in the workforce productivity by 0,5 % - 0,6 % (OECD, 2012). In this context Voříšek, Novotný et al., (2010) mention that the multiplication effects, which are characteristic of the information and communication technologies, contributed to the intensification of the performance and the quality of public administration, as well as triggered an increase in the productivity in other sectors, e.g. in the EU countries the increase in the workforce productivity by 50 % was caused by applications created by the ICT sector.

Figure 1. ICT sector in economy



Source: author own.

This paper deals with the issue of sectoral concertation in area of sector of Information and communication technology, the economic branch with a lot of socioeconomic intra-sectoral effects. Thus the aim of this submitted short paper is to describe factors and the economic-societal benefits, respectively costs that are resulting from this ICT sectoral specialization<sup>3</sup> for the region in the context of next - potential development of particular regions and to explain why it is done. There is also very essential to remind contributes of sectoral concentration to regional sectoral competitiveness, which is further from the micro level transforming the competitiveness of the sector and subsequently into the competitiveness of the economy

<sup>&</sup>lt;sup>3</sup> Or regional sectoral concertation because these two terms are two closely interrelated phenomena since they reflect the similar reality base on the identical production structures. It is "two sides of the same coin" (Aiginger & Rossi-Hansberg, 2006).

as a whole. All these factors, usually in the form of positive and reciprocal externalities compounded by multiplier effects help all stakeholders and other interested subjects to their positive (qualitative and quantitative) growth and welfare. There is necessary to adjust leadership and management of ICT firms to accept results of sectoral concertation and use them for the, not only business, success of their companies.

Practical part of this present paper is devoted to create, on theoretical base, a systematic framework for expressing all significant linkages, which characterize ICT firm in network with other ICT firms that are concentrating in particular region. In context of effects follow from sectoral concentration there is very hard to pecuniary express benefits for firm because of their intangible nature. That is why is this paper is more or less a theoretical character. The present paper is structured in several chapters. In the first part of the paper, after Introduction, theoretical concepts linked to effects of sectoral concentration in particular region are discussed, while the second part is devoted to established a graphical systematic concept for expressing effects based on local sectoral (ICT) concentration. There is not missing chapter of the methodology. The major findings are summarized in the Section 5, concluding remarks.

# 2. THEORETICAL REMARKS ON THE PROBLEM OF LOCAL SECTORAL CONCENTRATION

The possibility to define and measure geographical specialization and sectoral concentration allows us to focus on regional specialization and industrial concentration in the context of relevant microeconomic and macroeconomic analysis of the economy in particular region. Krugman & Venables (1995) consider transaction costs as the key role in geographical advantage of localities, when the first step leads to a greater economic integration and differentiation of regions, which alternates with the second phase of dispersion of economic activities in peripheral regions, including related changes in the industry structure. Hirschmann (1967) in Blažek & Uhlíř (2002) considers the basis of sectoral regional disparities in available infrastructure and developed service sector. Beginnings of defining effects of local (regional) sectoral concentration come from the Keynesian period, especially in the 50th to 70th years of the 20th century. Theory "core-periphery", respectively general theory of polarized development, explains some of the effects of concentration in the context of the "theory of cumulative causes" (Myrdal, 1957). Friedman (1966) emphasizes the importance of institutional structure and the social, political and cultural development in geographic space and explains the strengthening of dominance of center, where is concentrated sector through 6 effects: the effect of dominance, effect of linkages, information effect, the psychological effect, the modernization effect and the effect of production. Perroux (1950) in "theory of growth poles" emphasizes the importance inter-sectoral linkages, regional multiplier and the existence of agglomeration savings. Hirschamann (1967) realizes cyclic causality when developing dynamic sectors are concentrated in the territory - in the core, while these economic activities are declining on the periphery. A "New economic geography" (for example Krugman, 1998 or Romer, 1986) extends above mentioned theory on aspects of network effects, transfer of knowledge and technological progress, accumulation and dissemination of knowledge and the importance of positive expectations. A key factor for the concentration of particular economical sector is economies of scale. Sectoral specialization of regions, respectively concentration of industry in a given area can also be explained by other theories, for example via Brusco's "theory of manufacturing district" or the "theory of learning regions". The key to the prosperity of the region are of high quality social, cultural and institutional structures, non-hierarchical system of organizing, cooperation between small firms and "networking" (Brusco, 1982). Theory of learning regions (Lundvall, 1992 or Saxenia, 1991) explains the success of the region on the ability of their organizations to learn and share their experiences, knowledge, skills and information. A region, in which employees are positively motivated for further training and adapt to new technologies and procedures in a particular area of interest, achieves both subjective and objective competitive advantages compared to other regions. In the context of the nature of the ICT sector seems to be the theory of learning regions as an acceptable explanation for regional differences in this industry because the ICT sector is characterized by dynamic evolution. Negative effects of sectoral concentration are mainly the effects of stagnation, resp. sector recession (the growth of structural unemployment and its effects, monopolization vs. competitive fight (competing), "headhunting" of employees and spillover of know-how). Partial negative sector concentration is, for example, pollution, noise, dustiness, increased traffic, price increases over time and place, etc., depending on the sector.

There is an obvious causality of actual process of agglomeration of economic activities and regional economic policy in the areas which support new investments (investment incentives, industrial zones, subsidies of new jobs). Not only the regional economic policy, but also foreign direct investment is very important (Srholec, 2004). A significant regional specialization in a particular economical sector is an advantage not only for the relevant region, but also for the hierarchically higher geographical area. Kim, Harris & Vusovic (2009) demonstrated the positive impact of externalities on the effectiveness of the biotechnology industry in the United States. Driffield & Munday (2001) in their UK research confirmed that regionally concentrated industry improve its technical efficiency and pushes it to the very limits of production possibilities. Fukai, Kravtsova & Nakajima (2014) in their analysis of Japanese factories pointed to the effect of "clustering" which occurs in most industries and is characterized by a concentration of companies in the same sector in some regions. The most concentrated manufacturing companies were characterized by the highest production efficiency. Similar conclusions reached Mitra & Sato (2007) and Otsuka & Goto (2015). Improve efficiency and strengthen competitiveness resulting from the concentration of firms at the microeconomic level was confirmed in the textile industry in India (Mitra, 1999) and in the fish farming in Norway (Tveteras & Battese, 2006).

An ICT sector is important for its contribution to the competitiveness of the economy at the microeconomic - company level (Dedrick, Gurbaxani & Kraemer, 2003, Kramer, Jenkins & Katz, 2007) as well as macroeconomic level (Venturini, 2008, Dedrick, Kraemer & Shih, 2013 or Jorgenson, 2001). Such conclusion is confirmed by Doucek & Nedomová (2011) who believe ICT and its applications to be a relevant factor for the competitiveness of the countries, when the development in this sector transforms both directly and indirectly into the development of other economic sectors. The concept of competitiveness is based on regional competitiveness in combination on sectoral competitiveness. This sectoral competitiveness is also transform on microeconomic level where, for example, ICT has a positive effect on the international competitiveness of firms (Pena-Vinces, Capeda-Carrion & Chin, 2012). Muntean, Nistor & Nistor (2015) emphasize a role of ICT for the firms in example of firms in services sector when firms using appropriate information and communication technologies reaching increasing competitiveness and operational efficiency in particular business. According to the Czech ICT Alliance (2014), one of the means how to increase the competitiveness of the countries is to support the ICT services and the applications generated by them together with an overall support of science and research referring to the development of the ICT products. For this reason, it is essential to create and deepen the conditions for the development of this sector at the local, regional and national level. Countries and regions with a high level of an involvement in the information and communication technologies thus get a solid basis for a long-term improvement of the living standards of their population.

Regional competitiveness is a reflection of the quantity and quality of the structure of economic entities and subjects in the region (Nevima, 2014). These allow the region to be in the desired area (in the required field) better than others. Regional competitiveness is a combination of Theory of comparative advantage (Ricardo, 1956), Porter's concept of competitive advantage (Porter, 1990) and Theory of X-inefficiency (Leibenstein, 1966). Competitiveness of the sector of the economy is also supported by the inherent "the attractiveness of the sector in the country" where the sector or country have a set of elements, characters, relationships and characteristics, which enables them to overcome others in the ability to generate higher national income and attract more permanent factors of production (Turečková, 2014). This attractiveness of the sector usually has a form called "soft externalities" (Benes, 2006). According to Kitson, Martin & Tyler (2004), referring to Alfred Marshall, these benefits are characterized by a triad of externalities which is comprised of a skilled workforce, supporting and related industries and transfer of knowledge, experience and information. This creates a "special atmosphere", supported by the existence of public goods (knowledge, skills, common information), which creates conditions for the formation of wanted mostly - positive externalities reducing costs. This dynamic information dissemination, knowledge, technological processes and practices and innovation improves the competitiveness of the system itself (for example sectors as defined) and is also reflected in the growth of competitiveness of businesses and other entities participating in it.

## **3. METHODOLOGY**

The presented contribution is grounded in existing scientific research and summarize existing international research results in the area of regional sectoral concentration and specialization in context of sector of Information and communication technology. The text is also based on a long-term professional knowledge of the author of the given issue. That is why this paper mostly theoretical character has.

In the contribution, the current collaboration and cooperation between the ICT firms is determined with emphasis on soft, intangible network and other externalities and material and non-material flows. So there is used a description, supplemented with an analysis of the relevant effects which are patterned on of sectoral concentration. Big part of chapter Theoretical remarks on the problem of local sectoral concentration is based on literature review. The graphical systematic concept described in chapter 4 is grounded in the logical induction and generalization of the research deal with regional sectoral concentration and its effect on all involved subjects and institutions, on social and economic level, applied especially on sector of information and communication technology.

# 4. CONCEPT OF POTENTIAL OF DEVELOPMENT FOR ICT FIRMS BASED ON LOCAL SECTORAL CONCENTRATION

Figure 2 shows in simple way a process of local concentration if firms/companies operating in the same industry in one area. This area could be defined as industrial zone in particular part of town/city, city district or part of a whole region or country. Concentration of firms in a given area usually arises naturally when emerging economic sector in a given area; mainly because of "specific" favorable atmosphere for business and motivates companies and other actors to participate. This agglomeration have tendency to further develop not only in the number of economic entities but particularly in quality and interconnections. Firm agglomerations consist of a set of entities, private and public, features, traits, relationships and characteristics that create synergy relationships on both endogenous and exogenous levels and strengthen this system towards its surrounding (Turečková, 2015). We can also explain this

agglomeration as connection anything to anything associated with the economic sector in the vast network - linkages - different levels of relationships where they share resources and activities, expand the market and reduce costs (Fiala, 2005). Quality of agglomeration is determined by the quality of companies, other stakeholder, mutual relations and overall structure of the agglomeration. Because of all this we can say that ICT agglomeration is advanced degrees of process of firm – ICT concentration. Here is also necessary to point out that also this process has its limits (frontier of concentration)<sup>4</sup>.





Source: author own.

The key benefit of sectoral concentration is externalities that are generated through them, strengthened and broadened. This externality is an effect on entities participating in the network of relationships and elements in the agglomeration. Positive externalities exist in the case when benefits are an increasing function of the number of users and other elements while negative externalities exist in case when the advantages are a decreasing function of the number of other users and other elements in the agglomeration (the system). Positive externalities are necessary for development for origin of agglomeration. On the other hand the agglomeration naturally disintegrates (Turečková, 2015).

Agglomeration economies allow firms to concentrate in a particular area and take advantage of externalities such as acquiring low-cost inputs and skilled labor and benefiting from knowledge spillovers (Valle, 2015). Agglomerations have high communication potential and higher general usability. For successfully developing ICT agglomeration are characteristic process improvements, existence of tangible and intangible business support, using specific and dynamic technologic technique, operative and executive management, efficient transfer of knowledge, experience, information and skills etc. (see Figure 3). The companies themselves could obtain from the concentration of industry and of its participation in the agglomeration for example higher profit or turnover, they produce bigger gross value added (GVA), improve the quality of its knowledge, practice, innovation or processes. Agglomerations through

<sup>&</sup>lt;sup>4</sup> Can be compared for example to the production possibility frontier (PPF).

externalities improve technical and technological efficiency at firm-, industry-, regional- and aggregate-level.





Source: author own.

There are important also industry coalitions for sectoral concentration and successful agglomeration. Industry coalitions are significant sources of regional sectoral competitiveness and development of sector in particular region because of its synergy of mutual relation, positive externality and dynamical sharing of information, innovations and technological advancements. These industry coalitions mutually support cooperation and further development of the companies by creating a motivating environment for support of trade and innovation where the theory of research and development are applied into practice and where the sharing of knowledge, experience and information is the source of growth for all participating members. Companies consequent of participation in these industry coalition further increases their value (Turečková, 2014).

Externalities and principles of agglomerations, enhanced by multiplier effect, support dynamic dissemination of information, knowledge, skills, technological processes, procedures and innovations. These factors are reflected in the growth of labor productivity, cooperation, economies of scale, infrastructures improvement, decreased costs and increase of the competitiveness of the sector and/or region. It is reflected in the positive trajectory of the major microeconomic indicators and achieving positive results at the macroeconomic level.

#### 5. CONCLUDING REMARKS

This paper aimed to created systematic concept of economic-societal effects which are consequent upon local sectoral concertation in area of sector of Information and communication technology. These effects were discussed and presented on firm, local – regional and national level and mostly based on contemporary scientific researches and review of relevant literature. If we accept the assumption of a positive impact of the concentration on the internal and external environment of the company and for most of stakeholder, then it is on the hands of the management of the companies how the potential of concentration they use to. It is very necessary for management of firms to know the linkage in non-material system of firms that do business in the same economic branch. Managers can use the opportunity arising from the sectoral concentration to enhance a position of their firm in the market and ensure success for their companies. All these factors (effects, linkages, subjects interested in concertation, contacts, processes etc.) help all stakeholders to their growth and welfare.

The major findings of analysis of effect of sectoral concentration was that the most significant benefits resulting from local sectoral concentration are qualification labor force, cross transfer of knowledge, experiences and innovations, economies of scale, sharing many types of infrastructures and processes and mutual strengthening of the entire sector.

This present paper would be a theoretical groundwork for a further research on analyzing effects of sectoral (ICT) concentration and specialization on corporate, regional and national levels.

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## MONEY OR SKILLS – WHAT IS MORE IMPORTANT – STORIES FROM CROATIAN FRANCHISEES

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## ABSTRACT

Franchising, although among oldest organizational forms, is becoming more and more significant business startup model. It represents a relationship between two parties – franchisors and franchisees. Franchisees are often perceived as "light" entrepreneurs or frantrepreneurs (Sundbo et al., 2001). Although working with the proven business system, franchisees do need to have some skills and motivation to follow the game of a franchisor and to make it on their own. That is why they are somewhere between employees and entrepreneurs.

If entrepreneurs want to succeed with their business they usually need different skills. In case they lack some of the needed skills, they can take different courses, but in most cases, they will try to improvise, which can jeopardize their potential success in business. On the other hand, franchisors are providing training to their franchisees as part of their contractual relationship. Thus, franchisees receive different education for the potentially missing skills needed for the success of their businesses without any additional costs, since franchisors want to have successful franchisees.

So, it might be seen as though franchisees do not need any skills in order to be successful business owners. If so, why do many franchisees fail? The aim of our paper is to research whether money is enough for frantrepreneurs to start and grow their business or are skills as necessary. Therefore, the main research question of the paper is – what is more important for the success of franchisees (frantrepreneurs) – having money or having skills?

The paper looks upon several Croatian franchisees and franchisors from different industrial sectors. Research will be done through online questionnaire within Croatian franchising community and CATI interviews with selected franchisors, master franchisees and franchisees who have started their entrepreneurial "adventure" through franchising.

Based on conducted research, main paper contribution are implications for further research. Since authors will argue that knowledge and skills are equally important (if not, sometimes, even more) as having money this paper can lead to further research about the common skills and competencies of successful frantrepreneurs and the role of both formal and informal education system in promoting franchise and raising the percentage of successful franchise systems.

## 1. INTRODUCTION

Recently, different hybrid organizational forms, such as joint ventures, strategic alliances and franchising are becoming increasingly popular in the global economy. Those organizational forms are contractually based between at least two parties. Among them, franchising is the oldest organizational form and its usage has significantly grown during the last ten years. Franchising and entrepreneurship are connected in two aspects: as a way of new venture creation (for the franchisee) and a growth strategy (for the franchisor). Those two aspects are mutually interconnected and they complement each other.

The focus of this paper is in finding what is more important for the success of a franchise business – level of franchisees' financial capacity or additional skills, competencies, and personal attributes. Relationship between skills and success of the new entrepreneurial venture has always been interesting to researchers (Watson, Hogarth-Scott and Wilson, 1998; Baron and Markman, 2000; Brush et. al., 2001) and there was no straight answer. For some of them skills are more important and they are the key to success while for other money means success. When franchisee buys a proven business venture he is starting his own new entrepreneurial venture. Can this initial capital guarantee the success of his business? If the money is enough, what has happened to many franchisees that have failed? Even if someone would say they lacked additional financial resources does that not proves that it is necessary to have skills to find needed resources. Thus, this topic is an interesting field of research since franchising is supposed to give a proven recipe to franchisees but many franchisees fail. Therefore, this raises other important questions. Is money enough? Do franchisees need to have (and develop) certain skills and competencies in order to be successful? And, what of those two is more important – money or skills?

The paper gives an overview of skills necessary for the success of a business, with a special emphasis on franchise businesses. It also gives an overview of franchising in Croatia – its history, present and future possibilities. The empirical part covers the Croatian franchising community. By employing questionnaires and short interviews respondents gave their perception on what impacts the success of a franchise business and what role franchisees' skills play in that process. Finally, the paper gives implications for further research of franchisees' skills, competencies and personal attributes and their impact on the long-term success of franchise businesses. This might be helpful in increasing knowledge about franchising within Croatian business community, as well as in removing barriers and increasing interest in franchising as a potential career option.

## 2. FRANCHISING – WHAT IS IT ALL ABOUT?

Franchising has been present in the world since the Middle Ages although there is a saying that franchising is as old as the world itself. Development of franchising, as we know it today, started at the end of the 19<sup>th</sup> century in the USA, while the main milestone for franchising was Ray Kroc and McDonalds, which developed business format franchising in the 1960s. There are many different definitions of franchising (Table 1). However, the most common and used

definition is that of Boroian and Boroian (1987), which defines that franchising occurs when a company (franchisor) licenses its brand and way of doing business to another company (franchisee) which agrees to work in accordance with the franchising contract.

Authors	Emphasis	
Emmerson (1990)	on the legal relationship between the franchisor	
	and the franchisee	
Stanworth (1991)	on economic category that offers a favourable	
	combination of the economy of scale	
Spinelli et al. (2004)	on trade or service mark	
Mlikotin-Tomić (2000)	on intellectual property package and franchise	
	agreement	
European Franchise	on system of placing goods, services, and	
Federation - EFF (2005)	technologies on the market	

Table 1.	Franchisin	g definitions
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Source: authors' compilation, 2016

Companies use franchising when they want to grow in geographical sense, do not rely on their own sources of finances and/or would like to enter a certain industry (Alon, Alpeza, Erceg, 2010). Franchising as a relationship has many advantages for both involved parties (franchisor and franchisee), but it also has disadvantages. Probably the most important advantages of franchising are proven business model, which guarantees market recognition (Maitland, 2000), and franchisors' training that can compensate for the franchisees' lack of knowledge and experience (Spasić, 1996). Other advantages, beside the already validated business system, include lower risk of failure, benefits from franchisors and franchise system development program (Shane, 2005; Murray, 2003). These advantages could lead to the conclusion that potential franchisees do not need skills to succeed in the business, but only the money to buy a franchise business and money for its continued development.

Franchising is considered to have influence on employment growth and further entrepreneurship development (Alpeza, Erceg and Oberman Peterka, 2015), but there is an open question if franchising is entrepreneurship? One of the possible answers to this question can be found in research by Ketchen, Short and Combs (2011). They gave three possibilities: franchising is entrepreneurship, franchising is not entrepreneurship, and franchising is maybe entrepreneurship. Entrepreneurship in franchising can be seen from two standpoints (growth and new venture creation), which complement each other: as a way of growth and further development for franchisors and as a way of new venture creation for franchisees. All franchise researchers agree with the statement that franchisor is an entrepreneur, but there is dispute over whether franchisee is an entrepreneur or not. Franchisees have the ability and motivation to follow a standardized and proven business and they considered to be somewhere between employees and entrepreneurs. As explanation of such connotation, Sundbo et al. (2001) stated that franchising allows the development of special entrepreneurial roles that franchisees can have. These roles are defined by the term *frantrepreneur*, which is a combination of franchised and entrepreneur. It represents a franchisee who has started a new venture by buying a franchise. The main characteristic of a frantrepreneur is his/her possibility to enter an already existing and working business format, which can require different and/or specific skills, but a franchisee can work on his/her local market independently.

If entrepreneurs want to succeed with their business they usually need different skills and competencies. In case they lack some of the needed skills, they can take different courses,

surround themselves with a good team or even improvise, but the last can seriously jeopardize the potential success of their business. On the other hand, before entering a market, frantrepreneurs will, in most cases, receive additional training from franchisors as part of their contractual relationship. Usually, this additional training does not require any additional costs, since it is considered a kind of franchisor's' investment into franchisees' success and it is usually a part of the franchise contract. However, is it enough for long-term success?

## 3. WHAT ARE FRANCHISORS LOOKING FOR?

The most common and acknowledged reason for franchising is based on the *resource scarcity theory* by Oxenfeld and Kelly (1969), which emphasizes the importance of money as the basic resource required to develop and maintain a business. Franchisees bring money to the franchisor, by paying the initial fee and ongoing royalties. However, according to Diaz-Bernardo (2012) franchisees do finance the investment to start the operation, but also provide the ongoing capital required to continue the operation that allows the franchisor to expand their business and gain a valuable new market share. Although franchisors are the ones with the knowledge and necessary information about the business, success of a franchise greatly depends on the quality and skills possessed by franchisees. Very often, franchisors have problems finding and recruiting franchisees that can bring certain personal expertise and knowledge to the business, such as risk taking, motivation, ability to resolve crises and solve problems.

Watson and Stanworth (2006) argue that the success of an organization depends on the ability of organization to exploit its resources, especially the intangible ones, such as knowledge and skills. Those resources are known as intellectual capital, which consists of three elements: a) human capital - related to tacit knowledge - skills, experiences, attitudes, ideas, values and competencies of the people in the firm; b) relational capital – nature and quality of relations business establishes with external stakeholders and c) structural capital - processes and infrastructure owned by the organizations and used to support the development of human capital. As stated by authors, there are many reasons to go into franchising and one of them is that franchisees might be more aware of their shortcomings or their lack of self-confidence. Since franchisees are usually provided with training to operate the business, Watson and Stanworth (2006) suggest that franchising is more favored by those individuals who believe that they do not have the necessary skills to start their own business from the beginning. According to Watson et al. (2005), here lies the most important reason why franchise systems are especially concerned with intangible assets. Kaufman (1999) points out that franchisees are more likely to buy a franchise outside of their business expertise, while franchisors prefer to recruit franchisees without prior industry experience (Stanworth, 1991). However, could initial capital and franchisor's training be enough for developing, growing, and making the franchise business successful?

According to Shane and Hoy (1996), both franchisors and franchisees are entrepreneurs and as such they both own a set of skills and competencies that can make their business cooperation successful or unsuccessful. The success of a franchise largely depends on the collaboration of franchisors and franchisees and their relationship must be strong and trustworthy. In other words, the success of a franchise largely depends on the ability of the franchisor to choose a franchisee with the right profile (Bergen et al., 1992).

Although there is no agreement on the exact characteristics of an ideal franchisee, Ramirez-Hurtado et al. (2011) made a list of the main franchisee characteristics, according to the review of literature (Table 2).

Shrewdness	Previous experience operating any business
Self-esteem	Previous experience operating a connected business
Management ability	Ability to adapt to change
Human relationship ability	Faithfulness to franchisors
Entrepreneurial character	Intelligence and practical skills
Ethical behavior	Open-mindedness
Creativity	Education level
Need for achievement	Financial status
Willingness to work hard	Perseverance
Communication	Personality
Age	Personal relationship
Emotional stability	Support from family
Marital status	

Table 2.	<b>Characteristics</b>	analyzed of	of the	franchisee	profile
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Source: Ramirez-Hurtado et al. (2011)

In order to evaluate the different characteristics that may conform the franchisee profile, Ramirez-Hurtado et al. (2011) conducted a survey in 2008 among 39 representative experts. Those experts were selected among the members of associations of franchise chains, university professors researching franchising, managers of franchise consultants, editors of magazines from this sector, managers of websites focused on franchising and managers of the area of franchising from financial firms specialized in franchising. The results of the research have shown the nine most frequently marked attributes<sup>1</sup>: loyalty to franchisors, management capability, willingness to work hard, capacity for human relations, perseverance, entrepreneurship, wish for success, financial level and previous experience in a related business. Although, franchisee's financial level is an important aspect in choosing a franchisee, this attribute is not as important as other attributes and characteristics, such as loyalty to franchisors or management capability. As authors suggest, financial level is important, but it is viewed as a minimum financial requirement to join the franchise chain.

In recent research about the difference between a successful and an unsuccessful franchisee carried out by Gaul (2016), requirements of franchisees were divided into hard skills, soft skills and local knowledge (Figure 2). The research has been conducted in Germany among 208 franchisors, with 149 successful and 59 unsuccessful stories.

<sup>&</sup>lt;sup>1</sup> Attributes are arranged according to the level of importance



Figure 1. Gaul's Triple, including soft skills, hard skills, and local knowledge to determine franchisee success

Source: Gaul (2016:50)

Overall, Gaul's research has shown that unsuccessful franchisees had lower grades in all three sets of skills. Although this research cannot be generalized, since franchisors did not do a self-evaluation, but rather an external evaluation was conducted, franchisees" opinions were not included, and each franchisor defined success according to their own perception, it is interesting to notice that soft skills have been ranked as the most important skills and as skills that where the least developed in unsuccessful franchisees.

Clarkin and Swavely (2006) have explored six franchisee selection criteria and the level of their importance according to franchisors. As an end to a mean, financial qualifications are among one of them, because a person must meet certain financial criteria to become a franchisee. Other selection criteria are experience, management ability, formal education, attitude and personality. Although prior experience is, in most cases, very helpful when starting a business, the possibility of receiving training from franchisors allows a future franchisee to have a minimum or no experience in the selected industry. It is however, a different situation when it comes to management, since the ability to manage operations was the key factor used by franchisors in their selection process. However, according to Jambulinghman and Nevin (1999, cited in Clarkin and Swavely, 2006) having prior managerial experience can slow down the franchise training process since franchisor must first break old habits of the franchisee and teach him/her new ways of doing business.

The number of universities that offer entrepreneurship courses is increasing due to the need for more a entrepreneurial society. Entrepreneurship education is perceived as one of the most important development and economic mechanisms (Oberman Peterka et al., 2015). When investigating success of businesses, many studies have concluded that formal education does have an effect on the rate of success of any kind of business, thus emphasizing that entrepreneurs with less formal education are more prone to failure. Therefore, many entrepreneurship programs offer courses designed for managing and leading a franchise business and according to Fraser, Weave and Grace (2012), the surviving franchise business

owners tend to hold higher levels of formal education. On the other hand, Clarking and Swavely (2006) mention the research done by Bates (1995), which has shown that franchisees had weaker educational background and were more susceptible to failure than non-franchised businesses. This emphasizes a poor representation of franchise as a topic in both formal and informal education and the need to educate the potential franchisees on franchising in general (Alpeza, Perić and Šoltić, 2012).

For Jambulihngam and Nevin (1999, cited in Clarking and Swavely, 2006), the main reason for considering personal characteristics as criteria for selecting a franchisee is a good working relationship that can be maintained between franchisors and franchisees during the whole life time of the business. According to Fraser, Weaven and Grace (2012), personal factors such as motivations, personality, decision-making, autonomy and adaptability were more likely to affect business survival than external factors. Therefore, attitudes and personality do have influence on the success of job performance of any kind of entrepreneurial venture, and it is suggested that franchisors should consider personal characteristics of franchisees as an important criterion in the selection process.

## 4. FRANCHISING IN CROATIA

Franchising was introduced to Croatia in 1969 when Diners Club sold its franchise in Croatia. Diners Club Adriatic was the first franchisee in former Yugoslavia and American Express soon followed. Later, during the 1970s, famous soft drinks producers Pepsi Cola and Coca Cola started their franchise operations in Serbia and Slovenia, and hotel chains Intercontinental and Holiday Inn sold their franchises in Zagreb and Ljubljana. McDonalds was the first fast food chain to start franchising in former Yugoslavia, when it opened its franchised restaurants in Belgrade in the late 1980s. At the same time, Croatian company Varteks bought its Levi's franchise and Croatian oil company Ina sold three franchise locations. Textile industry Nada Dimić prepared its chain of franchised sport clothing stores "Endi" but, due to the war in Croatia, the stores never opened. These are the only examples of franchised chains in former Yugoslavia.

The next milestone for franchising development in Croatia was in the 1990s when McDonalds opened its first restaurant in Zagreb. This was soon followed by Esprit, Escada, Palmers and Yves Rocher, which established big textile and shopping chains, such as Magma, Tekstil promet and Sportina. Croatian chocolate producer Kraš started its franchise chain of chocolate shops. In the beginning of 2000, Fornetti, Subway and more textile franchise chains (Terranova, Geox, Calzedonia) started their franchise operations in Croatia. In addition to textile and fast food franchise brands, there are franchise chains in other industrial sectors, such as foreign language schools (Berltiz, Helen Doron Early English), real estate agencies (Re/Max), energy (Centar energije) and tourism (Fly travel) (Erceg, 2016). According to World Franchise Council data (Schwarzer, 2016), there are around 180 franchise systems currently operating in Croatia in 12 industrial sectors at around 1,000 locations and with around 17,500 employees (Figure 2). It is important to state that only 25 franchise chains are of Croatian origin.





Source: Schwarzer, 2016

The majority of franchise networks present in Croatia are in textile and fashion industries, since this was the way for famous foreign fashion brands to enter the Croatian market. Food industry (fast food and restaurants) is the second sector with the most franchise chains. Those two sectors together account for more than half of the total number of franchise chains in Croatia. Table 3 shows Croatian franchisors and the number of their franchised locations.

Table 3. Croatian franchisors and their locations

Franchise chain	Sector	Number of
		locations
Aqua	Retail – souvenirs	55
Surf'n'Fries	Fast food	56
Centar energije	Energy savings	15
Putovanja za dvoje	Travel magazine	5
Bio-Bio	Retail – food	5
Galeb	Retail – textile	7
Taxi Cameo	Transport	50
Mlinar	Retail - food	5
Diadema	Retail – textile	14
Body Creator	Wellness	5
San Francisco Coffee House	Café bars	3

Source: authors' compilation, 2016

Regardless of the small number of Croatian franchise chains, some of them have expanded across Croatian borders. The most successful is Surf'n'Fries with locations in more than 10 countries. Mlinar and Body Creator have franchise locations in two countries, San Francisco Coffee House in one, while Aqua has locations from Dubai to Mexico.

Franchising has been present in Croatia for almost 50 years, but it is still underdeveloped and not recognized as a potential career option. Some of the largest Croatian companies (Ina, Agrokor, Hrvatska pošta) have recognized franchising as a way of expanding their business

and are currently using and/or evaluating potential for growing their franchise systems (Erceg and Čičić, 2013). Potential franchisors and/or franchisees face many obstacles on their "road to franchising" and the main obstacles to the development of franchising in Croatia have been recognized by Alpeza, Erceg and Oberman Peterka (2015) in:

- the absence of franchising legislative regulations;
- the lack of banking franchise purchase (co)financing programs;
- the lack of accompanying advisory and informational support for franchising;
- the lack of knowledge on franchising.

Those obstacles have a huge influence on further development of franchising. Without raising the level of support for franchising as a potential career option and in the process of developing and growing a business, it is unrealistic to expect further development of franchising in Croatia. In 2016, the Croatian Franchising Association and the Croatian Chamber of Economy started a project that should result in a database of all franchise systems that are operating in Croatia. This database will give insight in the status of franchising in Croatia and its impact on Croatian economy – the number of people directly employed in franchising, the number of existing locations and turnover. This will help with getting a better legislative framework for franchising, as well as more infrastructural, financial, and educational support for further development of franchising.

#### 5. RESEARCH METHODOLOGY AND DISCUSSION

This paper presents the research conducted within the Croatian franchising community, which consists of two parts. In the first part, answers were collected through questionnaires sent to 60 Croatian franchisors, master franchisees, and franchisees and in the second part interviews with selected franchisors, master franchisees and franchisees were conducted with use of CATI method With the online questionnaire we received the basic data about franchising in Croatia – number of franchise systems, and their own franchise sector in which they operate, the years of their experience and their gained knowledge about doing business within franchise sector in Croatia and further. Conducted interviews were used to get their own insights on what helped them to succeed. Since this paper is focused on individual perception this structured interview allowed us to get more qualitative information about their business and potential influence money and skills had on their success.

The starting sample was compiled using available lists from the Croatian Franchising Association, the Franchise Center Osijek, the Croatian Chamber of Economy, and the Ministry of Entrepreneurship. There are approximately 180 franchise systems in Croatia (Erceg, 2016). However, some of the franchises are held by same master franchisee which are no longer potential franchise system for new franchisees since they don't grow their network (e.g. Ireks Moda, Tekstilpromet, Sportina,) some are owned by banks (e.g. Diners Club, American Express) and some are not real franchise system since they do not sell franchise location (e.g. Bike Express). That is why the "real" number of franchise system is much smaller. Thus, the number of our starting sample was smaller than it should be expected in similar researches which represents limitation in our research. Secondly when creating sample there was intention to have as many as possible Croatian origin franchise systems since they are the ones that know how to operate in Croatian business environment, what are the

obstacles and what are the benefits in working as franchisees and what is needed to grow their business and to be successful.

Survey was conducted based on replies to e-mail invitations for participation in research during November and December 2016 and by using Google Forms as a survey tool. The response rate in the first part of the research was 40% (24 replies), out of which 11 were franchisors, 8 were master franchisees and 5 were franchisees. More than half of respondents (54.2%) have more than 5 years of experience in franchising and only 16.7% have less than one year of franchising experience. When asked about industrial sector of operations, eight respondents replied that they are working in various service sectors, three in retail trade, three in beauty and wellness, two in the fast food and restaurant sector, one in the fashion industry, and one in the automotive sector. The remaining six have operations in other industrial sectors. Almost 80% (19) of respondents have their operations in Croatia, 3 in Slovenia, 2 in Bosnia and Herzegovina and Serbia and 1 in Germany and Austria. Some of the respondents have operations in more than one country.





Source: authors' compilation, 2016

As it shown in Figure 3, in order to be successful in franchising most respondents (79.2%) stated that money and skills are equally important. It is interesting to see, however, that when choosing between money and skills, more respondents answered that having the right skills is more important and some respondents have even complemented the list with their own important characteristics for success in franchising, such as previous business experience and openness to find benefits in the franchisor-franchisee partnership.


Figure 4. Important skills in franchising

Source: authors' compilation, 2016

The most important skills for success in franchising, according to our respondents, are communications skills, followed by management, leadership and problem-solving skills (Figure 4). It is important to note that all skills are important for success for more than 50% of respondents. One of our respondents stated that "having money is more important. Without the money, you can't even start. Franchisor should help you to become skillful." and another stated that "money is necessary, but not the most important." Those two replies are the only ones suggesting that money is more important for success in franchising. Some respondents supplemented the list with other skills, such as flexibility, the ability to be in the right place at the right time with the right idea, ability to follow the franchise system and not reinventing the wheel, necessity to follow steps of the franchise system and ability to choose a franchise that will suit the franchisee personally and that will bring fun to franchisee. Almost all answers imply that having skills is more important for success in franchising than having money. Money is important for buying a franchise and starting a franchise business (paying the franchise fee), but for success in franchising, franchisees need skills which go beyond initial franchisors' training. If they have skills and competencies needed for managing and leading the business, the business will grow and the money will come as a reward.

# 6. STORIES FROM CROATIAN FRANCHISING COMMUNITY – SKILLS OR MONEY?

Second part of research was conducted using the CATI method. This method is usually used for public opinion measuring. It represents quick and easily standardized method for collecting data from large samples for carrying out statistical analyses but on the other side there are weaknesses which are connected to method of sampling and process of interviews – no face to face interview. In the second part of the research, short telephone interviews were conducted with six representatives of franchise businesses. Two of them represent Croatian franchisors, two are master franchisees and two are franchisees working in Croatia. This sample was intentionally created based on the respondents from the first part of study in order to have representatives from all three groups of respondents. Second reason of creating such

sample was to have Croatian origin franchise systems in one of the groups and to have service oriented master franchisees and franchisees. Duration of conducted interviews was 15-20 minutes per interview and they took place in December 2016. Interview had seven questions which allowed deeper insights into way respondents do their business and about the level of influence money and skills had on their business success.

#### 6.1. Franchisors' stories

As examples of franchisors in Croatia, the two oldest, but still present Croatian franchisors were selected: Body Creator from Zagreb and Surf'n'Fries from Rijeka.

#### 6.1.1. Body Creator

Body Creator was founded in 2001 and started franchising in 2005. It is one of the famous Croatian centers for slimming and reshaping the female body. Ljiljana, the owner of Body Creator, choose franchising as the model of growth based on experience she had during her work in Italy. During last 12 years, Body Creator franchise network grew to 15 franchising locations in Croatia, Slovenia and Bosnia and Herzegovina. Although this is a relatively small franchise system, it is important to state that they were the first in Croatia and in the region to start franchising in their business sector. Due to the global financial crisis, their franchise network currently consists of 4 franchisees and 5 small licensed centers in Zagreb. They have recently started a micro-franchising program to enlarge their network again.

According to Ljiljana, franchise business has a higher chance for success if there is a transfer of knowledge from franchisor to franchisee. However, it does not guarantee success. According to Ljiljana, there is not much difference between the success of a franchise and a non-franchised business. To be a successful in either, communication, management and leadership skills are of utmost importance. However, those skills are part of the training and education that she, as a franchisor, provides to her potential franchisees. This training is compulsory for everyone signing a franchising contract with her company.

Based on her experience in franchising, a good team, creativity, and vision will create results and money. Having money can make things go easier, but there is always the question if the franchisee will put enough energy and effort into business success. Every success depends on work, effort, teamwork and team skills, and money is not a crucial element for success in franchising – concludes Ljiljana.

#### 6.1.2. Surf'n'Fries

Surf'n'Fries is the most known and largest Croatian franchising system. They have started their operation in Rijeka in 2009, and the first franchising location was opened less than a year later, in Zagreb in December 2009. Soon after, their franchising networks started to grow, first in Croatia and soon afterwards they have grown internationally. Currently they have over sixty franchise locations: more than 30 in Croatia, 5 in Russia and Austria, 3 in Norway and Vietnam, 2 in Bosnia and Herzegovina and Slovenia and 1 location in Ireland, Turkey, Romania, Montenegro, Germany, Iran, Hungary, Macedonia, and Sweden. In 2013, they have started a micro franchising system in Croatia in response to economic environment in Croatia, but continued with the regular franchising in their international expansion. Denis and Andrija, owners of Surf'n'Fries, started with franchising as a response to market demand for their products and their business model.

They too, consider training and education of franchisees to be an essential part of the franchising agreement. Besides technical skills (preparing and serving potatoes), Surf'n'Fries gives potential franchisees management and leadership training, since those skills are essential for franchise success. The 80% success rate of their franchisees, proves that their training and skills transfer is good enough. For Denis and Andrija, the most important skill a franchisee needs to have is the ability to network and communicate with their stakeholders and the ability to find the best possible location for the business. Both consider money important for buying the franchise, but long-term success can be achieved only with skills and competencies of franchisees. They even think that, regardless of their own success so far, they need to invest more in their own education and develop more skills as franchisors to enable further growth of their business and the franchise system.

#### 6.2. Master franchisees' stories

From the list of franchising systems that are present in Croatia, two master franchisees were selected: Expense Reduction Analysts and Helen Doron Early English, both from Zagreb.

#### 6.2.1. Expense Reduction Analysts

Nikola worked in middle management at Coca Cola in Zagreb until 2004. He was quite successful in the company, but he decided that he needed something new and more challenging.

In 2004, he visited the Franchise Fair in Zagreb and found out what franchising is. Soon after the franchise fair Nikola bought his first franchise - Redac point (toner reparation), and in 2007 he bought his second franchise - I Quit Smoking (IQS). Since he was the master franchisee, he was also in charge of growing the franchising system for both franchises in Croatia. Redac had 7 franchisees and IQS had 3 franchisees in Croatia. In 2015 he sold his first franchise (Redac) and purchased a new franchise - Expense Reduction Analysts. His second franchise (IQS) failed in 2010. Based on his rich working experience, Nikola argues that buying a franchise per se is not a guarantee for success, as he witnessed with his second franchise IQS, which failed mostly due to tobacco laws and policies and frequent legal changes. He believes that different sets of skills are needed for success in franchising: from legal, accounting and administrative to leadership, management, and strategic planning skills. Nikola has received very little training and gained no skills necessary for success from his first franchisors, but the skills and experience gained at Coca Cola were a good basis and the main reason the first franchise was successful. As part of the franchising contract with his third franchisor, he is receiving training and constant one-on-one coaching for the first 18 months.

To him, money was important when he was buying the first franchise, but without skills and experience gained before he entered the franchise world, his first franchise would not be as successful.

#### 6.2.2. Helen Doron Early English

Danijela has a B.A. in management and has worked in banking for 10 years (Zagrebačka and Raiffeisen bank in Zagreb). In 2009 she bought the Helen Doron Early English master franchise for Croatia. The decision to buy the franchise was based on her children's experience with Helen Doron Early English and because franchising meant a lower risk for

starting a business. Before she bought the Helen Doron Early English franchise, she tried to learn about franchising and which skills she needs to be a successful master franchisee.

After almost 10 years in franchising, she stated that a franchise does not guarantee success in business, but that cooperation between master franchisees and local franchisees helps. For the success in franchising, both franchisors and franchisees need to have entrepreneurial skills, such as readiness to try new ideas, new procedures and new products, sales, team management and communication. Money is needed for starting/buying a franchise, but after that, skills predetermine the success or failure of the business.

As a master franchisee of a world-renowned franchise system, she must perform according to the existing business model, follow the rules, apply the tools, and sell the same product. However, she has the possibility to suggest new sets of learning tools, which, with the franchisor's approval, will be used to enhance the skills and competencies of other franchisees in Croatia. She concluded that learning never stops and that both the franchisor and the franchisee must continuously work on developing their entrepreneurial skills if they want their franchise to be successful and to open new franchise locations in Croatia. According to her, the biggest problem for a franchise business is to have a non-entrepreneurial franchisee.

#### 6.3. Franchisees' stories

From the list of franchisees operating in Croatia, the Helen Doron Early English – center in Osijek and the Franchise Center Osijek were chosen.

#### 6.3.1. Helen Doron Early English – center in Osijek

Alan was born and raised in the USA and has finished his education there as well. He has a PhD in Philosophy and he used to teach at a university in New York, and his wife has a Master's degree in Business Administration. He and his wife decided to return to Croatia and wanted to start their business on the Adriatic coast and work in tourism, but the starting costs were too high and there was no guarantee of success. They have found out about the Helen Doron Early English franchise, and after learning more about franchising, they decided to buy the franchise and start their center in Osijek.

After signing the contract, they have received the training from the master franchisee on how to run the company – language school. Alan and his wife are continuously receiving training for improving their business performance and they have the possibility to send questions and ask for help in case they require additional information or need to develop some other skill needed for managing the business. The uniformity of design of all centers around the world and the procedures regarding teaching, welcoming new students, marketing activities, etc., also shows how important management and leadership skills are, as well as continuing education and training. Therefore, franchisees receive additional training about new products and services at least twice a year.

Based on their success in Osijek and on business results, they opened another franchise in Slavonski Brod. Alan concluded that the training received from the master franchisee enabled them to run another language school in another town without any problems. Also, he said that in his case, having skills attained through prior business experience and through continuous education provided by the master franchisee was the key element for success. Money is important in order to expand and open schools in different locations, but it comes as a result of good business performance.

#### 6.3.2. The Franchise Center Osijek

The Franchise Center in Osijek was founded in 2002 as a franchised operation from the Franchise Center at The University of Texas at El Paso. The Franchise Center Osijek is a part of the Center for Entrepreneurship in Osijek. As franchising was still very unfamiliar and undeveloped in this region, the Center for Entrepreneurship decided to expand its services with education about franchising. They had two options: to start on their own or to purchase a franchise. They decided to buy a franchise since they knew they would get the whole package, which included know-how about franchising, organizing events and seminars and marketing activities (newspaper promotion, radio and TV ads). This has saved them time needed to learn everything about franchising by themselves and to prepare all the materials needed to start offering their new service.

To start their franchise business, they needed money. However, such success of the Franchise Center in Osijek would not have been possible if the people involved in the Center had not received the knowledge, competencies, and skills required for running such a business. After signing the franchise contract, they have received additional training from their franchisor (lecturing, networking). They liked their franchise story from the beginning to the end. The only thing they would have done differently is to have a better relationship/contacts with the franchisor and insist on better training for running the franchise center – because skills and knowledge about franchising are important for giving lectures and transferring franchise knowledge to potential franchisors and franchisees in Croatia. In this case, skills and money were equally important for success. However, money was a means to an end – they had some prior business experience and they did receive some know-how through initial training from the franchisor (according to their opinion, not enough). Still, to be successful, they had to financially invest in themselves by taking various additional courses, seminars and workshops.

#### 6.4. Findings from cases – cross case comparison

In this paper we have analyzed several franchisees which are operating in Croatia and which are successful. Every respondent emphasized that money is very important for starting a franchise business. However, given that a business success depends on the circumstances and changes on the market, respondents argue money cannot be enough for a long-term growth of the franchise. In most cases, it is up to a franchisee and his capacity and skills to overcome those circumstances and changes. So regardless on if they are master franchisees or franchisees they all value skills as important (if not even more) as money.

Two franchisors although they are working in different industrial sectors put skills as the most important for the success in business but they also stated the money can play significant role. They had to invest in their franchise systems money since they needed to change their franchise systems to micro-franchising due to the economy crises in Croatia.

Second pair which can be compared is master franchisee and franchisee for Helen Doron Early English. Both respondents did not have previous experience in this field but both are very successful thanks to the education and investments in skills needed to run business. Both stated that training they received was something that helped and that skills are something that makes difference between success and failure.

Expense Reduction Analyst master franchisee and The Franchise Center can form third group since they did not receive any education needed for potential success in business. But both

realize that the investment in their personal development will pay-off so they invested their own financial resources and time in getting additional education get skills necessary for succeeding in business.

## 7. CONCLUSION AND IMPLICATIONS FOR FURTHER RESEARCH

This paper explored how the people involved in franchising perceive the key elements for success of a franchise. The unavoidable fact is that, without adequate financial capital, one cannot start a franchise business. Many authors believe that money is of the utmost importance for the success of a franchise, because the franchisee must not only pay the initial fee and royalties, but should also be able to cover any unpredictable costs that may occur. However, many studies have shown that finances, although very important, cannot be a substitute for the lack of business management and leadership skills.

According to the interviewed representatives of the Croatian franchising community, success in franchising is strongly connected with having skills. Money is important for purchasing a franchise for master franchisees and franchisees, or for starting a franchise system for franchisors, but it will not bring results and success if there are no skills. All the interviewed franchisors, master franchisees and franchisees are constantly working on their education, either through the franchise system they belong to, or by attending different trainings outside their systems. For some of them, money came because of their good skills and enabled them to grow further (like Alan with Helen Doron Early English) or to buy a new franchise (like Nikola with Expense Reduction Analysts). As several interviewed members of the franchising community stated, franchising is not a guarantee for success. However, since franchisors are transferring knowledge and necessary skills to franchisees as part of the package, this form of business venture might make it easier to succeed in today's turbulent and extremely competitive market.

This research has its limitation which is presented in sample size. Since the research was conducted only in Croatia, there was a relatively small number of potential franchisors and franchisees comparison with franchise communities in other EU countries. Because of small sample size further research should be conducted within region i.e. Central and Easter Europe to provide better and more confident results. Thus, this paper should be looked as a first step in wider research about this matter. In addition, the results might have been different if failed franchises had been included in the survey. Therefore, a further study could be conducted to explore why most franchises fail. Such research can indicate the main reason for failure – lack of education (skills and competencies) or lack of money.

Since most studies have shown that franchisees have less formal education about this organizational form, further research could be done to investigate the possibilities for education of franchisees outside of their systems. It is of utmost importance for potential franchisees to learn what franchising is, even before they enter a franchising relationship, so that they understand what skills will they need and how should they approach their potential franchisors.

Main contribution of this paper can be seen in presenting recent developments of franchising community in Croatia since there are few studies about franchising in Croatia and there are only few researchers which are dealing with this business model.

Since skills are needed for success in franchising, this study has also potential practical implications for developing educational programs for potential franchisors and franchisees in

Croatia. These educational programs will help all included parties in franchising relationship to find all necessary information about how to start franchise systems (for franchisors) and how to start franchised location and maintain the success of chosen franchise model (for franchisees).

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# QUADRUPLE INNOVATION HELIX MODEL: AN ENGINE FOR A SMART GROWTH

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#### ABSTRACT

Innovation, research and development and technology are at the heart of economic growth and development. Like the developed countries, the developing ones need to keep pace with technology progress in order to achieve a smart, sustainable and inclusive growth.

The Quadruple Helix is a new concept in the innovation research extended from the Triple Helix model. In fact, the civil society as the fourth innovation actor in the Quadruple Helix model has proved its important role in the innovation system. In this context, this article aims to explore the importance of innovation and the complementarities degree between the economic actors to evaluate the growth rate in the perspective of the Quadruple Helix approach. The four helices of this model are: Academia and Technological Infrastructures, Firms, Government and Civil Society.

The model was solved numerically and we found that a higher economic growth rate is achieved as a result of an increase in synergies and complementarities between the different productive units, or an increase in the consumption substitution elasticity during two periods of time. However, an increase in the preference time parameter would result in decreasing the growth rate.

## 1. INTRODUCTION

The crucial role of innovation for economic growth has been increasingly recognized in the last two decades. Inspired by the work of Schumpeter (1934, 1939, 1947), an increased interest in the study of innovation and growth began in the early 1980s with the pioneering contributions in modern evolutionary economics. In this period a "new" growth theory emerged in the wake of an empirical research trying to explain the movements to the declining growth rate. This theory, called "endogenous growth" pioneered by Romer (1986) and Lucas (1988) aims to endogenize the underlying source creating the long-term growth, namely the accumulation of knowledge. Indeed, the endogenous growth models have attempted to provide a more in-depth analysis of the sources of long-run growth, built on investments based on knowledge creation in economies. This allowed the two-way causal link between innovation and growth. In addition, the endogenous innovation models view technological advances as the key to a long-run growth. Aghion and Akcigit, (2015) analyzed the diverse innovation-led growth models from different perspectives in their paper and pointed up the role of the macroeconomic policy in sustaining such a growth. The basic process used in these models to explain economic growth is the phenomenon of increasing returns to scale, which arises from the externality aspects of technological change. But these externalities have to be adapted by the absorbent economies according to their specific characteristics whether economic, social or political ones.

This new growth theory focuses on innovation as a mechanism for economic change. In fact, economic development is driven by the emergence of new sectors of economic activity, new technologies and new institutions that cancel and replace the old: it is the creation of new paradigms and economic trajectories (Simmie et al., 2006). The endogenous growth model proposes two new ideas in the growth debate: first it is the technical progress which caused by deliberate actions of different agents in the economy. Second, the important technological externalities occur between the different entities of the aggregate economy. Thus, technical progress is no longer inexplicable and there is a difference between public and private incentives to invest in the process of technology due to the existing externalities in the market. These externalities distort the market mechanism, and call for possible government intervention to ensure a more stable market solution where the social surplus is optimized.

Thence, the government intervention is made clear through the support, supply or regulation shaping the entrepreneurs' evolution. The endogenous growth models identify the adaptability of Information and Communication Technologies and Innovation in economies. This identification is one of the important determinants that allow the country to face powerful external sources of change over which they have little or no direct control. It is therefore crucial to determine the degree to which economies become immobilized in the old economic, technological and institutional forms. Besides, it is also useful to determine the extent to which they can adapt their trajectories to new forms leading to improvements in economic performance based on information and knowledge. It is within this framework that several models have been developed relying essentially on innovation and technological progress. The Quadruple Helix Model elaborated by Carayannis and Campbell (2009b) is one these new models.

This paper, therefore, aims to explore the latter growth model based on research and development (R&D) with productive public expenditure in order to illustrate the Quadruple Helix (QH) innovation theory. The purposes of this paper are twofold: it firstly aims to analyze the new growth theory based on innovation in particular the Quadruple Helix innovation theory. Its second goal is to resolve numerically the Quadruple Helix model

developed by Afonso et al.'s (2012, 2014) within deploying simulations that justify the theoretical objectives of this model, identify the role of innovation and the R&D and confirm the important role of the consumer in achieving economic growth.

The rest of the paper is organized as follows: "The innovation theory Quadruple Helix" in section two dealt with the literature review. Then, the "Modeling" outlining the Quadruple helix Model was introduced in section three and the "Simulations and interpretations" represent the fourth section. The conclusion concludes the paper.

## 2. THE QUADRUPLE HELIX INNOVATION THEORY: A LITERATURE REVIEW

Innovation is a complex process that affects many players including technologists and scientists, businesses, consumers, universities, skilled workers, government agencies, government and other institutions that interact in different ways. To build an innovation and an efficient investment ecosystem, there must be a judicious combination of these agents while keeping the flow of discovery and information open.

In recent years, a number of concepts has been proposed for modeling transformations in the process of knowledge creation and innovation. The Europe 2020 strategy defines innovation as one of the solutions to achieving smart, sustainable and inclusive growth (Barroso, 2010).

Innovation prospects have evolved over time, from linear models to systemic models simultaneously with the evolution of knowledge production modes. Recent theories and approaches to innovation emphasize that knowledge is created abundantly in economic and social contexts where innovation users have a large role to play.

• Mode 1

Gibbons et al. (1994) emphasize the traditional role of academic research in a classical understanding of the linear model of innovation. The linear model indicates that first there is basic research, which is carried out in an academic context. Later, this basic research is converted into applied research and goes from the university to the university-related sectors. Finally, applied research is translated into the experimental development carried out by companies. The linear model presents considerable gaps in the communication of users' preferences to the step of the basic research output.

Subsequently, several approaches to non-linear innovation models were introduced. The most familiar is the chained model (Kline and Rosenberg, 1986), which emphasizes the importance of feedback between the different stages of R&D.

• Mode 2

The Mode 2 thesis can be characterized by the following five principles: knowledge generated by application, transdisciplinarity, heterogeneity and organizational diversity, social responsibility and reflexivity and quality control (Gibbons et al., 1994).

Relying on the same idea of interaction between innovation contributors, called institutional spheres (university, industry and government), Etzkowitz and Leydesdorff (1995) developed the Triple Helix (TH) model. This model adopts a spiral innovation model that combines multiple reciprocal relationships between institutions (public, private, and academic) at different stages of knowledge capitalization.

Arnkil et al. (2010) state that the new approach to interaction is characterized by: i) a key role of universities as the main producer of knowledge; ii) the strategic mission of enterprises in the production of innovation by improving organizational processes and placing products and services on the market; and iii) the critical role of government in supporting the development of technology-based science and in the formulation of targeted innovation policies. The concept of Triple Helix was innovative in its introduction, but many practical examples show that there are inherent difficulties in this approach. Hence, specialized knowledge institutions (universities, R&D institutions, thinks thanks, etc.) are not the exclusive producers of knowledge. Many international companies maintain large R&D departments, possess a large number of patents and are often able to hire the best brains in a generation with higher financial incentives than public universities.

• *Mode 3* 

This concept accordin to Carayannis and Campbell (2006a) is more inclined to emphasize the coexistence and co-evolution of different modes of knowledge and innovation. Mode 3 further accentuates this pluralism and diversity of modes of knowledge and innovation as necessary to advance societies and economies. This pluralism supports processes through cross-learning of different modes of knowledge.

Between *Mode 1* and *Mode 2*, multiple creative arrangements and configurations are possible, linking basic research and problem solving. *Mode 3* according to Carayannis and Campbell (2010) encourages interdisciplinary reflection and the transdisciplinary application of knowledge as it allows and underlines the coexistence and coevolution of different paradigms of knowledge and innovation.

For more than a decade, researchers, practitioners and decision-makers began to experiment with the improvement of these approaches on the basis of the Triple Helix model and tried to resolve the limitations associated with the technological paradigm.

One of the major contributions in this trend was Yawson (2009). During the construction of a new architectural framework for a national ecological innovation system, the author presented the Quadruple Helix theory: *« The triple helix of state, university and industry is missing an essential fourth helix, the public ».* 

• The Quadruple Helix approach

In their proposed QH approach, Arnkil et al. (2010) stressed the need to broaden the concept of innovation of the TH model with a societal perspective. In fact, Arnkil et al. (2010) indicate that QH is controlled by CLIQ (Creating Local Innovation Quadruple Helix) which requires the assumption that civil society is the missing element that must be engaged in innovation. The CLIQ network was created to explore the Quadruple Helix (QH) innovation model. Since then, the literature on innovation models based on propeller approaches has flourished. In particular, ordinary studies have been moved from the concept of the knowledge economy of the Triple Helix to the notion of a knowledge society or the democracy of knowledge obtained with the addition of a fourth sphere.

Park (2014) defines that the Quadruple Helix replaces the Triple Helix by adding the fourth helix "civil society". This allows realizing that more perspectives need to be added to understand innovation in the course of the twenty-first century. The TH is not sensitive enough for these democratic complementarities in contrast to that of the Quadruple Helix.

This perspective allows territories to follow non-traditional paths of innovation, such as those linked to non-technological improvements, the creation of services and the exploitation of creativity. It also makes it possible to move towards open innovation where innovation becomes an inclusive process of all stakeholders as active actors in the creation and experimentation of new ways of doing and of creating new services and products jointly (European Commission, 2015).

In addition, the role offered to public authorities in the distinguished QH basic models is different. A wide range of usage concepts will eventually yield better results. Indeed, QH research describes four different types of QH models with varying degrees of citizen / user involvement:

**The Triple Helix + Users model:** where the traditional Triple Helix is enlarged by citizens or users who give information about their needs and experiences in general. For example, the testing of products or services but in a phase of late development.

The Living Lab model focuses on companies: where the citizen (the user) participates in the idea and development of the innovation phase, but business remains the main driving force.

The Living Lab model centered on the public sector, which compares with the previous model with the difference of having the public authorities in a central position.

**The citizen-centered model:** where the user finally decides which innovations are needed and where the citizen is really at the center of the cooperation platform.

These roles can be a catalyst, supporter, decision maker, user, developer, marketer, and quality controller (Arnkil et al., 2010). However, they can be achieved through the strategic use of resources or the integration of knowledge and skills into innovative thinking, community building, procurement, regulation, grants and rewards. To this end, the authorities need to develop their own capacities and skills and face constraints. They face the challenge of renewing themselves as an interesting partner in the reform of local and regional innovation ecosystems.

We chose the new QH theory because it describes a new economic reality, where innovation is seen as the result of co-creation between businesses, citizens, universities and government in a context characterized by the existence of partnerships, collaboration networks and symbiotic relations. The economic structure of a country is based on four helixes: the academy and technological infrastructures, industry, government and finally civil society. The economic growth is managed by the creation of differentiated productive units that interact with one another and complement each other by producing permanent innovations (Carayannis and Campbell, 2006a, 2009a, 2009b; Arnkil et al., 2010; MacGregor et al., 2010).

In this paper we adopted the model introduced by Afonso et al. (2012) that links these four pillars and analytically analyzes their interactions and their joint impact on economic growth. This model allows us to establish a new "bridge" between the theories of endogenous growth and the systemic approach of innovation presented by the QH theory.

The Quadruple Helix theoretical hypothesis consist in the importance of the complementarities between intermediate inputs in the production function in order to define analytically the need to co-create and the need for partnerships between innovative agents.

Our contribution is to solve the QH model numerically (based on Afonso et al. (2012, 2014)) and add some simulations that could clarify better the model and introduce a new path of research in the innovation field.

#### 3. MODELLING

The theoretical QH model developed by Afonso et al. (2012) assumes that the whole of society is an actor in the innovation process as it represents the consumption side in the model. The production side there is a one high-technology-sector in which Academia, Firms and Government produce innovation, new knowledge, technology products and services in an integrated way.

Innovations are materialized in intermediate goods and services (inputs). The final product (global output) is produced using labor, productive public expenditure and all the inputs. Each physical input unit is produced by business and technological infrastructure, university and industry.

The technological infrastructures are R&D infrastructures. They create networks, partnerships and associations to develop R&D, and sell technical goods and services.

#### 3.1. Presentation of the QH model

The model is understood in a circular perspective: all the existing goods and intermediate services are used to generate an overall production. In turn, the whole production can be either consumed or invested. The total investment is the gathering of the invested capital and the accumulation of the physical one needed to produce more intermediate goods and services and promote more innovation. This is how economy grows.

#### • Production side: the technology curve

The final good Y(t) is produced by the constant labor force (civil society), L(t), using public expenditure, G(t), and inputs (intermediate goods and services),  $x_i(t)$ , and a number A(t) of productive intermediate units i (i = 0, ..., A). Each intermediate productive unit is associated with an innovation i. Thus, the produced innovations are the result of co-creation between university and technology infrastructure, government, business and civil society within a single sector.

#### **Government expenditure**

Following Barro (1990), the productive public expenditure is assumed as a flow variable. For all , the current flow of productive government expenditure, G(t), is a constant fraction of the current output, Y(t), that is:

$$G(t) = \tau Y(t), 0 < \tau < 1 \tag{1}$$

The government's budget is balanced in all periods. Assuming zero-public-debt, and zero-consumption-taxes, for simplicity, the government's budget constraint is:

$$G(t) = T(t) = \tau Y(t) \tag{2}$$

#### **Intermediate Productive Units (IPUs)**

In order to capture the synergy effects produced by and among the interaction of the existing intermediate production units with innovation systems, Carayannis and Campbell (2006b) and Carayannis and Campbell (2009a) confirm that complementarities exist between IPUs.

Matsuyama (1995), for example, sees these complementarities as an imprint of industrialized economies, an essential booster for economic growth for such developed countries but impoverishing the developing countries' economies. In addition, drawing on the work of Evans et al. (1998) and the work of Thompson (2008), the IPU inputs introduces the complementarity in the production function Y(t).

#### Final good

The production function Y(t) where G(t) is replaced with its equivalent is as follows:

$$Y(t) = \tau^{\frac{\beta}{1-\beta}} L(t)^{\frac{1-\alpha-\beta}{1-\beta}} \left( \int_0^{A(t)} x_i(t)^{\gamma} di \right)^{\frac{\phi}{1-\beta}}, \phi\gamma = \alpha, \frac{\phi}{1-\beta} > 1$$
(3)

 $\phi \gamma = \alpha$  is imposed in order to preserve homogeneity of degree one. And the assumption  $\frac{\phi}{1-\beta} > 1$  is made so that the inputs  $x_i$  are complementary to one another, that is, an increase in the quantity of one input increases the marginal productivity of the other inputs.

Assuming that it takes one unit of physical capital K(t) to produce one physical unit of any type of intermediate productive units input, the physical capital is related to inputs  $x_i(t)$  by the rule:

$$K(t) = \int_0^{A(t)} x_i(t) di \tag{4}$$

#### Innovation

In this model, Afonso et al. (2012) retained Anagnostopoulou's (2008) argument that innovation spending is specified as a part of the capital expenditure in the total capital. Without depreciation and simplification, the total investment at each period  $\dot{W}(t)$  will be equal to the accumulation of the physical capital  $\dot{K}(t)$  plus innovation spending  $P(\dot{t})AA(t)^{\xi}$ .

$$\dot{W}(t) = \dot{K}(t) + P_A(t)\dot{A}A(t)^{\xi}$$
(5)

W(t) is equal to physical capital plus innovation capital and the marginal productivity of the total capital is constant. Thus the investment equation becomes:

$$W(t) = K(t) + P_A \frac{A(t)^{\xi+1}}{\xi+1}$$
(6)

#### **Internal Costly Investment**

In agreement with Benavie et al. (1996) and Romer (1996), the QH model involves investment costs. In Thompson (2008), it is assumed that the total capital investment W(t) has total internal costs  $I(t) = \dot{W}(t)$ , which means that to install new units of capital, it is necessary to spend a value which is given by the following equation:

$$J(t) = I(t) + \frac{1}{2}\theta \frac{I(t)^2}{W(t)}$$
(7)

where  $C(I(t), W(t)) = \frac{1}{2}\theta \frac{I(t)^2}{W(t)}$  is the installation cost of Hayashi (1982), with  $\theta > 0$  for the adjustment cost parameter.

To end this model to a single sector, the budget constraint of this economy is given by the below equation:

$$I(t) + \frac{1}{2}\theta \frac{I(t)}{W(t)} = Y(t) - G(t) - C(t)$$
(8)

The equilibrium investment rate maximizes the cash flow present value. The present Hamiltonian value (Hamilton, 1833) is thus:

$$H(t) = BW(t) - I(t) - \frac{1}{2}\theta \frac{I(t)^2}{W(t)} + q(t)I(t)$$
(9)

Where q(t) is the market value of capital and the transverse condition for optimizing this problem is  $\lim_{t\to\infty} e^{-rt} q(t)W(t) = 0$ . *r* is the real interest rate.

Turning to the construction of the technology curve, the producers of the final goods are the price takers in the input market. At an equilibrium state, they equate the rental rate on each input with its marginal productivity. The demand curve for each UIP is denoted by:

$$\frac{\partial Y(t)}{\partial x_j(t)} = R_j(t) \tag{10}$$

At each period, the monopolistic UIP maximizes the profits given the demand curve for this good by:  $\max_{x_j(t)} \pi_j(t) = R_j(t)x_j(t) - rqx_j(t)$ , which leads to the rule mark-up:

$$R_j = \frac{rq}{\gamma} \tag{11}$$

On the balanced growth path, the interest rate and the shadow-value of capital are constant and therefore correspond to R.

Starting from equation  $R = \Omega_{\rm R} A^{\frac{\phi-1+\beta}{1-\beta}} x^{\frac{\alpha-1+\beta}{1-\beta}}$  where  $\Omega_{\rm R} = \frac{\alpha}{1-\beta} \tau^{\frac{\beta}{1-\beta}} L^{\frac{1-\alpha-\beta}{1-\beta}}$  is a constant, we have to achieve:  $\left(\frac{\phi-1+\beta}{1-\beta}\right) g_{\rm A} = -\left(\frac{\alpha-1+\beta}{1-\beta}\right) g_{\rm X}$ ,

So

$$g_{x} = \xi g_{A} = r - \frac{\pi_{j}}{P_{A}A^{\xi}} \text{ et } \xi = \frac{\phi - (1 - \beta)}{(1 - \beta) - \alpha}$$
(12)

The production equation becomes:

$$Y = \tau^{\frac{\beta}{1-\beta}} L^{\frac{1-\alpha-\beta}{1-\beta}} A^{\frac{\phi}{1-\beta}} x^{\frac{\alpha}{1-\beta}}$$
(13)

which with differentiation in the time order gives the following output growth rate: (for more details see Afonso et al. (2012))

$$g_{Y} = \left(\frac{\phi + \alpha\xi}{1 - \beta}\right) g_{A} = (1 + \xi) g_{A}, \tag{14}$$

to change the expression:

$$g_{Y} = \frac{1+\xi}{\xi} \left( r - \frac{\Omega_{Y}}{R^{(1-\beta)-\alpha}} \right), \Omega_{Y} = \frac{(1-\gamma)}{P_{A}} \Omega_{R}^{\frac{1-\beta}{(1-\beta)-\alpha}}$$
(15)

This latter equation is the equation of the technology, and the (r, g) pair determines the BGP equilibrium on the production side of this economy.

#### • Consumption Side - The Euler Equation

The civil society in this model contains all the citizens of this economy, assuming that they live infinitely and that they are homogeneous, well-informed and cultivated. They want to consume innovation, new knowledge, technology, high quality products and services. All these are aggregated into the final good, Y(t), whose production requires innovation.

Analytically, a standard specification for inter-temporal consumption can be adopted. The consumer must solve an inter-temporal problem of optimization that it maximizes, under a budget constraint, the discount value of their representative utility:

$$\max_{C(t)} \int_0^{\infty} e^{-\rho t} \frac{C(t)^{1-\sigma}}{1-\sigma} dt$$
(16)

$$\dot{E}(t) = rE(t) + w(t) - C(t)$$
 (17)

The variable C(t) is the consumption of Y(t) at period t,  $\rho(t)$  is the time preference,  $\frac{1}{\sigma}$  s the consumption substitution elasticity between two periods of time. The variable E represents the total of assets, r is the interest rate, w is the wage rate, and it is assumed that households spend one unit of work per unit of time. The condition of transversality is given by  $\lim_{t\to\infty} \mu(t)E(t) = 0$  where  $\mu(t)$  is the price of assets.

The civil society consumption decisions are given by Euler's known equation:

$$g_{c} = \frac{\dot{c}}{c} = \frac{1}{\sigma}(r - \rho)$$
(18)

#### 3.2. General equilibrium

Time-differentiation of the investment equation tells us that W grows at the same rate as Y:

$$\dot{W}(t) = \dot{K}(t) + P_A(t)\dot{A}A(t)^{\xi}$$
<sup>(19)</sup>

We conclude that W grows at the same rate of Y:

$$\frac{\dot{W}}{W} = \frac{\dot{K}}{K}\frac{K}{W} + \frac{\dot{A}}{A}\frac{A^{1+\xi}}{W}P_A$$
(20)

that is  $g_W = (1 + \xi)g_A$ 

 $g_W$  require that  $\left(\frac{\dot{Y}}{W}\right) = \left(\frac{\dot{G}}{W}\right) + \left(\frac{\dot{C}}{W}\right)$ .

where G and W grow at the same rate as Y and so C will also do the same. As labor is constant, the per capita economic growth rate is given by:

$$g_{C} = g_{Y} = g_{K} = g_{W} = (1 + \xi)g_{A} = g$$
 (21)

The solution of the general equilibrium is obtained after solving a system with two equations in order to two unknown variables: r and g. By taking equation  $q = 1 + \theta g$ , the system to be solved is written as follows:

$$\begin{cases} g = \frac{1}{\sigma} (r - \rho) \\ g = \frac{1+\xi}{\xi} \left( r - \frac{\Omega}{(r+r\theta g)^{\overline{(1-\beta)-\alpha}}} \right), r > g > 0 \end{cases}$$
(22)

where  $\Omega = \gamma^{\frac{\alpha}{(1-\beta)-\alpha}} \frac{(1-\gamma)}{P_A} \Omega_R^{\frac{1-\beta}{(1-\beta)-\alpha}}$ ,  $\Omega_R = \frac{\alpha}{1-\beta} \tau^{\frac{\beta}{1-\beta}} L^{\frac{1-\alpha-\beta}{1-\beta}}$ 

We will follow the hypothesis of the restriction r > g > 0 therefore: (i) the current value will be finite; and (ii) the solutions have positive interest rates and growth rates. The Euler equation is linear and has a positive slope in space (r, g). Despite the non-linearity of the technology equation, the model has a unique solution.

#### • Numerical solutions

Considering the non-linearity of the technology curve, we will solve the system through a numerical example. The values of the selected parameters are as follows:

 $\sigma = 2$ ;  $\rho = 0.02$ ;  $\alpha = 0.4$ ;  $\beta = 0.3$ ;  $\gamma = 0.1$ ;  $\Phi = 4$ ;  $\xi = 11$ ; L = 1;  $\theta = 3$ ;  $P_A = 15$ ;  $\tau = 0.15$ where the values of  $\alpha$  and  $\gamma$  and consecutively  $\Phi = \frac{\alpha}{\gamma}$  are the same as those used by Evans et al. (1998) in their example and therefore,  $\xi = \frac{\phi - (1 - \beta)}{(1 - \beta) - \alpha} = 11$ .

The values for the preference parameters  $\sigma$  and  $\rho$  are consistent with those found in the empirical studies of Barro and Xavier (1995).

The value assigned to parameter  $\tau$  is consistent with that of Irmen and Kuehnel (2009). The population is generally chosen as unit value and therefore the idea that growth depends on the size of the economy is not important, we neglect the scale effects present in the majority of growth models.

Now we will choose among different possibilities of general equilibrium solutions for the different parameter values  $\theta$  and  $P_A$  using the Maple program. The values chosen for the parameters  $\theta$  and  $P_A$  in harmony with those proposed by Whited (1992) and Connolly (1999) are given in Table 1. We have got absolutely the same results as those of Afonso et al. (2014).

	$P_A = 1$	$P_A = 6$	$P_{A} = 15$
0 - 1 5	g = 0.0395	g = 0.0170	g = 0.0117
$\theta = 1.5$	r = 0.0811	r = 0.0379	r = 0.0254
0 - 2	g = 0.0391	g = 0.0179	g = 0.0117
$\theta = 3$	r = 0.0802	r = 0.0377	r = 0.0255
0 - 2	g = 0.0383	g = 0.0177	g = 0.0116
$\theta = 3$	r = 0.0787	r = 0.0374	r = 0.0252

Table 1. General equilibrium solutions

And for practical reasons, we will choose the combination  $\theta = 1.5$  and  $P_A = 6$  and the system of equation will be then:

$$\begin{cases} g = 0.5r - 0.01 \\ g = \left(\frac{12}{11}\right) \left(r - \frac{0.000283}{(r+1.5rg)^{\frac{4}{3}}}\right) \end{cases}$$
(23)

Figure 1, with *r* on the horizontal axis and *g* on the vertical axis, shows the unique numerical solution of the general equilibrium BGP (r = 0.037 and g = 0.017) for the values of the selected parameters.

We can also say that for higher  $\theta$  and  $P_A$  values (for example  $\theta = 50$  and  $P_A = 100$ ), the configuration of the model does not change significantly.

Figure 1. General Equilibrium Solution (BGP)



#### 4. SIMULATIONS AND INTERPRETATIONS

In order to justify the theoretical assumptions of this model, we made three simulations. The first simulation analyzes the increase in complementarities between the production parameters; the second simulates the increase of the time preference parameter while the third

is devoted to the increase in the consumption substitution elasticity between two periods of time.

• Simulation 1: Everything else constant, an increase in the parameter of complementarities  $\frac{\phi}{1-\beta}$  leads to an increase in the equilibrium growth rate.

**Proof:** An increase in  $\frac{\phi}{1-\beta}$  implies an increase in  $\alpha$  (from 0.4 to 0.6) and  $\Omega$ .

The new balance achieved higher values for r = 0.042 and g = 0.020 as shown in Figure 2.

Taking  $g = \frac{Y}{\theta}$ , this leads to a higher value for the growth rate.

This result confirm the QH innovation model theoretical assumption that the complementarity of the innovation agents generates an increase in the economic growth and the production of diverse innovations and the creation of new technologies allows admitting a smart, sustainable and inclusive growth.





• **Simulation 2:** Everything else constant, an increase in the parameter of the time preference parameter leads to a decrease in the growth rate of the equilibrium.

**Proof:** by increasing  $\rho$  from 0.002 to 0.008, the new equilibrium values have decreased with respect to the initial equilibrium ones which are of the order of r = 0.035 and g = 0.013 as shown in figure 3.

Figure 3. New general equilibrium (simulation 2)



This result indicates that the benefits of R&D do not have an immediate impact on the economic growth but take time to become fruitful. The lack of patience will result in less R&D.

• **Simulation 3:** Everything else constant, an increase in the parameter of the consumption substitution elasticity between two periods of time, leads to a higher growth rate value.

**Proof:** An increase of  $\frac{1}{\sigma}$  (by decreasing  $\sigma$  from 2 to 1.5) provides an improvement of the interest rate of 0.042 and a growth rate of 0.027.

Figure 4 clarifies that the new equilibrium is higher than that of the initial equilibrium state.

This simulation confirms that the consumption growth is very sensitive to changes in the real interest rate. As a result, in the QH model, when the real interest rate is high the consumers will save a little and consume a lot as they are a part of the production and the consumption of

the innovation ecosystem. However they create new needs and demand new products and services, which leads to promote innovations and generate a smart economic growth.

#### Figure 4. New general equilibrium (simulation 3)



#### 5. CONCLUSION

From the results of the achieved simulations, we can confirm that the hypotheses of the Quadruple Helix model were satisfied. In fact, the complementarities of the actors involved in production illustrate a smart (by promoting knowledge, innovation, education and the digital society), sustainable (by making resources more efficient while reinforcing competitiveness), and inclusive (through improved labor market participation, skills development and poverty reduction) economic growth.

The Quadruple Helix confirms the structures of an economy and society based on global knowledge as indicated by Carayannis and Campbell (2009a) and Carayannis and Campbell (2009b). Thus, innovation systems lead to a democracy of knowledge, which is transdisciplinary, non-linear and hybrid. The new and emerging nature of innovation means that no single innovator has the resources and skills to act alone. The interdependence of institutions is therefore the characteristic that distinguishes these innovation economies. Our main goal was to highlight the importance of the Quadruple Helix innovation theory in creating economic growth. Our contribution to this literature was through solving numerically the QH model and justifying its theoretical assumptions. Besides our simulations confirmed that this model strongly contributes to create a smart, sustainable and inclusive economic growth, promoting innovation and highlighting the contribution of skilled labor as part of an innovation ecosystem.

Thus, this innovation growth model represents a better solution for economics especially for the developing countries within the digital convergence trends context. Testing empirically the Quadruple Helix model for a sample of countries and highlighting the governmental role in supporting the innovation will be the target of a future research perspective.

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# EUROPEAN TRANSITION COUNTRIES' RISK CLASSIFICATION AND RANKING: TEN YEARS LATER

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#### ABSTRACT

The paper uses the original methodology proposed in Tomić-Plazibat et al. (2010) for country risk assessment of the European transition countries. The methodology combines multivariate cluster analysis aided by ANOVA testing and multicriteria PROMETHEE method, evaluating the performance of countries while considering their economic and socio-political characteristics. This combination of the existing classification and ranking methodologies enables dynamic (over years) and relative (in particular year) analysis of credit risk of observed countries. The methodology was originally applied to the sixteen Central, Baltic and South-East European transition countries for 2005 and 2007.

Ten years later, national, regional and for sure global political – economic conditions, situations and positions highlight once again the issue of country-risk assessment of the European transition countries. In the paper, the proposed methodology is applied, now to the seventeen countries, according to fifteen socio-political and economic-financial criteria. The paper findings have shown that within ten years, negative trends prevailed; differences/distances between countries on ranking lists became higher, in almost all cases values of socio-political indicators are in the best case stagnating, if not declining. Unfortunately, for some countries, especially for South-East non EU members' countries, with deep economic problems, this constant fall of socio-political conditions and environment makes them highly risky in the sense of country risk, delaying so needed stable economic conditions and faster economic growth.

## 1. INTRODUCTION

If we just employ definition of the credit risk from a simple internet providers and lexicons, or go through very rich scientific and professional sources, there is no need any more for emphasizing the importance of the credit risk assessment. Concisely, we can say that credit risk is the risk of investing in a particular country. The question may be what determinates the credit risk; which variables, indicators, criteria, risks should be taken into consideration when assessing credit risk. Some consider that the most direct measure of country risk is a measure of default risk when lending to the government of that country – sovereign default risk, like in Aronovich (1999). Sometimes economic and financial indicators are more in focus, like in Deceanu et al. (2010), sometimes political indicators and risks, Mawanza et al. (2013), however the combination of economic – financial and socio – political criteria prevails, Economou and Hassapis (2015), Hayakawa et al. (2013), Tomić-Plazibat et al. (2010).

The question arises: How to combine these criteria in the process of credit risk assessment? There is no standardized protocol. Moreover, as data gets richer and easier to access there will be more services trying to measure country risk and even more divergences in approaches and measurement mechanisms, Damodaran (2015). Nevertheless, two main approaches can be recognized: classifications and ratings, equally among agencies as well among studies and researchers. In the paper Tomić-Plazibat et al. (2010), authors proposed the original method of country risk assessment which combines classifications and ratings employing multivariate cluster analysis, together with other statistical tests to confirm any significant differences among formed classes, and the PROMETHEE method as one of the most popular and widely used multicriteria decision making methods. According to the relevant indicators grouped as economic-financial and socio-political, this combination of methods gives results on the basis of concrete mathematical statistical calculations offering transparency of inputs, principles and procedures. There are no results biases, assuming of course, that all inputs are unbiased.

The proposed methodology was applied to the sixteen Central, Baltic and South-East European transition countries for 2005 and 2007, resulting with very interesting and indicative country-risk assessments, especially in, at that time very actual, EU (non)membership context.

Ten years later, national, regional and global political – economic conditions and environment put the country-risk assessment of the observed countries as a very important issue. Within the last ten years, the big global financial economic crisis, the post crisis responses, new born countries, Croatia – the new EU member, wrenching economic problems, the euro zone crisis, the migration crisis, illiberal nationalism, a growing crisis of confidence to the European institutions, threats to the Europe's unity and liberty are recorded. In the South – East region, beside the huge and really challenging economic problems added with migration crisis, sometimes even fundamental principles of democracy are challenged. There is always the question of ensuring short term and long term stability together with the effort for convergence with European norms.

In this paper, the method proposed in Tomić-Plazibat, Aljinović and Pivac (2010) is applied to, this time, the seventeen Central, Baltic and South-East European transition countries for 2015, giving again very good insights and complete pictures about countries' recent achievements in socio-political standards and financial economic conditions, putting them actually on a very wide country risk assessment scale. Countries included in the analysis are: Albania (ALB), Bosnia and Hercegovina (BIH), Bulgaria (BGR), Croatia (CRO), Czech Republic (CZE), Estonia (EST), Hungary (HUN), Kosovo (KSV), Latvia (LVA), Lithuania

(LTU), FYR of Macedonia (MKD), Montenegro (MNE), Poland (POL), Romania (ROM), Serbia (SRB), Slovakia (SVK), Slovenia (SVN).

The paper is organized into six sections. After this introductory section, the second section is devoted to the data, criteria and methodology, explaining sources and reasons for selected country risk assessment criteria and briefly presenting methods combined in the assessment process. The third section presents results carried out by multivariate cluster analysis, while the fourth section does the same with PROMETHEE method results. Section five analyses and discusses countries' risk classifications and ratings regarding taken indicators. Section six closes the paper with the conclusion remarks.

## 2. CRITERIA AND METHODOLOGY

## 2.1. Data and resulting criteria

Fifteen country risk indicators are selected for the analysis for 2015, eight from the group of economic-financial criteria and seven from the socio-political group.

There were multiple reasons for the final criteria list. First, we wanted that the study and results are comparable with the study Tomić-Plazibat et al. (2010), so we wanted the same criteria again, but also enriched with additional economic-financial criteria, following for example Prochniak (2011). But there comes the problem of the availability of data. All criteria from this group are drawn from the World Bank's World Development Indicators, where we can find as data sources: World Bank national accounts data, OECD National Accounts data files and OECD GDP estimates, International Monetary Fund, International Financial Statistics and data files, International Debt Statistics, Balance of Payments database, supplemented by data from the United Nations Conference on Trade and Development and official national sources. Impressive list, the best and most reliable sources, but unfortunately still insufficient, at least when recent 2015 data for all observed countries are in question. Where it was possible the missing data from 2015 are replaced with 2014 data, like for the criteria Life expectancy at birth and Stock market return. Unfortunately, some criteria appraised as very important in this kind of analysis, like Labour force criteria and Market capitalisation of listed companies (% of GDP) criterion, could not be reached for many years backwards.

Finally, here is the list of eight economic-financial criteria employed in the analysis, denoted by  $c_8 - c_{15}$  (coming after seven socio-political indicators) respectively: Life expectancy at birth (LE), GDP (US\$, billions), Exports of goods and services/GDP (EGS/GDP), Current account balance/GDP (CAB/GDP), Annual GDP growth (AGDP), Consumer price index (2010 = 100) (CPI), Foreign direct investment – net flow, billions (FDI), Stock market return (%, year on year) (SMR).

All seven socio-political indicators, denoted by  $c_1 - c_7$ , are selected from Freedom House, Nations in Transit and they are given consecutively: Electoral Process (EP), Civil Society (CS), Independent Media (IM), National Democratic Governance (NDG), Local democratic Governance (LDG), Judicial Framework and Independence (JFI), Corruption (C).<sup>1</sup>

Nations in Transit's ratings are based on a scale of one to seven, with one representing the highest level of democratic development, and seven representing the lowest. The ratings

<sup>&</sup>lt;sup>1</sup> Values of all indicators are given in Tables 3 and 4, further in the article, in the section devoted to ranking of countries according to the credit risk, in so called decision matrices.

reflect the consensus of Freedom House, its academic advisors, and the authors of reports for each country.<sup>2</sup>

#### 2.2. The elements of Multivariate Cluster Analysis and the PROMETHEE Method

Observed countries are classified according to the credit risk by multivariate cluster analysis.

Multivariate analysis (MVA) is based on the statistical principle of multivariate statistics, which involves observation and analysis of more than one statistical variable at a time. In any design and analysis, the technique is used to perform trade studies across multiple dimensions while taking into account the effects of all variables on the responses of interest. Multivariate analysis examines interdependencies and group variables, according to their similarity (factor analysis) and/or grouping of cases, according to their similarity, e.g., connections (cluster analysis).

Clustering is a type of multivariate statistical analysis also known as cluster analysis, unsupervised classification analysis, or numerical taxonomy. It is based on a mathematical formulation of a measure of similarity. The term 'cluster analysis' (Anderberg 1973) encompasses a number of different algorithms and methods for grouping objects of similar kind into respective categories. A general question facing researchers in many areas of inquiry is how to organize observed data into meaningful structures, that is, to develop taxonomies. In other words, cluster analysis is an exploratory data analysis tool that aims at sorting different objects into groups in a way that the degree of association between two objects is maximal if they belong to the same group and minimal otherwise.

A matrix tree plot, or dendrogram, visually demonstrates the hierarchy within the final cluster, where each merger is represented by a binary tree. Connected vertical lines designate joined cases. The dendrogram rescales the actual distances to numbers between zero and 25, preserving the ratio of the distances between steps.

Use of different distance metrics for measuring distances between clusters may generate different results. The most common distance measurements between data points are the Euclidean distance and Euclidean squared distance. In this article, the multivariate cluster analysis by Euclidean distance using the Average Linkage method is applied to classify countries into each associated class for 2015.

Cluster analysis does not presuppose any statistical significance, and it is therefore recommended to use appropriate statistical tests in practical analyses.

The multivariate cluster analysis is by now well-known and widely spread method. Deeper and wider insights into the method can be found in sources such as Anderberg (1973) and Hair et al. (2006).

Observed countries are ranked according to the credit risk by the PROMETHEE multicriteria decision making method.

The PROMETHEE method is appropriate to treat multicriteria problem of the following type:

<sup>&</sup>lt;sup>2</sup> Although reports are clear, transparent and argumentative, there are different authors of different countries reports and the slight feeling of subjectivity is present. We have to accept that, knowing that with this kind of criteria subjectivity is impossible to avoid completely.

$$Max \Big\{ f_1(a), \dots, f_n(a) \Big| a \in K \Big\}$$

where K is a finite set of possible actions (here countries), and  $f_j$  are n criteria to be maximized. For each action  $f_j(a)$  is an evaluation of this action. When we compare two actions,  $a, b \in K$ , we must be able to express the result of this comparison in terms of preference. We, therefore, consider a preference function P:

$$P: K \times K \to [0,1],$$

representing the intensity of action a with regard to action b. In practice, this preference function will be a function of the difference between the two evaluations d = f(a) - f(b), and it is monotonically increasing. Six possible types (usual, U-shape, V-shape, level, linear and Gaussian) of this preference function are proposed to the decision maker (Brans and Vincke (1985), Brans and Mareschal (1989). The effective choice is made interactively by the decision maker and the analyst according to their feeling of intensities of preference. In each case, zero, one, or two parameters have to be fixed:

- q is a threshold defining an indifference area;
- *p* is a threshold defining a strict preference area;
- *s* is a parameter the value of which lies between *p* and *q*.

Now, we can define a preference index:

$$\Pi(a,b) = \frac{\sum_{j=1}^{n} w_j P_j(a,b)}{\sum_{j=1}^{n} w_j},$$

where  $w_j$  are weights associated with each criteria.

Finally, for every  $a \in K$ , let us consider the two following outranking flows:

i. leaving flow:

$$\phi^+(a) = \sum_{b \in K} \Pi(a, b)$$

ii. entering flow:

$$\phi^-(a) = \sum_{b \in K} \Pi(b, a)$$

The leaving flow  $\phi^+$  is the measure of the outranking character of *a* (indicates how *a* dominates all other actions of *K*). Symmetrically, the entering flow  $\phi^-$  gives the outranked character of *a* (indicates how *a* is dominated by all other actions). The action is better if the leaving flow is higher, and the entering flow lower. The PROMETHEE I gives a partial reordering of the set of actions in which some actions are comparable, while some others are

not. When the decision maker requests the complete ranking, the net outranking flow may be considered:

$$\phi(a) = \phi^+(a) - \phi^-(a).$$

And the higher the net flow, the better the action is. All the actions of K are now completely ranked (PROMETHEE II).

The PROMETHEE method is one of the most accepted and widely used multicriteria decision making methods, has founded place in a very rich and various area of applications. More about the method can be found in Babić (2011), Brans and Vincke (1985), Brans and Mareschal (1989).

#### 3. COUNTRY RISK CLASSIFICATION

As it was said before, cluster analysis does not presuppose any statistical significance and therefore it is recommended to support multivariate analysis with appropriate statistical analysis. Now, a statistical analysis (ANOVA) is conducted for the selected criteria with regard to their statistical significance in differentiation between two groups of countries: EU and non EU members, the division of countries which is for sure still actual and will be for a while.

The ANOVA analysis requires homogeneity of samples' variance for each criterion, which is confirmed by Levene statistics in Table 1.

	Country risk indicators	
$c_1$	Electoral Process (EP)	0.436*
$c_2$	Civil Society (CS)	0.323*
C <sub>3</sub>	Independent Media (IM)	0.082*
$C_4$	National Democratic Governance (NDG)	0.745*
$C_5$	Local Democratic Governance (LDG)	0.893*
C <sub>6</sub>	Judicial Framework & Indep. (JFI)	0.107*
<i>C</i> <sub>7</sub>	Corruption (C)	0.703*
$c_8$	Life expectancy at birth (LE)	0.968*
C9	GDP (US\$) billions (GDP)	0.052*
<i>C</i> 10	Exports of goods and services/GDP (EGS/GDP)	0.124*
$c_{11}$	Current account balance/GDP (CAB/GDP)	0.085*
$c_{12}$	Annual GDP growth (AGDP)	0.579*
<i>C</i> <sub>13</sub>	Inflation (CPI)	0.051*
<i>C</i> 14	FDI-net flow (US\$) bill. (FDI)	0.170*
$c_{15}$	Stock market return (%, year on year) (SMR)	0.212*

 Table 1. Test of Homogeneity of Variances Results for the Selected Country-risk Indicators (Significance for Levene statistics)

\* Denotes acceptance of the null hypothesis of homogeneity of the samples variances at the 0.05 significance level.

Source: Estimated according to the World Bank (2016)<sup>3</sup> and Freedom House data (2016)<sup>4</sup>.

<sup>&</sup>lt;sup>3</sup> Word Bank data. 2015. Life expectancy at birth, GDP, Exports of goods and services/GDP, Balance of Trade/GDP, Annual GDP growth, Inflation, FDI-net flow (US\$) bill, http://devdata.worldbank.org (accessed December 15, 2016).

<sup>&</sup>lt;sup>4</sup> **Freedom House data**. Nations in Transit. 2015. Electoral Process, Civil Society, Independent Media, National Democratic Governance, Local Democratic Governance, Judicial Framework & Indep, Corruption. www.freedomhouse.org (accessed December 15, 2016).

The ANOVA results in Table 2 show that all socio-political indicators statistically differentiate the two groups of countries at the .01 significance level. According to economic and financial indicators (except  $c_{10}$  EGS/GDP and  $c_{11}$  CAB/GDP), there is no significant difference between the two groups of countries.

Table 2. ANOVA Results	for the Selected	Country Risk Indicators	(F statistics)

	Country risk indicators	
$c_l$	Electoral Process (EP)	22.993*
$c_2$	Civil Society (CS)	21.601*
C3	Independent Media (IM)	17.150*
$C_4$	National Democratic Governance (NDG)	22.866*
C5	Local Democratic Governance (LDG)	16.898*
C <sub>6</sub>	Judicial Framework & Indep. (JFI)	20.286*
C7	Corruption (C)	22.904*
C <sub>8</sub>	Life expectancy at birth (LE)	1.180
C9	GDP (US\$) billions (GDP)	3.442
<i>c</i> <sub>10</sub>	Exports of goods and services/GDP (EGS/GDP)	16.532*
<i>c</i> <sub>11</sub>	Current account balance/GDP (CAB/GDP)	29.168*
<i>c</i> <sub>12</sub>	Annual GDP growth (AGDP)	0.015
<i>C</i> <sub>13</sub>	Inflation (CPI)	2.272
C14	FDI-net flow (US\$) bill. (FDI)	0.587
<i>C</i> 15	Stock market return (%, year on year) (SMR)	0.699

\* Denotes rejection of the null hypothesis that the variance of varying factor (the two groups of countries) is zero at the 0.01 level.

\*\* Denotes rejection of the null hypothesis that the variance of varying factor (the two groups of countries) is zero at the 0.05 level.

Source: Estimated according to the World Bank (2016) and Freedom House data (2016).

Now, the multivariate cluster analysis by Euclidean distance using the Average Linkage method is applied to classify countries into each associated class and here are the results.

First, the analysis is done for the socio-political criteria added with criteria Life expectancy at birth. The appropriate dendogram is shown in Figure 1.

Dendogram shows that there are two clusters: first one consists of Kosovo and the other one of all other countries, showing that Kosovo significantly differs from all others according to socio-political criteria. If we look at the values of socio-political criteria with added Life expectancy at birth in the same category, given in table 3, we can see that Kosovo has the highest (meaning the worst) values of all socio-political indicators and the lowest value of Life expectancy at birth, only 71.1. Inside the second cluster, where all other countries are, the division into two groups can be recognized. One consists of Czech Republic, Estonia, Latvia, Lithuania, Poland, Slovakia and Slovenia, group of countries which evidently went forward with socio political conditions and environment, or at least did not go backward significantly. The other one consists of: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, FYR of Macedonia, Hungary, Montenegro, Romania and Serbia. Despite the EU membership, Croatia, Bulgaria, Romania and Hungary are in this sense much closer to the non EU countries, which still have to fulfil a lot of very strict conditions on their way to the EU membership.





Source: Estimated according to Freedom House data (2016).

Figure 2. Dendrogram Using Average Linkage (between groups) According to all Socio-political and Economicfinancial Criteria



Source: Estimated according to the World Bank (2016) and Freedom House data (2016).

Distances from the dendogram of the cluster analysis based on all socio-political criteria together with all economic-financial criteria, given in Figure 2, show that countries can be classified either in three or in two clusters. We decided to proceed with three clusters. One consists only of Kosovo, confirming again the unenviable position of the country regarding
country risk. The other two clusters are actually consisting of the same countries as the two groups of countries from the previous dendogram regarding socio-political criteria. Only, grouping inside two clusters in comparison to grouping inside two groups from previous analysis, is different. We are going to explain the specific position of particular country later, together and in accordance with the results of countries' ranking regarding country risk.

### 4. COUNTRY RISK RANKING

Within the context of multicriteria decision analysis, a statistical analysis for the selection of the decision criteria, in this case country risk indicators, is not necessary, given that a decision maker can specify the criteria which are considered to be relevant to the analysis. Nevertheless, on the basis of ANOVA results, it was decided to proceed with three different groupings of criteria in forthcoming analysis. First, all socio-political criteria are included together with all economic-financial criteria, then, all of them are included as a democracy score (DS) indicator – which is an average of ratings of all seven socio-political indicators – and finally, only the economic-financial indicators are included.

For each criterion, one of the six offered preference function types and its thresholds have been chosen. In this way, the problem was completely prepared for the implementation of the PROMETHEE. Its advantages lie in the possibility to define indifference and preference thresholds that have the real economic importance. The choice of the function types, and its thresholds, was carried out and the final ranking is obtained by cumulating mutual comparisons of alternative pairs, according to all the criteria, into final leaving and entering flows, i.e. the final rank of alternatives.

The group of alternatives (actions) consists of 17 countries which are compared according to the 15 previously observed criteria. The sum of all weight values of criteria included in the analysis has to be one hundred. Following that condition weight values of socio-political together with economic-financial criteria are ordered. The types and weight values of all criteria for 2015 are shown in Tables 3 and 4, in so called decision matrices, where all input data values for all criteria and all countries are given. We can see that GDP and FDI are almost equally important, and together they dominate the remaining economic-financial criteria. Other criteria are at similar weights. Probably, today we would choose a slightly different set of criteria and their weight values, but as it was said before, one of the reasons for such criteria set and its characteristics, lies in the fact that we want analysis comparable to the analysis of Tomić-Plazibat et al. (2010). This criteria weights were ordered to reflect the fact that transitional countries, which had reached (or surpassed) the pre transitional level of the GDP, were more attractive to foreign investors, as they were seen as countries enabling profitable investments.

After country-risk assessment including all indicators, multi-criteria analysis is done with the economic-financial indicators together with democracy score indicator as an average of ratings for all socio-political indicators. Finally, only economic-financial indicators are included. Types and weights of those indicators are shown in Tables 5 and 6.

Finally, with the analysis has been carried out, the final rank of alternatives according to the country-risk assessment is given in Table 7.

CRITERIA '15.	C1	C2	C3	C4	C5	C6	C7	C8			
Name	EP	CS	IM	NDG	LDG	JFI	С	LE			
Min/Max	min	Max									
Туре	5	4	5	5	5	5	5	4			
Weight	5	5	5	5	5	5	5	8			
ACTIONS 2015											
ALB	4.00	3.00	4.00	4.50	3.50	4.75	5.25	77.83			
BIH	3.25	3.50	4.75	5.75	4.75	4.50	4.75	76.43			
BGR	2.25	2.25	4.00	3.75	3.00	3.50	4.25	75.41			
CRO	3.25	2.75	4.00	3.50	3.75	4.50	4.00	77.33			
CZE	1.25	1.75	2.75	2.75	1.75	1.75	3.50	78.28			
EST	1.75	1.75	1.50	2.25	2.50	1.50	2.50	77.24			
HUN	2.75	2.50	3.75	3.75	3.00	2.75	3.75	75,87			
KSV	4.75	3.75	5.50	5.50	4.75	5.75	6.00	71.10			
LVA	1.75	1.75	2.00	2.00	2.25	1.75	3.00	74.19			
LTU	2.00	1.75	2.25	2.75	2.50	1.75	3.50	73.97			
MKD	3.50	3.50	5.00	4.25	3.75	4.25	4.25	75.34			
MNE	3.50	2.75	4.50	4.25	3.25	4.00	5.00	76.18			
POL	1.50	1.50	2.50	2.50	1.50	2.50	3.50	77.25			
ROM	3.25	2.50	4.25	3.75	3.00	3.75	3.75	75.06			
SRB	3.25	2.25	4.25	3.75	3.50	4.50	4.25	75.53			
SVK	1.50	1.75	3.00	3.00	2.50	3.00	3.75	76.72			
SVN	1.50	2.00	2.25	2.00	1.50	1.75	2.50	80.52			

Table 3. Decision Matrix with Socio-political Indicators in 2015

Source: Freedom House (2016) and according to authors' analysis.

Table 4. Decision Matrix with Economic and Financial Indicators in 2015

CRITERIA '15	C9	C10	C11	C12	C13	C14	C15
Name	GDP	EGS/	CAB/	AGDP	CPI	FDI	SMR
		GDP	GDP				
Min/Max	max	max	Max	Max	Min	max	Max
Туре	5	3	4	3	4	5	5
Weight	10	7	7	7	7	10	9
ACTIONS 2015	5						
ALB	11.4	27.189	-10.72	2.80	111.4	-0.91	-
BIH	16.2	33.904	-5.70	3.03	103.9	-0.25	-7.40
BGR	50.2	64.107	0.39	3.62	106.6	-1.79	30.30
CRO	48.7	49.378	5.11	1.64	107.4	-0.18	-3.34
CZE	185.2	82.955	0.91	4.54	107.5	1.09	1.63
EST	22.5	79.286	2.20	1.44	111.5	0.19	-3.40
HUN	121.7	90.727	3.24	3.15	111.4	-1.92	-3.82
KSV	6.4	19.435	-9.09	3.92	111.8	-0.32	-
LVA	27.0	58.980	-0.78	2.74	107.6	-0.64	1.04
LTU	41.2	76.452	-2.37	1.62	107.6	-0.80	14.15
MKD	10.1	48.525	-2.02	3.67	109.7	-0,23	-
MNE	4.0	42.775	-13.36	3.15	111.0	-0.69	12,92
POL	477.1	49.551	-0.61	3.94	108.1	-9.82	-0.14
ROM	177.9	41.094	-1.18	3.66	114.2	-3.29	18.10
SRB	37.2	46.674	-4.71	0.76	133.0	-2.00	14.78
SVK	87.3	93.488	0.22	3.83	108.7	0.01	10.57
SVN	42.8	77.936	5.18	2.32	106.0	-1,37	23.27

Source: World Bank (2016) and according to authors' analysis.

Table 5. Types and Weights of Economic-financial Indicators and Democracy Score in 2015

CRITERIA '15	C0	C8	C9	C10	C11	C12	C13	C14
Name	DS	LE	GDP	EGS/	CAB/	AGDP	CPI	FDI
				GDP	GDP			
Min/Max	Min	Max	Max	Max	Min	max	Min	Max
Туре	5	4	5	3	4	3	4	5
*** * * .	25	(	21	(	0	6	6	21

Source: According to authors' analysis.

CRITERIA '15	C8	C9	C10	C11	C12	C13	C14
Name	LE	GDP	EGS/	CAB/	AGDP	ICP	FDI
			GDP	GDP			
Min/Max	Max	Max	Max	Min	Max	min	max
Туре	4	5	3	4	3	4	5
Weight	9.5	25	9.5	12	9.5	9.5	25

Source: According to authors' analysis.

Table 7. PROMETHEE II Complete Ranking according to Appropriate Indicators in 2015

All Soci	io-political and Eco inancial Indicators	onomic-	Econom	ic-financial Indica Democracy Score	tors and	Economic-financial Indicate		
RANK	ACTION	PHI	RANK	ACTION	PHI	RANK	ACTION	PHI
1.	CZE	0.29	1.	CZE	0.36	1.	CZE	0.33
2.	SVN	0.27	2.	SVN	0.19	2.	HUN	0.17
3.	SVK	0.19	3.	POL	0.19	3.	SVK	0.17
4.	POL	0.16	4.	SVK	0.18	4.	ROM	0.11
5.	EST	0.11	5.	HUN	0.11	5.	POL	0.11
6.	BGR	0.10	6.	EST	0.11	6.	SVN	0.10
7.	LVA	0.08	7.	LVA	0.08	7.	BGR	0.05
8.	HUN	0.07	8.	ROM	0.06	8.	CRO	-0.02
9.	LTU	0.07	9.	LTU	0.05	9.	EST	-0.03
10.	ROM	0.04	10.	BGR	0.00	10.	MKD	-0.03
11.	CRO	-0.09	11.	CRO	-0.08	11.	LVA	-0.06
12.	MKD	-0.14	12.	MKD	-0.14	12.	LTU	-0.07
13.	MNE	-0.14	13.	BIH	-0.19	13.	BIH	-0.08
14.	SRB	-0.20	14.	MNE	-0.20	14.	MNE	-0.15
15.	BIH	-0.22	15.	ALB	-0.22	15.	ALB	-0.16
16.	ALB	-0.22	16.	SRB	-0.23	16.	KSV	-0.19
17.	KSV	-0.38	17.	KSV	-0.25	17.	SRB	-0.25

Source: Estimated according to the World Bank (2016) and Freedom House data (2016).

#### 5. THE ANALYSIS OF CLASSIFICATION AND RANKING METHODS RESULTS

The PROMETHEE II ranking results are in accordance with the cluster classification results, countries from the same clusters or groups are ranked next to each other. But the order inside groups is rather changed if we compare the actual results with the results from 2005 and 2007 from Tomić-Plazibat et al. (2010) analysis.

The Czech Republic has the constant and convincing primacy, also in previous analyses, but Poland lost the primacy, in all cases. Slovakia and especially Slovenia went forward significantly; Slovenia obviously primarily due to socio-political indicators, and what is interesting, not because of improving socio-political environment – judging according comparison of the values of socio-political indicators in 2007 and 2015, but because of stagnation and/or even regression in socio-political conditions of others. For example, it is obvious how big ballast of worse marks of socio-political criteria Hungary has; from the 8<sup>th</sup> position when all socio-political indicators are included, to the 5<sup>th</sup> position when they are included through democracy score and to the second best position, when they are excluded! The value of democracy score fell down from the value of 2.14 in 2007 to the value of 3.18 in 2015, and continues to fall in 2016. The three criteria: National Democratic Governance, Independent Media and Corruption are evaluated with the worst mark for Hungary, 3.75.

The Baltic countries are always the closest countries to each other in the same cluster for both cluster analyses (Figures 1 and 2) and also following each other on rank lists (Table 7), but always with the certain path: Estonia is the first, then Latvia and then Lithuania. When we compare the actual position of these countries with the rather low position in 2007, we can

conclude that these countries have made an effort in improving economic – financial environment and recovering from the crisis, always keeping socio-political conditions on a high level.

Middle to down part of ranking lists is, beside the Baltic countries, 'reserved' for the South-East European countries. Romania and Bulgaria, always followed by Croatia, are in the same clusters and in the middle of ranking lists. We can see that these countries have much better positions regarding only economic – financial indicators. It is interesting to see if and how the EU membership influenced country risk assessment for Croatia. Unfortunately, we can copy the comment for Croatia from the Tomić-Plazibat et al. (2010) analysis for 2005 and 2007: 'Other Southeast European countries are regularly at the bottom of all rankings. Croatia appears as the leader in this group of countries, especially when only economic-financial indicators are considered. It can be concluded that Croatia still has to achieve European socio-political standards, primarily in judicial framework and corruption, before it rises in the rankings.' It stays completely in the current moment!

From the rest of South-East countries, FYR of Macedonia takes the best position in all cases. Kosovo makes the special cluster in both classifications with the by far lowest values of socio-political indicators, and takes the last position on ranking lists, except the one case, when only economic – financial indicators are considered. There Serbia is situated at the last position, and this attracts our attention: the fact that Serbia is in the negotiating process for EU membership should by itself upgrade the country's position. This applies both to the socio-political and economic-financial parameters. In the sense of socio-political environment, Serbia stays at the almost same level for years (or even regresses), the value of democracy score for 2015 is 3.68. It is on higher level than in the rest of non EU countries, but obviously insufficient as a good basis for serious structural reforms which will enable stable economic conditions and support much faster economic growth.

We can say that the classes and ranks of countries are very similar to those from 2005 and 2007. And, that is not the problem. The problem is that trends of recovering, developing and, in general, going forward, cannot be recognized in most cases. Let us see the values of net flow  $\phi(a) = \phi^+(a) - \phi^-(a)$  of PROMETHEE II ranking for all countries. Namely, as it is known from previous section, the action (country) is better (in the sense of country risk) if the leaving flow  $\phi^+$  is higher, and the entering flow  $\phi^-$  is lower. The higher the net flow the better state the country is in. So, the values of the net flow  $\phi$  are useful not only for positioning of each observed country, but also for showing differences (distances) between countries. From the Table 7, columns 'PHI', we take ranges of net flows: [-0.38, 0.29] for PROMETHEE II complete rankings according to all socio-political and economic-financial indicators, [-0.25,0.36] for PROMETHEE II complete rankings according to economicfinancial indicators and democracy score and [-0.25, 0.33] for PROMETHEE II complete ranking according to only economic-financial indicators. The appropriate intervals for 2007 are: [-0.13, 0.20], [-0.16, 0.39], [-0.20, 0.46]. In the first case where all indicators are considered, not only that there is no improvement, the difference i.e. distance is much higher in 2015 than it was in 2007! Even if we exclude Kosovo as a cluster for itself, still the difference stays as much higher in 2015. In the second case, where economic-financial indicators are taken together with democracy score, the situation is similar. Only in the case when only economic and financial indicators are considered, situation in 2015 is better than in 2007, i.e. there are smaller differences between economies of observed countries.

#### 6. CONCLUSION REMARKS

The paper employs previously introduced and applied methodology, for country risk assessment of seventeen Central, Baltic and South-East European transition countries for 2015. The method combines the multivariate cluster analysis as a classification method and the PROMETHEE multicriteria decision making method as a ranking method, enabling to find position and ranking of each particular country or group of countries. With the method it is possible to follow improvements, stagnations or declines of countries, their mutual differences or similarities regarding groups of criteria or a particular criterion. The criteria were chosen in accordance to their availability and need of comparison of results with the old ones, but the fact that criteria should be on one side filtrated and enriched on the other, together with the revision of their weights – influences, stays.

With the end of 2015 and further, numerous challenges influencing country risk of observed countries (and not only of them) have appeared, putting the assessment of country risk as a necessity.

The results and the analysis of country risk assessment have shown mostly negative trends and even bigger differences among countries than it was in previous analyses.

The Check Republic is keeping the leading position according to all scenarios, while some other countries from the group of Central European transition countries lost their leading or high positions like Poland and especially Hungary, loaded with high decline of socio-political conditions judging to the socio-political criteria values, which, in general, are declining.

In the middle of rank lists are Romania, Bulgaria and Croatia and the Baltic countries, which are surpassed by the first three in the rank list when only economic-financial criteria are considered, although the Baltic countries achieved an obvious improvement in this sense in accordance to 2007, when they took rather low positions. It can be seen that Croatia, despite the EU membership still follows the similar path and takes very similar positions at the rank lists as it was the case in 2007, meaning that there is no serious movement forward and convergence to the leaders of the rankings.

Other countries, all of them Southeast European countries, non EU members, are closest in the clustering process (with the exception of Kosovo which forms the special cluster by itself) and take the bottom of all rank lists, with mostly bigger distances from the top of lists than in previous analyses. Unfortunately, instead of needed huge progress in the sense of socio-political conditions, democratization and full affirmation of human rights, even worse trends are recorded. This represents a serious obstacle for progressing in terms of economic policy, pronouncedly needed in ensuring stable economic conditions and faster economic growth.

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# IS EXPERIENCE OF THE OWNER A DETERMINANT OF SME'S CAPITAL STRUCTURE?

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## ABSTRACT

The purpose of this paper is to test whether the experience of the owner of an SME can affect the capital structure decision-making process. Experience in the market, especially in the same industry, greatly affects company profitability. Through experience in the market, SME owners can develop networking; easily collect the necessary information, as well as information about available financial resources. Hence, the owners of SMEs with 10 or more years of experience will use it more during the capital structure decision-making process. Experience in the market can be seen as experience in managing a small company, "guts" for making good decisions, knowledge about advantages of different sources of finance, or even who on the market (from direct or indirect competitors) should be copied.

In crisis situations, when access to capital is even more restricted, those owner/manager characteristics should be more visible and secure competitive advantage. Overall, prior literature offers mixed results on capital structure decisions during crisis, which opens the question about importance and influence of owners/managers' prior experience in the capital structure decision making process.

A sample of 108 Croatian SMEs from different industries was used to test whether there is a correlation between experience as an important determinant and the capital structure of SMEs. The research has been conducted during a period when the national economy was in constant decline. It is assumed that during this time owners of SMEs will profusely use their knowledge and experience in order to keep their competitive position in the market. Results show that there is no single determinant in the capital structure decision-making process that can be seen as crucial, but also that lack of experience can be crucial for a company's survival.

## 1. INTRODUCTION

From the very first papers (Durand, 1952; Modigliani and Miller, 1958), capital structure has been a topic that attracted a great number of researchers. Looking at the number of different papers covering the topic of capital structure (either trying to develop a model of optimal capital structure or trying to identify determinants of capital structure) and the number of pages devoted to this theme, we haven't made big steps toward the theory of optimal capital structure.

In the last ten years, researchers have shifted their research towards the hypothesis that there is no optimal capital structure that can work for all companies, in every industry and in every business ecosystem. Rather, they support the thinking that capital structure is "*a specific combination of financial leverage and owner's capital that company is using for financing of their activities*",<sup>1</sup> which depends upon a number of different determinants (industry, financial behaviour, macroeconomic conditions, size of the company, etc.). Determinants that can significantly influence capital structure also include macroeconomic conditions, i.e. financial crisis. But, empirical evidence on the impact of financial crisis on SMEs' capital structure is sparse. Campello, Graham and Harvey (2010) find that due to reduction in demand, as well as cash flow, additional funding was perceived costly and difficult. Therefore, debt and equity issuance decreased, while cash holdings increased due to postponement of investments. Iqbal and Kume (2014) concluded that leverage ratios from the pre-crisis level are not significantly different from each other, and that leverage ratios in the post-crisis period returned to the pre-crisis levels.

Prior experience plays, according to Cosh, Cumming and Hughes (2008) an interesting role in determining initial capital structure. Owners with prior start-up experience tend to rely on external equity more than others.

The purpose of this paper is to test whether prior experience of SME owners/managers can affect the capital structure decision-making process. Further investments are postponed during financial crisis, and capital structure will remain constant, which allows analysis of prior experience of building capital structure in the SME sector.

Experience of the owner can ensure better networking, knowledge about the processes, better understanding of industry structure, and be a competitive advantage. Experience can be seen as number of years in the same industry, having guts for the right decision and financial literacy.

Determinants that can influence the decision in the capital structure decision-making process can be observed from different points – financial ones (size of the company, age, profitability, assets, etc.) and non-financial ones (mostly characteristics of the owners that cannot be easily measured). While researchers have profusely tested financial determinants, non-financial ones are scarce.

## 2. CAPITAL STRUCTURE THEORIES IN SMALL AND MEDIUM SIZED COMPANIES

Capital structure theories and most of previous research have been developed on large companies and on developed financial markets. In the 60s and 70s of the last century, big

<sup>&</sup>lt;sup>1</sup>Ross, S.A., Westerfield, R.W., Jordan, B.D., (2001): Essentials of Corporate Finance, III. edition, McGraw – Hill/Irwin, New York

companies have dominated the market and all the researchers were focused on them. But, in the period from 1972 to 1988,<sup>2</sup> the number of small and medium-sized companies rapidly grew, and researchers started to test the generated theories about capital structures of small companies. Ang (1991) concluded that small and medium-sized companies use different sources of capital and that their sources of finance are strongly connected with the firm's life-cycle. Also, small and medium-sized companies are affected more by the organizational form and "*small businesses may use debt for various purposes not related to the capital structure decision*".<sup>3</sup>

Other researchers, like Gibson (1992) continued the research on capital structure in small and medium-sized companies. Gibson proved that only the theory of asymmetric information can be applied to small companies, while other theories are not applicable. Sherr et al. (1993), Rob and Robinson (2012), Mateev et al. (2013) concluded that the agency theory can also be applied to small and medium-sized companies, but there are limitations that are connected with special characteristics of small companies.

Since all the known capital structure theories could not provide an explanation for the structure of capital in small companies, it becomes evident that we do not know enough about the topic and that conclusions can be reached only if we dig deeper.

In order to find the "missing piece of the puzzle", it was necessary to detect and analyse all the determinants that can influence the process of capital structure decision-making in small companies. Myers (1984) is among the first researchers who introduced financial behaviour, as an important predictor of the capital structure in small companies. Other studies (Norton, 1991; Chaganti et al., 1995; Mizruchi et al., 2001; Manolova et al., 2006; Le et al., 2006; Huimin et al., 2008) continued to follow the search for the "soft" predictors or determinants. They have found that decision-making process on capital structure in small companies depends heavily on owner's risk propensity, control, goals, age of the owner-manager, as well as their experience. They have combined knowledge from management and psychology – the strategic choice and theory of reasoned actions. Guler (2007) claimed that organizational decision makers are typically experts in their fields and therefore are able to tap into their previous experience to avoid repeated decision errors. Matthews et al. (1994) concluded that capital structure decisions are a result of systematic analyses of the situation (rational) combined with the unique experiences of the decision maker (intuitive). The determinants that they have found crucial in the capital structure decision-making process are: need for control, risk propensity, experience, social norms, and personal net worth. Those characteristics shape owners/mangers beliefs about debt and attitudes towards debt. According to Matthews et al. (1994) "one must assume that positive past experience with the use of debt would lead to a positive attitude toward debt."4

Berger and Udell (1998) offered a theory that firm's life-cycle will have a big impact on the decision about the capital structure in a small company. These two authors presented their research results in which they proved that small companies do not have access to all sources of finance and that this access depends on the development of the business ecosystem, mainly development of the financial market, but also on the life-cycle of the company. Start-up

<sup>&</sup>lt;sup>2</sup>Commission of the European Communities (2003): Green Paper; Entrepreneurship in Europe, ec.europa/investin-research/pdf/download\_en/entrepreneurship\_europe.pdf [Accessed 3.01.2017.]

<sup>&</sup>lt;sup>3</sup>Ang, J.S., (1991): Small Business Uniqueness and the Theory of Financial Management, Journal of Small Business Finance, 1 (3), p.10

<sup>&</sup>lt;sup>4</sup> Matthews, C.H., Vasudevan, D.P., Barton, S.L., Apana, R. (1994): Capital Structure Decision Making in Privately Held Firms: Beyond the Finance Paradigm, Family Business Review, 7 (4), p. 364.

companies do not have accumulated profit, so they may become excessively dependent on short-term debt, where they are carefully monitored by creditors (Myers, 1977; Serrasqueiro and Nunes, 2011). While growing, small companies may end up in a vicious circle of constant debt adjustment toward a target debt level (Serrasqueiro and Nunes, 2011). In the later stages of the life-cycle, small companies could rely more on reputation (Diamond, 1989), credibility and tangible assets (Berger and Udell, 1998). Business results and data from financial reports can minimize the information asymmetry problems, but also help creditors to better understand the company and the owner's goals.

Researching the determinants of small companies in Central and Eastern Europe, Mateev et al. (2013), concluded that older companies have more accumulated internal funds and that they use less external funding. But, with past financial results and reputation that they gained on the market, they tend to demonstrate similar behaviour as large companies. Their results proved once more that reputation is an extremely important determinant of capital structure in small companies.

In underdeveloped financial markets, especially those that are bank-oriented, small companies tend to become addicted to bank loans to finance their investment opportunities. In this situation, it is crucial to minimize information asymmetry problems and agency costs. The greater the number of years a small company operates on the market the more it can contribute to the reduction of these problems and costs.

Reputation can be twofold. It can be observed from the financial and business results of the small company, but since these results depend largely on the owner-manager's values and choices<sup>5</sup>, it can also be seen through networking that the owner has built over the years of managing the company. Time is a crucial variable for reputation building, and therefore, companies that are older (present in the market for a longer time) with owners that have more experience, should have less problems in obtaining external sources of finance – bank loans, and their leverage should be higher.

Having in mind that business ecosystem is extremely important for small companies, companies with higher reputation should have less problems in obtaining external sources of finance (Mizruchi and Stearns, 2001), although operating in an underdeveloped financial market (such as the Croatian financial market).

Through years of managing the company, owner-managers of small companies will develop a bigger network of people that can be used as a source of important information about the available sources of finance and their advantages and disadvantages. So, in the process of capital structure decision-making they will rely on their network and all the advice and information that they can get. Owner-managers that have bigger networks will use more advice from different people in the network and therefore have higher leverage. Also, experience in the industry and in managing a business will extremely influence their financial results (Bazerman, 1999), but also their choices while arranging capital structure in their companies.

<sup>&</sup>lt;sup>5</sup>Norton, E., (1991): Capital Structure and Small Firms Growth, Journal of Small Business Finance, 1 (2), pp. 161-177

## **3. RESEARCH DESIGN**

For the purpose of finding a correlation between the experience of the owner-manager of a small company, through which company can build a reputation on the market and secure access to external sources of finance, a survey was conducted on 108 Croatian small and medium-sized companies. The financial data from the companies in the survey were collected through the database of financial reports, which is maintained by the Croatian Financial Agency (FINA).

The sample in the research was occasional, with response rate of 20.05%.

Companies in the sample were registered as limited liability companies, and were present on the market for more than 1 year. The survey covered the whole Croatia and all industries, excluding only those that were registered for financial activities. The majority of the companies in the sample was registered in the period between 1996 and 2007, 80% of the companies. Looking at their presence on the market, 42% of the companies were present only on the local market, 46% were present on the regional market and 44% covered the national (Croatian) market with their activities. Only 22% of the companies had exporting activities.

Majority of the companies in the sample (58.3%) had less than 10 employees and 38% of the companies in the sample used help from family members on everyday basis, either in running the business or in finishing products or services. Small and medium-sized companies in the sample were mostly dealing with services (40.7%). Other companies were involved in the manufacturing industry (33.3%), construction and building (4.6%), trade (18.5%) and other (2.8%).

The survey was conducted in the period from February to November 2011 for the purposes of a doctoral dissertation. During this period, Croatia was going through a recession, which reduced activities of companies in the sample, but also limited the availability of sources and amount of external financing. In this period, tangible assets, credibility and reputation were even more important in order to get necessary financing.

Analysing the demographic characteristics of the owners of companies in the sample, 37.5% of owners were between 40 and 50 years of age and only 5.8% of them were under the age of 30. Experience of owners in the sample is shown in Table 1.

Experience of the owner-manager in running the business	Frequency	%
Without experience	10	9.5
Less than 5 years	15	14.3
5 to 10 years	21	20.0
10 and more years	59	56.2
Total	105	100
No answer	3	

Table 1. Number of years of SME owners experience in running the business

Source: Delić, A., (2012): Determinants of capital structure in SMEs in capital structure decision-making process on underdeveloped financial market of Croatia, doctoral dissertation

Asking the owners about the importance of experience for capital structure decision-making process, 58.7% responded that experience is very important. For financing their investment activities, they mostly used internal sources (84%) and bank loans (69%), and those results are in line with previous research (Serrasqueiro and Nunes, 2011). Companies that were using

external sourcing of finance were doing so very often (13%), often (10.9%) and from time to time (32.6%).

Respondents were also asked about the importance of determinants for capital structure decisions in their companies: experience in managing the business, good feeling (guts) about decisions, financial literacy, copying competition, advice from accountants and advice from bankers, in order to understand which determinants the owners of small companies find important in the capital structure decision-making process.

In the capital structure decision-making process, the owners of companies in the sample were using advice from family members (44.3%), accountants (39.6%), bankers (29.2%), and other entrepreneurs (32.1%). Looking at the frequency of using advice, the owners of companies in the sample very often used advice from family members (28.8%) and from accountants (14.1%). Advice from others was used only occasionally.

Levin's test was used to find a correlation between experience and owners' network. Correlation test was used to test the importance of experience in the capital structure decision-making process.

## 4. **RESULTS**

Croatian financial market can be described as really shallow, with very small options of external sources of finance. The business eco-system is described as complex with lots of barriers that haven't changed for a long time (Delić, 2016).

Previous research showed that in a complex business eco-system, especially one characterized by an underdeveloped financial market, age of the company, as well as networking activities of the owner-manager can be a significant determinant in the process of capital structure decision-making.

Capital structure theories, developed on the basis of results from large companies, usually operating in developed financial markets, could not provide an explanation for the optimal capital structure puzzle. So, the search for determinants that could bring us one step closer to the explanation of how owners of small companies are making capital structure decisions, continued.

This paper focuses on experience of the owner in running the business. Previous research showed that through years of operating companies can gain reputation, credibility and enough tangible assets to act like large companies.

Table 2 shows the results for variable experience of the owner as a crucial determinant in the process of capital structure decision-making in small companies.

 Table 2. Results for experience as a determinant of capital structure in small companies

	Crucial for capital structure decision- making in small companies
Experience of the	r = 0.010
owner in the industry	p = 0.917

Correlation between experience of the owner and decisions about capital structure in small companies has not been found.

Since experience can be connected with other variables – feeling for the right decision (guts), financial literacy, copying the competition, advice from accountant or banker, it was necessary to examine the correlation between other variables and the process of capital structure decision-making.

*Table 3. Group statistics for determinants crucial in the capital structure decision-making process in small companies* 

Dotorminante aruaial f	or N	Moon	Standard	Standard arror
Deter minants cruciar i		Ivican	Stanuaru	Stanuaru error
capital structure decisi	on-		deviation	
making				
Experience of the owner	r in running the busine	SS		
No	43	3.09	1.042	0.159
Yes	58	3.31	1.030	0.135
Having guts for the righ	t decision			
No	69	3.25	1.035	0.125
Yes	32	3.16	1.051	0.186
Financial literacy				
No	54	3.30	0.964	0.131
Yes	47	3.13	1.115	0.163
Copying the competition	1			
No	83	3.19	1.076	0.118
Yes	18	3.33	0.840	0.198
Advice from accountant				
No	71	3.25	1.038	0.123
Yes	30	3.13	1.042	0.190
Advice from bankers				
No	86	3.24	1.040	0.112
Yes	15	3.07	1.033	0.267
Something else				
No	99	3.21	1.043	0.105
Yes	2	3.50	1.707	0.500

Crusial		Levin's test		t-test for equality of arithmetic means						
determinant		F	Sign	т	df	Sign	Mean	Standard	95% confid	ence interval
ucterminant		ľ	Sign	1	ui	Sign	difference	error	Lower	Upper
Experience in	Assumed equality of variances	0.073	0.788	-1.043	99	0.299	-0.217	0.208	-0.631	0.196
running the business	Non-assumed equality of variances			-1.042	90	0.300	-0.217	0.209	-0.632	0.197
"Good feeling"	Assumed equality of variances	0.201	0.655	0.405	99	0.686	0.090	0.222	-0.351	0.531
decision	Non-assumed equality of variances			0.403	59.6	0.688	0.090	0.224	-0.357	0.538
Knowing the advantages and	Assumed equality of variances	2.238	0.138	0.815	99	0.417	0.169	0.207	-0.242	0.579
advantages and disadvantages of sources of financing	Non-assumed equality of variances			0.807	91.6	0.422	0.169	0.209	-0.246	0.584
Observing the	Assumed equality of variances	1.539	0.210	-0.520	99	0.604	-0.141	0.270	-0.677	0.396
competitors	Non-assumed equality of variances			-0.610	30.4	0.547	-0.141	0.231	-0.611	0.330
Advice from bankers	Assumed equality of variances	0.285	0.595	0.531	99	0.597	0.120	0.226	-0.329	0.569
Advice from balkers	Non-assumed equality of variances			0.530	54.5	0.598	0.120	0.227	-0.334	0.574
Something else	Assumed equality of variances	0.003	0.959	0.611	99	0.543	0.178	0.291	-0.399	0.754
Something else	Non-assumed equality of variances			0.614	19.3	0.547	0.178	0.289	-0.427	0.782

Table 4. Independent test of the sample for determinants crucial in the capital structure decision-making process in small and medium-sized companies

No correlation has been found between any of the proposed determinants. Owners of small companies were using advice from bankers and accountants, they claimed that the experience on the market and in running the business is extremely important, but neither of the proposed determinants seems to be crucial for the process of capital structure decision-making.

An explanation for these results can be find in the influence of the market and the business eco-system. In a bank-oriented financial market, agency problems and information asymmetry problems are higher and owners of small companies will, in order to minimize these high costs, follow the pecking order theory, i.e. tend to finance their investment projects primarily through internally accumulated funds.

Similar results have been obtained through research conducted by Colombato and Melnik (2008), Miettinen and Virtanen (2013) and Scherr et al. (1993). They have proven that age is not a significant variable for capital structure in small companies. There are several reasons because of which they have obtained these results. Their research was implemented on young firms that did not have enough time to build reputation and credibility. Secondly, they tried to measure significance of the age of small companies by connecting age with the level of companies' leverage, neglecting the influence of the pecking order theory. Thirdly, the availability of sources of finance differs extremely on different financial markets. And finally, although financial crisis stopped the growth processes and there were no changes in capital structure, it also affected the opinions and responses of owners/managers.

Contrary to these authors, Ang (1991), Serrasquieiro and Nunes (2011) and Mateev et al. (2013) proved that age is a significant factor of capital structure in small companies. These researchers take into consideration limitations that are coming from operating on different financial markets, but also that small companies in different stages of life-cycle need different sources of finance.

Croatian small and medium-sized companies operate in an underdeveloped financial market that is also bank-oriented and have other barriers, which makes their business eco-system very complex. Problems connected to information asymmetry and agency costs are a big obstacle and owners of small companies rather postpone their activities or follow the pecking order theory.

Research in this paper has been conducted during a period of constant economic decline, which additionally reduced the offer of external sources of finance on Croatian market. Majority of activities were postponed or abandoned during this period, which influenced results of this research.

## 5. CONCLUSION

Experience of the owners of small companies in running their businesses or knowing the industry could be an important determinant in the process of capital structure decision-making. In the research that was conducted on Croatian small and medium-sized companies, there was no correlation between the experience of owners and the capital structure of their companies. Although there are studies that have proven a connection between age of the company (experience of the owner) and capital structure, owners of Croatian small companies claim that their experience is not crucial for making capital structure decisions in their companies. On the financial market where the sources of finance are limited to bank credits and incentives from the state, capital structure determinants may differ from those proven in developed financial markets. In such a complex business eco-system, owners can rely only on

their internally accumulated resources. This raises the concern that credit conditions at the time of the survey were unique and results are specific for this type of market in a specific timeframe.

In the capital structure decision-making process in small and medium-sized companies, determinants should minimize agency costs, as well as the problem of information asymmetry. Age, experience and networking are important, but not crucial for capital structure decision-making in small companies. Determinants and predictors of capital structure are strongly connected with the market and conditions in the market. Since the research was conducted during a period of recession, it is possible that influence of economic decline and limited offer of sources of finance available on the market hindered further borrowing.

One of the most important conclusions from this research is that macroeconomic conditions are changing the capital structure decision-making process and that this determinant should be among the most important and crucial predictors of capital structure in small and medium-sized companies.

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## ANALYSIS OF PUBLIC OPINION ON AUTONOMOUS VEHICLES

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#### ABSTRACT

Autonomous vehicle is a technology of vehicles programed to be able to drive by itself without human interactions. Due to revolutionary idea, public opinion on this topic is highly important. Therefore, this paper focuses on public opinion on autonomous vehicles. Questionnaire for evaluation public opinion was constructed with integration of different questions related with most important issues identified throughout literature review on autonomous vehicles. Paper is focused on public opinion on autonomous vehicles in Slovenia. Results were cross-compared with research of Schoettle and Sivak from 2014 made for China, Japan, India, UK and USA. Results have shown that even if Slovenian survey was carried out 2 years after Schoettle and Sivak survey, share of those who knew autonomous vehicles was smaller in Slovenia. Less people was interested in purchasing autonomous vehicle in the future as well as less prepared to pay extra for autonomous vehicle feature. We concluded that public opinion on autonomous vehicles in Slovenia is more negative than in other compared countries.

#### 1. INTRODUCTION

Idea of vehicle driving itself without human cooperation where all functions of a car are managed by a computer is already almost 100 years old since first short article about it was published almost 100 years ago in Scientific America journal (Biba, 2016). Even if the idea is not new, use of autonomous vehicles (AV) are still not in use massively. It is forecasted that by 2035 approximately 45 million AV will be in use and by 2050 AV will replace all man controlled vehicles (Cohen, 2015).

AV are vehicles with special technology, programed to be able to control and manage a vehicle by itslf without active human interaction and cooperation (Terwilleger, 2015). The idea is that computer is more reliable as human can be because it does not make mistakes, therefore positive consequences of AV integration should be less traffic accidents, less traffic jams, improved fuel economy, fever parking spaces will be needed allowing more green spaces and increased mobility of those who are unable to drive a conventional vehicle (Fagnant & Kockelman, 2015).

Future of AV and their integration with existing road infrastructure is related with three important factors. First is legislation that can allow AV or forbid them. AV is currently allowed only in some states of USA - Florida, California, Michingan and Nevada (Terwilleger, 2015). Slovenia must be consistent and in accordance with the EU legislation (European Justice, 2014) therefore the EU must be the first institution that allow AV. Second factor for efficient integration of AV is road infrastructure that must be adjusted to AV. Slovenian existing road infrastructure currently does not allow safe driving with AV (as well as other infrastructures across the EU) especially due to dilapidation and deterioration of some roads. The last but not least is public opinion on AV and decision of each individual to buy or to be interested in buying AV. It is believed that public opinion is extremely important factor because if people do not trust AV technology and if they do not know it they will not use AV, therefore even perfect infrastructure and legislation that is up to date with new technology would be meaningless.

Casley, Jardim in Quartulli (2013) found out that people fear especially what would happen if AV would malfunction. Nonetheless public still believes that AV use would increase safety and reduce tension and tiredness as a result of driving. Research on Insurance.com (2014) also revealed that approximately one third would never consider AV as an alternative to conventional vehicles. The main reason for this is that most of them evaluate that they are better drivers as a computer system in AV could be. Schoettle and Sivak (2014) made a survey about AV in six distant countries. This survey was used also for cross comparison with our survey data. Contrary to other researches carried out before 2013 they found out that almost one third is very interested in AV. It might be that public opinion on AV is improving with more news spread about AV and more car manufacturers dealing with AV.

Terwilleger made interested findings in 2015 based on research carried out in 109 countries. Research revealed that there is strong correlation between personal income and willingness to buy new car. Hsu (2016) on the other hand found out that 75 % of respondents in American survey is afraid of AV because of technology systems integrated in them. Main findings of research carried out on MIT are that younger generation is more susceptible for AV use and integration and that they are also prepared to pay extra for AV technology, contrary to older generation that is not prepared to pay additional fee for AV. It was also found out that when considering AV as an possibility for future purchase, trusting car manufacturers that produce these AV is also very important (Abraham et al., 2016).

In this paper results on public opinion on AV, knowing AV in general public, willingness to buy and pay extra for AV and factors that influence development, commercialisation and integration of AV in Slovenia are presented. In addition, these results were cross compared with data on AV gathered in India, China, Japan, Australia, UK and USA to get better picture on public opinion on AV in Slovenia compared to other countries. Hypothesis was that public opinion on AV in Slovenia is in general more negative (lower grade) than in other countries compared.

## 2. METODOLOGY

Research on public opinion on AV was carried out with questionnaire with 26 questions. 22 of them were closed and 4 of them were open type questions. For closed type questions Likert scale was used. Respondents were selected using the nonprobability sampling technique among population older than 18 years old (e.g. potential drivers). Questionnaire was carried out on the web and in classical form. For web questionnaire QuestionPro platform was used. With classical questionnaires opinion on AV were collected also from older population that is not using computer and web based tools as frequently as younger generation. 549 questionnaires were answered. Research was carried out from March 2016 until June 2016. When designing questions for this survey questionnaire of Schoettle and Sivak (2014) who carried out similar research in six different countries was used and modified to achieve possibility of more objective cross comparison afterwards. Collected data were statistically processed in SPSS software and descriptive statistics was used for its analysis. Analysed results are also discussed to propose possible reasons for data distribution. Some of the most interesting results are also graphically presented.

Research structure can be divided on three partially divided parts (demography, vehicle ownership and acceptance and the most important par on AV). When designing demographical part different demographical characteristics that were estimated to be important for segmentation of results on AV were included. Questions on vehicle ownership, current vehicle features and acceptance were included because it was believed that opinion on AV can differ between different car owners and between car owners on cars from different classes. Third and most important part was related on AV acceptance, public opinion and willingness to purchase AV as well as to evaluate activities people would carry out when driving with AV as well as to identify reasons for and against AV integration. This paper focuses especially on knowing AV and comparing general knowing and acceptance of AV in Slovenia with other countries. Detailed results on activities people would carry out when driving with AV, willingness to buy and pay for AV as well as to identify reasons for and against AV integration along with analysis of specific differences between different demographic segments will be published separately in the future. Those respondents who never heard of AV (95 respondents) were excluded from the analysis made in the third part of the survey. Results of this research were also cross-compared with results of Schoettle and Sivak (2014) who analysed public opinion on AV in USA, UK, Australia, China, India and Japan.

## 3. RESULTS

Results on public opinion on AV in Slovenia are presented analysed and discussed hereafter. Where possible, Slovenian data are compared with data from foreign countries such as Japan, India, China, Australia, UK and USA, gatherd by Schoettle and Sivak (2014).

## 3.1. Demography

Figure 1: Number of respondents by countries



Source: Schoettle & Sivak, 2014 and own results

549 respondents cooperated in this survey on public opinion on AV in Slovenia. Similar number of respondents were identified also in other compared countries. The highest number of respondents were in China and the smallest in the USA. In all countries included in this paper the number of respondents is between 500 and 610. 5 % more men than women cooperated in Slovenian survey. According to survey topic – AV – that are subject of technic and technology this was expected since the topic is more interested for men. Most respondents (over 86 % of them) were in the age group between 19 and 59 years old. This segment was also the most interesting for this survey and was carefully chosen since members of this segment are participating in traffic as car drivers or car users and are relevant for public opinion on new technologies such as AV. In Slovenia driving license for individual driving can be obtained with 18 years of age and 16 years of age for driving with a supervisor. Majority of respondents (over 90 %) responded that they have a valid driving license. Only less than 10 % of respondents did not have a driving licence.

Almost half of respondents in Slovenian survey were employed. Segment of employed respondents were followed by students, retirees, unemployed and self-employed. 82.9 % respondents have net annual income below 20.000  $\in$ , followed by group with net annual income between 20.000 and 30.000  $\in$  (12.4 %), group with income between 30.000 and 40.000  $\in$  (1.5 %) and 3.3 % have annual net income above 40.000  $\in$ . This was examined since net income of individual is usually correlated with status of employment which affect the possibility of purchasing a vehicle in the future.

#### 3.2. Ownership, use and types of respondent's personal vehicles

It was assumed that public opinion on AV can vary between car owners/users and those that do not use own and use personal vehicles. Slovenia has surprisingly the highest share of respondents who own personal vehicle. This is in accordance with data from national statistic as well. Analysis revealed that there are differences between car owner and non-owners, between men and women as well as between different age groups and different income segments. Among those that own personal vehicles most of them are senior men with higher income.

Most respondents in Slovenian survey drives cars from class A and B (mini and small cars – 29.8 %), class C (lower middle class cars – 33.1 %) or class D (higher middle class cars – 23.2 %). Only minority of them have class S cars (large limousine – 1.2 %). Among owners of cars with lower price there are mostly respondents with lower income, women and younger respondents. Employed respondents own more class E and F cars (high and luxury class). Almost half of Slovenian respondents drive a car that is worth up to 5,000  $\in$ . Owners of more expensive cars are usually men.

When reviewing literature and analysing results from this survey it was revealed that public perception on AV is significantly dependent also from systems for partially autonomous driving in currently owned/used vehicle. More than half of respondents do not have any system integrated in their current vehicle that could be related with autonomous driving. 40 % of them already have integrated cruise control, 13.5 % have active parking systems and sensors, 12.9 % have systems for maintaining driving lane, 7.4 % have systems for accident prevention with pedestrian detection systems and 1.2 % of them already have integrated systems for detection of traffic signs and signalisation.

## 3.3. Knowledge and perception of autonomous vehicles

On Figure 2 average knowledge and awareness of AV in 8 different countries is presented. In average 70.3 % of respondents already have some knowledge and awareness about AV before cooperating in the survey which is evaluated to be relatively high percent.



Figure 2: Recognition (awareness and knowledge) of autonomous vehicles by countries

Source: Schoettle & Sivak, 2014 (China, India, USA, UK, Australia and Japan); own source (Slovenia and average)

As seen on Figure 2 the highest share of respondents have already heard about and knew AV in China (87 %) followed by Slovenia, India and USA which are above the average (70.3 %). Share in Slovenia might be high also because the survey in Slovenia was carried out in 2016 and in other countries in 2014 when AV were not so frequently addressed my professional and general media. When analysing data, correlation between sex and age of respondents on their opinion on AV was identified. More men know AV than women what was expected. However, surprising was that older respondents know AV in greater extent and are more familiar with AV technology than younger generation (younger than 29 years of age). 46.8 % of respondents in age group up to 29 years of age evaluated their knowledge and recognition of AV with grade 1 (do not know anything about AV) or grade 2 (have heard of AV but do not know them well) od Likert scale from 1 to 4.

In average 42.1 % of female respondents evaluated their knowledge and recognition of AV with grade 1(never heard of AV) and only 7.3 % of male respondents. On the other hand, 77.8 % of male respondents and 22.0 % of female respondents evaluated their knowledge and recognition of AV as good (graded with grade 3 or grade 4)

In table average public opinion on AV in Slovenia and in other comparing countries is presented as well as shares of answers by particular grades.

	Very positive	Positive	Neutral	Negative	Very negative	Average value
China	49.8	37.4	9.8	2.3	0.7	4.3
India	45.9	38.3	12.5	3.0	0.2	4.3
Japan	10.1	32.8	50.3	6.2	0.7	3.6
USA	22.0	34.3	27.3	12.4	4.0	3.6
UK	13.9	38.3	34.2	11.2	2.5	3.5
Australia	16.2	45.7	26.7	8.3	3.0	3.5
Slovenia	10.3	33.5	38.0	12.4	5.8	3.3

Table 1. Comparison of public opinion and perception on autonomous vehicles by countries

Source: Schoettle & Sivak, 2014 (China, India, USA, UK, Australia and Japan); own source (Slovenia and average)

Even though general recognition and knowledge of AV is relatively high in Slovenia as presented on Figure 2 (and higher as in most other comparing countries except China), results in Table 1 revealed that general opinion on AV in Slovenia is much less positive and is in average the lowest among all studied countries. Average level of understanding of studied topic could vary due to many factors such as demographics, availability of data, media coverage of AV etc. The highest share of all respondents by all studied countries (5.8 %) answered that they have very negative opinion on AV. It is assumed that news about fatal accident of Tesla car testing AV might influence such distribution of evaluations which was released during the study. AV are one of the emerging technologies and can receive distrust of public when launched on a global market and public opinion can be changed significantly on the basis of positive or negative daily news. It can be assumed that there is also relation of GDP and opinion on AV. Probably respondents from countries with higher GDP and consequently higher income should have more positive opinion on AV because they could afford it more easily. However, these relations were not further investigated and could be studied independently.

Results of Slovenian survey revealed that there is significant correlation between knowing AV and opinion about AV. Those who have better knowledge of AV also have more positive general opinion on AV. This is normal since not knowing something is always related with

fear and mistrust. On the other hand, data analysis also showed that respondents from countries with more positive general opinion on AV (China, India, USA) are also more concerned about AV integration because they aware their pros and cons. According to comparative analysis between studied countries it can be concluded that more positive opinion on AV also means greater concern on factors related with AV.

It was also studied what is the opinion of cooperating public about integration of AV on Slovenian roads. Over 60 % of them evaluates that AV will be implemented but its implementation and commercialisation will take more than 10 years. Approximately 15 % of them believe that AV will never take the leading position among transport technologies on Slovenian roads. Approximately the same percent of respondents believe that conventional vehicles will have advantage vs. AV. Main reasons for such believe were also investigated. Most mentioned among them were: possible high price of AV technology; joy of driving and controlling a car by yourself; greater confidence in people than in AV technology performance and algorithms; bad conditions of Slovenian road infrastructure; risk of intrusion in AV software and possible legislation violations or interpretation in case of accidents. Only 7.7 % of respondents is convinced that AV will be commercialized and implemented on Slovenian roads within the next 10 years (up to 2026). All participants that have positive opinion on AV are also convinced that AV will take the lead and contrary those that have negative opinion on AV believe that leading role will always be reserved for conventional vehicles driven and managed by a man. Female respondents are more convinced that AV will take the lead than male respondents. It was also examined where will AV be implemented first. Respondents believe that AV will be first implemented within large close systems such as large factories, airports etc. followed by public transportation (taxis and buses) and military units. Personal transportation was evaluated low and was on ranked on fourth place that means that public opinion is that AV will be integrated in public transportation after all other transportation modes.

Share of respondents prepared to purchase AV is in most of studied countries in correlation with average values of public opinion on AV. Most of respondents is ready to buy AV in the future in China (which also have the most positive opinion on AV), followed by India with 1 % smaller share of respondents prepared to buy AV in the future (second best opinion on AV). Slovenia is ranked as the country with the smallest share of respondents willing to purchase AV in the near future which is consistent with the average grade of public opinion on AV which is the lowest. As mentioned before this was surprising since Slovenian survey was performed 2 years after surveys in the other comparing countries therefore we expected better public opinion on AV and more willingness to buy AV in the near future Again media attention on death accident of Tesla AV testing can be one reason for that.

When analysing Slovenian data correlation with knowing and recognition of AV was identified. Higher the knowledge and recognition of AV is, higher is the willingness for purchasing AV in the near future. Main reasons for interest in AV is more relaxing drive, being relaxed when reaching destination and time to attend other activities than driving (reading, working, phone calls etc.) as well as increased traffic safety.

According to the relatively low average public opinion on AV in Slovenia it was expected that there would also be high share of respondents who would not be willing to sit and drive with AV managed by a computer. However, comparison with other countries revealed that this is not necessary right. The highest share of respondents who would not be willing to sit in the AV and drive with it was identified in Japan and the smallest in China (as expected according to average grades). Very small share of people cooperating in Slovenian survey also stated that they would be watching the road and follow the driving of AV. This share was significantly lower than in other compared countries. Most of respondents would be watching the road and follow the driving in UK and the least in India however the share in India is still for 23,5 % higher than in Slovenia. That could mean that people in Slovenia are not that freighted of AV and concerned about their safety features after all.

When analysing data differences between male and female population was identified here as well. Men answered most often that they would follow the driving of AV and would watch the road. On the second place it was reading, followed by working. Women on the other hand identified reading as most frequent activity to be carried out when driving with AV, followed by watching the and working on computer. Men were also more concerned about what could go wrong than women. Differences occur also between different age groups. Younger respondents would spend more time for sleeping and resting as well as communicating with smart phones and older respondents would watch the road and follow the driving. It was also revealed that respondents who are using newer and better cars with more already integrated systems for partially autonomous driving (cruise control, lain maintaining system etc.) are less concerned about possible negative consequences that those who drive older cars.

Research also examined how much extra money would respondents from Slovenia be willing to pay for completely AV. It was found out that in general respondents are not willing to pay much extra for AV. In average men are more willing to pay extras for AV. It is also surprising that respondents with lower annual net income are slightly more willing to pay something extra for AV. One reason for this might be that those respondents with higher income already pay extra money for current technology and current systems allowing partially autonomous driving.

Detailed study on activities people would carry out when driving with AV, willingness to buy and pay for AV as well as to identify reasons for and against AV integration along with analysis of specific differences between different demographic segments is suggested to be studied and published separately in the future.

## 4. **DISCUSION**

It was found out that Slovenia is not yet fully prepared on integration and commercialisation of AV since it has obstacles in legislation, on road infrastructure development and in low average public evaluation of AV acceptability.

Probably the most important obstacle for the beginning of integration of AV is identified in legislation on road transportation. In most of the EU Member States road transport legislation is based on Geneva Convention from 1949 and legislation from 1968, that both require complete control over the vehicle from the person driving the vehicle (Miklavc, 2015). Slovenian legislation is based on the same foundations. However, the idea of AV is completely contrary to such legislation since it enables autonomous driving without human interaction. The idea is to control over the vehicle to electronics, special sensors and software that can response better and faster that human driver under the premise that it is programmed and assembled correctly.

When reviewing four Slovenian laws related with road transportation it was found out that it should be completely changed if AV integration would be implemented. For the beginning »driver« of regular vehicle and »user« of AV should be separated as two different concepts. Both concepts should be integrated in existing Slovenian laws to fulfil the legal requirement

for responsibility of drivers of regular and autonomous vehicles. If AV should replace conventional man driven vehicles only concept of AV would remain as a part of traffic legislation.

Second obstacle was identified within legal interpretation of responsibility as well as personal one for accidents in which AV would be involved. Experts as well as some car manufacturers (e.g. Volvo, Google and Mercedes-Benz) believe that responsibility should be on a site of car manufacturers and AV software producers. However, some car manufacturers disagree. It is also very complicated to determine the penalty for such responsibility since it cannot be related with anyone's freedom as it is now (imprisonment in case of causing traffic accident on purpose, causing traffic accident with injuries or death etc.). Some professional as well as scientific literature appears to be more favourable to the idea that users of AV should take the responsibility, because they chose to purchase and use AV therefore they should also be completely sure about their AV safety features as well as possible interactions with other autonomous and conventional vehicles and traffic accidents. Authors believe that one solution is that responsibility of AV that can be controlled by a person could remain partially on that person but responsibility for any traffic accidents related with AV without e.g. steering wheel, throttle, gas and brake pedals and therefore without possibility to control it by user should not be connected with a user because car manufacturers should not promote and sell AV if it is not completely safe and tested. This solution seems to be the only one where car manufacturer could not avoid complete responsibility for possible accidents.

Third factor is road infrastructure that in Slovenia does not allow integration of AV. The basic framework for AV is many times seen in road markings that should be visible and well maintained. Holes and uneven roads etc. could also represent a problem in this case. Traffic signs should also be considered and well placed to be visible and not even partially covered by trees, bushes or fences. Snow or ice on roads is another problem that must be solved before integration of AV. It can be proposed that road infrastructure monitoring and maintenance should be more often for more efficient integration of AV.

Because the basic idea of AV is to let the control of driving to the computer managed system such vehicles should also be designed differently. That means it should also be considered that AV would not need to be produced from the same components as conventional vehicles (steering wheel, gas and brake pedal etc.) but might have some other components (e.g. TV or bed to relax).

Hypothesis set in this research that »in general more Slovenians have more negative opinion on AV believe as in other compared countries« can be confirmed. Hypothesis can also be confirmed with willingness to buy and use AV in the near future because only 25.4 % of Slovenian respondents is willing to buy AV and average for comparing countries is much higher (approximately 70 %).

For improvement of public opinion on AV authors propose test driving with AV as a good solution for increasing acceptability of AV and willingness for future purchases. Authors believe that general public would gain trust in AV if tested and convince themselves that AV are safe for use. However, AV technology is not yet fully operational and reliable especially in unpredicted situations. Driving a car can always bring unpredicted situations therefore one major task of AV manufacturers will also be to reduce the amount of possible unpredicted situations instead of programing AV for each and every one of them.

#### 5. CONCLUSION

Autonomous driving that means driving in a car without human interaction is becoming highly topical issue and AV technology is developing rapidly. Experts believe that AV will change current conventional vehicles completely in the next 30-35 years. However numerous obstacles exist such as legislation, road infrastructure and public acceptance. In this paper main findings of recognition and knowing of AV in Slovenia is presented as well as public opinion on AV in Slovenia and comparison with public opinion in Japan, China, India, Australia, UK and USA.

Our assumptions that knowing AV technology influences the opinion about AV and willingness to use them was confirmed. Even though relatively high share of participants already heard of AV and know them, not many of them is willing to purchase such a vehicle in the near future. Main reasons for this were identified in joy of driving and controlling a car as well as fear for AV system malfunctions. Hypothesis that general opinion on AV in Slovenia is more negative than in other compared countries was also confirmed even though research in Slovenia was carried out 2 years later than in comparing countries. Slovenia also does not have suitable legislation for AV integration as well as it does not have suitable road infrastructure.

Findings of this research can be of great help to understand general opinion on AV and can influence significantly to AV integration into road transportation. AV could bring new positive features for the society. The biggest advantage is recognized in possible reduction of traffic accidents because AV would be better informed about traffic situations and could be better informed with help of smart infrastructure and also informed in advance. This is useful especially in case of fog, traffic jams or congestion when such vehicles would mean more effective energy use and faster journey. Time spend in AV could also be used more efficiently e.g. for work or relaxation instead of focusing solely on driving. However autonomous driving also has many obstacles that should be examined for AV integration such as safety features in unpredicted situations, legal and personal responsibility for possible accidents etc. Findings of this research could also be upgraded with a new survey on personal responsibility in case of possible accidents with AV and reactions of people using AV, being unable to control AV especially in unpredicted situations and in case of possible accidents. Authors believe that the most notorious issue related with future of AV is the responsibility and reactions of programed algorithms of AV in hypothetic situations when traffic accident could not be avoided and computer reactions will be programed to choose which traffic accident participant will live and who will be killed.

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## THE INFLUENCE OF LEGAL REGULATION ON THE PERCEPTION OF THE ACCOUNTING CAREER - POLISH STUDENTS' OPINION

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#### ABSTRACT

The failure of the communists system in 1989 was the beginning of a new career stage for most accountants in Poland. The accounting profession suddenly became prestigious but also very challenging. In recent years the issue of reliability of accounting has become increasingly important for organizations around the world, due to the worldwide financial crisis. The current economic situation is the reason of asking questions about the role and prestige of accountants in the contemporary world. The determinants of being reputable accountants are also worth investigating. Taking into consideration all the mentioned issues, the authors of the paper are curious about the choices of young people – are they interested in becoming accountants?

This study focuses on the students of the Faculty of Finance and Insurance perspective towards their potential career in accountancy in Poland. The main motivation for authors to investigate this topic was the current situation of accountants in Poland after legal deregulation of the profession. The authors of the paper have stated two goals:

- 1. Analysing and evaluating changes in the accounting profession in the field of the provision of accounting services in Poland,
- 2. Examining the opinion of students of the University of Economics in Katowice of 'Finance and Accounting' course on the consequences of the changes in relation to the prestige of the accounting profession.

The studies have shown that Polish students – contrary to their counterparts from the USA – have a different approach to the certification of accounting profession. They do not perceive the liberalization of the accounting profession in relation to the provision of accounting services as a thread to the profession itself and their career in it. The research results indicate that there is a need for an increased emphasis on the importance of accountability in this profession in the university education of accountants, which is consistent with the results of other studies.

#### 1. INTRODUCTION

The role and significance of the accounting profession is increasing with the growing importance of financial information generated by the accounting system in the business entities. With the expanding scope and use of financial data in the economy, there are new challenges for the accounting profession (Snead & Harell, 1991; Jackling, Cooper, Leung & Dellaportas, 2007). In Poland, since the political and economic transition, the change on a massive scale in the organization, functioning and in the regulatory sphere of accounting system can be observed. These changes entail a reorganization of the accounting units in business entities in terms of the number of employees, tasks assigned to positions and responsibilities to the Management Board. This is accompanied by the process of reducing the operating costs of the accounting in the business entities. At the same time, there has been an increase in the number of employees and have no need for establishing separate accounting units.

For these reasons, a new type of business – provision of accounting services by entities called accounting offices spread on the market. Conducting such entities required from the owners to have special powers regulated by law. One of the requirements was the state exam in accounting. Such an examination could have been obtained individually, it could have been included as part of post-graduate studies with specific competences conferred at the higher education establishment or a person could have graduated from a business school with a degree in accounting. In 2014 within the framework of the deregulation policy of certain professions came into force a new law that abolished the obligation of having formally confirmed rights to provide accounting services. This change means that virtually every person without a criminal record can establish an entity to provide accounting services in Poland. This change fundamentally impacted on the labor market for the accounting profession, on the one hand, facilitating access to the profession for wider circles of people, on the other, retaking primacy in conducting this type of activity from professionally prepared graduates of business schools. Universal access to conducting this type of activity has increased the number of these types of entities and strong competition among them. This, in turn, has influenced the conditions of employment, in particular pay conditions.

This study focuses on the students of the Faculty of Finance and Insurance perspective towards their potential career in accountancy in Poland. The main motivation for authors to investigate that topic was the current situation of accountants in Poland after legal deregulation of this profession. The basis of analysis was the literature and law review in order to indicate the most important changes in the job of accountants. According to some previous studies concerning gender aspects of accounting (Ang, Goh, &Toh 1993; Tan, &Laswad 2006; Hashim, Embong, & Shaari,2012) the authors perceived some possible differences in opinions of male and female students.

The authors of the paper have stated two goals:

- 1. Analyzing and evaluating changes in the accounting profession in the field of the provision of accounting services in Poland,
- 2. Examining the opinion of students of the University of Economics in Katowice of 'Finance and Accounting' course on the consequences of the changes in relation to the prestige of the accounting profession.

The current economic situation is the reason of asking questions about the role and prestige of accountants in the contemporary world. The determinants of being reputable accountants are also worth investigating. Taking into consideration all the mentioned issues, the authors of the paper are curious about the choices of young people – are they interested in being accountants?

#### 2. LITERATURE REVIEW - OPPORTUNITIES FOR ACCOUNTING STUDENTS

Multidisciplinary research regarding accounting students has been conducted in the USA (Nelson, Vendyk, Quirin & Kovar, 2008). The study was carried out by the Federation of Schools of Accountancy (FSA) and was conducted in several stages covering the periods of 1991-1995, 2000 and 2006. The research was aimed at monitoring the demographic trends among the analyzed students, their experiences and preferences, as well as plans for professional certification. The study included undergraduate, graduate, and postgraduate students. In 2000, the survey covered 1,384 students and 1,612 in 2006. According to comparative analyzes, the majority of accounting students are women and their share in the population has increased (55% in 2000 and 57% in 2006). The studies revealed an increase in the number of students who have already decided to continue their professional activity in accounting, although initially while choosing business schools they did not have an intention to pursue a career in accounting profession. Most students pointed to the job availability as the main factor for choosing the education in accounting. Approximately 72% of graduate students indicated that they were encouraged to pursue further education in accounting by good and very good impression in teaching accounting subjects. The vast majority of students said that in the future they would be interested in certification of a profession requiring additional examinations (e.g. CPA exam). Interesting results were obtained by researchers in the case of students' preference for further occupational activity. Among graduate students, the vast majority wanted to work in public accounting (71.8% in 2000 and 73.1% in 2006), while the number of students willing to work in manufacturing decreased (14.1% in 2000 and 12.1 % in 2006).

The subsequent studies conducted on the group of accounting students indicated that they need help in understanding the importance and accountability of the accounting profession in business practice (Violette, Sanders, 2004). The authors postulate the introduction of extracurricular activities to the study program, without which university graduates are not sufficiently prepared to pursue this profession. Students should choose this profession with full awareness of their duties and responsibilities [Allen, 2004]. Results of other studies show that the earnings of highly qualified accountants are rising, and simultaneously, the expectations of the community regarding their competences, ethical attitudes and accountability are also growing. The demand for accountants with PhDs is increasing, as confirmed by the American Accounting Association (Corkern, Parks, Morgan, 2013; Tatikonda, McKnight, 2005). Gibson and Schroeder (1998) emphasize the need to maintain a close association of accounting practitioners with university education. According to the authors, this also applies to the certification of the accounting profession,

## 3. LEGAL REGULATIONS OF PROVIDING ACCOUNTING SERVICES IN POLAND

One of the most intensively developing economic activities in Poland is the maintenance of accounting books, commonly referred to as accounting offices. This type of activity is subject to the freedom of economic activity, and the basic legal act governing accounting activities in

Poland – the Accounting Act (Journal of Laws 2013). Until August 2014, this activity could be performed by:

- entrepreneurs who are natural persons, if they had the appropriate entitlement to perform the actions specified in the Accounting Act,
- other entrepreneurs, but with the provision that the tasks were performed by persons entitled to do so.

Until 2009, the activity of accounting offices was governed by the Regulation of the Minister of Finance of 18 July 2002 on the entitlement of providing accounting services (Journal of Laws 2002). This entitlement was quite liberal. In order to ensure proper standards, an amendment was introduced to the Accounting Act as a chapter on the provision of bookkeeping services (Kiziukiewicz, 2011).

According to it, the activities that make up this service include:

- keeping the accounting records,
- keeping taxation records,
- keeping other taxation records,
- preparing tax returns and declarations,
- preparing financial statements.

Entities that were engaged in this type of activity could use the work of people who did not have the appropriate entitlement. However, a constant and direct supervision of the person holding the qualifications was to be ensured in such a case. In practice, final year master degree students of business schools or graduates of undergraduate studies of this profile, who already had sufficient substantive preparation and, at the same time, did not have the appropriate entitlement, were employed to this end.

The basic entitlement to perform activities falling within the scope of providing accounting services was an accounting certificate issued by the Ministry of Finance.

According to the Accounting Act (Art. 76b) the certificate could be obtained only by persons who fulfilled the following conditions:

- had two-year experience in accounting and at least secondary education, and passed a state examination checking the qualifications of persons applying for a certificate,
- had three-year experience in accounting and Master's degree obtained in accounting or other course in economics with accounting specialization, or other specialization for which the curriculum of studies and training program suited the requirements specified by university's authorities for the accounting major,
- had three-year practical work experience and Master's degree or its equivalent from a study course other than accounting and completed postgraduate studies in accounting in one of authorized organizational units.

The units, i.e. universities, which could conduct such a teaching process had to be included in a special list, according to the Announcement of the Chairman of the Central Commission for Academic Titles and Degrees (Polish Monitor 2002), these organizational units were required to have the right to confer the degree of doctor of economics sciences.

It should be emphasized that the graduates of the University of Economics in Katowice, majoring in Finance and Accounting met the second condition. On the other hand, graduates of postgraduate studies in the fields of accounting fulfilled the third of these conditions. For graduates of the University of Economics in Katowice both full-time and part-time as well as of postgraduate studies in accounting (or similar) specialization, it was important to have a documented internship in accounting in order to obtain a certificate.

From a formal point of view, a person applying for the certificate was required to submit to the Department of Accounting of the Ministry of Finance the following documents:

- application for the issuance of the certificate,
- information from the National Criminal Register of no criminal record,
- documents proving the practical work experience in accounting,
- documents proving formal adequate education,
- a certificate confirming an examination with a positive result.

Such a state of affairs, in the opinion of the authors, guaranteed adequate substantive and practical preparation for providing accounting services.

In the years 2013-2014, the Polish authorities took measures to facilitate access to certain professions for a wider group of citizens. The intention of the government was the abolition of artificially regulated labor market by professional associations. The provision of accounting services was also included in the list of these professions. Passed by the Parliament on 9 May 2014, the Act to facilitate access to perform certain regulated professions, introducing deregulation in the field of certification of accounting, was signed by the President of Poland on 30 May 2014 (Journal of Laws 2014). According to the Deregulation Act, article 76a, paragraph 3 of the Accounting Act, the introduction of new conditions for obtaining the relevant permissions was amended.

According to the novella of the Accounting Act (Art. 76 a, paragraph 3 of the Act, Journal of Laws of 2016, item. 1047) a candidate applying for the appropriate entitlement must meet only two conditions.

The first condition is to have liability insurance. The insurance concerns damage caused in connection with the operation of this type of economic activity. The amount of the minimum guarantee sum contracts liability insurance of accounting offices defined in the Regulation of the Minister of Finance on compulsory insurance of third party liability of entrepreneurs engaged in activities in the field of providing accounting services (Journal of Laws of 2008). The minimum guarantee amount for the liability insurance contract in respect of any one event, is varied, in fact it depends on the subject of economic activity and is given in the equivalent of Polish zlotys (Art. 4, paragraph 1) of:

- 15,000 euros if the economic activity regards the provision of accounting services and tax advisory services;
- 10,000 euros if the economic activity exclusively regards the provision of accounting services;
- 5,000 euros if the economic activity exclusively regards the provision of tax advisory services.

The second condition is to have full legal capacity and no conviction of a strictly defined catalog of offenses. This group of offenses includes:

- an offense against credibility of documents,
- an offence against property, economic relations, trading in securities,
- tax offenses and other.

As a result of the change, virtually any person who meets these conditions can provide accounting services (www.SKwP.pl; www.infor.pl) According to the authors, this can lead to a reduction in the quality of the services provided if the work is performed by people without adequate substantive and practical preparation.

As a result of the changes, there has been an increase in the number of entities – accounting offices – or extension of business activity for this type of service. According to data of the Central Statistical Office, Poland had 42718 entities providing accounting services in 2011 (www.stat.gov.pl). According to the Ministry of Finance as of 24 May 2011, 50 800 people were certified accountants, while there were 69 232 persons as of 28 June 2016. (www.mf.gov.pl). The deregulation of the accounting profession and rapid development of new technologies resulted in a very high competition among entities involved in the provision of accounting services. This type of economic activity is very often appended to other activities within a single entity.

Increasing competition resulted in the level of prices for these services leading to the reduction in the cost of outsourcing services. The Accounting Information Centre, which is one of the information platforms for accountants, indicates serious concerns of the accounting community about the quality of services. In response to the increasing and uncontrolled number of accounting offices, a list of certified accounting offices was created (www.cik.org.pl/Certyfikowane-Biura-Rachunkowe-Lista.php).

#### 4. THE REQUIREMENTS FOR THE PERFORMANCE OF THE ACCOUNTING PROFESSION IN SELECTED COUNTRIES

Legal regulations regarding the accounting profession influence not only the quality of accounting but also the possibilities of engagement in an occupation (Barac & Tadic 2011; Jackling, Cooper, Leung, & Dellaportas 2007). In the United States, it is theoretically enough to have a high school diploma to pursue the occupation of a bookkeeper or accounting clerk, but to serve as an accountant it is good to be associated in one of several popular professional accountancy organizations. One of them is the American Institute of Professional Bookkeepers (AIPB) with 30 thousand members (https://www.aipb.org). The principal professional membership organization for certified public accountants (CPAs) is the
American Institute of Certified Public Accountants (AICPA). Currently, there are registered about 400 thousand members (www.aicpa.org). Due to the fact that as of May 2013, the U.S. Department of Labor estimated that there were roughly 1,586,380 current employees of the bookkeeping and accounting profession, the market of accounting services is highly competitive and people having specialized degree and skills confirmed by certificates come out on top.

In Germany, there are many opportunities to gain an accounting profession. Most students begin as 'Steuerberater' (a German chartered 'Tax adviser'), which requires three written examinations and one oral examination before deciding to move onto the Wirtschaftspruefer. A qualified 'Tax Advisers' may opt to take the Wirtschaftspruefer. There are relatively few Steuerberaters and Witschaftpruefers in Germany (https://www.idw.de).

In the UK, there are no strict regulations governing the activities of accounting offices, however, a person not having a license to practice as an accountant does not have the right to fill in and send tax returns or company settlements on behalf of a third party. There are a number of UK institutions and associations issuing licenses to practice as an accountant. The most popular are ACCA – Association of Chartered Accountants, with 188 thousand members worldwide (www.accaglobal.com) and AAT – Association of Accounting Technicians of 130 thousand worldwide membership (https://www.aat.org.uk/). There is also popular ACA qualification awarded by the ICAEW (The Institute of Chartered Accountants in England and Wales), founded in 1880, the international organization for more than 140,000 certified accountants from around the world (www.icaew.com).

Table 1 provides a summary of the requirements necessary to obtain a different qualification of the accounting profession in selected countries.

Country	Requirements
	Title: ICPAC (of The Institute of Certified Public Accountants of Cyprus)
Cyprus	Candidates take ACA exams as in England and Wales. Learning takes place in accordance
	with UK standards, even though Cyprus tends to deal more with IFRS.
	Title: FRR (of The Danish Institute of Certified Public Accountants)
Donmark	To be public accountant students should have a Master's degree and undergo a three-year work
Denmark	placement under the supervision of an authorized public accountant or an approved public
	<i>Title:</i> KH1 (of Finnish Institute of Authorised Public Accountants)
Finland	KHT is considered a basic qualification conferred by the Central Chamber of Commerce in
	Finland. Students should demonstrate the fulfillment of the requirements of education, having experience and passing the exams
	Title: Expert Comptable (of the National Association of Chartered Accountants)
	There are several opportunities to gain accountant's qualifications in France Most starts from
	getting a degree from a business school Gaining qualifications usually takes up to four years
	and passes through the following intermediate diplomas:
France	– DPECF (Diplôme Préparatoire aux Etudes Comptables et Financères) DECF (Diplôme
Trance	d'Etudes Comptables et Financères)
	<ul> <li>DESCF (Diplôme d'Etudes Supérieures Comptables et Financères)</li> </ul>
	In addition to the required exam, candidates must demonstrate work experience.
	Title: Wirtschaftspruefer (of Chamber of Public Accountants)
	In Germany, there are many opportunities to gain an accounting profession. Most students
Germany	begin as 'Steuerberater' (a German chartered 'Tax adviser'), which requires three written
	examinations and one oral examination before deciding to move onto the Wirtschaftspruefer.
	A qualified 'Tax Advisers' may opt to take the Wirtschaftspruefer. There are relatively few

Table 1. Summary of qualifications of the accounting profession in selected countries.

	Steuerberaters and Witschaftpruefers in Germany.
	Title: Chartered Accountant (of The Institute of Chartered Accountants of Ireland)
Ireland	Candidates for qualification must pass a series of professional exams whilst under a training
	contract with a recognized practice firm. Candidates must also demonstrate IT skills.
	Title: Dottore Commercialista (of National Council of Accountants and Chartered
Italy	Accountants) Students taking the Dottore Commercialista must hold a university degree and
Italy	then complete a four year training program within a recognized practice firm, followed by a
	series of oral exams.
	Title: Register Accountant (of Royal Netherlands Institute of Chartered Accountants)Students
Netherlands	should complete the training program, which should start as soon as graduation after high
1,00101101100	school, college or university but eventually a BSc followed by a MSc in accountancy program
	and finally KA certification is achieved.
р ·	Title: RCA(of Accountants Institute in Romania)
Komania	Despite the existence of Accountants Institute in Romania, most Romanians prefer to gain an
	International ACCA qualification, which automatically provides the RCA license.
Deserte	Title: CIPA (of Certifiea International Professional Accountant)
Kussia	candidates should demonstrate a university degree and university d
	Title: SCA (of The Swigg Expert Association for Audit, Tax and Eiducian)
Switzerland	Title: SCA (0) The Swiss Experi Association for Audit, Tax and Flauciary)
Switzerland	in order to be Swiss Certified Fublic Accountant students must pass 10 written exams and an
	Title: Certified Public Accountant (of Union of Chambers of Certified Public Accountants of
	Turkey)
Turkev	In order to obtain the qualification students must demonstrate the BA degree in economics
	law or management, and take a two-year work placement under the supervision of a CPA.
	Then they should pass 7 exams.
	Title: Certified International Professional Accountant ('CIPA') (of The Ukrainian Association
	of Certified Accountants and Auditors)
Ukraine	Students must pass the Certified Accounting Practitioner exam ('CAP'), confirming the basic
	knowledge of accounting. In order to obtain full qualifications they pass a few exams, and
	must demonstrate three years of work experience.

Source: own elaboration based on http://www.careersinaudit.com/article/european-accounting-qualifications-explained/

According to the authors of the paper, the increase in the scope of operation and popularity of various types of accounting organizations was due to the reduction of the state's role in regulating the accounting profession. In 2015, the International Federation of Accountants (IFAC) announced that the number of professional accountants represented by more than 175 organizations in over 130 countries reached 2.84 million ('The accountancy profession - a global value-add,' The report of IFAC, November 2015 www.ifac.org). According to the report published by IFAC, there is a strong correlation between the number of accountants employed in the economy and GDP per capita. An accounting profession is an important aspect of the existence of vigorous, transparent and responsible economies. According to the report, the global accounting system brings to the global economy 575 billion dollars. This contribution is defined as the gross value added (GVA), including the sum of employee compensation, profits, surpluses and taxes. Such a contribution to the world economy can be compared with the contribution of a medium-sized developed country ('The accountancy profession - a global value-add,' the report of IFAC, November 2015 www.ifac.org). Should such an economically strong professional group be deprived of a system of legal regulation and left under the influence of various professional organizations?

#### 5. HYPOTHESES DEVELOPMENT AND METHODOLOGY OF RESEARCH

Based on an analysis of studies on monitoring trends in student preferences and their professional certification plans in the USA, the authors formulated research questions related to students' opinions on the situation of accountants in Poland.

The authors asked the question whether in the assessment of students of business schools majoring in accounting and its specializations, the changes described above resulted in lowering the prestige of the profession and its general degradation? The objectives of the paper are based on the analysis of University of Economics in Katowice students' opinion majoring in 'Finance and Accounting' expressed in surveys. The questions raised in the survey focused on two issues:

- 1. assessing changes in the accounting profession in the field of providing accounting services in Poland,
- 2. students' opinions on the consequences of the changes in relation to the prestige of the accounting profession and the job market for accountants.

The study was conducted among the under- and postgraduate students at the Faculty of Finance and Insurance, majoring in Finance and Accounting at the University of Economics in Katowice. The study was conducted by anonymous questionnaires.

In order to answer above-mentioned questions, the following hypotheses were adopted for the study:

H1: Students negatively evaluate the deregulation of the accounting profession in the field of providing accounting services and fear the worsening conditions of employment for themselves.

H2: Students recognize the deregulation of the accounting profession in the field of providing accounting services as the cause of lowering the prestige of the profession in Poland.

H3: Students recognize the deregulation of the accounting profession in the field of providing accounting services as the cause of the decline in the quality of accounting services in Poland.

Additionally, in order to investigate the students' opinions on the current situation of the accounting profession in Poland auxiliary hypothesis were posted:

H4: Students highly evaluate the prestige of the profession of statutory auditor.

H5: Students negatively evaluate the direction of changes in the accounting law in Poland.

H6: Students positively evaluate the preparation for the accounting profession at their university.

#### 6. RESEARCH RESULTS

The study was conducted in the period from November 2016 to January 2017 among the students of accounting at the University of Economics in Katowice. The surveys consisted of 14 questions related to the characteristics and attitudes of the respondent employee. For the purpose of the study 300 questionnaire surveys were distributed, of which 294 were returned.

Due to the incomplete answers 40 surveys were rejected, so 254 complete questionnaires were analyzed.

Table 2 contains general data on studies conducted with respect to 254 complete questionnaires.

Table 2. Characteristics of respondents

Gender	Men: 52 (20,5%), Women: 202 (79,5%)
Age	20 to 30 years: 234 (92,0%); 31 to 40 years: 13 (5,0%); 41 to 50 years: 7 (3 %); 51 and more years: 0 (0%);
Type of study	Undergraduate full-time: 69 (27,2%) full-time postgraduate students:130 (51,2%) C: part-time postgraduate students 55 (21,6%)

Source: own elaboration

Of 254 questionnaire surveys returned, 79.5% were filled by women. Due to the fact that the respondents were full- and part-time students, most of them, as much as 92%, were in the age group up to 30 years of age. Only 5% of questionnaires were filled by people aged 31 to 40 and 3% over 40 years of age. Most surveys were distributed among full-time postgraduate students, due to their high level of expertise in the field of accounting. They filled out 130 questionnaires which accounted for 51.2% of respondents. Undergraduate full-time students completed 27.2% of questionnaires. Regarding part-time students, it was decided to analyze postgraduate students only, who made up 21.6% of the respondents.

Most of the surveyed students, as many as 117 of them (46%) intend to become accountants in the future. 31 respondents (12.2%) are planning to choose the profession of statutory auditor, 27 students marked the profession of a manager as their future career path. 63 students (24.8%) are not planning a career as an accountant, auditor or manager and 16 of them indicated a number of different professions.

As for the first of the hypotheses regarding the negative assessment of the deregulation of the accounting profession in the field of providing accounting services and fearing the deterioration of the conditions of employment for themselves (H1), 83 respondents (32.7%) believe that the social degradation of the accounting profession is taking place. The opposite view was expressed by 80 respondents, and 91 of them (35.8%) had no opinion about the degradation of the accounting profession. Among those who see the phenomenon of degradation of the profession, 70 respondents said that the cause of the degradation was the 'release' of the accounting profession has a negative impact on the quality of services, which verifies hypotheses H2 and H3.

The question posed in order to prove the hypothesis about the prestige of the profession of statutory auditor (H4) received 201 affirmative responses which accounted for 79.1% of the total responses. Only 21 students did not consider the profession of statutory auditor as prestigious and 32 had no opinion on the subject.

It should be noted that the vast majority of students (139 persons - 54.7%) were not able to assess the changes in the Polish accounting law (hypothesis H5). 69 students assess the changes in the accounting law as moving in the right direction, which represents 27.2% of the total responses. For 28 students these changes are going in the wrong direction, and 10 of them found the changes in the accounting law as confusing.

Students in different ways assessed the level of preparation for the profession in today's complex business environment (verification of hypothesis H6). For 35.4% of respondents, namely 90 of them, the level of degree courses offered by the University of Economics in Katowice is high, for 8 students this level is very high. 101 students (39.7%) recognized the level of degree courses as moderately high, and for 46 students the level of degree courses is low. Others (9 people) did not express their opinion.

# 7. DISCUSSION

The results show that only 32% of students believe that deregulation in the field of providing accounting services has led to the degradation of the accounting profession. Only fewer respondents think the opposite. The results cannot clearly confirm hypothesis H1 and H2.

Students, who considered the degradation of the accounting profession, in the majority also decided that the cause of this process is the deregulation of the profession. 29% of respondents felt that the change in the applicable law will worsen the quality of services in the field of accounting. Hypothesis H3 was only partially confirmed.

Comparing the obtained results with the US research, attention should be paid to the differences in motivation for choosing studies in accountancy. According to Nelson, Vendrzyk, Quirin and Kovar [2008], the factor of 'job availability' was the most important one while deciding to study accountancy for the US students. Students in Poland seem to be unaware of the risk of reducing the 'job availability' caused by the liberalization of the accounting profession and the admission of persons without adequate education and competence to the profession. In the opinion of nearly 39% students, the University of Economics in Katowice provides a good and very good preparation for the profession. Almost 40% of students felt that the level of education is moderately high. Only 18% felt that the level of education in this field is low. The obtained results indicate that the students positively assess the teaching process of accounting conducted at the University of Economics in Katowice is related to the effort of gaining an education, which in the era of universal access to the profession, can no longer be appreciated.

Total percentage of graduate students in the USA, who have taken or are planning to take additional certification exams (CPA), has remained at roughly 95%. In contrast, an interesting observation is that as much as 35.8% of the students of the University of Economics in Katowice did not have opinion on the issue of deregulation of the accounting profession, which shows the lack of interest in the legislative process in this area and the lack of associations with their own professional situation. Given that the respondents are students of university binding their professional future with accounting this phenomenon should be assessed negatively.

As much as 79.1% of respondents felt that the profession of statutory auditor in Poland enjoys high prestige, which confirms hypothesis H4. The result indicates that the respondents do not combine professional situation of a statutory auditor with the deregulation of the accounting profession and, associated with it, a possible degradation of the accounting profession.

One of the reasons for changes in the perception of the attractiveness of the accounting profession in Poland is permanently changing accounting law as well as the organizational, financial and information conditions of work in the financial and accounting services. These changes require from accountants a continuous training to 'keep up with' legislative changes

and their optimal use in the interest of the entity. Thus, the accountant should have strong opinions on the direction of changes in the law. In addition, accountants must adapt to changes in the software used in accounting and organization of the accounting system on a day-to-day basis. Against the background of these conditions, the results of study on the assessment of the direction of the change in the accounting law in Poland by the respondents seem to be particularly interesting. As much as 54.7% of the surveyed students cannot assess whether these changes are going in a positive or negative direction. It should be emphasized that most of the changes in the accounting law in Poland result from the process of harmonization and standardization of the law. This outcome may indicate a lack of awareness among students about the causes and effects of changes in the accounting law in Poland. Despite the emphasis in the curriculum on knowledge of the detailed rules and arrangements contained in IAS/IFRS, probably there is a gap in the teaching process in the area of the essence of the changes and their consequences for the entire economy of the country. The obtained results do not support hypothesis 5. Similar gap in the teaching process was noted by Violette, Sanders (2004), who also stressed the need to build awareness among students of the importance and accountability of the accounting profession for economic practice.

#### 8. CONCLUSION

The changes introduced in Poland in terms of providing accounting services meant that almost every person who has not committed a specific catalog of offenses can conduct such an economic activity. This is a very liberal approach which does not require the person concerned with pursuing such activities to demonstrate relevant substantive competences and necessary experience.

The legislative changes presented in the paper resulted in an increase in the number of accounting offices, and as a consequence, in lowering of prices for services and very high competition. Accountants affiliated in professional organizations are concerned about the threat of deterioration in the quality of services provided.

Against this background, results of the survey conducted among the students at the University of Economics in Katowice, majoring in Finance and Accounting, seem to be surprising. The respondents mostly do not see the threat of the adopted solutions to the accounting profession which they may perform in the future, nor have an opinion on this subject. Only 32% of respondents felt that changes in the regulations regarding the provision of accounting services lead to the degradation of the accounting profession. The results show that the students highly regard the profession of a statutory auditor and the prestige of this profession is not combined with the prestige of the accounting profession.

It is also worth noting that there is the dominant lack of students' opinions on the trend of changes in regulatory accounting in Poland despite a good knowledge of the detailed rules of this law. These results may indicate a lack of awareness of the effects of changes to the accounting law for the domestic and global economy. At the same time, students mostly well and very positively assess the preparations for the accounting profession in the process of teaching carried out at the alma mater.

The obtained detailed results of the study induce the authors to continue it, taking into account the quality of the accounting services in Poland and the activity of students in the labor market in the broadly understood accounting profession, particularly in the accounting offices.

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# AN ANALYSIS OF VALUE CREATION IN CZECH FOOD COMPANIES

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#### ABSTRACT

The subject of this article is based on an analysis of food companies in the Czech Republic. The aim of the article is to identify differences in value creation (including causal ones) across the companies. We chose a basic sample of all 931 Czech companies in the food industry sector, in segments such as meat and fish processing, milk and dairy products and so on. Of this group, 707 companies had sufficient and available financial data for the year 2014. In the second step we calculated the EVA and ROE indicators for those companies. Subsequently, 382 successful companies (EVA indicator > 0) and 103 extremely unsuccessful companies (ROE < 0) were selected for further analysis. For these companies, a profile analysis, considering difference in averages, was done which allowed us to compare each of selected financial indicators in both groups of companies and to find the greatest differences between them. In the next step a logistic regression model was used (for indicators with a statistically significant difference) identifying which indicators would serve as the basis for a model for distinguishing high-performing companies from low-performing ones. Thus obtained indicators are evaluated on the basis of the food company model. We created a CVM model which is able to identify companies which create values in 97.1 % of cases and in 79.6 % of cases is able to recognize companies which destroy value. An advantage of the model is its ability to detect areas where the companies are strengthened or weakened due to used financial indicators.

# 1. INTRODUCTION

The aim of the article is to analyse food companies in the Czech Republic. It focuses on recognizing the differences in value creation (including causal ones) across the companies. It is partly aimed at dividing the companies into a high-performing group (creating value) and a low-performing group (destroying value) and attempts to identify the indicators that best distinguish between these two groups of companies. The result would then be a comprehensive indicator (composed of selected financial indicators) that with considerable accuracy would be able to identify the high-performing and low-performing companies, including areas where there is creation or, conversely, destruction of value.

Within the research, the authors combine a performance and value approach. A performance approach is typified by a complex view of various areas of the company through a wide range of financial indicators which serve as indicators of a good or, conversely, a problematic or bad situation. In contrast, the value approach, as represented by the EVA indicator, is typical for its overall view of the company's ability to create or destroy value. Linking the two approaches makes it possible to identify the areas (through various financial indicators) where value (as detected by the EVA indicator for the company as a whole) is created or destroyed.

The use of the EVA indicator allows us to categorize the companies into those creating value (EVA > 0 while ROE > 0) and those destroying value (EVA < 0 while ROE < 0). However, the design of the EVA indicator does not allow us to find out the causes of the creation or the destruction of value. Rather, it is based on an estimate, more precisely, on a calculation of risks that are often external (see, for example, the risk-free rate risks derived from government securities) or are only focused on one area of the company, i.e. on profit and profitability, or on the market value of equity (cf. Kaur, Narang, 2009, Chvátalová, Hřebíček, 2012, Kuběnka, Bolečková, 2015). Within the structure of the indicator EVA equity, which is also used in our research, is a greater focus on the inner workings of the company, nevertheless, the view of the company through risk remains the same (Neumaierová, Neumaier, 2014). The authors Neumaierová and Neumaier (Neumaierová, Neumaier, 2014), Walters (Walters, 1999) and Panigrahi et al. (Panigrahi et al., 2014a) seem to have gone the furthest regarding the inner workings of the company, including the identification of the causes of value creation. These authors, however, link the factors affecting the value (its creation) directly to the EVA indicator, whereas in our study, it is merely used to categorise companies. The other indicators (including the constructed model) are attached to it only indirectly. Such an approach should ensure better identification of potential sources of value creation, as it is wider and does not focus on areas that are directly affected by the EVA indicator (in this case, ROE and cost of equity).

Conversely, the financial indicators within the investigation into performance are able to identify problem areas in the company, thereby attracting the attention of managers and enabling a speedy identification and subsequent solving of the problem. However, in the context of performance, value, or more precisely, its creation, expansion, or destruction, is only one of the areas of investigation, that is to say, it is only one of the possible approaches. Thus, if a company (managers or owners) wants to focus on value, i.e., where and why it comes into existence, grows or, vice versa, expires, it offers the opportunity of using those financial performance indicators that have the greatest impact on the value measured by EVA, either individually or within the presented model.

#### 2. THEORETICAL FRAMEWORK

Performance is a common term (and not only in relation to customer satisfaction), and many authors deal with performance measurement. Nevertheless, there are few authors who concern themselves with defining it, even though there is no standard and generally accepted definition of this term. This makes a comparison of differently measured performance problematical, as different tools measure performance which is conceived differently.

Performance is defined in different ways, usually with regard to the degree of generality. Drucker defines performance as the final test of any organization (Drucker, 1992). It can be added that this test must have its economic dimension. Performance can also be defined more specifically as the company's ability to increase the value of invested capital (Hindls et al., 2003). A company is high-performing if it achieves its objectives and, at the same time, is able to satisfy the demands of its customers more effectively and with greater efficiency than its competitors (Kotler, 1984). Effectiveness, in this context, means the degree of satisfaction of customer demands, while efficiency is the efficacy with which the company spends resources on ensuring the required level of customer satisfaction (Neely et al., 1995). Performance reflects a company's ability to increase the value of invested resources by its activities, and to produce profit and ensure future development (Škodáková, 2009). It can be added that performance embraces all the areas of the company's activities, which it is necessary to harmonize in such a way that the result is a functioning and prosperous company with good, long-term prospects (Pavelková Knápková, 2005). In this research, performance will be viewed as effectiveness. Performance will then be assessed with regard to the expended resources of the company from a purely financial point of view.

When measuring performance, it offers up the possibility of using a complex perspective that allows us to assess all the economic aspects of the functioning of a company in a quantitative way. This view corresponds with the one of Drucker's, who, as early as the 1950s, came up with the thesis that market position, innovation, productivity, physical and financial resources, profitability, the performance of managers and their development, the performance and approach to work of employees, and public accountability are the proper criteria of performance (Drucker, 1954).

At present, companies tend to focus on maximizing shareholder value, whereby the measurement of economic values and financial measurements are integrated together to help management to achieve its goals (Esbouei et al., 2014). Due to this, the EVA indicator in our research is derived from the ROE indicator (EVA equity) (cf. Varaiya, et al., 1987).

The financial performance measurement indicators can be divided into two groups: traditional indicators (including, for example, ROE, ROA) and modern indicators (e.g. EVA). These measure the same financial performance, but in different ways (Yalcin et al., 2012). For the best Turkish companies in the food industry (evaluated as high-performing), the results of assessment are the same according to both methods (Yalcin et al., 2012). We can conclude that there should be a significant statistical difference between the selected traditional indicators of two groups of companies which were created by dividing the research sample of companies into high-performing and low-performing by means of the EVA indicator (*hypothesis 1*). The EVA indicator and its results does not include grey zone.

Within a complex approach to measuring company performance, it is possible to encounter different groups of financial indicators. Some authors use indicators of profitability, activity,

indebtedness, liquidity, growth and indicators of asset structure (see Delen et al. 2013). Others use indicators of profitability, indebtedness, liquidity and growth (see Heikal et al. 2014).

It follows that, at least for the long-term viability of the company, its profitability, which seems to be the primary measure of performance, is influenced by a number of other factors. The company must ensure it is solvent, because without this it cannot survive in long-term. Ability to pay, however, represents a certain limitation of profitability, because the company is forced to retain a certain amount of funds in its account, which, therefore, cannot be invested and increased in value. The company must also maintain a reasonable proportion of debt, and thus a reasonable share of risk associated with debt. This is another limitation of profitability, because the maximum debt would represent, on the one hand, a maximum return on equity (in the case of a positive effect of financial leverage), but on the other hand, the maximum risk of over-indebtedness (in the case of a negative effect of financial leverage). Effectiveness also has an influence on profitability, which is treated as the company's resources and it is reflected in the indicators of activity (turnover). The capital market perspective is also important. It serves as a correction device for the identified (accounting) performance of the company, more precisely it allows us to assess the real performance of the company from an external (independent) view.

It is therefore appropriate to assess performance in this context, at least in the area of profitability, liquidity, indebtedness and activity. Unfortunately, due to the absence of a developed capital market, it is not possible to use indicators of this type when researching the financial performance of companies in the Czech Republic (with the exception of a few dozen companies).

Authors such as Walters (Walters, 1999), Neumaierová and Neumaier (Neumaierová, Neumaier, 2014) or Panigrahi et al. (Panigrahi et al., 2014) have elaborated the relationship of performance and value in terms of areas, which are, on the one hand, reflected in the degree of efficiency, and on the other, more or less contribute to the creation of value. Panigrani et al. have also elaborated a relationship of selected financial indicators (including EVA) to shareholder value (Panigrahi et al., 2014b), which corresponds with the approach used in our research. It suggests that the indicators showing the level of performance are also able to indicate the degree of value creation.

# 2.1. Methodology

The companies will be divided into three groups on the basis of the EVA indicator plus will be added the grey zone. In the first group (high-performing companies) will be those companies where EVA > 0 and ROE > 0, the second group (the grey zone) will consist of companies where EVA < 0 while ROE > 0 and in the third group (low-performing companies), will be made up of companies where EVA < 0 and ROE < 0.

Only companies from the first and third groups will be used for further analysis of the differences between the selected traditional indicators. Thus, the difference between high-performing and low-performing companies will be emphasised and more striking. This should reflect in the differences in the selected traditional indicators of both groups of companies.

The construction of the EVA indicator was based on the methodology of the Ministry of Trade and Industry which is used as standard in Czech companies (Department of Economic Analyses, 2014, pp. 158-161). The general construction of the indicator, in which the ROE indicator, cost of equity ( $r_e$ ) and the amount of equity (VK) also feature, is as follows:

$$EVA = (ROE - r_e) * VK$$

The costs of equity are further calculated by using a modular method and they represent the sum of the risk-free rate of return, business risk, financial stability risk, and risks related to the size of the company and financial structure.

After dividing the companies into the appropriate groups (high-performing and low-performing) a profile analysis will be done for each company in both groups. For this analysis, 34 common financial indicators will be used (see Table 1), again designed in accordance with the methodology of the Ministry of Trade and Industry (Department of Economic Analyses, 2014).

 Table 1. A selection of the indicators used in the model from a list of the financial indicators used in the profile analysis (all indicators are listed in Appendix 1)

Current liquidity = current assets / short-term liabilities
Net profit margin = net profit result / (operating income + extraordinary income)
Leverage = total assets / equity
The degree of financial autonomy = equity / (long-term liabilities + short-term liabilities + bank loans and
overdrafts)
Indebtedness ratio = equity / external resources
Immediate liquidity = financial assets / short-term liabilities
Share of own resources = equity / total assets
Quick liquidity = (current assets – reserves) / short-term liabilities
Operating liquidity = (depreciation + EBIT+ reserves) / (long-term liabilities + short-term liabilities – long-
term financial assets)
ROCE = EBIT / (equity + reserves + long-term liabilities + long-term bank loans)
Source: The authors

The profile analysis allows us to compare each of the selected financial indicators in both groups of companies and to determine the differences between them. In order to create a model that is best able to distinguish between high-performing and low-performing companies, the indicators with the greatest differences will be used. The degree of an indicator's differentiation will be examined through the distance of average values of the relevant indicator between the two groups of companies, and individually for all studied indicators. The authors draw on the assumption that the more diverse the indicators, the easier it will be to distinguish between high-performing and low-performing companies.

In the second step, we get to the modelling of selected indicators using logistic regression. Logistic regression is applicable where there are only two expected results - the company is either high-performing or low-performing. It is prerequisite of normality that is important for logistic regression. In our model, it is fulfilled by drawing from a basic file, and not only from a selection of data (Pecáková, 2007). At the same time, it is essential that both results are adequately represented in the data (Hendl, 2012). Then it is possible to construct a logistic regression model in the following form (Hosmer, 2013):

$$P[Y(x) = 1] = \frac{\exp(\beta' x)}{1 + \exp(\beta' x)}$$

Where Y takes the values 0 and 1, and thus defines the difference between the categories Y = 1 as a high-performing company and Y = 0 as a low-performing company. The concrete calculations are processed using the statistical software GRETL (Gretl, 2016). To verify the reliability of the model variables, a t-test is used with a set level of significance of p = 5%.

To verify the validity of the model as a whole, a Chi-square was used. It is calculated as follows:

$$Q_{LR} = 2(\ln L(\hat{\beta}_{k}, \hat{\beta}_{-k}) - \ln L(0, \tilde{\beta}_{-k}))$$

A P-value < 0.05 rejects the null hypothesis that the model without residuals is better than the one under consideration, which can be interpreted to mean that the model is reliable (provides correct results).

The individual financial indicators (including EVA) are variously mutually interconnected through the use of the same or similar input data. This is why the multicolinearity of the modelled variable will also be tested in the final model. Therefore, the intensity of dependence between two or more explanatory variables will be measured, in which the capacity of the detected rate of multicolinearity will be ascertained. The calculation of the value of multicolinearity (VIF) is as follows: VIF (j) =  $1 / (1 - R (j)^2)$ , where R (j) is the multipath correlation coefficient between the variable j and the other independent variables. The co-linearity test accepts the model, if the minimum value is higher than 1 and lower than 10. In this context the multicolinearity is acceptable. The differentiation rate will be ascertained by means of the distance of averages of the individual groups for each indicator.

#### 2.2. Research sample

We chose a basic sample of all 931 Czech companies in the food industry sector, in segments such as meat and fish processing, milk and dairy products and so on. Of these companies 707 companies had sufficient and available financial data for the year 2014. From this group, 485 companies were then selected for further analysis (382 high-performing and 103 low-performing companies).

#### 3. RESULTS

In creating a comprehensive model from financial indicators, which would at the same time be able to identify high-performing companies (creating value) or, conversely, the low-performing ones (destroying value), it was, first of all, necessary to categorise the companies into two groups using the EVA indicator. The results are shown in Table 2. It is clear from the results that, in our categorisation, the high-performing companies are more numerous (78.7%).

Group of	Number	EVA	EVA max	EVA min	ROE	ROE max	ROE min
companies		average			average		
High-	382	69 302	1 737 341	1	27.07 %	423.65%	0.27%
performing							
Low-	103	-16 322	-8	-338 636	-20.62 %	-0.06%	-478.92%
performing							

Table 2. Characteristics of the high-performing and low-performing companies

Source: The authors

The table also shows that all the companies belonging to the group of high-performing or low-performing companies were selected, i.e. those of 'very high-performance' with a maximum EVA or ROE or those of 'very low-performance' with a minimum EVA or ROE. Due to the fact that the survey excluded the 'grey zone' group of companies with a negative EVA and positive ROE, the results of high-performing and low-performing companies do not overlap. The attained variety of data from the two groups of companies, along with the non-

overlapping of the results of the EVA and ROE indicators, allowed us to create a robust model that respects the diversity and differences of the surveyed companies.

The second step was to identify indicators that were appropriate for the model construction. The suitability of the indicators was assessed on the basis of differences in values of averages of the indicators between high-performing and low performing companies, where a greater divergence meant a greater suitability of the indicator for inclusion in the model. The average values of the selected indicators and their mutual differences within both groups of companies are set out in Table 3 (the values of all indicators are given in Appendix 2). The values in Table 3 are ranked from the largest positive differences to the largest negative differences. Positive differences mean that the average value of the indicator for the group of high-performing companies was higher than in the group of low-performing companies. In the case of negative differences, the average value of the indicator for the group of high-performing companies, was on the contrary, lower than in the group of low-performing companies. Five factors with the largest positive differences and five indicators with the largest negative differences were then selected for further analysis.

Differences in averages	Order	Indicator		
Positive differences				
320%	1	Degree of financial independence		
123%	2	Immediate liquidity		
111%	3	Quick liquidity		
104%	4	Current liquidity*		
79%	5	Share of own resources		
Negative differences	·	·		
-158%	30	Financial leverage		
-162%	31	Indebtedness ratio		
-169%	32	Operating liquidity		
-177%	33	Net profit margin		
-226%	34	ROCE		

Table 3. A comparison of coefficients of averages – the selection of the indicators used in the model

Source: The authors

While modeling with logistic regression, based on the results of the t-test, statistically insignificant indicators were gradually removed. The following six indicators were removed:

- Financial leverage (p-value: 0.2449),
- Degree of financial independence (p-value: 0.4403),
- Immediate liquidity (p-value: 0.5693),
- Share of own resources (p-value: 0.0915),
- Quick liquidity (p-value: 0.9738),
- Operating liquidity (p-value: 0.1561).

The resulting equation of the logistic regression model of value creation (value creation model - CVM), which is able to distinguish between high-performing and low-performing companies with regard to the ability to create or destroy value that was constructed by means of logistic regression then takes the following form:

$$CVM = \frac{1}{1 + e^{-(1.1064 - 0.0585 * F_1 + 0.02787 * F_2 + 1.1487 * F_3 + 0.2086 * F_4)}}$$

Where:

- F1 current liquidity,
- F2 net profit margin,
- F3 ROCE,
- F4 indebtedness ratio.

There are four indicators which are statistically significant (p-value < 0.05) in the logistic regression model shown in Table 4, meaning that they can be included in the model. This table also shows specific p-values, and in particular the coefficients of the individual variables (the used indicators) which determine the model equation. To verify the validity of the model, the chi-square was calculated (see Methodology section) with a value of 129.613 and a p-value of 0. This makes it possible to reject the null hypothesis and consider the resulting model as reliable.

Variable	Coefficient	p-value
Invariable	1.10642	< 0.0001
Current liquidity	-0.0584979	0.0023
Net profit margin	0.0278744	0.0002
ROCE	1.14867	< 0.0001
Indebtedness ratio	0.208643	< 0.0001

 Table 4. The variables and parameters of the final model

Source: The authors

Given the closeness of individual data in the financial statements and their possible interactions, a test was conducted that detects the possibility of collinearity (see Table 5). With regard to the achieved values, it is possible to say that the final model is correct and to rule out the possibility of collinearity of the used indicators.

Table 5. Collinearity test results of the variables used in the model

coefficient
1.008
1.023
1.140
1.128

Source: The authors

To verify whether the model corresponds to the real data and has a real explanatory ability, the resulting model was tested using data from the food industry. Given the fact that the model was created using a basic file so that the maximum information value could be

obtained, a special test pattern was not used, the input data was. In this testing, the agreement with classifying the companies in the original way (using the EVA and ROE indicators into two groups of companies) with their classification using the CVM model was studied. At the same time, limit was set in CVM model for high-performing (creating value), low-performing (destroying value) and 'grey zone' companies (it cannot be clearly said whether they create or destroy value). In this test - putting values into the equation model, it was found that the model showed a high ability for similar classification, as in the case of using the EVA and ROE indicators, when setting the limit values in CVM to 1 - 0.758 for high-performing companies, then 0.758 to 0.628 for 'grey zone' companies and 0.628 - 0 for low-performing companies (see Table 6).

Table 6.	The	results	of	testing	the	model	with	the	input de	ata
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	CVM values	Number of companies	% sample	Consensus
High-performing companies	> 0.758	349	71.13%	97.13%
'Grey zone' companies	between	85	17.53%	Was not studied
Low-performing companies	< 0.628	55	11.34%	79.63%

Source: The authors

The consensus of Grey zone was not studied due to is character. The EVA indicator does not include the grey zone, which means we can't compare the consensus CVM x EVA in this category.

### 4. **DISCUSSION**

Using the EVA equity indicator and the ROE indicator, which is, in this case, part of EVA, companies were divided into high-performing ones (creating value) and low-performing ones (destroying value). This construction of the indicator is possible, although it differs from the original structure (cf. e.g. Neumaierová, Neumaier, 2014 O'Hanlon, Peasnell, 1998). The explanatory power of the EVA equity indicator is different from the original indicator and tells us more about the value for the owners of the company (shareholder), than the value from the viewpoint of potential investors (stakeholders). In terms of evaluating the performance of the company, focusing on its inner workings, where the owners' point of view is very important even critical, we consider a fitting structure.

The EVA indicator as constructed here serves only to differentiate the companies into highperforming (creating value) and low-performing (destroying value) groups. The subsequently constructed CVM model, which is capable of identifying the creation or destruction of value, is independent of the indicator EVA. This independence means that the indicators used in the CVM model are not a direct component of the EVA. This distinguishes the CVM model from INFA (and derived indices IN), which is, by its construction, directly linked to EVA (cf. Neumaierová, Neumaier, 2014). However, due to the interdependence of the individual financial indicators, it is not possible to ensure the complete independence of the indicators (see above).

The construction of CVM model was done in two steps, the first of which was to reduce the potentially usable financial indicators to those which were, in terms of the extent of their differences within the groups of high-performing and low-performing companies, most likely to become part of the construct of the CVM model. This reduction was done objectively, and it was necessary because of the lower number of companies in the group of low-performing

companies (103 in total). The use of ten indicators in the CVM model is, thus, appropriate in terms of dimensionality reduction.

The CVM model that we created includes four financial indicators, one of which refers to liquidity, two refer to profitability and one relates to indebtedness. The indicator of liquidity affects the creation of value negatively. Because the growth of liquidity (in this case, current) represents an increase in the amount of funds (in this case, rather an increase in current assets) in relation to short-term resources, it can be concluded that this activity contributes to the creation of value negatively. This does not alter the fact that the effect of this variable in the CVM model compared to other models is weak (the second weakest in the model). If increasing (current) liquidity reduces performance and company value, it means that relevant assets or money is not being used appropriately, whether fully or partially. It is clear from the Table 3 that the liquidity of high-performing companies is significantly higher than that of low-performing ones, where it can be assumed that the higher liquidity is caused by higher levels of reserves, i.e. not making use of current assets. It will need to be analyzed within the specific company, where this inefficiency lies, whether in short-term assets, accounts receivable, stocks of materials and completed products and so on. In terms of value creation, it can also be inferred that current liquidity should be rather low, more precisely that value can be created by actions that reduce this liquidity.

The indebtedness indicator (indebtedness ratio) has a positive effect on value creation. Upon closer examination of the indicator of indebtedness, it is obvious that a decrease in indebtedness has a positive effect on growth and value creation. This is contrary to the generally accepted finding that increased indebtedness increases performance (Park, Jang, 2013). There is also, however, research that shows a negative effect of indebtedness on performance (Rajan, Zingales, 1995), which, on the other hand, supports our findings. From Table 3, it is clear that the indebtedness of high-performing companies is significantly lower than that of low-performing ones. With regard to the trade-off between profit and costs associated with debt, it was found that companies target optimal debt (Park, Jang, 2013). It can be inferred that the lower indebtedness of high-performing companies contributes to creating value more than the higher indebtedness of low-performing companies. This raises the question of whether the high-performing companies should be recommended to reduce their debt further, although it can be presumed from the model. It can be assumed that the use of equity (including debt) by low-performing companies is worse than that of highperforming ones. This is evident from differences in the profitability indicators of highperforming and low-performing companies, especially ROCE. The question is though, whether this is due to the high price of liabilities or whether the causes must be sought in the inner workings of the company.

With regard to the negative effect of liquidity, indebtedness reduction (if, at the same time, there is an increase in balance sheet totals by increasing the amount of equity) must not project into an increase in liquidity (e.g. increasing the volume of money), but into an increase of in operations of the company (it must be properly invested, i.e., it must generate profit). The influence of this variable in the CVM model is relatively strong (the second strongest), which means that the indebtedness ratio has a great influence on creating value.

The indicators of profitability (ROCE and net profit margin) also effect value creation positively. In view of the construction of the EVA indicator, which includes profitability indicators (whether ROE or ROA), this is not a surprising finding. On the contrary, it confirms that for value creation (its growth), profitability (its growth) is crucial. It is clear though that it is not enough only to increase profits in relation to the balance sheet, or the

ROCE part, i.e. the value of used resources (financial - liabilities or material - assets), but also profit against sales (net profit margin), which means company performance. The use of assets (or resources) is, in this respect, more significant and has a greater impact on value creation, than increasing the profit margin (see Table 4).

Recommendations for the creation and growth of company value from the viewpoint of the CVM model can be formulated as follows: increase company performance while increasing the profitability of invested resources, and while reducing the involvement of debt and lowering long-term liquidity (current ratio). For this, we recommend taking into account the risk of using one's own and external liabilities, which should then be reflected in their price and therefore profitability. The risk of insolvency should also be considered, which means comparing company liquidity with the recommended values or the average of a particular sector, and monitoring the structure of current assets.

This design of the CVM model is very similar to the index IN05 which is based on the INFA analysis (Neumaierová, Neumaier, 2014). In this index, there also are indicators from the same areas, i.e. profitability, liquidity and indebtedness, as in the case of the CVM model. However, the specific indicators are different. This is probably due the fact that the construction of the index IN05 and the CVM model is different, and also that the CVM model is constructed on a narrower set of data. While the index IN05 can be used universally, the CVM model can only be used (so far) for the food industry.

It is interesting that there is no indicator from the area of the activities of the company either in the index IN05 or the CVM model. It seems that these indicators have very little or no effect on value creation. It can be concluded that for value creation, it is not important how fast the individual resources are (either individually or together) utilised (how long they stay in the company), but the effect that is achieved by their use. From this point view value and its creation is very closely linked to profit and its creation.

# 5. CONCLUSION

A CVM model was constructed which from current data forms an equation, by means of which the analyst can classify companies into one of two groups – high-performing companies that create value (CVM greater than 0.758), and low-performing companies that destroy value (CVM less than 0.628). The model has greater explanatory power for companies that create value (97.13%), than for those that destroy it (79.63%).

The intervals set in this way allow us to utilise the maximum potential of the model. However, at the same time, it is in some cases not possible to clearly define the performance of the company, that is to say whether the company creates value or destroys it, and this introduces a so-called grey zone. This signals the fact that the company is heading for problems, and by extension does not generate enough value. Given that the design of the CVM model also meant to identify traditional indicators with statistically significant differences between the high-performing and low-performing companies, it is possible to consider hypothesis las verified.

The model is designed so that it covers three areas of company finance, namely liquidity, indebtedness and profitability. Contrary to models from abroad (see e.g. Altman, E.I. (1968) it includes liquidity, which is consistent with models from the Czech Republic (Neumaierová, Neumaier, 2014 Grünwald, 2001). Although the model is similar to, for example, the index IN05, it was constructed in a different way and the specific indicators that were used are also

different. The CVM model does not aspire to predict potential value creation of the company in the future. It is a model that evaluates the company retrospectively (ex post) based on actual data. However, the CVM model enables us to get a quick idea of the extent of the achieved value also in the areas where the value is mostly created or, conversely, mostly destroyed. The use of the model is particularly applicable to the corporate sector, whereby the owner or the manager of a company can easily check the economic performance of their investment (company).

#### 6. LIMITATION

This model can be used as a model of solvency, which means as a model that determines whether company creates value or destroys it. However, the model is unable to determine whether the company goes bankrupt. With regard to its structure, it may also be recommended for use more in the short term. The model is further limited to the area of the food industry in the Czech Republic. It was constructed based on the results of this sector and to transfer the findings to other sectors or countries would only be possible on the basis of further research and verification. It must also be emphasized that for proper explanatory power, it is necessary to use the identical construction of indicators, including the relevant accounting data, without which it cannot obtain the correct outcomes. On the contrary, a different or incomplete construction of indicators, will most probably lead to distorted, inaccurate and ultimately misleading results and interpretations.

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# APPENDICES

Appendix 1: List of all	financial indicators	used in the pre	ofile analysis
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Current liquidity = current assets / short-term liabilities
Total debt = external resources / total assets
Net profit margin = net profit/ operating income + extra income
Net working equity = current assets / short-term external resources
Net working equity II = profit / operating income + extra income
Debt repayment period = external resources – reserves / profit for the accounting period + depreciation
EBIT = profit + tax payable + expense interest
EVA as a proportion of assets = $EVA / total assets$
Financial leverage = total assets / equity
The index of financial leverage = $ROA / ROE$
Self-financing coefficient= equity / total assets
Reserves coverage by working equity = net working equity / reserves
Degree of financial independence = equity / (long-term liabilities + short-term liabilities + bank loans and
overdrafts)
Indebtedness ratio = equity / external resources
Cost = total cost / total revenue
NWC / long-term resources = (current assets - short-term external resources) / long-term assets
NWC / assets = (current assets - short-term external resources) / total assets
Turnover of total assets = total revenue / total assets
Turnover of long-term assets = total revenue / long-term assets
Turnover of current assets = total revenue / current assets
Turnover of receivables = total revenue / receivables
Turnover of equity = revenue / equity
Turnover of reserves= total assets / revenue
Immediate liquidity = financial assets / short-term liabilities
Share of own resources = equity / total assets
Quick liquidity = (current assets – reserves) / short-term liabilities
Operating liquidity = (depreciation + EBIT+ reserves) / (long-term liabilities + short-term liabilities – long-term
financial assets)
ROA = EBIT/total assets
ROCE = EBIT / (equity + reserves + long-term liabilities + long-term bank loans)
ROE/NWC = ROE / (current assets – short-term external resources)
ROS = profit/revenue
Interest burden = (short-term + long-term) liabilities - financial assets / balance cash flow
Indebtedness CA = (short-term liabilities + long-term liabilities + bank loans and overdrafts) / total liabilities
Indebtedness VK = equity / external resources

Indebtedness VK = equity / external resources Source: The authors

Coefficient	Order	Indicator	
320%	1	Degree of financial independence	
123%	2	Immediate liquidity	
111%	3	Quick liquidity	
104%	4	Current liquidity	
79%	5	Share of own resources	
75%	6	ROE/NWC	
47%	7	Reserves turnover	
36%	8	Current assets turnover	
21%	9	NWC/long-term resources	
4%	10	Receivables turnover	
-6%	11	Cost	
-39%	12	Turnover HIM	
-40%	13	Total asset turnover	
-42%	14	Debt repayment period	
-55%	15	Interest burden	
-57%	16	NWC/assets	
-77%	17	Total indebtedness	
-80%	18	ROS	
-87%	19	Net working equity (alt.)	
-91%	20	Net working equity	
-93%	21	Self-financing coefficient	
-97%	22	Reserves coverage by working equity	
-113%	23	EBIT	
-115%	24	Own equity turnover	
-116%	25	Financial leverage index	
-138%	26	Total assets indebtedness	
-153%	27	Indebtedness VK	
-156%	28	ROA	
-157%	29	EVA as assets share	
-158%	30	Financial leverage	
-162%	31	Indebtedness ratio	
-169%	32	Operating liquidity	
-177%	33	Net profit margin	
-226%	34	ROCE	

Appendix 2: Coefficients of individual indicators according to the profile analysis and comparison of averages

Source: The authors

# E-SCHOOL DEVELOPMENT AND QUALITY OF MANAGEMENT AND LEADERSHIP IN EDUCATIONAL SYSTEMS IN CROATIA AND BOSNIA & HERZEGOVINA

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	Information technology, Education
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# ABSTRACT

In this paper, the quality of management and leadership in educational systems in Croatia and Bosnia & Herzegovina, approximated by the assessment of primary and secondary school principals, is analyzed in terms of 'e-school' development, i.e. application of contemporary information & communication technologies (ICTs) in the educational environment. Authors critically (re)examine the educational practice in the wider region of South East Europe (SEE), which presupposes that projects, related to introduction of ICTs into educational systems, have an inherent potential to improve the effectiveness of schools and the entire educational systems. The empirical analysis is limited to the assessment of a smaller segment of the described problem, related to the potential influence of ICTs to management and leadership in selected schools in Croatia and Bosnia and Herzegovina. Nevertheless, it is believed that the obtained results provide solid grounds for the assessment of ICT-based quality of education in the SEE region.

#### 1. INTRODUCTION

Principals play a fundamental role in the functioning of schools and other educational institutions, upholding the operational management, coordinating teachers and motivating students, while providing instructional leadership (Wills, 2015). With the pressures, arising from the imperatives of decentralizing educational policy and achieving (at least a certain level of) independent financing, the school principals are also expected to provide creative, entrepreneurial solutions to educational and social problems (Yemini et al., 2015). In this context, the principal is no perceived as the 'ultimate' leader of the school, but, rather, a part of the managerial/leadership team, who recognizes the strengths (as well as limitations) of teachers and other employees and shares with them the responsibility for the school's effectiveness (Shawn, 2009). Many challenges, faces by the contemporary educational institutions, need to be addressed by the principals and their management/leadership teams, including the ever increasing influence of information and communication technologies to the educational and social processes in schools.

The most commonly mentioned technological challenge/trigger of changes in education is the e-learning (Jochems, Koper & Merrienboer, 2004), although a range of other educational processes are influenced by contemporary ICTs, including the assessment (Redecker & Johannessen, 2013), as learning outcomes tend to be influenced by the technology-enabled teaching and learning (Biagi & Loi, 2013). Some authors argue that the schools' entire organizational arrangements are shaped by ICTs (Tubin, 2007), which implies the potential difference in school effectiveness for varying levels of ICT application.

With principals representing an essential lever of school effectiveness (Vican, Alfirević & Relja, 2016), and the previous research, implying that information systems hold a potential for transformation of principals' and teachers' work (Shah, 2014), the role of ICTs in promoting efficiency and effectiveness of school management and leadership becomes an important research field.

This study is one of the first attempts to address this issue by analyzing the principals in elementary and secondary schools in Croatia and Bosnia and Herzegovina as transitional countries in the South East European (SEE) region. With practical projects, carried out by practitioners, and labelled by using the term of an 'e-school', in Croatia<sup>1</sup>, Bosnia and Herzegovina<sup>2</sup> and Slovenia<sup>3</sup>, the application of contemporary ICTs in the educational environment seems to be accepted as a significant driver of school improvement (at least, by EU and other donors, funding such projects). The objective of this study is to analyze such a notion from the empirical point of view, as to determine whether the ICT application influences the quality of school management and leadership. The further analysis of the two countries, as well as other countries in the region, could be also a potentially interesting research approach, which could also take into the account the major policy events, such as EU membership of individual countries. Nevertheless, there is a 'patchy' implementation of the 'e-school' concept in the wider SEE region, i.e. the individual 'e-school' projects seem to be driven by the policy and budgetary priorities, instead of being implemented within a wider policy framework, influenced by EU-related priorities. Therefore, this line of research is to be addressed by future research.

<sup>&</sup>lt;sup>1</sup> See: http://www.e-skole.hr/en/e-schools/project-description/

<sup>&</sup>lt;sup>2</sup> For an overview of the 'Dositej' project in Republic Srpska (RS) – one of the B&H entities, see: https://www.lanaco.com/Edukacija/dositej/Pages/default.aspx

<sup>&</sup>lt;sup>3</sup> See: http://projekt.sio.si/e-solstvo/

The paper is organized in the following manner. After providing the conceptual understanding of the dimensions and the role of 'e-school' development for efficiency of school management and leadership, the research methodology is presented. Following the presentation of the research findings, the chapter concludes with a discussion of the conclusions, implications for educational practice and future research directions.

# 2. TECHNOLOGICAL LEADERSHIP IN EDUCATIONAL INSTITUTIONS: AN OVERVIEW OF THEORY

As early as the beginning of the 1970s, Squires (1973) suggested that the conceptual analysis of education needs to be expanded from the notions of 'schooling' and teaching, toward the learning dimension(s), being incorporated at the levels of organizations and the entire society, as systems being capable of learning. The other dimension of the traditional educational system, singled out as prone to changes, has been the *credentialing*, i.e. 'official' recognition of the learning within the formal system.

The ICTs and their proliferation within the so-called 'knowledge society' have created significant challenges to both aspects of the traditional educational processes and systems (Anderson, 2008). The non-traditional providers of educational services have already became the commonplace in the (sub)fields of higher and adult/continuous education (Cunningham & Cunningham, 2000; Schütze & Slowey, 2000) and such 'flexibilization' can be expected to increase along the educational landscape. The overall tendency of educational reform(s) to validate previous knowledge, attained by a range of non-formal and informal paths, both in EU (CEDEFOP, 2009), as well as across a range of highly developed market societies (Harris, Wihak & Van Kleef, 2014), presents an additional 'flexibilization trigger' by making the transition among different learning paths easier and socially acceptable than ever before.

Response(s) of educational institutions and their leaders is shaped by the notion of embracing the potential(s) of ICTs and transforming the educational practices and processes along different dimensions. Usage of ICT systems in school administration is expected to have wide-ranging consequences, by providing an opportunity for data-based decision-making and inclusive distribution of educational information, which should improve both school effectiveness and its culture. Blau & Presser (2013) refer to such a technological opportunity as *'e-leadership' of school principals* and argue that only comprehensive, school-wide application, supporting the 'comprehensive innovation' (as described by Avidov-Unger & Eshet-Alkalai, 2011) can lead to such a positive outcome.

Nevertheless, there is a lack of empirical studies of this issue. Tan (2010) has identified only twelve such studies, conducted in the 2000-2009 period and analyzed them in terms of *technology leadership dimensions*, i.e. areas of (potential) school improvement. Those include the ICT infrastructure; organizational structure and school policies (with a wide range of policies, from ICT planning, to entrepreneurial networking with external partners; to evaluation and assessment of school progress); teaching and learning patterns and the school culture. All those dimensions are empirically linked, or identified as predictors of the school level of the technology use.

One should also add that notion of the 'e-leadership' has been conceptualized as a form of distributed leadership, which is, also, applicable to the computer-mediated environments (CMEs), in which 'pure' e-learning is taking place (Gurr, 2004). Such a finding can be interesting from the viewpoint of developing virtual educational institutions, offering education without any (or with a very limited amount of 'physical' delivery).

In the SEE region, the 'virtualization' of schools has not been considered as a relevant issue, as some countries, rather, focused on *digital maturity*. It has been declared as the main objective of the *e-Schools* project in Croatia<sup>4</sup> and promoted by the EU Commission as a relevant educational policy tool<sup>5</sup>. The school digital maturity is based on a generic notion of an ever increasing level of integrating the ICTs' use in the organizational processes and strategic management (Pöppelbuß & Röglinger, 2011). In the specific case of an educational organization, this translates to a journey from the isolated 'islands of application' (as previously noted by Avidov-Unger & Eshet-Alkalai, 2011), to the most advanced levels, along the dimensions, identified by an adequate tool/framework, such as the EU European Framework for Digitally Competent Educational Organisations (DigComp) policy tool<sup>6</sup>. Within the Croatian *e-Schools* projects, principals were also offered a self-assessment tool, as to identify and benchmark the digital maturity of their school<sup>7</sup>.

At the other hand, the *Dositej* project, in RS-B&H, concentrated on the deployment of affordable and practical *Intel* ICT infrastructure and training of staff and students, as to develop the one-to-one e-learning as one of the standard pedagogical tools in this B&H entity<sup>8</sup>. The former Slovenian project *e-Šolstvo (e-Education)* was concentrated on the development of Open Educational Resources (OERs), available across the entire national educational system, as well as on the individual technology support to Slovenian teaching staff.

Such a diverse interpretation of the 'e-school' (or the 'technology-based', 'technologically capable', etc.) school notion in educational practice could create highly diverse models, related to the constructs involved. Nevertheless, there is a common presumption of a *positive relationship between the adequate application of ICTs (i.e. introduction of the 'e-school' concept and the associated educational and managerial practices) with the different aspects of school effectiveness* (e.g. Telem, 2001, based on a single case of an Israeli school; Yuen, Law & Wong, 2003, based on the empirical analysis of practices in 18 Hong Kong schools; an illustrative review of theory and ICT applications by Flanagan & Jacobsen, 2003; Abdullah, DeWitt & Alias, 2013, based on a case of a single school principal in an urban secondary school in Malaysia, etc).

The *mechanisms of influence* could be modelled by a range of different approaches, but the majority presumes that the *school leaders'* (*i.e. managers'/administrators'*) *competences will be developed by the application of ICTs.* For instance, Perez & Uline (2003) associate the ICT application with the principals' competence to achieve pedagogical outcomes from the integration of ICTs into the teaching and learning processes (Bennett, 1996); creative problem-solving capacity; Blau & Presser (op. cit.) refer to the data-driven decision-making; improved outcomes for students and teachers/staff (Flanagan & Jacobsen, op. cit.), etc. Regardless of the route projected by a range of different studies, the choice of school-level variables (i.e. *different dimensions of ICT application and school effectiveness)* still remains stable, providing the rationale for the research question, outlined in the following section.

<sup>&</sup>lt;sup>4</sup> See: http://www.e-skole.hr/en/results/digital-maturity-of-schools/

<sup>&</sup>lt;sup>5</sup> See: European Framework for Digitally Competent Educational Organisations, https://ec.europa.eu/jrc/en/digcomporg

<sup>&</sup>lt;sup>6</sup> See: This tool recognized the following dimensions of a school's digital competency: leadership and governance practices, teaching and learning practices, professional development, assessment practices, content and curricula, collaboration and networking, ICT infrastructure.

<sup>&</sup>lt;sup>7</sup> See: Available at: https://digitalna-zrelost.carnet.hr/ (in Croatian, with restricted access).

<sup>&</sup>lt;sup>8</sup> See: https://www.lanaco.com/Edukacija/dositej/Documents/Dositej\_Brochure\_email.pdf

#### 3. 3. RESEARCH METHODOLOGY AND RESULTS OF THE EMPIRICAL STUDY

#### 3.1. Key empirical constructs, measures and hypotheses

The research question of this study is related to the potential influence of ICTs application to the quality of educational management and leadership. Key research constructs used in this empirical study include different aspects --of the 'e-school' concept and its development, relevant from the viewpoint(s) of both the theory review and the EU and national educational development projects in the SEE region (as presented in the previous section of the paper). The three constructs and their measures, related to 'e-schools' and further explicated in this section, are analysed in terms of potential relationship with the school-level management and leadership quality. Measures for these constructs were developed and verified in the previous empirical studies in the SEE region. Based on the described body knowledge, the following hypotheses have been developed:

**Hypothesis 1 (H1):** Educational management and leadership quality can be predicted by the level of critical success factors (CSFs), related to the implementation of the 'e-school' concept.

**Hypothesis 2 (H2):** Principals and educational institutions, demonstrating the differing levels of CSFs in implementation of the 'e-school' concept, will be characterized by statistically significant differences in the quality of educational management and leadership.

With the concepts of 'e-schools' and principals' technological leadership being multi-faceted, both from the theoretical, as well as practical point(s) of view, several research constructs were considered for inclusion into the study. Firstly, the systematic and inclusive planning of ICT application in an educational setting was singled out, due to the potential danger of adopting whatever technological tool might be considered as appropriate/convenient, and labeling the action as 'e-school introduction'. The ICT planning has been singled out as significant components of the already described technological school leadership (Vanderlinde, Dexter & Braak, 2012), with the inclusive planning, across a range of relevant school stakeholders, being required, as well.

Measurement of ICT planning in this study included four items, related to the use of factbased, school-level ICT policies and its inclusiveness toward both internal and external school stakeholders. The value of Cronbach Alpha, used to assess the internal consistency of the indicator, can be considered as adequate (0.788). Nevertheless, the educational environment(s), faced by the schools in the sample are very different, which leads to the recommendation that the future research should also try to identify additional factors, influencing the intended modes of ICT application in schools, by referring to national educational ICT policies (Austin & Hunter, 2013).

The critical success factors (CSFs) for the successful implementation of a school-level digital agenda have been analysed by Wastiau et al (2013), following an EU-wide project, entitled "Survey of Schools: ICT in Education Benchmarking Access, Use and Attitudes to Technology in Europe's Schools". This study identifies the following CSFs and recommends their benchmarking across the EU educational systems: the quantity and quality of ICT equipment in schools (i.e. ICT infrastructure), patterns of ICT access and use, the staff and students' self-assurance in using the ICTs (i.e. in their own digital competences), as well as relevant stakeholders' attitudes toward the ICTs and the ICT-related strategy/leadership at the school level. These factors are extremely useful in terms of determining and improving the digital maturity of schools, as described in the previous section of the paper.

Authors of this study singled out two (out of seven) elements, proposed by such a EU framework, as especially relevant at the school level, regardless of the educational environment, which could be considered as exceptionally variable across our research sample. Those include the e-learning, as a specific form of the teaching and learning practices, considered by the framework, as well as the principals' patterns and leadership in ICT use (including professional development), referring to the school-level leadership and governance. Three items have been developed to measure the principals' involvement into ICTs and 'technological leadership', while the e-learning patterns and their relation to the ICT planning were measured by three additional items. The empirical analysis shows that the measure for technological leadership still needs to be improved, as its internal consistency, measured by the Cronbach Alpha, is not completely satisfactory (0.687), while the measures for e-learning practices are extremely consistent (with the Cronbach Alpha value of 0.927).

Due to the recent interest for the role of social media in education (Redecker, Ala-Mutka & Punie, 2010) and their potential influence to students (see, e.g. O'Keeffe & Clarke-Pearson, 2011), additional items were introduced to the survey. They were related to the informal use of the most common social networks (including Facebook, Twitter and Instagram), and the potential practice of 'officially' representing a school on such networks. These items were not meant to be included into the strict analysis of the previously described research question, but were, rather, expected to deliver an initial assessment of the potential research potential in the area of schools' usage of social networks in Croatian and B&H.

Additional measures included into the study are related to educational leadership and management quality, which were used in a range of previous empirical studies in Croatia and B&H. These measures were developed by employing the factor analysis to a survey of Croatian primary school principals (Alfirević, Pavičić & Relja, 2016) and further verified by an empirical study of the influence of entrepreneurial orientation to the managerial activities of both primary and secondary school principals in Croatia and B&H (Alfirević & Petković, 2017). With the empirical validation of the two mentioned measures in two contexts, they are considered as acceptable for this study, as well.

This study uses the same (re)classification of principals' activities, which relied on structured theoretical reviews of educational management (Vican, Alfirević & Relja, 2016) and leadership (Vican, Relja & Popović, 2016), as conducted by the Croatian Scientific centre of excellence for school effectiveness and educational management. In this framework, the administrative practices, actually performed by school principals, although this might not be recommended from the theoretical viewpoint, were labelled as school operations. The previous study (Alfirević & Petković, op. cit.) indicated adequate Cronbach Alpha values for the measures of educational leadership and management quality (in the 0.8-0.9 range), while the measure of school operations had not been completely satisfactory (in the 0.6-0.7. range).

The standard Likert scale, with five pre-determined levels of agreement with adequately developed statements, expressing the previously described items, was used throughout the survey questionnaire.

#### 3.2. Research population and sample

The research study, related to the application of the e-school concept and its potential influence to educational management and leadership, has been conducted in Croatia and B&H. The sampling frame for Croatian schools was readily available in the form of an Excel

table, prepared by the Ministry of Science and Education of the Republic of Croatia<sup>9</sup>. At the other hand, in Bosnia and Herzegovina, the authors were not able to locate the officially produced sampling frame, which was approximated by lists of schools in both entities of Federation of B&H (FB&H) and Republic of Srpska (BH), which were compiled and published on the Internet, by a private organization<sup>10</sup>.

In Bosnia and Herzegovina, there is a complex administrative and policy landscape, involving two individual entities (FB&H and RS), as well as an additional District of Brčko. In addition, each of the FB&H cantons is granted autonomy in pursuing the educational policy, which makes it extremely difficult to collect, or analyse the country-wide educational data. Nevertheless, authors were able to collect questionnaires from 123 schools, which represent approximately 15% of the sampling frame used. At the other hand, data collection was easier in Croatia, where additional assistance has been provided by a number of organizations<sup>11</sup>. All questionnaires were delivered to the school principals, by a range of communication channels (including the Google Forms-hosted questionnaire, e-mail, fax and postal mail), which were customized to the requirement of a group, or, even, individual respondents. In Croatia, the total number of questionnaires collected, by using multiple channels of communication and additional cleaning of data, equals 293, representing approximately 23% of the official sampling frame.

The resulting sample is considered as representative, since its structure has not been biased, either in terms of the school level, or the geographical coverage of the two countries. The additional checks could be useful in future research, if the application of ICT in education is to be viewed in a broader socio-economic context.

# **3.3. Results of the empirical research**

Values of research constructs were compared across the two countries and the B&H entities, which could be considered as interesting, due to Croatia being admitted to full EU membership in 2013. This created a time frame of approximately three years (at the time of data analysis) to identify potential effects of EU membership in the SEE region, considering the school-level effects of educational policies. It should be also noted that the values of individual indicators varies, due to the number of items used, as the constructions of measurement was based on summative indexes (see columns Min. and Max. for minimum and maximum empirical values obtained).

It is interesting that the comparison of 'e-school' indicators, used by this study, is not completely analogous to the evaluation of school management, leadership and operations practices across the sample, which has shown only small differences among the countries and entities analyzed (see Alfirević & Petković, op. cit.). Namely, national and entity differences among the empirical values of research constructs (see Table 1) *can be confirmed for ICT planning* (p<0.01) *and e-learning dimensions* (p<0.01) *of the 'e-school' development*, by using the non-parametric Kruskall-Wallis tests. This could be attributed to the outcomes,

<sup>&</sup>lt;sup>9</sup> Available at: http://www.mzos.hr/datoteke/Ustanove/USTANOVE\_OS.xls (for primary schools) and http://www.mzos.hr/datoteke/Ustanove/USTANOVE\_SS.xls (for secondary schools).

<sup>&</sup>lt;sup>10</sup> Available at: http://skolegijum.ba/static/pdf/5204c52864f20.pdf (for primary schools), as well as a list of secondary schools: http://skolegijum.ba/static/pdf/5208e83558b90.pdf.

<sup>&</sup>lt;sup>11</sup> Authors wish to express their gratitude to the Scientific Center of Excellence for School Effectiveness and Educational Management and Association of School Legal and Accounting Professionals in Croatia, for their assistance in surveying the Croatian school principals.

linked to EU projects in education, conducted in Croatia, as well as to the *Dositej* project, conducted in the RS entity of B&H.

Country		Min.	Max.	Mean	Std. Dev.
Croatia	ICT planning	4.00	20.00	12.6471	2.85774
	Principals' ICT patterns	7.00	15.00	13.5211	1.73803
	E-learning	3.00	15.00	10.0724	2.81216
В&Н- F В&Н	ICT planning	4.00	18.00	10.7222	3.28758
	Principals' ICT patterns	8.00	15.00	13.1818	2.05562
	E-learning	3.00	13.00	8.0943	3.15780
B&H - RS	ICT planning	5.00	17.00	12.0149	2.68832
	Principals' ICT patterns	8.00	15.00	13.1515	1.77367
	E-learning	3.00	15.00	9.6119	2.63402

Table 1. Empirical values of research constructs

Relationships among research constructs were analyzed by using the correlation analysis, which was preceded by the non-parametric Kolmogorov-Smirnov (K-S) tests for all research constructs, as to determine the potential departure from the statistical presumption of normal variable distribution. With the p<0.05 for the educational management and leadership variable distributions and p<0.01 for distributions of all other variables considered, the K-S tests demonstrated non-conformance to the normal distribution presumption. This finding required the use of non-parametric statistical methods in the further data analysis.

Table 2 presents the results of non-parametric correlations (by using the rank-based, Spearman indicator) among the key research constructs.

	ICT planning	Principals' ICT patterns	E-learning	Educational leadership	Educational administration	School operations
ICT planning	1.000	.730**	.263**	.287**	.347**	.126*
Principals' ICT patterns		1.000	.321**	.233**	.275**	.082
E-learning			1.000	.167**	.255**	.204**
Educational leadership				1.000	.728**	.428**
Educational administration					1.000	.446**
School operations						1.000

Table 2. Correlations among research constructs

\*\*. Correlation is significant at the 0.01 level (2-tailed).

\*. Correlation is significant at the 0.05 level (2-tailed)

The research results demonstrate that, practically, all research constructs (except for principals' ICT patterns and school operations), are statistically significant at the level of p<0.01. Although the strength of relationship is relatively high for the ICT planning and principals' ICT patterns only, the obtained results provided solid grounds for the further analysis. It should be also noted that the correlation analysis revealed that the proposed measures of schools' social media use are significantly correlated with the principals' ICT patterns only, although the correlation strength was quite low. Due to such a result, these

measures were not considered in the further analysis, which was continued by the estimate of potential causal relationships among the constructs.

Linear regression, as one of the simplest statistical methods available for the estimate of potential causal relationships has been used in subsequent analysis. The following tables present linear models of educational leadership (Table 3) and management (Table 4), obtained by stepwise regression, with the three dimensions of 'e-schools' serving as predictors. The *causal model of educational leadership* has been developed in two steps, with ICT planning and principals' ICT patterns being accepted as statistically significant predictors (p<0.01) in the final model. Due to statistically partial correlation of the e-learning dimension with the residual, in both cases, this variable has been dropped from the regression model.

The both regression models are also statistically significant (p<0.01), without any detected problems of multicollinearity (tolerance of 1.0 and VIF = 1.0 for Model 1, tolerance of 0.916 and VIF = 1.091 for Model 2), or the assumption of independent errors (Durbin-Watson/DW value of 1.819). With the  $R^2$ =0.125 for the final model, *ICT planning* and *principals' ICT patterns* proved to serve as significant predictors of educational leadership, which is perfectly logical, due to their association to the principal's personality. However, the strength of these predictors is quite low, which shows that *the indicators of 'e-school' development might not have been chosen adequately*. In addition, *the lack of e-learning dimension involvement into the developed causal model could prove to be a disturbing deficiency of the empirical research*, which could imply that the *surveyed principals are not involved enough into the e-teaching and learning in their institutions*.

	Model	В	Std. Error	Beta	Sig.
1	(Constant)	33,399	1,135		0.000
	ICT planning	,606	,090	,327	0.000
2	(Constant)	28,462	2,088		0.000
	ICT planning	,530	,093	,286	0.000
	Principals' ICT patterns	,436	,155	,141	0.000

Table 3. Linear stepwise regression model of educational leadership

Note.  $R^2$ =.107 for Step 1;  $\Delta R^2$ =.018 (p=0.05)

The *causal model of educational management* (Table 4) proves to be comparable to the previous model, related to educational leadership. Once again, ICT planning and principals' ICT patterns are accepted as statistically significant predictors (p<0.01) in the final model, while the e-learning is dropped. The significance of the two obtained regression models is high (p<0.01), although the predictive power is comparable to the causal models of educational leadership. With the R<sup>2</sup>=0.156 for the final model, the empirical results *also indicate that the choice of 'e-school' measures could be improved and/or modified in future research*.

There were no methodological problems with the causal models of educational management, as multicollinearity has not been detected (tolerance of 1.0 and VIF = 1.0 for Model 1, tolerance of 0.919 and VIF = 1.088 for Model 2), which was the case with the assumption of independent errors, as well (Durbin-Watson/DW value of 1.896). The assumptions of linearity and homoscedasticity have been also checked by the visual inspection of the P-P plot of regression standardized residuals.

	Model	В	Std. Error	Beta	Sig.
1	(Constant)	34,926	,999		0.000
	ICT planning	,577	,079	,350	0.000
2	(Constant)	29,062	1,809		0.000
	ICT planning	,488	,081	,296	0.000
	Principals' ICT patterns	,518	,134	,189	0.000

 Table 4. Linear stepwise regression model of educational management

Note.  $R^2$ =.123 for Step 1;  $\Delta R^2$ =.033 (p<0.01)

As to determine potential differences in the quality of educational leadership and management, across the sample groups with the 'low' and 'high' levels of 'e-school' development, the simplest clustering algorithm has been used in SPSS/PASW. The K-means clustering option developed the two clusters: the 'low e-school development' one (N=145, Mean ICT planning = 9.43, Mean principals' ICT patterns = 12.70, Mean e-learning = 7.08) and the 'high e-school development' one (N=249, Mean ICT planning = 13.94, Mean principals' ICT patterns = 13.85, Mean e-learning = 11.35). It is interesting that some patterns of 'e-school' development differences are observable (see Table 5) and consistent with the previous findings, related to the values of key research constructs across the analyzed sample.

Country		Frequency	Percent
Croatia	Low usage cluster	88	29.5
	High usage cluster	189	63.4
	Missing	21	7.0
B&H- F B&H	Low usage cluster	30	54.5
	High usage cluster	22	40.0
	Missing	3	5.5
B&H - RS	Low usage cluster	27	39.7
	High usage cluster	38	55.9
	Missing	3	4.4

Table 5. Differences in 'e-school' development across countries and entities

The cluster membership variable has been used to obtain the cluster means for the quality of educational leadership and management (see Table 6). Differences of mean values for the two clusters are also confirmed as statistically significant by the non-parametric Mann-Whitney test for equality of means, as related to educational leadership and management (p<0.01). Since the school operation construct, actually, describes the 'disorganization' of the educational management at the school level, it could be expected that the high-usage ICT cluster should have a significantly lower value than the low-usage ICT cluster. Nevertheless, no statistically significant differences across clusters could be identified by using the non-parametric Mann-Whitney test.

Table 6. Differences of educational practices across clusters defined by the level of 'e-school' development

ICT cluster membership		Min.	Max.	Mean	Std. Dev.
Low usage cluster	Educational leadership	24.00	52.00	39.0426	5.75931
	Educational administration	24.00	54.00	40.1871	5.14510
High usage cluster	Educational leadership	29.00	55.00	41.8843	5.08548
	Educational administration	32.00	55.00	43.0490	4.49472

# 4. DISCUSSION, CONCLUSION AND IMPLICATIONS FOR EDUCATIONAL PRACTICE

The first hypothesis, related to the relationship of the educational leadership/management and the selected dimensions of the 'e-school' concept, can be only partially accepted. Although the statistical association has been demonstrated, the selected predictors did not prove to represent a good fit, which calls for additional research and modelling of 'e-school' indicators, relevant for the South East European (SEE) region. The second hypothesis is accepted, due to the significant statistical differences in the management/leadership indicators for the two school clusters obtained. This finding is not surprising, as it follows the well-established notion of association among the ICTs application and different forms of school effectiveness.

From the theoretical viewpoint, the obtained results are in line with the existing theoretical and empirical findings, although they require the improvement of modelling the 'e-school' concept. To the educational practitioners, *this study signals the importance of inclusive ICT planning and the 'leadership by example', when it comes to principals' use and commitment to applying technology in education.* At the other hand, dropping of the e-learning dimension in the empirical results could *indicate that principals in the SEE region need to be more personally involved in advocating the e-learning as a significant mode of teaching and learning in their schools.* 

This study can also serve as a starting point for future research, since (according to the information, available to authors) no previous empirical research on this topic has been conducted in SEE. Some methodological limitations have been already identified and should be addressed in the future, along with a more systematic approach to sampling, which could be performed in multiple SEE countries, if resources are available.

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# PROCEDURE OF THE CAPITAL STRUCTURE MANAGEMENT STRATEGIES DEVELOPMENT: PRACTICE FROM UKRAINIAN LISTED POWER-PRODUCING COMPANIES

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## ABSTRACT

The article is dedicated to a research of the capital structure management strategies and their development process. The following research explores the financial planning and its long-term and short-term parts, defines the financial strategy, the capital structure management, summarizes the scientific investigations related to the development of the capital structure management strategy and provides the additional information that is important for the research. The introduced paper reflects author's own proceedings related to the identified topic. Thus, the development procedure of the capital structure management strategies, which includes three logical blocks and nine stages combined by three in each of the block, is presented in the following research. All three logical blocks and nine stages were introduced and described within this paper. According to the stated point of view, such sequence of logical and parallel steps will help the power-producing listed companies to develop the capital structure strategy in much efficient way.

## 1. INTRODUCTION

Financial strategy at an enterprise is a constituent part of the financial planning process and serves as a strategic activity of capital sources manipulation, capital structure changes, budgeting etc. It is a result of a long-term financial planning, on the one hand, which helps the enterprise to define its future financial steps that will support all main activities and correspond to general corporate strategy. From the other hand, it is a great basis for overall entrepreneurial activity. A firm from any field struggles to modify and adapt its financial sources (short-term and long-term) in such proportion that leads to maximization of the financial performance. Some researchers from Sri Lanka, summarizing their investigations, state that short-term debt negatively related to profitability of the company, while long-term debt positively related to company's performance (Madhubhashani, Jayamaha, 2016). Addae, Nyarko-Baasi and Hughes (2013), exploring the relationship between capital structure and profitability of the Ghanaian listed companies, found out that there is statistically positive relationship between short-term debt and company's performance and negative relationship between long-term debt and profitability. Continuing personal researches (Mastiuk, 2016; Mastiuk, Valouch, Krush, 2016) it is important to mention that the capital structure of the Ukrainian power-producing listed companies negatively related to their profitability. Nevertheless, it has a positive correlation with economic value added. These short-term and long-term sources form a capital of a company, which consists of a debt and an equity and has a structure. Initially, the formation of the capital structure is not enough for successful achievement of the set of objectives, as it requires a wise management and a well-formulated strategy. The development process of the strategy of the capital structure management needs a comprehensive approach that covers all necessary parts and acquires vital and accurate information for its solid formulation. Therefore, the aim of the article is to introduce author's approach to the development of the capital structure management strategy and provide its substantiation.

## 2. THE EXPLORATION OF THE RELEVANT LITERATURE

# 2.1. Financial planning, Long-term and short-term financial planning, The relevance of the capital structure management for the performance of the company

Conducting the research in the capital structure management, and the strategies development for its further adaptation to the real-time environment, it is important to start with a definition of the financial planning. According to Gitman and Zutter (2010), financial planning is a crucial element of the company's operations as it provides a road map for a guidance, a coordination, and a control on the company's financial actions to reach its objectives. The financial planning process begins with long-term planning, or in other words strategic financial plans (Gitman, Zutter, 2010).

It is important to reveal what is the long-term financial planning, and what is the difference from a short-term planning. Downes (1998) states that long-term financial planning is directed to accomplish the long-term financial goals. A long-term plan, or strategic financial plan, will project how much money will be needed to fund any planned activity of the company in next five years or more by designing an investment strategy to meet that goal (Downes, 1998). Gitman and Zutter (2010) define the long-term (strategic) financial plan such that lays out a firm's planned financial actions and the anticipated impact of those actions over the period from two to 10 years. Besides, they say that long-term financial plans, guides the firm toward strategic goals (Gitman, Zutter, 2010), and they consider proposed outlays for fixed

assets, marketing and product development actions, research and development (R&D) activities, capital structure, and major sources of financing.

Short-term (operating) financial plans differ from long-term financial plans and specify short-term financial actions and the anticipated impact of those actions. These plans cover a one to the two-year period (Gitman, Zutter, 2010). At the same time, short-term financial planning, according to Brealey, Myers and Allen (2010), makes focus on short-term cash budgeting, involves short-term assets and liabilities, which are easily reserved and ensures that a company does not run out of cash. Short-term financial planning is closely related to working capital management the objectives of which are to settle the appropriate cash level and avoid its cut-down and deficit; to establish an apt level of debtors and prevent its increasing. Moreover, to establish and control an apt level of stock and to identify an appropriate and effective level of short-term liabilities (Attom, 2016). Whereas, the long-term financial planning is such focused on long-term financial decisions related to investments that will be needed to meet the firm's long-term objectives. Long-term financial planning focuses on the determination and implications of alternative financial strategies that have been developed in advance (Brealey, Myers and Allen, 2010).

It is important to state that capital structure management plays one of the crucial roles in the enterprise's activity. The reason is that the overall performance of the company is influenced by the capital of the company generally and exactly by the proportion of the resources acquired and timing of the acquisition, the costs payed for using of these resources and the planning activity of the company regarding payments for the resources. Moreover, each of the aspects can have its own completely distinguished from others impact.

The study conducted by Tailab (2014) defines the impact of the capital structure and its management on the performance of 30 power-producing companies in the USA. The research has been done for the period of nine years from 2005 to 2013 and has been tested through Partial Least Square model and multiple regression model. The Total Debt appears significantly negatively related to ROE and ROA. Though, a short term debt creates positive impact on return of equity (Tailab, 2014). The study of the Pakistani joint stock companies and the influence and relevance of the capital structure management reveals that poor decision making process and management of the resources significantly decrease the level of the profitability, which was measured by two main ratios - ROA and ROE. Summarizing the study, the ROA and ROE decrease on 15% yearly, impacted by inadequate Debt-to-Equity structure that represents the capital structure (Basit, Hassan, 2017). Researcher from Ethiopia (Negasa, 2016) conducted the study aiming to define the effect of the capital structure on firms' profitability, the findings of which reveal that there is a significant positive relationship between profitability and total debt ratio which indicates firms' capital structure. Abor (2005) concluded that Ghanaian companies that generate high profits tend to acquire more debt to equity as their main financial decision.

Summarizing all above, it is necessary to underline that the correct development of the financial strategy in terms of structure of the resources according to their amount and costs leads to increase of the overall performance of the company and helps to create additional value to shareholders. The decision making process and defined steps of creation and choosing of the financial strategy, based on the influential factors, theoretical and empirical analysis, need to be adapted to the actual specifics of an enterprise and directed on the fulfillment of the performance maximization aim. Therefore, in order to develop clear and understandable development procedure of the capital structure management strategies the

conducted research complies with the theoretical and practical aspects of the financial management.

## 2.2. Financial strategy

As a main subject of the provided article is the development of the strategy of the capital structure management, therefore, the attention is paid exactly on the long-term (strategic) part of planning. The research states that long-term financial planning and financial strategy are correlated and, technically, are identic of the essence. Herein, it is necessary to identify what is a financial strategy. For such purpose, the article operates with the definition of Bender and Ward (2009), who say that financial strategy is about attracting the funds required by the enterprise in the manner most suitable to its overall corporate and competitive strategies and managing the application of those funds within the enterprise. Besides, by Kaličanin and Todorović (2014) the financial strategy focuses on determining the target capital structure and aims to minimize the weighted average cost of capital (WACC) and maximize company's value. They add that all financial decisions should be made in accordance with the intended financial strategy (Kaličanin, Todorović, 2014). Donaldson (1994) in his research indicates that the financial strategy is passive in relation to a business strategy and its instruments; moreover, we cannot ignore the fact that financial conditions determine any intended business strategy. Thus, hereinafter the financial strategy from the article's point is considered as a combination of principles, rules, methods and actions, which have long-term character and directed on managing of all financial constituent parts related to and influenced the achievement of identified objectives. Financial strategy orients on the identification of financial sources and choosing the most relevant, assessing of company's capital needs, establishing the capital structure and calculating its effectiveness etc.

#### 2.3. Capital structure management and development of the strategy

Going further into the research, we operate with term of capital structure, which is, according to Parsons and Titman (2009) a mix of different sources of financing. Oxford Dictionary (2016) defines it as a particular distribution of equity and debt that makes up the finances of a company, when Watson and Head (2007) says that it is a mix of equity and debt that minimizes WACC and maximizes net present value (NPV) and therefore the well-being of owners. From the point of view of Wilkinson (2013), capital structure is referred to a capital structure management as the last one affects the various sources of funding in order to minimize WACC and maximize NPV. Capital structure management, in accordance with Valmet corp. (2016) approach, encompasses both equity and debt with the primary aim to maintain the strong capital structure in order to secure customers, investors, creditors, and market confidence. Taking into account all mentioned definitions, we say that capital structure management is an activity carried out by an enterprise and related to all financial sources that comprehend the capital structure of the enterprise. Such activity involves assessing, planning, decision-making, implementing, monitoring, and controlling processes directed on capital structure.

As it was written, the financial strategy implies and affects all financial constituent parts (the capital structure of the enterprise is among them) that influence the long-term objectives achievement. Therefore, combining stated above theoretic information about financial strategy and capital structure management, we say that a strategic management of the capital structure is an extremely important part of the overall financial activity. Herein, we concentrate our view on the strategic capital structure management and a procedure of a development of the capital structure management strategy, as it is the main object of the

provided research. Form this point of view, the strategy of the capital structure management pertains to the financial strategy.

The capital structure management strategy requires its own process of development that connects all logic components and steps directed to its creation. Kolodiziev and Boyko (2015) were investigating the formation process of the customer capital management strategies at the engineering enterprise. As the result, they have introduced the matrix approach to strategies formation and choosing, which is based on integrated indicators and quality levels. Vitka (2012) dealt with strategic management of the capital at an industrial enterprise and introduced the "scheme of formation" of the strategic management of the capital. Continuing the research of the financial strategies development, Nikolaenko and Heraschenko (2010) investigated the development of the financial strategy as a part of anti-crisis program of the enterprise. In their paper, they have provided an algorithm of the financial strategy formation at the enterprise and stages of its formation.

In the Guide to Developing a Financial Strategy (SCOTTISH COLLEGES FINANCIAL MANAGEMENT NETWORK, 2005) the key objectives and essential requirements for the financial strategy development and mechanisms and procedures for implementing, monitoring and refreshing strategies. Financial Wisdom: online resource library (2013) reflects the financial strategy development through three major steps that are the measurement of a current financial status, the identification of financial objectives and the identification of steps for their achievement. Within the research of Korneiev and Hololobov (2012), the theoretical background of capital management and the basic principles of it have been explored. Moreover, authors provided the scheme of tactical and strategic areas of capital management and basic types of strategies. Buhaiov R.V. (2013) decomposes and details in his research the process of the capital structure management, whereas Grepan D.S. (2012), introduced the complex interconnection of actions included into the formation and management process of the capital structure.

Based on the revealed information above, in is important to state that the process of the development of the capital structure strategies has not been studied by the scholars in decent way. Some of the researchers paid their attention only at the capital structure and its management, or only at the financial strategy and its creation, while only few of them concentrated their studies on the strategy of the capital structure management and its development. Nevertheless, the partial exploration of this issue exists; it needs to be deepen in the provided research. Therefore, we can consider this topic as relevant for its further evolving.

#### **3. RESEARCH METHODOLOGY**

For the purpose of stated article, we have used and explored the entrepreneurial activity of the five power producing listed companies at the Ukrainian market (Ukrainian Exchange, 2016). These are private joint-stock company (PJSC) DTEK Zakhidenergo (ZAEN UK), PJSC Centerenergo (CEEN UK), PJSC Donbasenergo (DOEN UK), PJSC Kievenergo (KIEN UK), and PJSC Dniproenergo (DNEN UK), which have been studied for the period from 2003 to 2016. These companies were taken as the research basis in reasons of extreme importance of the power generation for the Ukrainian economy, which generates up to 33% of overall industrial products and services, and expandability of the previous researches (Mastiuk, 2016; Mastiuk, Valouch, Krush, 2016; Mastiuk, 2017). Besides, each of them owns the thermal power plants and stations that increase the value and importance of these companies for the

research because of their defined specialization. Moreover, these five companies are the only companies that works with such type of power generation.

Our previous empirical researches (Mastiuk, 2016; Krush and Mastiuk, 2016) had provided us with relevant information that gave an opportunity to say and conclude the next:

- The Ukrainian power-producing listed enterprises do not use any constant, standardized approach for the capital structure formation and its strategic management, which sags their positions in all directions.
- The enterprises are constantly staying overleveraged with the highly volatile debt-toequity ratio.
- Within the debt structure, the short-term liabilities prevail over the long-term liabilities.
- The cost of debt exceeds the cost of equity.

Such statements help us to underline the importance of creation of the precise procedure of the capital structure management strategies development and its adaptation to a modern environment. This can help the chosen enterprises to manage their capital structure in proper way, wisely choose the financial sources and plan their long-term financial activities.

The review of different sources that contain theoretical and empirical researches gives an opportunity to identify crucial issues, clarify them and, eventually, introduce author's modified approach to the strategy development of the capital structure management. For instance, the Financial Wisdom (2013) source introduces the process of strategy development, in our point of view, in very simplified way that does not show important parts related to the empirical analysis of the capital structure and the connection between future developing strategies and a general corporate strategy. Korneiev M.V. and Hololobov M.I. (2012) orienting their research on the theoretical background of the capital management introduced the areas of the strategic management and types of strategies, but not the development process. At the same time, Vitka (2012) did not include into provided scheme of the strategic capital management the compliance to a corporate structure and assessing of the effectiveness of the capital structure etc.

The clearest explorations were provided by Vykydanets (2013) and Nikolaenko and Heraschenko (2010). The first author introduced well-organized conceptual approach to the development of the financial strategy of the capital formation, nevertheless, he had not included the capital analysis and it structure effectiveness assessment, and not corresponded to the corporate strategy (Vykydanets, 2013). The algorithm of Nikolaenko and Heraschenko (2010) covers all necessary parts of the financial strategy formation and includes most of relevant steps. Nonetheless, we consider it a bit cumbersome and difficult for the understanding.

The main aim of the article is to introduce the author's approach to the development of the capital structure management strategy. The article is based on the previous authors' investigations, is a part of personal research and is written to expand it. Within this research the several steps were taken to complete it. At first, the article provides brief literature review on long-term and short-term financial planning, financial strategy and capital structure management. Besides, it explains the relevance of the capital structure and its importance for

achievement of profitability maximization. The article describes the relation between overall performance and capital structure and its management, based on the scientific papers conducted by international counterparts. In combination with the previous researches (Mastiuk, 2016; Mastiuk, 2017) the correlation of these two parts is explained. The provided in further procedure was created within the personal scientific paper research and is the result of different steps, methods and processes combination (Mastiuk, 2016; Krush and Mastiuk, 2016; Mastiuk, Valouch, Krush, 2016; Mastiuk, 2017; Mastiuk, 2017).

## 4. RESULTS

Bearing in mind the provided review of scientific works and the results of previous empirical researches (Mastiuk, 2016; Krush and Mastiuk, 2016; Mastiuk, 2017), in this paper we introduce author's approach to the process of the development of a management strategy directed on the capital structure at the power-producing enterprises in Ukraine. Therefore, below, on the Figure one, you can find the development procedure of the capital structure management strategy at the power-producing enterprises, which includes three logic blocks with three steps in each of them.





Source: author's own proceedings.

As it is presented above, the procedure of the capital structure strategies development encompasses three logic blocks and nine stages that are connected between each other. On this figure, we try to show how all stages are combined and grouped, and how blocks are related. From our point of view, the procedure of the strategies development has to involve the cyclic character. Thus, it means that any of three blocks with three stages in each interplays with others and brings the important information for the development of the capital structure management strategy. The procedure can be repeated at any time, when the enterprise's management feels the necessity of it. The process of the development starts from the basic analysis (which is the first block) of the economic and financial data, relevant for an enterprise. The second block includes the specific analysis of the capital structure and its effectiveness, and the forecast of further changes. The third block orients on the managerial aspect. Within this block an enterprise comprises and comprehend gathered information from the previous two blocks in order to combine it with the corporate strategy and set the targets for the capital structure management strategy and identify the appropriate one. The Table 1 introduces a short description of logic blocks identified in the procedure.

*Table 1. Logical blocks of the development procedure of the capital structure management strategy at the power-producing enterprises.* 

Block	Description of a block
(고고고고) (관련간원)	Block of the initial analysis. Provides with basic financial and economic, and market information. Such analysis is general; nevertheless, it is an important step for a power-producing enterprise.
['	Core block of the capital structure and its effectiveness assessment, and forecasting of the general performance. This block reflects the specific analysis and a forecast.
	Decision-making block based on previous information, and interconnected with the managerial aspect. Herein, the power-producing company sets strategic targets and identify the most relevant strategy.

Source: author's own proceedings.

Provided logical blocks on the Table 1 above are vital for the strategies development at the power-producing enterprises as they separate involved into a process stages on three groups, concerning the actions and the information they are carrying. Such division helps the power-producing companies to manage the capital structure strategies development in much efficient way. Furthermore, it is significant to provide an explanation of all stages related to the procedure of the capital structure management strategies development. The Table 2 gives a description of the stages.

N⁰	Stage	Description
1	Financial and economic analysis of power-producing listed company's activity	On this stage, an enterprise should analyse its current financial and economic status as a primary and important step, find weakens, and identify the threats.
2	The capital cost assessment	On the second stage, an enterprise does the appraisal of debt (cost of debt) and equity (cost of equity) in accordance with the identified, by the financial policy, methodology of calculation.
3	The lifecycle stage identification of the power- producing listed enterprise. Analysis of market and general economic environment.	At the third stage, the basic analysis of the market environment and the macroeconomic situation has to be carried out by an enterprise. Moreover, the identification of the lifecycle stage is highly crucial for the enterprise on this step of the procedure.
4	Analysis of the capital structure	The fourth stage contains three sub-stages that are oriented on the core analysis of the capital structure and evaluation of its effectiveness.
5	The capital structure changes forecast	Based on the previous capital structure assessment, an enterprise creates a forecast of the possible future changes of the capital structure and its effectiveness.
6	Forecasting of the general economic results	Based on the first stage of the procedure, an enterprise forecasts the general financial and economic results, which will help to understand the further possible changes.
7	Compliance to the objectives of the general corporate strategy of the enterprise	This stage is related to the general corporate strategy of an enterprise. Herein, the enterprise has to identify all significant objectives within the corporate strategy and make an outline of primary financial goals.
8	Setting of the targets and identification of a further strategy of the capital structure management	At this stage, the quantitative targets, limits, constrains etc. has to be established; from the set of alternatives the type of a strategy of the capital structure management has to be identified.

*Table 2. Procedure stages of the development of the capital structure management strategy at the power-producing enterprises.* 

JN≌	Stage	Description
9	Implementation of a chosen strategy in accordance with target objectives and general corporate strategy	The final stage implies the implementation, monitoring, and control of changes of the identified capital structure management strategy.

Source: author's own proceedings.

These defined stages include the next actions:

- The first stage is directed on general economic and financial analysis of liquidity, profitability, activity, market ratios etc. (Gitman, Zutter, 2010).
- The second step manages with the capital cost assessment. For the purpose of cost of equity evaluation, the CAPM was applied, while for the cost of debt assessment the after-tax weighted average cost of debt had been used, based on Bloomberg methodology (Mastiuk, 2016; Krush and Mastiuk, 2016). Moreover, this stage includes calculation of WACC.
- On the third stage management of an enterprise has to evaluate the market position of their company, compare it with the rivals, and identify how macroeconomic conditions influence their activity including the financial decisions.
- The capital structure analysis involves three sub-stages that cover analysis of the basic chosen ratios of equity and debt, modelling process, based on Panel Data models with fixed or random effects and assessment of the capital structure effectiveness (Mastiuk, 2016; Krush and Mastiuk, 2016).
- At the stage number five enterprise forecasts the strategic changes of the capital structure and its effectiveness, taking into consideration the defined influential factors and lifecycle.
- Stage 6 has a supportive character. The forecast of the general economic results makes enterprise aware of further changes in their financial and economic stability. This step is vital as it provides managers with relevant information.
- At the stage seven, the company has to identify the goals of the general corporate strategy that are related or can be related and can have an impact on the desired strategy of the capital structure management.
- At the stage eight, the company chooses the strategy of the capital structure management grounding on previously gathered information and from all alternatives. It sets targets, constrains, methods of achievement of marked out objectives.
- The last stage is the stage of implementation, controlling and monitoring of the chosen strategy on the previous step.

The presented stages of the defined procedure, in combination, reflect the logical and parallel development process of the capital structure management strategies. From our point of view, these stages cover different types of information and areas vital for the capital structure management strategy at the power-producing enterprise. Yet, this wideness of the specified stages does not make the development procedure too unwieldy, hard for understanding and application at the chosen power-producing enterprises. Moreover, the beneficial side of the

introduced procedure is that is can be adapted to any public joint-stock company and can help to increase its overall performance by influencing the capital structure management process.

## 5. CONCLUSION

To summarize, the article at the beginning has generalized and provided theoretical methodology related to the topic. It has revealed the primary information connected to the capital structure management strategies and the process of their development. Further, in the conducted research we have introduced the logical and parallel development procedure of the capital structure management strategies for the power-producing listed companies of Ukraine. Such procedure involves a financial and an economic analysis, a forecasting and the specific capital structure analysis, and managerial aspects of an enterprise. This procedure combines nine stages directed on the strategy development of the capital structure management, which are divided on three logical blocks. These blocks are connected and interrelated to each other on the cyclic principle. According to this, the results of the research state that the introduced procedure covers all crucial parts of the capital structure strategic management, while has the logical sequence and stays clear and easy for understanding, and its application. Hence, the usage of the provided procedure will increase the effectiveness, flexibility, and adaptiveness of the strategies development of the capital structure management at the investigated powerproducing enterprises. In further researches, we are planning to modernize the introduced herein procedure of strategies development with strategies options based on the effectiveness of the capital structure level. Besides, it is planned to test the suggested procedure on chosen enterprises in their actual business activity.

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# DEBT AS ELEMENT DETERMINING FINANCIAL POTENTIAL OF LOCAL GOVERNMENT ENTITIES IN POLAND

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## ABSTRACT

Financial capacity of the local government entities (LGEs) is a factor that provides a basis for the implementation of development projects. One of the major identified factors influencing the level of the financial capacity is debt and the potential of its secure maximum absorption. At the same time, debt requires its repayment from the future spare funds (operating surpluses).

The elementary research question is how the volume of the operational surplus generated by LGE determines its financial capacity and debt absorption potential. The considerations were conducted adopting a criterion resulting from the individual debt ratio. The following hypothesis was made: the financial capacity depends on the potential to generate an operational surplus.

The study was made on the group of all the LGEs by their types and basing on financial data from 2005-2015. The analysis of their financial capacity was conducted by means of the methods of estimating the maximum level of debt absorption. The analyses clearly indicated that Polish LGEs have a relatively high financial capacity in terms of the expansionary development model based on the use of debt instruments.

## 1. 1FINANCIAL CAPACITY AS LGE DEVELOPMENT FACTOR

#### 1.1. Financing of LGE Development – Theoretical Approach

The end of the EU financial perspective covering the period of 2007-2013 is also the beginning of a new situation which the Polish LGEs have to face in terms of the possibilities to finance their tasks and projects basing on debt instruments, because there has been a complete move-away from the system of debt limitation based on the debt/income ratio towards the debt limitation based on the individual debt ratio (IDR) calculated individually for each LGE according to an adequate formula. This is a universal solution, independent from the type and size of the LGE. Simultaneously, a new programme of allocating the EU funds was launched where LGEs will have to function according to completely new rules of indebtedness and with debts resulting from the tasks and projects implemented in the previous financial perspective. The other method of financing capital projects is Pay-As-You-Go Financing. This method of financing capital projects relies on funding from current revenues. (Morgan and others, 2015: 464) The level of development in Poland is not conducive to the implementation of capital projects on the basis of this method.

The development of individual LGEs is usually understood as the possibility to implement investment projects that improve the ways and methods to satisfy the needs of both a local and a regional community. In the majority of cases we deal with not only the restoration of infrastructure but also with modernisation and growth of infrastructure necessary for the realisation of public tasks. This fact indicates the necessity to finance not only the investment stage, but also to cover additional current costs associated with the operational stage – providing services basing on the newly-built or modernised technical infrastructure. It is worth emphasising that total costs of public services include both direct costs – those that can be assigned specifically to a particular service or program – and indirect costs – those from ancillary services or central Staff functions that cannot be directly assigned to one service or program. (Gianakis, McCue 1999: 94; Fisher, 2016: 244-246).

The possibility to finance the development of an LGE will be first of all determined by its financial capacity. This capacity denotes the ability in a given field, the efficiency and proficiency of some body, particularly the state, in some area of its activity. The literature outlines various characteristics and definitions of the capacity. (Filipiak, Tarczyńska-Łuniewska 2016). The financial capacity should be understood as the LGEs potential to raise funds and to spend them effectively. (Miszczuk 2004) The another definition determines the capacity as the ability to realise investment projects, to raise and manage debt. It also indicates that creditworthiness, sufficient to pay off all the liabilities and interests in time is one of the major elements building the financial capacity.(Szpak 2001) B. Filipiak and M. Tarczyńska-Łuniewska point to the universal approach to this problem and suggest that the financial capacity should be understood as financial resources (capital, loans, cash at hand, funds on bank accounts) as well as the potential to create financial assets through local government policies (e.g. income or expenditure policy aimed at promoting entrepreneurship) or through the possibility to passive creation of financial assets (such as capability to raise debt or to raise liabilities not included into debt). (Filipiak, Tarczyńska-Łuniewska 2016) in other words, the financial capacity comprises two essential elements: real financial assets and potential financial assets resulting from the LGE's capability to absorb debt instruments.

The LGE decision-makers should be interested in what financial capacity they will have in the future. As H. Frank claims, long-term planning including the assessment of the future financial capacity of an LGE, is a necessity rather than luxury. It allows them to allocate

better their existing assets in the context of their perspective financial capacity. (Frank 1993: 6). The capital improvement of the planning process begins in advance of the operating budget of the planning process to allow time to develop requests, evaluate funding options, prioritize projects, and assess the impact of projects on the operating budget (GFOA 2006).

Broadly understood practice, as well as theoretical studies, indicates that the financial capacity depends on the following factors:

- The capacity of the LGE's income base, including the adequate legal regulations in this respect. (Aronson 1985: 343-351),
- The range of the LGE's obligatory tasks that LGEs are obliged to tackle. (Rosen 1995, 517-520),
- Legal regulations concerning the options of and the constraints on the use of debt instruments,
- Conditions of taking on debt instruments on the financial market, depending on the LGE model,
- Sensitivity to market fluctuations.

The above factors refer to phenomena, things, events that can determine the LGE capacity. I general approach these factors can be divided into two categories: quantitative and qualitative factors that emerge in the direct and indirect LGE environment. (Tarczyńska-Łuniewska 2008; Domański, Pruska 2000). In the development processes one of the major factors determining the LGE financial capacity is debt and the capability of its absorption.

In the development processes investment expenditure is of particular importance. It role and significance make it different from operational expenditure. Investments play a vital role in maintaining or improving the quality of life of local residents and they have effect on a given LGE's capacity to create more competitive business environment. This is why the investment processes and their character should not be treated lightly because of their impact on the future shape of this LGE. In the conditions of a shortage of funds and current insufficient financial capacity the adopted development strategies determine financial montages as well as their financing instruments and ways they are used, which can have an effect on both the level of services provided by means of the new infrastructure and on the size and range of the infrastructure itself. (Kitchen 2004: 3)

Local development and the LGE's increased attractiveness mean a stable strategy, resources, a supportive attitude of local and regional authorities, skills, entrepreneurship, creative approach to regional and local affairs, relatively low and stable fiscal policy and, last but not least, the use of leadership skills. Hence, through conscious creation and initiation of local growth and attractiveness, local authorities are heading towards creative, effective and rational use of tangible and intangible assets. (Blackley 1995: 2) The LGE financial capacity is a product of its investment, social and economic attractiveness.

Public funds can be allocated to financing development projects to the extent that correspond with the LGE's current financial capacity or with the level of external financing, primarily on the basis of financial instruments. Therefore, it is important to assess accurately the LGE current and future financial capacity. It should be kept in mind that liabilities associated with the implementation of tasks financed from financial instruments are borne in subsequent years. It is usually connected with the fact that it is future generations who pay for the opportunity to use public services today. (Gianakis, McCue: 122-123) The debt repayment is often spread over tens of years.

#### 1.2. Debt Limitation as Maximum Limit of LGE Financial Capacity

By 2010 in Poland the problem of the necessity to generate the operational surplus by LGEs was not relevant. Its importance was increasing in the situation when it was necessary to secure adequate funding resources for the repayment of a previously raised debt. The year of 2011 marked the beginning of changes in regulations concerning the LGEs' borrowing. Before that the regulations put limits of the debt volume depending on the projected revenue. new regulations refer to the level of operational surplus understood as the difference between current revenue and current expenditure. Undoubtedly, investment capacity and the capability to absorb debt depend on the capability to generate spare funds which can be assigned to cover this expenditure.

The basis for debt limitation in LGEs is an individual debt ratio (IDR), as specified in the Public Finance Act, that refers to the realised current revenue, property income and current expenditure over the previous three years. No LGE can adopt the budget whose realisation will result in the fact that in the budget year and in every year after that budget year the relation of the total amount of credit or loan repayments with interests, redemption of securities with interests and discount and potential repayment of sums resulting from granted sureties and guarantees to the projected total budget revenue will exceed the arithmetical mean of the relation of its current revenue enlarged by income from property sale and diminished by current expenditure the three previous years to the total of budget revenue, according to the formula:<sup>1</sup>

$$\left(\frac{R+O}{D}\right)_{n} \leq \frac{1}{3} * \left(\frac{Db_{n-1} + Sm_{n-1} - Wb_{n-1}}{D_{n-1}} + \frac{Db_{n-2} + Sm_{n-2} - Wb_{n-2}}{D_{n-2}} + \frac{Db_{n-3} + Sm_{n-3} - Wb_{n-3}}{D_{n-3}}\right)$$

where:

R – planned for the budget year total repayment of credits and loans and redemption of securities raised or issued with a view to financing: projected LGE budget deficit; repayment of prior liabilities due to the issue of securities and to existing loans and credits; future tasks financed from the UE funds; long-term programmes, projects or tasks.

O- planned for the budget year interests on credits and loans as well as interests and discount on securities – raised or issued for the same purpose as stated above, and the repayment of sums resulting from granted sureties and guarantees.

D-total budget revenue in a given budget year,

Db – current revenue,

Sm – property income,

Wb – current expenditure,

<sup>&</sup>lt;sup>1</sup> Art. 243 of the Act of 27 Aug 2009 on Public Finance (Dz.U. No 157, item 1240 with changes)

- n the budget year for which the relation is being calculated,
- n-1 the year preceding the budget year for which the relation is being calculated,
- n-2 the year preceding the budget year by two years,
- n-3 the year preceding the budget year by three years.

It should be pointed out that the LGE's capacity to repay its debts is, as stipulated in Article 243 of the Act on Public finance, is defined *ex post*, which in fact may not correspond to the actual capability to absorb debt by this LGE. Also, the IDR is subject of criticism, especially its failure to refer to the LGE's future situation, as it reflects only the LGE's past because every future budget year is determined by the execution or planned execution of the bughrt in the three preceding years. (Marchewka-Bartkowiak 2012, Filipiak 2015)

If we assume that the income from property sale is of incidental rather than regular character, it is clear that (even if we merely transform a given ratio) that the variables, which determine the fact if a given LGE satisfies the statutory relation or not, depend on the volume of operational surpluses in three preceding periods of time and on the level of the total projected revenue. As for the operational surplus, we can refer only to the future periods of time, while the past reference is limited to just one year before the budget year in question. The only relevant variable that remains is the total revenue variable, in the case of which the overestimation of its value may lead to financial problems and the future loss of liquidity by the LGE. Interestingly, the structure of the ratio shifts the LGE's debt level to the background, which in the face of substantial revenue and operational surplus fluctuations may result in the failure to adopt a budget in a given year due to the limitations stipulated in Article 243 of the Act on Public Finance.

## 2. METHODS AND RESULTS

#### 2.1. Measures of Debt Impact on LGE Financial Capacity

The basic research question is how the volume of operational surplus determines the LGE's financial capacity and debt absorption capability. The following hypothesis has been adopted: financial capacity depends on the capability to generate the operational surplus.

A relevant question is how to define the level of the financial capacity of a given LGE or a given LGE community in general. From the point of view of the current ability to involve public funds in new projects or in the modernisation of the tasks that are being executed, the financial capacity will be reflected by the potential to provide spare funds after taking into account the tasks that have been completed. This capacity can be seen in a narrow or consolidated approach. The narrow approach embraces only the budget assets, while the wider, consolidated approach (not used in Poland) requires fundamental changes in keeping records and accounting of public assets which would comprise budgetary and non-budgetary capacity. In the narrow approach the financial capacity equals the operational surplus plus property revenue and the surpluses from previous years. It should be noted that the majority of the property revenue is a one-off income (the sale of public property).

The assessment of projected financial capital will cover financing both current (operational) tasks and new investment or operational projects. In practice, we are going to deal with two basic options of task financing, especially the development-oriented ones:

- Autonomic option where new projects are financed only from available funds generated by a given LGE, and from non-repayable external funds, bearing also in mind operational phases related with the implementation of new projects and the repayment of previously raised debt.
- Expansionary option where new projects are financed from available spare funds generated by a given LGE, non-repayable external funds and financial debt instruments, bearing also in mind operational phases related with the implementation of new projects and the repayment of previously raised debt.

The approach presented above gives a more complete picture of LGE's financial capabilities. Narrowing of the financial capacity assessment only to the surplus / deficit does not give a full picture of financial capacity, especially with regard to the level of LGE's debt. An important element of the research is the fact that there is the necessity to reach professional and detailed databases with simultaneous verification of methods of financial and accounting records. Verification of the proposed method will be the basis for conducting research in broader terms - comparable with other countries (the available EUROSTAT databases contain data that is too high for aggregation). The assessment financial potential in most countries is based on a debt analysis. The proposed approach takes into account the specificity of accounting policies in Poland. The overview of LGE's financial situation in different countries shows that it is not always possible to have such a detailed approach to assessing financial capacity. This approach is similar to the methods used in the corporate sector, where financial capacity decides about the ability to generate financial surpluses. Based on the proposed methodology, it is possible to present in-depth analysis of financial potential. Undoubtedly, this will be the basis for further international research, but based on detailed financial reports on LGE finances.

The volume of operational surplus in individual LGE types in Poland is shown in Table 1. In the general autonomic option, the communities and cities with poviat rights<sup>2</sup> have the largest financial capacity. They are also entities where the proportion of the operational surplus in current revenue is on a relatively high level. It is worth noticing that the self-governed voivodships have the biggest share of the operational surplus in their current revenue, but there are only 16 of them and they realise first of all the tasks of regional character.

 $<sup>^2</sup>$  In Poland there are three independent types of LGEs: communities (2412 incl. 237 towns), poviats (314), selfgoverned voivodships (16). Apart from this classification there are also hybrid LGE forms such as 65 cities with poviat rights (commune plus poviat) and the Capital City of Warsaw.

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Yearly average (CF <sub>A</sub> )
Communities	1 136.4	1 234.3	1 626.9	1 825.9	1 399.5	1 059.6	1 226.6	1 410.6	1 659.2	1 830.2	1 973.5	1 638.3
share in current revenue	11.8%	11.4%	13.7%	13.9%	10.3%	7.3%	8.1%	8.8%	10.0%	10.4%	10.9%	11.7%
Cities with poviat rights	835.0	939.2	1 535.6	1 300.3	674.0	565.7	630.1	581.4	938.5	1 165.1	1 322.2	1 048.7
share in current revenue	10.8%	11.2%	16.0%	12.7%	6.4%	5.2%	5.4%	4.8%	7.3%	8.6%	9.3%	9.8%
Poviats	152.7	71.9	220.5	248.5	199.7	176.4	286.5	246.8	283.9	338.1	364.7	259.0
share in current revenue	5.2%	2.3%	6.5%	6.6%	4.9%	4.0%	6.1%	5.3%	5.9%	6.9%	7.5%	6.1%
Self-governed voivodships	273.8	396.9	623.1	632.4	430.3	296.9	341.9	389.1	359.0	355.0	459.8	455.8
share in current revenue	19.5%	21.6%	28.2%	25.4%	15.3%	12.4%	13.5%	14.9%	13.7%	13.1%	17.7%	19.5%
Total	2 397.9	2 642.3	4 006.1	4 007.1	2 703.5	2 098.6	2 485.1	2 627.9	3 240.6	3 688.4	4 120.2	3 401.8
share in current revenue	11.1%	10.9%	14.8%	13.5%	8.8%	6.5%	7.3%	7.4%	8.8%	9.5%	10.4%	10.9%

Table 1. Operational surplus in individual types of Polish LGEs in 2005-2015 (in millions of EUR).

295

Taking both options into account a relevant question arises to what point a given LGE can raise debt regarding its financial potential. In such a case we can consider many variables that will define the limitations the LGE is going to face. In an aggregated model it will be a function of three variables: the volume of projected operational surplus, the market price of debt instruments and the available debt instruments repayment period. The formula proposed by B. Filipiak assumes that the maximum level of debt absorption determines the real secure level of debt for LGEs. (Filipiak 2011: 302) We should remember, however, that the total of spare funds should include the repayment of previous debt, the operational costs of new projects and the increased costs of continued tasks.

$$FP_{MAX} = \frac{CF_n}{(1+DR)}$$

where:

 $FP_{MAX}$  – maximum debt absorption in the planned period of time n (financial capacity in the budget-oriented approach),

 $CF_n$  – the total of spare funds (operational surpluses) in the projected period of n years,

 $\mathbf{DR}$  – effective interest rate calculated as a quotient of planned total costs of debt-servicing to the nominal amount of debt in the planned period of time n equalling the projected interest rate of the debt.

In the study on individual types of Polish LGEs, i.e. communities, cities with poviat rights, poviats and self-governed voivodships the assumption has been made that:

- mean available time of mobilising debt instruments n=10 years,
- interest rate DR = 2.45% p.a.,
- mean operational surplus (CF<sub>A</sub>) spare funds over n=10 years between 2005 and 2015 basing on collective financial reports published by the National Council of Regional Chambers of Accounts in Poland (LGE supervisory authorities).
- $CF_n = CF_A * 10.$
- Financial cost of debt-servicing in the projected period:  $FC_n = CF_n FP_{MAX}$

Table 2 shows the maximum debt absorption level in individual LGE types based on the average operational surplus from the previous 10 years, as calculated on the basis of the above assumptions.

109.0

1 617.2

16 192.2

	CFA	CF <sub>n</sub>	FPn	FCn	Debt 2015
Communities	1 638.3	16 382.7	15 991.0	391.8	5 747.9
Cities with poviat	1 048.7	10 487.1	10 236.2	250.9	7 506.8
rights					
Poviats	259.0	2 589.6	2 527.7	61.9	1 320.3

4 558.2

455.8

Self-governed

voivodships

Table 2. Maximum debt absorption level over n=10 years based on average operational surplus generated by Polish LGEs in 2005-2015 (in millions of EUR)

3 401.8 34 017.6 33 204.1 813.6 Total Source: financial reports published by the National Council of Regional Chambers of Audit – www.rio.gov.pl.

4 449.2

The estimation of the projected financial capacity clearly shows differences in the situation of individual types of LGEs. When we confront it with the liabilities at the end of 2015, there are emphases on the prospective financial capacity of LGEs. Both the communities and the cities with poviat rights have high financial capacity. It should be noted, however, that this capacity, particularly in the cities with poviat rights, is limited by high debt. In practice this means serious difficulty in absorbing additional debt raised with a view to finance new development projects. It is obvious that every LGE must be considered individually, but the aggregated data indicate that the new EU financial perspective may not be as easy to implement as the previous one, especially when we take into account the fact that the future EU approach to new projects may be more restrictive, particularly in terms of the volume of the required LGEs' contribution to these projects. All what LGEs will be able to do is to roll-over their debts. Unfortunately, they will often fail to meet the terms of the Individual debt ratio (IDR).

What is additionally important is the fact that the level of the operational surplus actually does not jeopardise the LGE's capability to repay its debt. Of course, we mean here an aggregated situation. In practice, there are some excessively indebted entities or the one that are implementing corrective programmes.

## 2.2. Financial Risk and its Effect on the LGE Financial Capacity

An important element is the level of financial risk associated with the level of market interest rates that affect the costs of debt-servicing which are also included in the IDR. Table 3 shows the simulation of the effect of sensitivity to interest rates on the maximum debt absorption level based on the projected cumulated operational surplus over the period of 10 years.

Table 3.	<i>Effect of changes in interest rates on maximum debt absorption level (LGEs in general) over</i> $n=10$
	vears on the basis of average operational surplus in 2005-2015 in Polish LGEs (in millions of EUR)

DR	FP <sub>n</sub>	FCn	Change of FP <sub>n</sub>
2.45%	33 204.1	813.5	-
2.94%	33 046.1	971.5	-0.48%
3.43%	32 889.5	1 128.1	-0.95%
3.92%	32 734.4	1 283.2	-1.41%
4.41%	32 580.8	1 436.8	-1.88%
4.90%	32 428.6	1 589.0	-2.34%

Source: financial reports published by the National Council of Regional Chambers of Audit – www.rio.gov.pl.

As the above estimations show, even a 100% rise in interest rates is not a relevant factor jeopardising the LGE's financial capacity. The estimated decrease was by 2.34% over 10 years juxtaposed with the financial capacity for the interest rate of 2.45% p.a. It is a consequence of the fact that presently the interest rates in Poland have been the lowest since the beginnings of the economic transformation in Poland. Hence, the financial risk and its costs should not be underestimated. When building financial projections with a view to investment projects, individual LGEs should obligatorily take into account the factor of financial risk. In practice, every LGE either has its own way of coping with this problem based on its financial policy or it ignores this factor whatsoever.

# 3. DISCUSSION – LGE DEVELOPMENT-DRIVEN DECISIONS VS DEBT LIMITATION

The above deliberations confirm the thesis that the capability to generate operational surplus determined debt absorption ability, thus increasing the LGE financial capacity. Obviously, it every LGE makes its own decision which development option is optimal – the autonomic one where new tasks are financed from the available spare funds generated by the LGE itself, or the expansionary option where new tasks are financed from debt instruments.

The approach taken to the assessment of the financial potential of an operational surplus is far better and more fundamental than the more aggregated, relating only to the surplus / deficit and debt, since it explicitly recognizes accounting records from financial statements that do not require significant data processing to their possible comparability. The budget accounting system enforced in Poland since 2005 has solved this problem, which is similar to the solutions used in GB (only for the classification of financial events).

A question should be asked about criteria to be used when making decisions about spending public funds associated with the choice of projects and programmes to support local development in the situation of limited assets augmented by debt absorption. In the commercial sector the elementary criterion is the effectiveness of business processes. The public sector is in a different situation because its major objective is to provide services to the local community, i.e. to implement socially useful projects and programmes. Therefore, the effectiveness criterion is particularly difficult to apply, which does not mean that it is not possible. The selection of projects and programmes should be made in an effective way, which means that it is necessary to obtain an optimal relation between the objectives or tasks and the actual results of their implementation. The effective execution of public tasks can be considered on two levels (Dylewski 2007, 158):

- the assigned tasks in this case it will be most effective to execute public tasks in a way that guarantees the best realisation of social goals, i.e. the pursuit of alternative solutions providing the effect that will be optimal from the point of view of the social needs that are to be satisfied;
- disposable financial assets in this case the pursuit is of the cheapest possible solution which brings the effect that is comparable to the alternative one.

The implementation of LGE projects and programmes imposes a particular obligation to assess every undertaking from the perspective of both current and expected benefits. This means that the assessment must refer not only to the current budget, but it also to see the future budgets in the medium and long term. Taking into consideration the costs and effects of the LGE task execution allows us to see clearly all the planned projects. The essence of such an approach is the concept that the longer the planning perspective, the wider the scope of vision, or the better the view of the debt-servicing capacity and of the effects or phenomena

resulting from the current decision-making process. The LGE debt limitation based on IDR basically ignores the amount of money involved and focuses on the mathematical aspect. Eventually, when the LGE projects are financed by means of debt instruments, the actual capability of debt repayment and servicing lose their importance to be overshadowed by the ability to manipulate the IDR variables.

It should be additionally emphasised that in the context of the new EU financial perspective and with regard to the conclusions from the previous perspective, it is apparent that strategic objectives and the expected effects of new projects will be subject to more constraints concerning the expected result measures.

Today's structure of IDR based on mathematical formulas does not quite realistically fit the financial capacity of LGEs. It seems that it would be better to turn to simpler solutions that have already been tested in the commercial sector. Should not the future capability to repay debts be determined by the ability to generate spare funds rather than by a mathematical formula that can be easily manipulated? Also, it seems recommendable that two documents, the annual budget plan and the long-term financial forecast, be replaced with one consistent document that will be on the one hand the long-term planning tool and, on the other, the tool of operational execution of tasks included in a long-term plan.

The conducted research and the methodology presented at the same time are the starting point for further research. The comparative analysis of the LGE's financial potential in individual countries where the LGE sector is relatively well developed, however, must be based on detailed LGE finance reports. The EUROSTAT data base example shows that they are too aggregated and do not give a full picture of LGE's financial capacity in a given country. Just comparing surplus / deficit versus debt is not enough. This may lead to unauthorized conclusions regarding the financial potential and financial situation of the LGE sector in given country.

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# EFFECT OF MEANING OF WORK ON JOB SATISFACTION: CASE OF LECTURERS IN HIGHER EDUCATION IN SIX CEE COUNTRIES

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## ABSTRACT

Main aim of our research was to empirically test the relations between meaning of work as a dimension of psychological empowerment and the nine dimensions of job satisfaction; pay, promotion, supervision, fringe benefits, contingent rewards, operating conditions, co-workers, nature of work and communication. We tested nine hypotheses in one structural model by using structural equation modelling (SEM). The quantitative data was collected through a survey on higher education lecturers from Austria, Croatia, Czech Republic, Germany, Serbia and Slovenia. Findings show that meaning of work as a dimension of psychological empowerment is positively and statistically significantly related to eight out of nine dimensions of job satisfaction. Research in the area of meaningfulness of work is relatively new; and based on our research, we can add to these studies the positive impact on dimensions of job satisfaction.

## 1. INTRODUCTION

Work matters and it plays an important role in people's psychological well-being (Blustein, 2008), because they do not want to work just to receiving a pay check. Investigating the influence of perceptions that work is meaningful to people is an exciting area for researchers, coaches, managers, organizations, and those who seek to increase their own satisfaction with their work and their contributions to their organizations and communities (Steger, Dik & Duffy, 2012). One of the main reasons is that employees are organizations' biggest asset (Jordan, Miglič & Marič, 2016).

In the 21<sup>st</sup> century, lecturers are scientific workers, independent educational professionals (Tschannen-Moran, 2009), and driving force of higher education institutions (Aslan, Shaukat, Ahmed, Shah & Mahfar, 2014). Their work is very stressful (Saner & Eyüpoğlu, 2012) and it is influenced by many factors, such as psychological empowerment and job satisfaction.

According to Lee and Nie (2014) managers should pay more attention to lecturers' psychological empowerment, because it has a big influence on their professional development and psychological well-being. Psychological empowerment consists of impact, self-determination, competence, and meaning (Spreitzer, 1995b). In our research, we have focused on dimension of meaning of work, because organizational scholars have conducted many researches about the potential benefits of meaningful work (Rosso, Dekas & Wrzesniewski, 2010).

Lecturer's job satisfaction is also of great importance, because it plays an important role in the satisfaction of students, in higher education institution's effectiveness (Lourdes Machado, Soares, Brites, Ferreira & Gouveia, 2011), and has a big influence on the quality of lecturers' work (Karabiyik & Korumaz, 2014). Lecturers work in a complex environment, because they have a great variety of duties, such as teaching, helping students and researching, which can affect their level of job satisfaction (Yılmaz, Çelebi & Çakmak, 2014). The research presented here will focus on the impact of meaning of work on the dimensions of job satisfaction of the lecturers in higher education, because work meaning itself is related to greater job satisfaction (Littman-Ovadia & Steger, 2010).

#### 2. LITERATURE REVIEW

#### 2.1. Psychological empowerment

Empowerment is a process of strengthening individuals' feelings of their own effectiveness among other members of an organization (Conger & Kanungo, 1988). Considering the advancement of science and technology together with the increase of global competition, empowerment is recognized to be crucial for the companies' effectiveness (Ergeneli, Ari & Metin, 2007) and is considered to be one of the key factors of organization's success (Jose & Mampilly, 2014).

Empowerment can be defined as individual's internal (Shapira-Lishchinsky & Tsemach, 2014) or external process of feeling empowered (Shapira-Lishchinsky & Tsemach, 2014; Thomas & Velthouse, 1990). It is also considered as an act of empowering others (Menon, 2001). Empowerment has been defined in several different perspectives: process approach, structural approach, and psychological approach (Leach, Wall & Jackson 2003; Mathieu, Gilson & Ruddy 2006; Menon 2001; Spreitzer 1995b; Uner & Turan, 2010; Quiñones, Van den Broeck & De Witte, 2013). Advocates of the process approach define empowerment as

the relationships between structural antecedents and resulting psychological states (Lee & Wei, 2011; Mathieu, Gilson & Ruddy, 2006). Advocates of the structural approach see empowerment as a set of management practices and managers' behaviours that include the delegation of authority and responsibility to the employees (Lee & Wei, 2011; Mathieu, Gilson & Ruddy, 2006; Özaralli, 2003). Advocates of the psychological approach contemplate empowerment as a psychological state of subordinates resulting from empowering practices at work (Lee & Wei, 2011; Mathieu, Gilson & Ruddy, 2006; Mishra & Spreitzer, 1998; Spreitzer, 1995b; Spreitzer, 1995a).

Psychological empowerment is a new approach of motivating and has gained great attention from managers (Edalatian Shahriari, Maleki, Koolivand & Meyvand, 2013); for this reasons, there are numerous definitions of this construct (Shapira-Lishchinsky & Tsemach, 2014). Conger, Kanungo and Menon (2000) defined psychological empowerment as motivation and as a process of individuals' perception of their own effectiveness in comparison to the other members in organization, together with the help of formal and informal procedures and techniques for encouraging effectiveness. Psychological empowerment can be defined as an active motivational orientation with regard to individual's work role and individual's feeling of being in control at work (Boudrias, Morin & Lajoie, 2014).

Psychological approach contemplates empowerment as the psychological state of subordinates resulting from empowering practices at work and it is defined as a fourdimensional construct of employees' perceptions (Kirkman & Rosen, 1999; Mishra & Spreitzer, 1998; Seibert, Wang & Courtright, 2011; Spreitzer, 1995b; Zhang, Song, Tsui & Fu, 2014): meaning of work (sense of meaningfulness that their work is important); competence (competence to perform their tasks well); self-determination (freedom to choose how they carry out their tasks) and impact (belief that their work has an impact on the effectiveness of the larger system). The concept of psychological empowerment plays an important role in behavioural, emotional and cognitive constructs, such as job satisfaction and organizational citizenship behaviour (Wang, 2015).

Meaning of work is defined as the value employees assign to their jobs according to their beliefs and standards, together with the fit between the organization's requirements of a task or work goal and personal values or ideas (Quinn & Spreitzer, 1997). Employees who perceive their work as important will likely have a greater sense of commitment and will participate in the organization's events more often plus they will be more focused on their work tasks; otherwise, the employees will be apathetic and less willing to be involved in organization's events (Thomas & Velthouse, 1990). When employees perceive that their job requirements are meaningful, they will spend more effort on understanding problems from multiple perspectives and searching for different solutions using information from numerous sources (Gilson & Shalley 2004; Zhang & Bartol, 2010). Employees perceive meaning of work as an intrinsic concern for a specific job (Amenumey & Lockwood, 2008) and they believe that it is one of the three critical psychological states of intrinsic motivation (Hackman & Oldham, 1975).

In teaching, meaning of work refers to professional relations, respect and comprehension from other lecturers, which are given based on their knowledge and capabilities (Shapira-Lishchinsky & Tsemach, 2014). Three main assignments of lecturers are teaching, researching and helping students (Lawrence, Ott & Bell, 2012; Veletsianos & Kimmons, 2013; Kelli, Adamsoo, Mets, Jonsson & Pisuke, 2013), but every lecturer develops his unique style of doing them (Hirsto, Lampinen & Syrjäkari, 2013).

Employees who are empowered will not wait passively for instructions yet they will actively change and affect their work environment, leading to greater efficiency (Sigler & Pearson, 2000). Empowered employees believe that they are important and influential in the organization, and they have a greater sense of commitment (Kark, Shamir & Chen, 2003). Numerous researchers have shown that employees who feel empowered are more loyal to the organization (Avolio, Zhu, Koh & Bhatia, 2004; Liden, Wayne & Sparrowe, 2000). Psychological empowerment has a positive effect on employees' self-efficacy and the result of this is that employees believe they can play an important part in adding to organization's productivity (Martin & Bush, 2006). Psychological empowerment is not a fixed personality attribute, since it consists of cognitions that are shaped by the work environment (Stander & Rothmann, 2010).

#### 2.2. Job satisfaction

Job satisfaction has a long-standing tradition in organizational research (Nguyen & Borteyrou, 2016) and due to that fact we can find numerous definitions (Westover & Taylor, 2010; Gözükara & Çolakoğlu, 2016). Job satisfaction is a main concept in organizational psychology, and research on its determinants and outcomes is significant for the development of appropriate human resource management practices (Hauff, Richter & Tressin, 2015). Job satisfaction is defined as an individual's affective reaction or a cognitive attitude toward job; it is an extent to which individuals like or dislike their job (Ivancevich & Matteson, 2002).

The assessment of the employee's work conditions is reflected in the attitudes, which are the unit of measurement of job satisfaction (Hajdukova & Klementova, 2015). It is an individual's emotional attitude towards work and work environment. During the investigation of job satisfaction, it is necessary to distinguish whether a person is completely satisfied at work, or is satisfied only by several factors, the extent to which various aspects of the work are important to him/her and to recognize if it is only a current state of satisfaction or dissatisfaction (Gok, Karatuna & Karaca, 2015).Understanding job satisfaction is of great importance for two reasons: first personally for employees and second for managers, because it affects employees' productivity (Keles, 2015). According to Spector (1997), employees can be satisfied or dissatisfied with pay, promotion, supervision, fringe benefits, contingent rewards, operating conditions, co-workers, nature of work, and communication.

Individuals who have high levels of job satisfaction generally have a positive attitude towards their work; if they have a low level of job satisfaction, they generally have a negative attitude towards their work (Robbins & Judge, 2015). If we want to understand the complexity of job satisfaction as a concept, we have to understand the relationship between an individual and an organization, because work itself produces feelings which cause satisfaction or dissatisfaction (Spector, 1997). Understanding of this perspective can help organizations to retain their employees (Westlund & Hannon, 2008).

Job satisfaction is an individual's perception and evaluation of a job, which is influenced by the individual's unique circumstances such as needs, values and expectations (Sempane, Rieger & Roodt, 2002). If employees are dissatisfied and they see a chance to work in another organization, they will leave their current organization without a sense of guilt (Martins & Coetzee, 2007). Job satisfaction is a specific job attitude relating to the reaction an individual has to either their work as a whole or specific facets of the job (Judge & Kammeyer-Mueller, 2012). Compatibility of employees' values and beliefs with those of the organization can result in increased job satisfaction (Kim, 2012).

Job satisfaction is interrelated with emotions and because of that it affects organization as a whole: productivity (Humphrey, Nahrgang & Morgeson, 2007), job performance (Riketta, 2008), fluctuation and absenteeism (Spector, 2008). Positive outcomes of job satisfaction show an increase in productivity and a decrease in counterproductive behaviour (Morrison, 2008).

Employees' job satisfaction also affects the health of their personal relationships outside of their work environment (Chen, Brown, Bowers & Chang, 2015) together with their self-evaluation (Wu & Griffin, 2012). Understanding job satisfaction is important for understanding if employment contributes to an individual's overall quality of life (Park, Seo, Park, Bettini & Smith, 2016).

## 2.3. Connection between meaning of work and job satisfaction

Studies have shown that there is a positive connection between meaning of work and job satisfaction (Lee & Nie, 2014; Spreitzer, 1997), but none of the research conducted had a more in-depth investigated into the connections between the sub dimension of meaning of work and the 9 sub dimensions of job satisfaction. Based on written above, we formulated 9 hypotheses to determine relations between meaning of work and pay, promotion, supervision, fringe benefits, contingent rewards, operating conditions, co-workers, nature of work, and communication. Proposed hypotheses were tested in the proposed model (Figure 1). The hypotheses are:

- *H1: Meaning of work is positively related to satisfaction with pay.*
- *H2: Meaning of work is positively related to satisfaction with promotion.*
- *H3*: Meaning of work is positively related to satisfaction with supervision.
- *H4: Meaning of work is positively related to satisfaction with fringe benefits.*
- *H5: Meaning of work is positively related to satisfaction with contingent rewards.*
- *H6: Meaning of work is positively related to satisfaction with operating conditions.*
- *H7: Meaning of work is positively related to satisfaction with co-workers.*
- *H8: Meaning of work is positively related to satisfaction with nature of work.*
- *H9: Meaning of work is positively related to satisfaction with communication.*

## 3. RESEARCH METHODOLOGY

#### 3.1. Participants

The participants in the research were lecturers in higher education from Austria, Croatia, Czech Republic, Germany, Serbia and Slovenia. The full set of questionnaires was completed by a total of 409 lecturers, of whom 195 (47.7%) were men and 214 (52.3%) were women. Out of 409 respondents, 84 (20.5%) come from Slovenia, 107 (26.2%) from Croatia, 71 (17.4%) from Serbia, 34 (8.3%) from Austria, 39 (9.5%) from Czech Republic, and 74 (18.1%) from Germany. They work at social science 227 (55.5%) or natural sciences 182

(44.5%) institutions. The average age of respondents was 41.3 years and in average they work for 14.6 years.

Out of 409 respondents, 227 (55.5%) were professors and 182 (44.5%) were other pedagogical workers. According to academic rank, respondents were: 54 (13.2%) full professors, 71 (17.4%) associate professors, 102 (24.9%) assistant professors, 21 (5.1%) senior lecturers, 18 (4.4%) lecturers, 11 (2.7%) language instructors, 3 (0.7%) senior research fellows, 27 (6.6%) research fellows, 36 (8.8%) teaching assistants with PhD and 66 (16.1%) assistants.

## 3.2. Instruments

Meaning of work was measured by using the Psychological Empowerment Questionnaire (PEQ) developed by Spreitzer (1995b). From the 12-item scale composed of 4 dimensions: competence, self-determination, impact, and meaning of work, we have used 4 items regarding meaning of work (e.g., "My job activities are personally meaningful to me"). The response scale was a seven-point Likert scale ranging from 1 (completely disagree) to 7 (completely agree). The higher scores indicate the perception of being more psychologically empowered. Evidence of the internal consistency of the psychological empowerment has been reported in numerous studies (Faulkner & Laschinger 2008; Seibert, Silver & Randolph, 2004; Spreitzer 1995b).

Job Satisfaction Survey (JSS) was used for measuring job satisfaction developed by Spector (1997). The 36-item scale is composed of 9 dimensions: pay (e.g., "I feel I am being paid a fair amount for the work I do"), promotion (e.g., "There is really too little chance for promotion on my job"), supervision (e.g., "My supervisor is quite competent in doing his/her job"), fringe benefits (e.g., "I am not satisfied with the benefits I receive"), contingent rewards (e.g., "When I do a good job, I receive the recognition for it that I should receive"), operating procedures (e.g., "Many of our rules and procedures make doing a good job difficult"), co-workers (e.g., "I like the people I work with"), nature of work (e.g., "I sometimes feel my job is meaningless") and communication (e.g., "Communications seem good within this organization"). The response scale was also a seven-point Likert scale ranging from 1 (completely disagree) to 7 (completely agree). The higher scores indicate the perception of having a higher job satisfaction. The questionnaire was used in more than fifty studies in different context and industries (Job Satisfaction Survey, 2011).

#### 3.3. Data collection

Empirical research on meaning of work as a dimension of psychological empowerment and the nine dimensions of job satisfaction of lecturers in six CEE countries was performed by survey method. To obtain data, we prepared and used two separate survey questionnaires – one in Slovene and the other one in English. We designed an online questionnaire, which was sent to lecturers via e-mail in spring 2016. After conducting online research, primary data was controlled and edited. For processing and analysing data, we used IBM SPSS Statistics 24.

## 4. **RESULTS**

In continuation, we present a method to test the model by applying structural equation modelling (SEM), which is used for testing structural relations between constructs. That operation was made by building a model in Lisrel 8.80 software package, which is an analytical statistics program, which allows the testing of multiple structural relations at once

(Prajogo & McDermott, 2005). It combines factor and regression analysis by which it tests the proposed model by which we can assess the significance of hypothesized cause-and-effect relations among the variables (Diamantopoulos & Siguaw, 2000). Therefore, in our model, the variables representing meaning of work and the nine separate dimensions of job satisfaction will be united into constructs and the relations between them will be calculated. The standardized solutions can range from -1 to 1 and present the relation between the constructs, whereas the t-test value has to be above 1.96 or below -1.96 for the standardized solution to be statistically significant otherwise it is not statistically significant, which would mean that we can neither confirm nor refute a hypothesis. The standardized solutions and t-values for the hypotheses tested in the model are presented in Figure 1.

Figure 1. Conceptual model with the standardized solutions (and t-test) for the hypotheses.



Source: Own research.

Standardized solution weights between meaning of work as a dimension of psychological empowerment and the nine dimensions of job satisfaction among higher education lecturers
ranged from 0.04 and 0.76 in the model presented in Figure 1. We can therefore with the use of structural equation modelling confirm positive relations between the researched constructs in our hypotheses:

- *H1: Meaning of work is positively related to satisfaction with pay.* (Standardized solution = 0.24, t-test = 4.21)
- *H2: Meaning of work is positively related to satisfaction with promotion.* (Standardized solution = 0.36, t-test = 5.93)
- *H3: Meaning of work is positively related to satisfaction with supervision.* (Standardized solution = 0.32, t-test = 5.55)
- *H4: Meaning of work is positively related to satisfaction with fringe benefits.* (Standardized solution = 0.25, t-test = 3.94)
- *H5: Meaning of work is positively related to satisfaction with contingent rewards.* (Standardized solution = 0.37, t-test = 5.83)
- *H6: Meaning of work is positively related to satisfaction with operating conditions.* (Standardized solution = 0.04, t-test = 0.65)
- *H7: Meaning of work is positively related to satisfaction with co-workers.* (Standardized solution = 0.42, t-test = 7.65)
- *H8: Meaning of work is positively related to satisfaction with nature of work.* (Standardized solution = 0.76, t-test = 9.46)
- *H9: Meaning of work is positively related to communication.* (Standardized solution = 0.46, t-test = 6.56)

Based on the standardized solutions we found (that except in H6, where the relation is not statistically significant and we can therefore neither confirm nor refute this hypothesis), that the relations are positive and statistically significant and can be ranked from the highest to the lowest value as follows: nature of work, communication, co-workers, contingent rewards, promotion, supervision and pay. Fit indices for the model are as follows:  $\chi^2/df=6.49$ , RMSEA=0.115, NFI=0.84, NNFI=0.86, CFI=0.87, IFI=0.87, SRMR=0.17. The whole model has a statistical significance of P-value=0.00000.

# 5. DISCUSSION AND IMPLICATIONS

Research in area of meaningfulness of work is relatively new (Bailey & Madden, 2015), studies have shown how the experience of meaningfulness is linked with higher levels of engagement (Hirschi, 2012), reduced absence (Soane, Shantz, Alfes, Truss, Rees & Gatenby, 2013) and, better quality performance (Rodell, 2013). Based on our research, we can add to these studies the impact on the nine dimensions of job satisfaction.

Knowing the level of job satisfaction is important for managers, because it is associated with a number of desirable organizational outcomes such as high productivity, low absenteeism, low turnover rates (Yang & Wang, 2013), mental and physical health (Shahmohammadi, 2015), to which all organizations strive. Employees with the highest level of job satisfaction

are those most likely to recognise organisational values and goals, and will remain with the organisation longer (Ahmad & Oranye, 2010; Lourdes Machado et al., 2011). Managers should focus on employees' job satisfaction, because otherwise they will leave the organization together with their knowledge (Alniaçik, Alniaçik, Erat & Akçin, 2013; Tnay, Othman, Siong & Lim, 2013); on the other hand, if they do not leave, their performance on the professional level will worsen (Şirin, 2009).

Employees will be satisfied, when they perform their job with enthusiasm and are or will be praised for work done (Avram, Ionescu & Mincu, 2015). Organizations' effectiveness depends on employees' job satisfaction (Bitmiş & Ergeneli, 2013), although it has to be pointed out, that the perception of job satisfaction is a subjective perception, which can differ from individual to individual, so it can vary a lot (Belias, Koustelios, Vairaktarakis & Sdrolias, 2015).

With proposed hypotheses, which were based upon previous research and in-depth study of relevant literature, we have tested the relations between meaning of work as a dimension of psychological empowerment and the nine dimensions of job satisfaction, based on the hypothesized relations between meaning of work as a dimension of psychological empowerment and the nine dimensions of job satisfaction. Meaning of work as a dimension of psychological empowerment plays an important role in achieving job satisfaction, and leads to an increased level of job satisfaction, also in the case of higher education lecturers as we have found by testing our hypotheses. For further research, we suggest investigating the effects of the determinants omitted or to put in other words not included in our study and research in among employees in other areas.

Limitations of this study need to be considered before interpretations of the results can be explored. The whole research was focused mostly on how meaning of work as a dimension of psychological empowerment relates to the nine dimensions of job satisfaction, whereas other determinants were not considered. As mentioned, meaning of work as a dimension of psychological empowerment is not the only determinant of job satisfaction, therefore we can only propose that meaning of work as a dimension of psychological empowerment in part affects the dimensions of job satisfaction, whereas there are also other factors involved in the process.

The theoretical contribution of this study is to the existing research of psychological empowerment and job satisfaction in the aspect of advancing previous research by empirically examining the relations between both of them. The practical contribution is in the presented results that the positive relations are also present in the case of higher education lecturers.

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# FOREIGN EXCHANGE INTERVENTIONS AS AN (UN)CONVENTIONAL MONETARY POLICY TOOL: PRELIMINARY ASSESMENT<sup>1</sup>

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# ABSTRACT

The zero level of interest rates constitutes a limit of this standard monetary policy instrument. On the example of the Czech Republic we argue that in such a situation foreign exchange interventions represent a meaningful monetary policy tool for small open economies with abundant liquidity. We provide an overview of the evidence of the functioning of FX interventions and the exchange rate pass-through to consumer prices. Finally we provide a preliminary evaluation of the Czech Republic experience with the use of exchange rate tool adopted in 2013 until the exit from the regime in April, 2017.

<sup>&</sup>lt;sup>1</sup> Theoretical ex-ante part of the paper is based on Lízal and Schwarz (2013). The paper reflects the views of the authors. Addresses: L. Lizal: CVUT FEL and CVUT CIIRC, Jugoslávských partyzánů 1580/3, 160 00 Praha 6, Czech Republic, and J. Schwarz: Czech National Bank, Na Příkopě 28, 115 03 Praha 1, Czech Republic.

## 1. INTRODUCTION

The latest, but lasting, economic difficulties have prompted a prolonged period of monetary easing worldwide. A significant number of (important) central banks have lowered their rates in response to the crisis in order to mitigate its consequences and meet their monetary (and other) goals and have announced that they expect rates to be at low levels for a significant period of time. The dismal status of the financial sector has also prompted the use of other, unconventional tools in order to boost the liquidity and maintain the stability of particular segments of the financial sector.

The long-lasting economic stagnation has thus left a number of central banks facing the limits of the standard monetary policy instrument – policy interest rates are often approaching the zero level. Depending on the particular situation of their economy and financial sector, central banks have turned their attention to various unconventional monetary policy measures, such as a negative interest rate on deposits (as used, for example, by the National Bank of Denmark, the Swedish Riksbank, the ECB, or the Swiss National Bank, but also by the Norges Bank and Magyar Nemzeti Bank), various forms of liquidity provision through quantitative or qualitative easing, and also foreign exchange interventions.

The Czech National Bank (CNB), an inflation-targeting central bank, has also approached the zero level bound (ZLB). However, the position of the CNB and the situation of the Czech financial system are rather dissimilar to those faced by the Fed, the BoE, or the ECB. The major difference determining the choice of another monetary instrument in the Czech Republic is neither the size of the economy (small open economy) nor the magnitude of the economic downturn (has been larger than in most counterparts and had second dip). Whereas most economies have been hit by a severe liquidity crisis and a subsequent credit crunch as a result of the global financial crisis, the Czech financial system is characterized by an abundance of liquidity. Its source was and is the inflow of foreign exchange into both the private and the public sector. Not only is the ratio of deposits to loans well above the EU average (see Figure 1), but total deposits exceed total loans. The significant excess liquidity is absorbed by the CNB using repo tenders.





Source: ECB

#### Figure 2. Open market operations



Source: CNB

In 2008, on the eve of the crisis, the CNB even introduced liquidity-providing repo operations, but they were used only very rarely (Figure 2) despite having an important psychological effect. However, due to the excess of liquidity, the introduction of a liquidityproviding program along Fed, BoE, or ECB lines cannot be expected to have a significant, if any, impact in the Czech economic situation.

Experience with negative deposit interest rates is still very limited and the economic consequences are in general unclear, in particular the lowest rate possible is not known and most likely country specific, if not even also condition-specific (see, e.g., Barr et al., 2016). Moreover, in some pieces of legislation in the Czech Republic, penalty interest is bound in a multiplicative manner to the discount rate. This may lead to severe legal complications if the rate is lowered below zero. In addition, the general legislation forbids negative interest rates in certain types of contracts.

As a consequence, given the abundance of free liquidity in the financial sector, foreign exchange (FX) interventions have been selected as the most appropriate monetary policy tool when interest rates hit the zero bound and cannot be lowered any further. Moreover, given that the Czech economy is very open and FX interventions are among the standard instruments of monetary policy, it seems only logical to choose them over the alternatives.

On November 1, 2012, the CNB lowered the two-week repo rate – its key monetary policy rate – to "technical zero" (0.05%). Following an internal debate about the other monetary policy instruments usable for further monetary easing outlined above, the Bank Board decided that FX interventions would be used where necessary to lower the value of the Czech koruna and decided to publicly communicate the choice of this instrument well in advance in order to transparently reduce the market uncertainty about the looming zero-rate threshold and to avoid a loss of ability to influence monetary-policy relevant inflation and inflation expectations in the event of a prolonged recession and a need for further monetary easing.

The paper is structured as follows: In Section 2 we address the issue of compatibility of inflation targeting and the use of FX interventions, in Sections 3 and 4 we provide a summary of international and Czech experience with FX interventions and their effectiveness. These theoretical foundations are based on Lizal and Schwarz (2013). Then we focus on exchange rate pass-through to consumer price inflation and argue that the situation changes with approaching the zero lower bound of nominal interest rates. In Section 6 we turn to the issue of FX intervention costs. Sections 7 and 8 describe the Czech economic situation in late 2013 and the start of using the exchange rate as an instrument for easing the monetary conditions by the CNB on November 7, 2013. In Section 9 we provide an early after-exit evaluation of the effects of the FX commitment. Section 10 concludes.

# 2. INFLATION TARGETING AND THE USE OF FX TOOL

Under inflation targeting (IT), the monetary policy tool is the interest rate. The exchange rate is not a tool, but an endogenous variable affecting future inflation expectations. The crucial general issue when dealing with FX interventions is therefore the question of their compatibility with inflation targeting. Is influencing FX contradictory to IT? Leaving aside technical and procedural compatibilities, does it compromise the credibility and goals of the central bank? The theory also states that FX interventions can have an impact only through expectations about depreciation/appreciation of the currency or the risk premium of the country.

The IT theory gives very little, if any, guidance on FX interventions. On the contrary, it assumes and usually recommends pure floating with no role for exchange rate management, because in this framework monetary policy affects the exchange rate through the interest rate. The only way in which the exchange rate enters the whole process is through the future inflation forecast influencing the interest rate.

And it is exactly this implicit reaction of monetary policy to exchange rate shocks that leads one to question FX interventions under standard conditions. Why intervene in the FX market if we have another monetary variable, the interest rate, at hand? Such behavior cannot be credible, as it contradicts the fundamentals of IT.

Under standard conditions, an unexpected depreciation shock eases the monetary conditions. However, in such a situation the interest rate is increased in order both to prompt appreciation of the currency and to tighten the easier monetary conditions directly. The important consequences are that

- 1. the implicit reaction of the monetary policy instrument strongly affects our ability to estimate the true effects that FX interventions have on macroeconomic variables, and
- 2. in the situation of a zero lower bound, appreciation shocks cannot be accommodated by a standard interest rate cut to ease the tighter monetary conditions caused by the exchange rate shock.

Figure 3 shows an example of the effects of a 3% exchange rate shock under the standard situation (with no zero bound and hence with an accommodating monetary policy reaction) on the Czech economy. This exercise is commonly used as a sensitivity scenario by the CNB in its inflation reports. The graphs reveal only a very modest reaction of both CPI inflation and GDP growth to the exchange rate shock. The very reason for such a small effect is exactly the response of interest rate that moves in a way to compensate for the exchange rate movement to have the overall monetary conditions unaffected. As the monetary index (i.e., measure of overall monetary conditions by accounting both for exchange rate and interest rate) dos not change, the overall effect (apart asymmetricities) on GDP cannot be expected significant.

The crucial question is to what extent do the results of the exchange rate fluctuations shown hold for the effects of FX interventions on the Czech economy if the need arises to use them to further ease monetary policy. What is the experience with FX interventions, and can we build on that experience? How does the zero lower bound on nominal interest rates change the situation? In the following sections we will try to shed some light on the issues inevitably brought up by such questions in line with the argument outlined above.





Source: CNB Inflation Report IV/2012

#### 3. INTERNATIONAL EXPERIENCE WITH FX INTERVENTIONS

First, let us focus on the case of known interventions under the standard situation in actual practice. The number of official floaters is steadily increasing, but we still observe a "fear of floating" (Calvo and Reinhart, 2002), as many central banks in open economies do intervene regardless of their official position. According to the IMF's classification, independent floating dominates among IT countries (with 19 countries as of April 2008), but managed floating coexists with this regime, too (10 countries). Moreover, many independent floaters do actually intervene at least occasionally, with interventions having been more common during the recent crisis: Brazil in October 2008, Chile in January 2011, Indonesia in October/November 2008, Israel in 2008–09, Mexico in 2009, New Zealand in 2007, Poland in April 2010 and from September 2011 to December 2011, South Korea in 2008–09, Switzerland since 2009.

Numerous proposals for managed floating regimes had already been put forward before the 2008 crisis (e.g., Bofinger and Wollmershaeuser, 2003; Goldstein, 2002). The core of the idea is that if the central bank was able to reduce exchange rate volatility, it could achieve a better trade-off between inflation and output variability. However, two important questions remain unanswered: Can the theoretically meaningful outcome really be achieved in practice? And can it be achieved without harming central bank credibility, the cornerstone of the inflation-targeting monetary policy regime? Cavusoglu (2010), reviewing studies which investigate the effectiveness of interventions, found that interventions have a significant short-lasting effect on exchange rates mainly through the signalling and coordination channels. But only a few studies have provided evidence that interventions have been effective in the longer term. Studies focused on the general effectiveness of interventions, not on any particular pass-through channels, give a very mixed picture. More recently, Chutasripanich and Yetman

(2015) point out that around 70% of central banks participating in a 2013 BIS survey believe that their interventions during the period 2005-2012 were successful.

When we limit ourselves to cases where interest rates are close to zero (i.e., ZLB is, or is close to be, binding), only two countries have experience with interventions – Switzerland and Japan. Both are, however, very specific cases (safe haven currencies and reserve currencies) where the central banks struggled to keep their currencies from further appreciating during periods of flight to safe assets.

That leaves us with just none but one comparable country. Probably the best example of a country comparable to the Czech Republic with recent experience of large-scale interventions is Israel. Israel, like the Czech Republic, is a small open economy, the Bank of Israel (BoI) targets inflation, and the Israeli spot FX market is similar in size to the Czech one. However, the purpose of the interventions was different and hence has limited relevance from such a perspective: Israel's interventions were motivated by exchange rate policy considerations rather than by FX being a monetary policy tool. The first round of interventions took place in March 2008 with the primary goal of increasing Israel's FX reserves. At the end of March, the BoI started buying about \$25 million a day, and in July 2008 the average daily rate of purchases was increased to \$100 million.

In August 2009 the BoI abandoned regular unidirectional interventions and introduced the possibility of ad-hoc bidirectional interventions, i.e., of buying and selling shekel at any time in the event of large movements in its exchange rate not only in the case of market failure in the FX markets, but also in situations where the development of the exchange rate was inconsistent with economic conditions. Between March 2008 and July 2012 the reserves of the BoI increased from \$29.4 bn to \$75.4 bn. During the period of interventions the FX reserves grew by 164% to more than 30% of GDP by the end of 2011. We can conclude that in the case of Israel a large volume of purchases was needed, but their impact on the exchange rate was not very clear, as numerous currencies depreciated during the observed period. Also, the fact that the BoI never officially terminated the interventions points to possible exit strategy difficulties.

# 4. PAST CZECH EXPERIENCE WITH MANAGED FX REGIME

The Czech exchange rate regime shifted from a fixed to a floating one in 1997 (see Figure 4 for the evolution of exchange rate policy). Since then, the CNB has intervened in the FX market in three distinct periods, almost always against appreciation of the koruna. The first intervention period took place between February and July 1998, the second between October 1999 and March 2000, and the third between October 2001 and September 2002. But the evidence on the effectiveness of these interventions (see Figure 5), is mixed. Sometimes there was a visible immediate impact which lasted up to 3 months. In other cases the effect was less clear, was weak, or was transient. Of course, without knowing the counterfactual this evidence cannot be used to convincingly address the impact of the interventions in question. However, there are several studies that address the effect of the CNB's FX operations on the FX market.

Disyatat and Galati (2007) found that the interventions of 2001–2002 had some (weakly) statistically significant impact on the spot rate and risk reversal, but that this impact was small. They did not find evidence that the interventions had had an influence on short-term exchange rate volatility. Geršl and Holub (2006) found the interventions had probably played a minor role in influencing the exchange rate in the short run at best. According to them, the

interventions contributed to increased volatility of the exchange rate, but only to a limited extent. According to Geršl (2006), the interventions had only a small short-term effect on the exchange rate level and to a certain extent contributed to increased conditional and implied volatility. And finally, Égert and Komárek (2006) conclude that from mid-1998 to 2002 koruna sales were effective in smoothing the path of the exchange rate for up to 60 days. This was not the case from 1997 to mid-1998.

In 2004 the CNB started selling a part of its yields on FX reserves (these sales were recently discontinued). Starting in June 2007, the previously discretionary approach to reserve sales, with the timing and size of sales not pre-announced, was changed to a regime of daily sales. Dominguez, Fatum, and Vacek (2010) analyze whether the euro-denominated reserve sales influenced the CZK/EUR rate and reach an interesting and slightly counterintuitive conclusion: over the period of the discretionary regime, there is little evidence that the sales influenced the koruna. However, starting in 2007, when the CNB sold euros every business day, the decumulation of reserves led to statistically significant appreciation of the koruna against the euro. One possible explanation is that in the ad-hoc regime the traders intentionally go against the market in order to minimize volatility, and the market trend dominates the effects of the sales.





Source: CNB



Figure 5. Past interventions and other operations on the Czech FX market

Source: CNB

## 5. EXCHANGE RATE PASS-THROUGH TO CONSUMER PRICE INFLATION

The existing international and Czech empirical evidence suggests that FX interventions have the ability to influence the exchange rate, even though this may not always be the case in the long term. Fatum and Pedersen (2009) made an interesting observation in this context when studying the effects of sterilized FX interventions of the Danish central bank. They found that interventions exert a significant influence on exchange rate returns only when the direction of intervention is consistent with the monetary policy stance. This is exactly the case when an FX shock <u>is not accommodated</u>, but rather fuelled, by monetary policy inactivity. This also justifies FX interventions being used as a tool of monetary policy when the interest rate has reached the zero limit and further easing is necessary to meet the inflation target. When the interest rate can no longer be used or is insufficient to influence inflation expectations and achieve price stability, FX interventions become a viable option.

Knowing that FX interventions have the ability to influence the exchange rate and are not in contradiction with IT under the zero-level limit is only the first step toward their practical use as a tool for achieving the inflation target. The next, practical step is to quantitatively assess the exchange rate tool. The question we need to address first is how exchange rate changes affect prices in the Czech Republic. In other words, we need to address the relevance of existing simulations of exchange rate pass-through.

The results of existing empirical analyses of the transmission of an exchange rate shock to Czech inflation lie in a relatively wide band of 0% to almost 80% (see Figure 6) and are hard to compare due to substantial differences in the methods, empirical specifications, and time series spans used. Also, a slight decreasing tendency in exchange rate shock pass-through over the last decade is apparent. One of the most recent estimates – an impulse response based on a vector autoregression (VAR) model estimated on quarterly data for 1998Q1–2012Q3 (depicted in Figure 7) – suggests pass-through of nearly 8%. We do not have any evidence on whether the decreasing trend in the pass-through is due to the methodology used, to better monetary policy adjustment fully compensating the exchange rate shocks, or indeed to a change in the characteristics of the underlying transfer channels.

In the standard inflation-targeting regime, an exchange rate shock transmits through both a direct channel (import prices) and an indirect channel (economic activity), taking into account the endogenous reaction of all other variables, including interest rates. Through the direct channel of import prices the exchange rate change passes through to consumer prices almost immediately. However, exchange rate changes influence not only prices, but also, with some lag, real volumes of imports and exports, which consequently cause changes in the rate of growth of wages and employment. The labor market is thus the means of indirect pass-through of the exchange rate shock to consumer prices. This pass-through, however, is moderated by the reaction of interest rates. The movement of interest rates not only causes a correction in the nominal exchange rate, but also, by changing real interest rates, influences investment and private consumption.

Other estimates, based on Bayesian vector autoregression model (BVAR) and vector autoregression model with time-varying parameters (TVP-VAR),<sup>2</sup> published in Babecká Kucharčuková et al. (2013) lie in the interval of 13–26% (see the red points in Figure 6). The reaction of consumer prices to a shock is rather quick, peaking after about four quarters. The impulse response based on the CNB's core dynamic stochastic general equilibrium (DSGE) forecasting model<sup>3</sup> is very similar to the empirical evidence in both the strength and the timing of the pass-through. Analyses conducted in the CNB indicate that the strength of the response to an exchange rate shock gradually decreases along the distribution chain. The largest pass-through (over 50%) is observed for import prices; the transmission of the shock to industrial producer prices and to consumer inflation is an order of magnitude lower.

We argue that as rates approach the zero lower bound (ZLB), the transmission of shocks to the economy may change. Addressing the issue of shock exclusion in constructing simulated density forecasts, Franta et al. (2014a) show on Czech data that differences in the forecasts can be sizable. Not accounting for the ZLB at all leads to ex-post observed monetary-policy-relevant inflation being on the edge of the centred 95% of the distribution forecast and an over-optimistic outlook for real output growth. These results highlight one important finding: the models we use in normal times will not necessarily work correctly as the economy approaches and hits the zero lower bound on nominal interest rates.

As shown by many authors (e.g., Portes, 1969), fixing one input or binding constraint in effect leads in general to higher responsiveness (or volatility) of the remaining variables, ceteris paribus. This is also true for the exchange rate pass-through with the ZLB binding. When monetary policy acts to stabilize the economy and reacts transparently to an exchange rate shock, the exchange rate pass-through to inflation is relatively small, as the above-mentioned empirical evidence suggests. But the transmission of an exchange rate shock changes as the central bank approaches the ZLB and interest rates cannot counteract the shock. Depending on how long economic agents expect monetary policy to operate in the ZLB regime, the pass-through of the exchange rate to inflation increases sizably. The first channel is import prices, which directly cause higher inflation without a stabilizing reaction of interest rates. The second channel is real interest rates: longer-term fixed nominal interest rates due to the ZLB and gradually increasing inflation push down real interest rates and thereby stimulate real

<sup>&</sup>lt;sup>2</sup> Compared to standard VAR model, which is used to capture interdependencies among multiple time series, Bayesian VAR allows imposing a priori information on the model parameters and mitigating the overparameterization problem. VAR with time-varying parameters enables to capture changes in underlying structure of the economy.

<sup>&</sup>lt;sup>3</sup> The DSGE methodology focuses on explaining economic phenomena using macroeconomic models based on microeconomic foundations. Therefore, DSGE models should not be vulnerable to the Lucas critique.

economic activity, for instance private consumption. The two channels therefore work in the same direction.





Note: The figure shows the reaction of consumer prices to an exchange rate shock of 1%. It summarizes 43 ERPT estimates for the Czech Republic collected from 22 papers and articles published in 2001–2012. Dark blue points represent time-invariant estimates. Light blue points are medians of time-varying estimates. Results based on Babecká Kucharčuková et al. (2013) are in dark red (VAR) or red (BVAR median and TVP-VAR for 2008Q1, 2009Q1 and 2010Q1).



Figure 7. Impulse response of the CPI and the short-

term interest rate to a Czech koruna depreciation of 1% (VAR model)

Note: The generalized impulse response is based on a VAR model estimated on quarterly data for 1998Q1–2012Q3. The vector of endogenous variables contains Czech GDP, the consumer price index (cpi), 3M PRIBOR (rs), the nominal effective exchange rate (neer), and monetary aggregate M2. The exogenous variables are the IFS All Primary Commodities price index, euro area GDP, and 3M EONIA.

Source: CNB

Source: CNB

#### 6. COSTS OF FX INTERVENTIONS

A major impediment to conducting FX interventions might be their adverse effect on central banks' balance sheets. However, one has to keep in mind that when intervening with the goal of easing monetary conditions, no costly sterilization is necessary because in such a situation the monetary consequences of intervention are in line with the monetary policy objective. But that does not mean that FX interventions are costless. Long-lasting interventions against one's own currency usually lead to a sizable build-up of international reserves. With the local currency appreciating due to the economic convergence of the country, assets denominated in foreign currency liabilities, such revaluation creates financial losses.

As, for example, Stella (2008) and Stella and Lönnberg (2008) point out, the accumulation of losses may have a negative impact on the financial strength of the central bank and undermine the credibility of monetary policy. However, in order to correctly understand the degree of credibility risk, the central bank's balance sheet situation has to be put in the relevant macroeconomic context that the bank faces. Cincibuch et al. (2009) develop a formal framework for assessing the sustainability of the central bank's balance sheet. Taking the long-run trends from the CNB's forecasts and simulating the long-term development of the CNB's balance sheet, they show that the CNB should eventually get into a profit-making situation as economic convergence progresses, and the risk premium, as well as the real

exchange rate appreciation trend, is likely to disappear. They conclude that the CNB will be able to repay its current accumulated loss out of future profits.

The long-term sustainability of the balance sheet and the central bank's credibility, therefore, will not necessarily be compromised even in situations of negative own capital if the losses stem from the economic convergence of the country. On the other hand, theoretical expectations are one thing, but the actual ability to pursue monetary policy objectives, such as stabilizing inflation expectations, may be harmed when the central bank becomes financially weak. Benecká et. al (2012) empirically address the link between central bank financial strength and inflation. On a panel of more than 100 countries between 2002 and 2009 they find that in a few cases there is indeed a statistically significant negative relationship between financial strength and inflation. But the results lack robustness with respect to the choice of alternative measures of financial strength and econometric technique. Also, there is some evidence that the relationship is non-linear, with only substantial financial weakness being associated with higher inflation, and the link exists only for countries with the lowest level of central bank legal independence and/or relatively high inflation rates.

In general, according to Benecká et al. (2012), the explanatory power of central banks' financial strength indicators is rather weak, while other inflation determinants seem to play a more important and robust role. According to our reading the finance weakness has to be accompanied with another major weakness to play a role.

# 7. THE CZECH ECONOMY IN LATE 2013

The Czech economy experienced a sharp slowdown in 2008 in reaction to the global financial and economic crisis. After one year in deep recession, a gradual recovery in 2010 and 2011 took place while public finances reform was started. The credibility of the public finance reform manifested in low interest rates; the Czech government enjoys lower premium than Euro counterparts, e.g., France. However, in 2012 and 2013 the economy witnessed mild, however protracted, recession again. At this time the economy also started to lag behind its major trading partners as the roots of the slowdown were not imported from abroad, but stemmed from weak domestic demand, too. The EU also experienced period of amoebic improvements, various new financial problems and many deep uncertainties. As a consequence, the domestic inflation was decreasing and hit the lower boundary of the tolerance band around the CNB's target by the end of 2013, in spite of VAT and other tax increases taking place in that year (see Figure 8). Monetary-policy relevant inflation was already around zero and also showed a decreasing tendency.

In addition, the so-called adjusted inflation excluding fuel prices, i.e. the indicator of core inflation, had been negative since 2009 due to deep decline in prices of tradable goods and services. Moreover, as Figure 9 reveals, in 2013, for the first time in Czech modern history, the growth of prices of non-tradables, i.e., the index that is the most closely related with domestic situation only, reflects prices of domestic services and gives hints about future wage pressures, got to zero level as well. As this index was historically the highest one, it has signalled very unusual circumstances, especially for a converging economy, and mainly reflected weak domestic demand, no wage growth and even expected wage decline. Together with still-falling prices of properties it was the edge of deflationary spiral forming in the economy.



*Figure 9. Core inflation – tradables and non-tradables* 



Source: CNB

The CNB responded to this development by gradually lowering interest rates to "technical zero" (0.05% for the two-week repo rate and the discount rate, and 0.25% for the Lombard rate) on November 1, 2012. In order to further ease monetary conditions, the CNB communicated that it is prepared to use the exchange rate as an additional instrument if a need arises. Finally, the forecast published in the Inflation Report IV/2013 pointed to a need for clearly negative levels of market interest rate, followed by a rise in rates only at the end of 2014 (see Figure 10). Given the ZLB on interest rates, this pointed to a significant need to ease monetary policy using other instruments.

Figure 10. Inflation Report IV/2013: Interest rate forecast



#### Source: CNB

The baseline forecasting model showed that ignoring this need would have dire consequences for the Czech economy (see Franta et. al, 2014b, for detailed assessment of costs, risks and uncertainties). Moreover, Cook and Devereux (2013) show that the optimal reaction of foreign policy rates to home rates at the ZLB is an increase. Otherwise, the home currency starts to appreciate uncontrollably. However, the situation was complicated by the fact that, according to our reading of the economic development in the euro area, ECB has been

expected to significantly ease the monetary policy in the (near) future as well. Therefore, the deadly appreciation spiral was not likely but almost certain to come.<sup>4</sup>

As historical note we add that the ECB indeed decreased its rates just 45 minutes after the Czech FX commitment was eventually announced. Without it, there would be further appreciation spree on the CZK, and consequent unsustainable tightening of monetary policy stance with deflation spiral further propelled by the appreciation.

# 8. EXCHANGE RATE COMMITMENT OF NOVEMBER 2013

On November 7, 2013, the CNB Bank Board decided to start using the exchange rate as an additional instrument for easing the monetary conditions. An alternative scenario constructed using the CNB core prediction model revealed that the optimal amount of monetary easing would be delivered by weakening the koruna so that the exchange rate is close to CZK 27/EUR. The exchange rate level was chosen to avoid deflation or long-term undershooting of the inflation target and to speed up the return to the situation in which the CNB will be able to use its standard instrument, i.e. interest rates. The exchange rate commitment was constructed as one-sided. This means that the CNB committed to prevent excessive appreciation of the koruna exchange rate below CZK 27/EUR. On the weaker side of the CZK 27/EUR level, the CNB allowed the exchange rate to move according to supply and demand on the FX market.

Using the exchange rate as an additional instrument at the ZLB was proposed mainly by McCallum (2000) and Svensson (2001), who proposes a "foolproof way" of escaping from a liquidity trap in an open economy. Svensson argues that such safe way consists of announcing a price-level target path corresponding to a positive long-run inflation target, a devaluation of the currency and a temporary exchange rate peg, which is later abandoned in favor of standard inflation targeting once the price-level target path has been reached. He further argues that "this will jump-start the economy by (1) a real depreciation of the domestic currency relative to a long-run equilibrium level; (2) a lower long real interest rate (since there must eventually be a real appreciation of the domestic currency, and expected real appreciation of the currency is associated with relatively low short and long domestic real interest rates); and (3) increased inflation expectations (since, with the exchange-rate peg, expected real appreciation is associated with expected domestic inflation)." (Svensson, 2001, 280–1)

Svensson's (2001) proposal emphasizes the role of inflation expectations as well as the effect of decrease of real interest rate and does not rely on the portfolio-balance channel of foreign exchange interventions as previous authors. The exchange rate peg serves to handle the credibility problem in his approach, as it allows the central bank immediately and credibly demonstrate its commitment to higher inflation rate by means the exchange rate peg. The price-level target makes the temporary peg consistent with long-run inflation target and allows inflation to deviate in short run from its standard target.

Although the practical implementation of the CNB commitment is different from Svensson's model, it has all the necessary features. In a similar manner, the inflation predicted to follow the CNB's November 2013 FX commitment (see Alternative scenario line in Figure 11) was expected to overshoot the inflation target in order to offset the significant undershooting in 2014. That is, the chosen approach implicitly contained an element of temporary price-level targeting recommended by Svensson (2001). Indeed, the main channel was Svensson's (2001)

<sup>&</sup>lt;sup>4</sup> The trading department of CNB, after long period of relative normal trading, indeed signaled development that was revealing of forming speculative positions on currency appreciation.

increase of inflation expectations and thus substantial decrease of real interest rate that has manifested in increase of investments (and imports despite the weaker currency), as we show later.



Figure 11. Comparison of scenarios constructed using the CNB core prediction model

Note: Baseline scenario = CNB baseline prediction with no limits on interest rate; Passive MP = Active ZLB and no reaction of additional monetary policy tools; Alternative scenario = Active ZLB and FX interventions used as an additional monetary policy tool.

#### Source: CNB

The commitment to offset past deviations from the inflation target by future developments increases inflation expectations and through a decrease in ex ante real interest rates speeds up exit from the ZLB. However, this element of price-level targeting was implemented without an explicit regime change as assumed in Svensson. As Franta et al. (2014b) argue, the implemented approach is equivalent only from an ex ante perspective. The CNB also weakened the exchange rate as a one-off action and did not introduce a crawl, and announced that a future change of the exchange rate to a weaker level was possible in case of strong anti-inflationary pressures. In these technical aspects, the CNB's approach differed from Svensson's (2001) recommendations.

Actual interventions were quite massive (EUR 7,499 bn.) and resulted in increase in foreign exchange reserves in about 8% of GDP (in terms of the reserves they grew by one third), but took place only for a few days after the policy decision of the CNB. After the CNB's policy announcement, koruna reached CZK 27/EUR quickly, and had been moving at somewhat weaker levels until the half of 2015 (see Figure 12). The exchange rate volatility decreased significantly (both the actual one, and implied by futures prices) in 2014.

circulation





(CZK billions) 1000 90 900 80 800 70 700 600 500 40 400 30 300 20 200 10 100 0 0 2008 2009 2010 2011 2012 2013 2014 2015 2016 Liquidty-withdrawing repo operations - Currency in circulation Deposit facility - Liquidity-providing repo operations (rhs)

Figure 13. Open market operations and currency in

Source: CNB

### 9. PRELIMINARY EVALUATION OF THE EFFECTS

For a long period of time, there was not enough data from the real economy to demonstrate how the FX commitment did help the Czech economy and what were the effects and their channels. Communication of the step and its consequences proved to be very complicated because model predictions were not sufficient to persuade the public. The major initial channel, i.e., reduction of real interest rate by means of changing the inflation expectation, was even beyond limits of many economic professionals. Only by the end of 2014, that is a year after announcing the FX commitment, we finally started to gather real statistical evidence of its longer term effects. The discussion is often skewed due fallacious arguments from era of the gold standard and associated beggar thy neighbour concept.

Table 1 reveals that the development of majority of macroeconomic indicators since November 2013 was changed in a positive way, i.e., in accordance with CNB's predictions. However, one needs to distinguish between the effects of FX commitment from the other sources of changes, e.g., general economic improvement in the euro area.

	Annual Percentage Changes					
	Available on 7.11.2013		Q1 2015		Available in January 2016	
Gross domestic product (s.a.)	II/13	-1.3	I/15	4.0	III/16	1.9
Consumer price index	9/13	1.0	4/15	0.5	12/16	2.0
General unemployment rate (in %, s.a.)	9/13	7.1	4/15	6.0	11/16	3.8
Average nominal wage	II/13	1.2	I/15	2.2	III/16	4.5
Number of vacancies	9/13	39,040	4/15	83,700	12/16	132,500
Gross operating surplus of nonfinancial corporations	II/13	1.3	I/15	7.5	IV/15	3.6
Insufficient demand as a limit of production (in %)	IV/13	52.0	4/15	44.2	1/17	36.1
Composite confidence indicator (index)	10/13	88.9	4/15	95.1	1/17	99.2

Table 1. Development since November 2013

Source: Czech Statistical Office

The first assessment naturally uses the change in GDP development but all the factors mentioned in Table 1 provide complex picture. As the monetary policy horizon is typically 12-18 months, let us focus on the comparison based on first quarter of 2015 which corresponds to standard monetary transmission lag of monetary policy. The post-crisis slowdown of the Czech economy had been exceptionally strong compared to other countries in the region. The Czech Republic had been consistently among the 10 worst-performing countries of the EU up to 2013. In the second quarter of 2013, the Czech economy fell by 1.3% vis-a-vis the same period of 2012. In 2014, the Czech economy already grew by 2% and the Czech Republic moved among the top 10 EU members.





Source: CNB

Figure 14 shows simple decomposition of the GDP change with respect to the main factors identified by the CNB's analyses. The change in dynamics of the Czech GDP reached 3.2 percentage points in 2014 (from -0.5% in 2013 to 2.7% in 2014). As we can see, improved development of foreign demand directly contributed to Czech economic growth by about 1.1 percentage points, assuming unchanged linkages from the past. The contribution of fiscal policy, which changed from significantly restrictive in 2013 to slightly growth-enhancing one in 2014, is estimated at 0.3 percentage points – mostly via recovered government investments co-financed from EU funds. After accounting for the effects of positive oil-price shock and

negative impact of tobacco excise tax increase, the remaining 1.9 percentage points can be attributed to the monetary policy action (FX commitment) combined with improved sentiment of businesses and households (as these effects could not be directly separated without further assumptions or usage the main CNB model).

In a similar fashion, unemployment went down by more than 1 percentage point in 2014, the growth of nominal wages accelerated, the number of vacancies almost doubled, and the financial situation of nonfinancial corporations improved notably. These changes are in line with the GDP change, although the wage development has been slower, most likely due to lower inflation, which we will discuss later.



#### Figure 16. Exports and imports



#### Source: CNB

Figure 15 and Figure 16 document the existing link between investments and foreign trade. As we see from the former figure, investment was severally reduced in the period 2008-2013. As the most import-intensive activity, the decline of investment has also affected the trade balance surplus, which has started to grow (the correlation of trade surplus and investment is high, about -0.9). Also when using the assumed import intensity of investment from the DSGE model (of 80%), we can explain almost all the newly generated trade surplus with the decline of investment. The perceived good results of trade surplus generated additional appreciation pressures leading to the collapse due continuous appreciation as described in theoretical model of Cook and Devereux (2013). However, as the results of surplus were not caused by higher growth in export activities but rather disinvestment, it lead to unsustainable appreciation – there is no economic reason why economy that does not invest into its future should witness long term appreciation trends due to "better prospects." The appreciation is also visible in REER development. Figure 17 shows that the Czech koruna appreciated during the onset of the financial crisis and stayed above its pre-crisis level - sizably above the real effective exchange rates of the Hungarian forint and the Polish zloty. That vicious linkage has been broken with the FX commitment.

In order to address the influence of FX commitment more rigorously and directly, a sensitivity scenario has been constructed using the CNB's prediction model which compares the forecast from November 2013 with reality and a hypothetical counterfactual scenario had the koruna not weakened. The sensitivity scenario reveals two interesting facts. First, both GDP growth and inflation would have been significantly lower had the CNB not decided to

-4

-6

use FX interventions as an additional monetary policy tool. The difference in growth between reality and this no-intervention counterfactual is, in face, slightly lower compared to what the growth decomposition provided above suggests.



Figure 17. Real effective exchange rate of the Czech koruna



Figure 18. Euro area consensus forecast in November 2013 and January 2017



Source: Consensus Forecast, CNB

As the general economic development has been in line with the model predictions, why is the inflation path so different? Inflation seems not to react to the weaker koruna as strongly, as expected in the models. We show that the driver of the difference is indeed the external development. The major reason for inflation staying far from predicted levels and the inflation target are strong disinflationary pressures which the Czech Republic imports from the euro area. Figure 18 illustrates the differences between euro area consensus forecasts for main macroeconomic variables in November 2013, the actual path till the end of 2016 and forecast since then. Not only was the effective euro area (euro area members weighted by their share on foreign trade vis-a-vis the Czech Republic) GDP growth significantly lower than expected in 2013, but consumer prices growth practically stopped at the beginning of 2015, and producer prices growth was, instead of recovering its growth, further deeper in negative figures.

To assess the impact of lower oil prices on Czech inflation, the CNB constructed a sensitivity scenario with oil price fixed at the 2014 level. Figure 19 shows that with oil price around 100 USD/barrel, inflation would be on average 1 percentage point higher in 2015. But, predictably, the GDP growth and household consumption would suffer significantly.

Hence we conclude that the difference in inflation development from the predicted path can be attributed almost solely to factors outside the Czech economy that monetary policy has no effect on. No secondary effects of low oil price, which could have lead to new deflationary dangers, were observed, and core inflation started to grow during 2014. Only by the end of 2016, with an unwinding of the decline in food and fuel prices, did inflation accelerate and reach the 2% target.

### Figure 19. Sensitivity scenario: Higher Brent price



Note: Left-hand scale = Annual change in %; Right-hand scale = Difference in percentage points

Source: CNB

In order to keep koruna above the CZK 27/EUR floor, the CNB had to start intervening again in July 2015. Although this inevitably lead to an increase in foreign exchange reserves, the size of foreign exchange reserves so far doesn't constitute an issue. Moreover, as Figure 20 reveals, interventions are not the only source of growing reserves. Since the beginning of 2013 until April 2017, client operations (mostly connected to conversion of EU-funds money) amounted to EUR 12.7 bn. and interventions to EUR 75.9 bn.

Foreign exchange reserves are now clearly more than large enough to cover their basic functions. After the exit, the return of economic convergence through the koruna appreciation, as well as increased costs of monetary policy operations (sterilization mainly through repo tenders and deposit facility) due to the probable increase in interest rates will lead to financial losses of the CNB. However, such development also provides an opportunity to seek further diversification potential of the FX reserves – more active reserves management may be used to compensate for the expected losses.

Currently, reserves are diversified among seven currencies: EUR, USD, CAD, SEK, AUD, GBP, and JPY. But the CNB was also among the first central banks that started to invest into equities. A gradual build-up of equity portfolio started in 2008 and reached the target level of 10% of FX reserves in 2011. Without significantly increasing the overall risk profile of the reserves, equities reached a total cumulative return of 61.4% from June 2008 to September 2014. The fixed income portfolio (mostly government securities) had a total cumulative return of 15% in the same period. In 2015, the equity portfolio, which due to intervention and external flows into the bond portfolio decreased its share to 8%, generated approximately the same yield as the rest of the reserves. Increasing the share of equities or other similar higher-yield assets would be one possible solution. Build-up of FX reserves doesn't have to be perceived as a complication, but rather as a unique opportunity provided by the recent economic environment.





Source: CNB

## **10. CONCLUDING REMARKS**

The use of foreign exchange interventions to ease the monetary conditions in an open economy is a rational choice. First, this monetary instrument is used only when interest rates are at a zero level, i.e., when the standard natural tool is no longer available. This implies the FX regime is not in contradicting position to IT but rather is the case when interest rate no longer accommodates the exchange rate movements. Second, the power of the central bank when intervening against its own currency is not limited by the size of the reserves. Third, the depreciation helps net exports in the short run, which is a good side-effect stimulating the economy. In essence, in an economy with abundant liquidity in the banking sector, such as the Czech Republic, FX interventions are the only efficient way to implement further significant monetary easing.

As far as the practical implementation is concerned, we firstly note that the implementation can indeed differ from the theoretical models in the literature but has to comprise all the necessary elements. Second, the FX commitment serves well even if the economic development changes, i.e., it showed to be both an efficient tool of monetary easing when needed as well as an anchor to inflation expectations in case the surrounding development would lead to unwanted monetary tightening.

Next, we would argue that in such a situation FX interventions did not reduce the transparency and credibility of inflation targeting. The inflation target – including the tolerance band around it – remains unchanged and is publicly known in advance. On the contrary, if further easing is necessary the zero interest rate bound prompts questions of credibility due to the primary tool having been exhausted. The prediction of the market interest rate path, despite reflecting the zero level, remains publicly announced. However, the exchange rate itself is still not the target, but rather a new tool for achieving the target. Consequently, it is not meaningful to specify a "target exchange rate." The desired policy exchange rate changes dynamically over time and is determined by the evolution of the forecasted economic conditions and the targeted inflation rate.

Finally we would like to note the absence of exchange rate shocks and erratic movement after the exit. This has to be yet scholarly analysed. At this stage we are convinced that the bank transparency and communication of exit conditions ex ante the exit eliminated a vast amount of the surprise effect. Therefore the instantaneous appreciation and lack of counterparties that has occurred in case of the termination of the Swiss commitment has been evaded.



Appendix. International comparison of real GDP growth development

Source: IMF

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# DECISION FOR THE ENVIRONMENTAL STRATEGY: POLITICAL OR ECONOMIC?

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## ABSTRACT

A proper understanding of environmental strategies requires managers to understand the motives for and results of these strategies. The paper uses structural equation modelling to test a conceptual model in which environmental motives are linked to a corporate environmental strategy, while a corporate environmental strategy is (both directly and indirectly through functional implementation activities) linked to company performance. With regard to the motives for an environmental strategy, the findings indicate that all of the examined motives positively affect the development of an environmental strategy, with top management commitment being the most important. Corporate environmental strategies are therefore mostly driven by an internal political force, while all external and economic drivers (represented by other analysed motives) seem to be less important. As for the results of an environmental strategy, the study finds no significant direct influence of a corporate environmental strategy on company performance. There is, however, an indirect positive link (mediated by the implementation of manufacturing and marketing environmental strategies) between a corporate environmental strategy and company performance, which implies that a planned corporate environmental strategy is useless unless it is actually implemented through the execution of green functional activities.

# 1. INTRODUCTION

The purpose of this paper is to contribute to the body of knowledge on companies' environmental strategies and their implementation in the manufacturing sector by systematically addressing two research questions: (1) why do companies incorporate environmental issues into their corporate strategy; and (2) does the development of a corporate environmental strategy and its implementation through functional strategies pay off? Specifically, we propose and test a structural equation model that builds on the causal-consecutive link "motives for environmental strategy  $\rightarrow$  corporate environmental strategy  $\rightarrow$  functional implementation activities  $\rightarrow$  results of environmental strategy".

The paper contributes to the environmental strategy literature in several ways. First, to our knowledge no study simultaneously includes motives, strategies and results in one comprehensive model even though, as we have argued above, a proper understanding of the motives for and results of environmental strategies calls for their simultaneous investigation. The paper tries to bridge this literature gap by systematically including motives, strategies and results in a single conceptual model.

Second, past studies have mostly discussed the direct influence of an environmental strategy on company performance, thus neglecting the issue of its implementation. In contrast, our research is designed so as to separately address the development and the implementation of a corporate environmental strategy, which allows us to test its direct and indirect (the latter being mediated by implementing functional activities) influences on company performance. According to Polonsky (1995), such a research approach is necessary because practically all green strategy literature focuses on broader organisational strategic issues, while much less is said and empirically investigated within specific areas like individual business functions. Similarly, North (1992) argues that the integration of environmental management into functional fields is necessary if studies want to be systematic. Therefore, by including a corporate environmental strategy as well as its implementation through functional activities, our unique conceptual model represents the second major contribution of this paper.

Finally, an important contribution of this paper is that the relationships are tested in a posttransitional context. The vast majority of research on corporate environmentalism has been done in developed market economies (e.g. Darnall et al., 2010; Delmas et al., 2011; Prašnikar et al., 2012), while not much is known about this topic in post-transitional context. Central and Eastern European (CEE) countries specifically were burdened with heavily polluted environments in the last years of communist regimes, but they managed to achieve dramatic decline in emissions, which creates the need for studies on the factors motivating polluters to reduce their emissions in such extent (Earnhart & Lizal, 2008). Regarding the outcomes, Earnhart et al. (2014) argue the benefits of a proactive sustainability strategy are also less clear in developing and transitional economies. Therefore, it is intriguing to examine how much it pays off to be green in this particular context.

# 2. CONCEPTUAL FRAMEWORK

The paper proposes a conceptual model (Figure 1) that investigates how regulation, public concern, an expected competitive advantage and top management commitment influence the development of a corporate environmental strategy, and whether the development of this strategy and its implementation through functional strategies pay off. The remainder of this section provides argumentation for and the definitions of the constructs, while in the next section the hypothesised links among the constructs are examined.


Figure 1. Conceptual model of companies' environmental motives, strategies and results

Note: All arrows represent the hypothesised positive links.

#### 2.1. The motives for environmental strategy

The first part of our conceptual model concerns the motives for environmental strategy. There are many different motives for environmental strategies (Sharma, 2001), probably too many to be discussed and analysed individually. For this reason, the literature has tried to propose a typology of these motives based on a combination of a political-economic framework and stakeholder theory (Harrison & Freeman, 1999; Henriques & Sadorsky, 1999; Banerjee et al., 2003). The political-legal framework sees companies' strategies as being influenced by political and economic forces both within and outside the company (Stern & Reve, 1980). On the other hand, the stakeholder theory (Freeman, 1984) explains that companies' environmental strategies are affected by a number of influential individuals or groups, i.e. company stakeholders (Buysse & Verbeke, 2003; Wheeler et al., 2003; Cordano et al., 2004; Fernández Gago & Nieto Antolín, 2004; Sharma & Henriques, 2005; Rueda-Manzanares et al., 2008), whereby in the environmental context the most important stakeholder groups are regulators, organisational members, community members and the media (Henriques & Sadorsky, 1999). Based on these two theoretical foundations, Banerjee et al. (2003) suggest four broad groups of motives for environmental strategies, namely: regulation, public concern, an expected competitive advantage and top management commitment.

*Regulation* is usually regarded as the most basic motive for companies' environmental strategies (Cater et al., 2009). According to James et al. (1999) and Sharma (2001), regulation is the minimum benchmark and appeared to be more important in the initial stages of corporate environmentalism, while later other motives became more important. Regulators represent a powerful stakeholder group (Fernández Gago & Nieto Antolín, 2004; García et al., 2009; Earnhart et al., 2014) that exerts both external political (by imposing direct environmental legislation) and external economic (by increasing the costs of environmentally irresponsible behaviour) forces on companies.

*Public concern* as a motive for environmental strategies is related to community members and the media as two environmental stakeholder groups according to Henriques and Sadorsky's (1999) classification. In the political-legal framework, public concern can be defined as an external political force exerted by different interest groups such as environmental activists, as well as an external economic force exerted by customers who demand environmentally friendly products (Banerjee et al., 2003; Teodorescu et al., 2009).

An expected competitive advantage is a motive for environmentally responsible company behaviour that is linked with a wide range of organisational stakeholders, both internal (i.e. owners, managers and employees) and external (e.g. customers and suppliers) to a company, who all share the same interest that a company builds and maintains its competitive advantage. An expected competitive advantage is therefore a strong internal and external economic force (Banerjee et al., 2003) that arises from the belief that a company can outperform its competitors because of its proactive environmental strategies (Sharma & Vredenburg, 1998; Moon & De Leon, 2007).

Finally, *top management commitment* as a motive for corporate environmentalism is also linked with organisational stakeholders in Henriques and Sadorsky's (1999) classification and can be seen as an important internal political force (Banerjee et al., 2003) in the political-legal framework.

## 2.2. Environmental strategy and its implementation

The second part of the proposed conceptual model relates to environmental strategy and its implementation. The diversity of strategic environmental issues in a company calls for a precise definition of an environmental strategy which, among other things, depends on the organisational level at which this strategy is discussed. As this paper focuses on the level of a company as a whole our understanding of environmental strategy suits the definitions of a corporate-level strategy. In strategic management literature, corporate-level strategies on the highest organisational level deal with the balance of a company's strategic business units and the links among these units (Wheelen & Hunger, 2006). A *corporate environmental strategy* therefore addresses the extent to which environmental issues are integrated into such a company's decisions like starting new businesses, the choice of technology, plant locations etc. (Banerjee et al., 2003). It can be defined as a set of initiatives that mitigate a company's impact on the natural environment (Walls et al., 2011).

Although the inclusion of environmental issues into strategic management is important, merely formulating a strategy is not enough if the strategy is not implemented (Epstein, 1996; Epstein & Roy, 1998). Several authors (e.g. James et al., 1999; Saha & Darnton, 2005) found there is a gap between the formulation and implementation of environmental strategy. For this reason, the conceptual model in this paper not only includes the corporate environmental strategy but also separately addresses its implementation through the realisation of functional strategies. The theoretical support for this conceptualisation can be found in the traditional strategies (activities) is necessary for the successful realisation of strategies at higher organisational levels, thus including the corporate-level strategy (Wheelen & Hunger, 2006). Within functional strategies, we focus on purchasing, manufacturing and marketing business functions and label them "green purchasing", "green manufacturing" and "green marketing".

When discussing the inclusion of environmental issues into a company's purchasing business function the literature mostly uses the term environmental or *green purchasing*. Zsidisin and Siferd (2001, p. 69) see green purchasing as a "set of purchasing policies held, actions taken, and relationships formed in response to concerns associated with the natural environment". Three common approaches within the environmental purchasing can be pinpointed, namely resource reduction, product reuse, and recycling (Carter et al., 1998).

From the viewpoint of production/operations management, being environmental requires a continuous improvement in various inputs' consumption, process and product efficiency

(Gupta, 1995; Oke & Oyedokun, 2007; Dornfeld et al., 2013). Lee (2003) sees the most important *green manufacturing* activities as the minimisation of air emissions, minimisation of water effluents, minimisation of solid waste (reduce, reuse and recycle), limitation of pollutants that enter soil at industrial sites, and reduction of the amount of energy required to manufacture and assemble a product.

Finally, environmental or *green marketing* can be understood as "the specific development, pricing, promotion, and distribution of products that do not harm the environment" (Simintiras et al., 1997, p. 418). This definition is also very close to Banerjee et al.'s (1995) understanding of a marketing environmental strategy, according to which the basis of such a strategy should be the greening of a company's marketing mix.

## 2.3. The results of environmental strategy

The final part of our conceptual model discusses the results of environmental strategy. The literature focuses on two types of environmental strategy results – direct results reflected in a company's environmental performance and indirect results represented by indicators of economic performance (Carmona-Moreno et al., 2004; Endrikat et al., 2014). When talking about *company performance* in the empirical part of our paper we address economic performance and not environmental performance. We understand it as "financial impacts of the application of firm environmental strategies" (Clemens & Bakstran, 2010, p. 395).

# 3. DEVELOPMENT OF THE HYPOTHESES

## 3.1. The influence of motives on an environmental strategy

The importance of regulation has been confirmed by several studies. Ghobadian et al. (1995), for example, found that legal compliance was the key environmental concern of UK companies, while García et al. (2009) and Earnhart et al. (2014) have found similar results in the CEE companies. In line with this, James et al. (1999) and Banerjee (2001) reported that regulatory forces are the major factor influencing an environmental strategy, particularly in high-impact industries such as chemicals and utilities. The highest importance of regulators (national government and local public agencies) and international agreements in shaping companies' green strategies was also found by Buysee and Verbeke (2003). Based on the presented findings of previous research regarding the importance of regulation, the following hypothesis is proposed:

## H1: Regulation positively influences the development of a corporate environmental strategy.

With regard to public concern as the second motive for an environmental strategy, Banerjee (2001) argues that customers increasingly demand environmentally friendly products, hence driving companies to implement more proactive green strategies. But customers are not the only important external pressure group. Saha and Darnton (2005) found that companies' principal motivation for going green was a reaction to pressures from government, non-governmental organisations, customers and other stakeholders. Companies therefore pay significant attention to how the public perceives them (Ghobadian et al., 1995) and the more companies are publicly visible the more they are environmentally proactive (Lee, 2003). Based on these arguments, the following hypothesis is developed:

H2: Public concern positively influences the development of a corporate environmental strategy.

Although few in number, some studies show that companies implement environmental strategies because they expect an increase in their future competitiveness. Parker (2000), for example, found that green strategies may be used to create new business and market opportunities, thus improving a company's competitive edge. Taylor (1992) and Shrivastava (1995) also report that companies may expect increased revenues and a better overall corporate image if they implement environmental strategies, while Sharma (2001) argues that continuous improvement and increased efficiency and productivity are the most important internal drivers of environmental strategies. In line with these findings, the following hypothesis is proposed:

H3: An expected competitive advantage positively influences the development of a corporate environmental strategy.

Similarly as for the other three motives, empirical evidence can be found showing top management commitment is a motive for going green. Rhee and Lee (2003), for instance, argue that voluntary environmental awareness and top management environmental leadership affect companies' environmental behaviour, while Lee and Rhee (2007) found that top management's attitude to the environment is also significantly related to environmental strategic change. Among more recent studies, López-Gamero et al. (2008) found that management. The role of top leadership is therefore rightly identified as a key influence on environmental strategy (James et al., 1999; Steurer & Konrad, 2009). In line with these arguments, the following hypothesis is developed:

H4: Top management commitment positively influences the development of a corporate environmental strategy.

## 3.2. The direct influence of an environmental strategy on performance

The direct effect of environmental strategies on economic/financial performance has received relatively mixed support in the literature (Walley & Whitehead, 1994; Christmann, 2000; Bansal, 2005; Aragón-Correa & Rubio-López, 2007), which could, at least partly be a result of different concepts and research methods used by researchers (Quazi & Richardson, 2012; Dixon-Fowler et al., 2013). It should however be noted that studies indicating a positive influence of environmental strategy on a company's performance outnumber those pointing to a negative influence. In addition, the results of several meta-analyses (e.g. Dixon-Fowler et al., 2013; Endrikat et al., 2014) also support the position that it "pays to be green", which led us to propose the following hypothesis:

H5: The development of a corporate environmental strategy positively influences company performance.

## **3.3.** The indirect influence of an environmental strategy on performance

While the previous section provides arguments for the hypothesised direct positive link between corporate environmental strategy and company performance, this section discusses the support for the indirect link (mediated by the implementation of functional environmental strategies) between both constructs. The prevailing strategic management theory (Hrebiniak, 2005; Wheelen & Hunger, 2006) undoubtedly supports the need to implement the developed strategies in order to achieve strategic goals and teaches us that lower-level (functional)

strategies must be implemented to support the implementation of higher-level (corporate) strategies (Wheelen & Hunger, 2006). This leads us to hypothesise the following:

H6: The development of a corporate environmental strategy positively influences the implementation of (a) green purchasing, (b) green manufacturing and (c) green marketing activities.

The final set of hypotheses concerns the links between implementation of the proposed three functional environmental strategies and company performance. Carter et al. (2000) found green purchasing to be positively related to net income and negatively to the cost of goods sold, thus providing evidence that environmental purchasing is positively related to a company's financial performance. Past research has also shown that green manufacturing provides cost advantages (Banerjee, 2001) either by using recycled materials which lowers raw material costs (Banerjee, 1998) or by decreasing waste production which reduces the costs of clean-up operations (Sharma & Vredenburg, 1998). Finally, green marketing can result in improved company's image and reputation among customers (Fraj-Andrés et al., 2009) and consequently in higher sales and stock prices (Marshall & Mayer, 1992). Favourable effects of green marketing can also be detected on the cost side (for a review see Leonidou et al. (2013)). In line with the above findings, the final set of hypotheses reads:

*H7: The implementation of (a) green purchasing, (b) green manufacturing and (c) green marketing activities positively influences company performance.* 

# 4. RESEARCH METHODOLOGY

Variables for our model were operationalised on the basis of operationalisations used in past research with some modifications. Statements about the corporate environmental strategy and green marketing were based on the scales developed by Banerjee et al. (2003), while to measure green purchasing and green manufacturing we adapted the scale used by Prašnikar et al. (2012). Our measurement of the motives for environmental strategies relied on Banerjee et al.'s (2003) scales for regulatory forces, public concern, an expected competitive advantage and top management commitment, whereas to measure the results of environmental strategies we adapted the scales on company performance from Jap (1999), Hoffman (2000) and Sun (2007). Each statement was evaluated on a scale from 1 to 5, where 1 means "not true at all" and 5 means "completely true". After we checked the validity of the contents, we adjusted the scales and tested the questionnaire on ten companies.

The population for the research is defined as all manufacturing companies with more than 50 employees in Slovenia. We addressed the questionnaires to Chief Executive Officers of the companies included in the initial sample. Out of 434 companies that were suitable for the research (the total number of manufacturing companies in Slovenia with more than 50 employees), 153 companies returned the questionnaires, which is a 35.3 percent response rate. In 39.5 percent of the companies the questions were answered by Chief Executive Officers, in 34.5 percent the respondents were middle managers, while in 25.2 percent of companies the questionnaire was completed by other relevant groups of employees. Companies in the final sample come from 22 different manufacturing industry groups. As for company size, the final sample includes 73.5 percent of small and medium-sized companies (up to and including 250 employees) and 26.5 percent of large companies (with more than 250 employees).

Prior to the LISREL analysis a set of items for each construct was examined in the pre-test using exploratory factor analysis to identify those items not belonging to the specified

domain. The properties of the proposed research constructs were then tested with structural equation modelling (SEM). We applied the maximum likelihood method of estimation. The SEM procedure was appropriate to test the proposed theoretical model because it enabled us to evaluate how well the proposed conceptual model that contains observed variables and unobserved constructs explained or fitted the collected data (Bollen, 1989; Hoyle, 1995).

## 5. EMPIRICAL ANALYSIS AND RESULTS

## 5.1. Measurement model

First, a confirmatory factor analysis (CFA) to test the measurement model was performed. We used the covariance matrix as an input to LISREL. Although we had used some previously validated scales, certain items turned out problematic, presumably due to translation or cultural differences. Table 1 shows the retained measurement variables and the proposed constructs. The measurement model has a statistically significant value of the chi-square test  $(\chi^2 = 287.62, df = 239, p = 0.02)$ . However, the proportion between the chi-square value and degrees of freedom is low and therefore within an acceptable range ( $\chi^2/df = 1.20$ ). RMSEA (0.04) and standardised RMR (0.05) show a good fit. Among other relevant measures, GFI (0.84) is slightly below the critical value, while other indices (NFI = 0.96; NNFI = 0.99; CFI = 0.99) are within an acceptable range, which allows us to conclude that the fit of the measurement model is acceptable (Bollen, 1989; Hoyle, 1995). Since the GFI was below the critical value, we also compared the fit of the final measurement model to the fit of the onefactor model. The one-factor model ( $\chi^2 = 894.72$ , df = 275, p = 0.0000, RMSEA = 0.12, SRMR = 0.09, GFI = 0.64, NFI = 0.88, NNFI = 0.90, CFI = 0.91) had much worse fit indices than the proposed measurement model. Due to otherwise acceptable fit we used the final measurement model in the subsequent analysis.

The item and construct reliability (Table 1) were then tested. All items are reliable and all values for composite reliability (except for regulation) are above 0.70 (Nunnally, 1978). Composite reliability of regulation is still above 0.60, which is a minimum threshold suggested by Bagozzi and Yi (1988). According to a complementary measure for construct reliability – the average variance extracted (AVE) – all constructs have good reliability. We also tested the model for convergent and discriminant validity. In line with Anderson and Gerbing (1988), all t-values of the loadings of the measurement variables on the respective latent variables are statistically significant. Thus, convergent validity is supported. Discriminant validity was assessed with the approach proposed by Fornell and Larcker (1981). For all pairs of latent variables, values of AVE were greater than the square of correlation between the latent variables, thus supporting discriminant validity.

Table 1. Overall (	CFA for the	modified	measurement	model	(n =	153)
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	Completely	Construct	AVE
Constructs and indicators	standardised	and	and
	loading	indicator	error
	(t-value)	reliability	variance
Regulation (EX)		0.66	0.50
Environmental legislation affects the continued growth of our firm.	0.69 (std.)	0.48	0.52
Our industry faces strict environmental regulation.	0.72 (4.98)	0.51	0.49
Public concern (EX)		0.82	0.60
The public is very concerned about environmental destruction.	0.61 (std.)	0.37	0.63
Our customers are increasingly demanding environmentally friendly products.	0.85 (7.31)	0.72	0.28
Our customers expect our firm to be environmentally friendly.	0.85 (7.54)	0.72	0.28
Expected competitive advantage (EX)		0.84	0.63
By regularly investing in research and development on cleaner products and	0.83 (std.)	0.60	0.31
processes, our firm can be a leader in the market.	0.85 (Std.)	0.09	0.51
Our firm can increase its market share by making our current products more	0.82 (14.67)	0.67	0.33
environmentally friendly.	0.82 (14.07)	0.07	0.55
Reducing the environmental impact of our firm's activities will lead to a	0.73(11.47)	0.54	0.46
quality improvement in our products and processes.	0.75 (11.47)	0.54	0.40
Top management commitment (EX)		0.92	0.85
The top management in our firm is committed to environmental preservation.	0.94 (std.)	0.88	0.12
Our firm's environmental efforts receive full support from our top management.	0.90 (16.56)	0.81	0.19
Corporate environmental strategy (ED)		0.85	0.66
Our firm has integrated environmental issues into our strategic planning process.	0.77 (std.)	0.60	0.4
We make every effort to link environmental objectives with other corporate goals.	0.85 (12.61)	0.72	0.28
Environmental protection is the driving force behind our firm's strategies.	0.81 (9.83)	0.66	0.34
Green purchasing (ED)		0.79	0.57
We closely co-operate with our suppliers in "greening" our supply chain.	0.52 (std.)	0.27	0.73
We have significantly increased the level of recycled content in our purchasing.	0.96 (5.73)	0.92	0.08
We use specific environmental standards for evaluating our suppliers.	0.71 (5.49)	0.51	0.49
Green manufacturing (ED)		0.79	0.55
We have significantly decreased the amount of waste produced in the last years.	0.73 (std.)	0.54	0.46
We launch green technological solutions that are new in our industry.	0.75 (9.76)	0.57	0.43
We encourage innovations that result in reduced energy and material consumption.	0.74 (9.92)	0.55	0.45
Green marketing (ED)		0.90	0.75
We emphasise the environmental aspects of our products in our ads.	0.84 (std.)	0.70	0.30
Our marketing strategies have been considerably linked to environmental issues.	0.87 (17.15)	0.76	0.24
We highlight our commitment to environmental preservation in our marketing.	0.88 (16.65)	0.78	0.22
Company performance (ED)		0.83	0.61
As a consequence of implementing our environmental strategy we compete	0.79 (std.)	0.62	0.38
more effectively in the marketplace.	5.75 (Std.)	0.02	0.20
With our environmental strategy we have achieved long-term advantages.	0.78 (11.00)	0.62	0.38
As a consequence of implementing our environmental strategy we have achieved a high level of profits.	0.77 (9.62)	0.60	0.40

Notes: EX = exogenous construct. ED = endogenous construct.

## 5.2. Structural model

The final structural equation model is shown in Figure 2. Corporate environmental strategy is explained by regulation, public concern and top management commitment ( $R^2 = 0.771$ ). Corporate environmental strategy accounts for variance in green purchasing ( $R^2 = 0.578$ ), green manufacturing ( $R^2 = 0.659$ ) and green marketing ( $R^2 = 0.775$ ). Company performance is explained by green manufacturing and green marketing ( $R^2 = 0.451$ ). The independent variables therefore explain most of the dependent variables well. The fit indices for the overall model are also acceptable. Like with the measurement model, the structural model also has a

statistically significant value of the chi-square test ( $\chi^2 = 375.18$ , df = 255, p < 0.001), but the proportion between the chi-square value and degrees of freedom is within an acceptable range ( $\chi^2/df = 1.47$ ). RMSEA (0.056) and standardised RMR (0.071) reveal an acceptable fit, GFI (0.81) is slightly below the critical value, while the relative measures of fit (NFI = 0.95, NNFI = 0.98) and parsimonious measure of fit (CFI = 0.98) show an acceptable fit.

The majority of the parameter estimates are statistically significant and consistent with the proposed direction in the hypotheses. Nine of the eleven proposed hypotheses are supported (Table 2). The results are in line with expectations concerning the effect of regulation, public concern, an expected competitive advantage and top management commitment on corporate environmental strategy, corporate environmental strategy on green purchasing, green manufacturing and green marketing and, finally, green manufacturing and green marketing on company performance. On the other hand, the results are not in line with expectations concerning the effect of corporate environmental strategy and green purchasing on company performance.





Note: Full arrows represent statistically significant paths (p < 0.05), while dashed arrows show statistically insignificant paths (p > 0.05).

Table 2. Results of testing the hypotheses

Hypotheses	Proposed direction	Standardised path coefficient (t-test)	Result
H <sub>1</sub> : Regulation $\rightarrow$ Corporate environ. strategy	+	0.24 (3.36, <i>p</i> < 0.05)	Supported
H <sub>2</sub> : Public concern $\rightarrow$ Corporate environ. strategy	+	0.26 (2.54, <i>p</i> < 0.05)	Supported
H <sub>3</sub> : Expected compet. advantage $\rightarrow$ Corporate environ. strategy	+	0.18 (1.99, <i>p</i> < 0.05)	Supported
H <sub>4</sub> : Top management commitment $\rightarrow$ Corporate environ. strategy	+	0.44 (3.98, <i>p</i> < 0.05)	Supported
H <sub>5</sub> : Corporate environ. strategy $\rightarrow$ Company performance	+	-0.43 (-0.96, p > 0.05)	Not supported
$H_{6a}$ : Corporate environ. strategy $\rightarrow$ Green purchasing	+	0.76 (4.68, <i>p</i> < 0.05)	Supported
$H_{6b}$ : Corporate environ. strategy $\rightarrow$ Green manufacturing	+	0.81 (7.74, <i>p</i> < 0.05)	Supported
$H_{6c}$ : Corporate environ. strategy $\rightarrow$ Green marketing	+	0.87 (10.10, <i>p</i> < 0.05)	Supported
$H_{7a}$ : Green purchasing $\rightarrow$ Company performance	+	0.03 (0.18, <i>p</i> > 0.05)	Not supported
$H_{7b}$ : Green manufacturing $\rightarrow$ Company performance	+	0.69 (2.54, <i>p</i> < 0.05)	Supported
$H_{7c}$ : Green marketing $\rightarrow$ Company performance	+	0.44 (2.13, <i>p</i> < 0.05)	Supported

## 6. DISCUSSION AND CONCLUSION

#### Summary of the results and theoretical implications

Similar to Banerjee et al.'s (2003) findings, our results show that all four examined motives positively affect the development of an environmental strategy. The main difference from previous research lies in the identification of the strongest motive. In this study, top management commitment was found to be the most important motive (as in, for example, James et al. (1999) and Nagypal (2014)), followed by regulation, public concern and an expected competitive advantage, while several authors (e.g. Ghobadian et al., 1995; James et al., 1999; Banerjee, 2001; Buysee and Verbeke, 2003) found regulation to be the strongest motive for environmental strategies. An expected competitive advantage was identified as the weakest motive, similarly as in the majority of previous studies (e.g. Nagypal, 2014) where only a few authors found this motive to be an important driver of corporate environmental strategy (Taylor, 1992; Shrivastava, 1995; Parker, 2000; Sharma, 2001). The findings on the relative importance of the analysed motives suggest that, according to the political-economic framework, corporate environmental strategies are mostly driven by an internal political force (top management commitment), while all economic and external drivers (the three other motives) seem to be less important. While it is relatively easy to explain the importance of internal drivers of a company's strategy (several core theories within strategic management, such as resource-based view, core competences, dynamic capabilities etc., argue that competitive strategies and company performance are mostly internally driven), it is more difficult to understand why economic forces are less important than political ones. A possible explanation of this may be that managers have begun to understand the seriousness of the global environmental destruction or that they still do not properly understand the long-term economic advantages of implementing green strategies, as it was found in several studies (e.g. Klassen & Whybark, 1999; Chan, 2005; Aragón-Correa et al., 2008; Earnhart et al., 2014).

The study found no significant direct influence of corporate environmental strategy on economic performance. This supports the findings of our literature review that there is no unified evidence in the literature about the relationship between the environmental strategies and economic performance of companies. On the other hand, the results reveal the positive influence of a corporate environmental strategy on all three analysed functional environmental strategies and the positive influence of green manufacturing and green marketing on company performance, which suggests that a corporate environmental strategy has an indirect (i.e. mediated by the implementation of manufacturing and marketing environmental strategies) positive influence on company performance. This finding has an important implication for the (environmental strategy is useless unless it is actually implemented through the execution of green functional activities. Similar conclusions were also reached by several other authors (e.g. Epstein, 1996; Epstein & Roy, 1998; Hrebiniak, 2005; Wheelen & Hunger, 2006) who studied the importance of the execution of a planned (environmental) strategy.

The comparison of the motives and results of an environmental strategy points to some kind of contradiction in our results. Namely, among all studied motives the managerial expectation of positive economic consequences of a corporate environmental strategy has the weakest influence on the development of this strategy while, on the other hand, a corporate environmental strategy, if properly implemented through green manufacturing and marketing activities, has an indirect positive effect on company performance. There are several possible explanations of this contradiction. On one hand, although we think this is a less probable reason, managers may develop environmental strategies for other, less rational reasons even though they very well understand that implementing an environmental strategy pays off (at least in the long run). On the other hand, the reason for the paradoxical result may also be that managers "incorrectly" perceived the positive consequences of their past environmental strategies, which resulted in their opinion that future environmental strategies should not be developed and implemented primarily because of an expected competitive advantage but for other (as the results show, mostly political) reasons. This "incorrect" perception is probably a consequence of the delayed positive results of past environmental strategies. Namely, most companies first face the costs of environmental strategies, while the benefits of these strategies, such as the generation of valuable organisational capabilities and an improved social reputation of a company (Sharma & Vredenburg, 1998; Klassen & Whybark, 1999; Christmann, 2000), are mostly delayed.

## Practical implications

In general, practitioners, especially managers in manufacturing companies and public policy decision-makers, might gain some new insights from our structural model which may help them craft better environmental strategies and policies. More specifically, practitioners can use our findings on three fronts. First, if companies want corporate environmental strategies to result in an improved performance they have to implement them through the execution of functional environmental strategies. Our results indicate that in the manufacturing sector especially manufacturing and marketing activities are critical. Therefore, managers must first introduce environmentally friendly processes that allow them to decrease the amount of waste produced and consume less energy and (raw) material. These manufacturing efforts must then be followed by proper marketing efforts through which a company's commitment to environmental preservation needs to be properly communicated to customers and other relevant stakeholders.

Second, within the discussion of the theoretical implications of our findings we argued that managerial perceptions of the expected competitive advantage as a motive might be underestimated due to the usually delayed positive results of environmental strategies. While we understand that many managers encounter a lot of pressure to improve their company's short-term financial performance, we strongly believe that they should not evaluate the expected results of environmental strategies only through short-term indicators. Although in the short run we can agree that, due to the need to invest in green products and processes, environmental strategies bring more additional costs than additional benefits, we believe that in the long run these additional costs are compensated by several positive financial consequences for a company.

Third, the relative importance of the analysed motives for environmental strategies should also concern public policy decision-makers. The finding that managers see an expected competitive advantage as the weakest motive indicates the absence of a market environment in which companies should be able to boost their competitiveness by being environmentally proactive. In a similar way, Steurer and Konrad (2009) point out that CEE companies compared to their Western counterparts act reactively in their environmental strategies. The task of state and regional governments is therefore to create an environment in which companies will be even more economically motivated to implement proactive environmental strategies. The measures (such as full implementation of the emissions market) need to reward environmentally innovative technologies and increase the economic pressure on those less environmentally conscious. In addition to economic pressure, governments can do a lot to ratchet up the "political" pressure on polluting companies. They can provide financial and administrative support to different organisations and stakeholder groups which exert public pressure on environmentally ignorant companies.

## Limitations and suggestions for future research

An important limitation of our study is that it builds on the perceptions of the managers in the surveyed companies. The results could therefore be subject to "social desirability bias". In order to avoid the risk of a bad reputation, as concerns environmental protection individuals and businesses may present a brighter image than is truly the case. This problem could probably be minimised by relying on more qualitative research methods (including in-depth interviews and direct observations) that allow a more detailed understanding of why companies execute environmental strategies. It also needs to be emphasised that our study collected data from various companies operating in both B2B and B2C contexts. Such a uniform approach has strengths and weaknesses. Among the latter, it should be noted that the motives for environmental strategies might differ considerably between both contexts. Further research is therefore needed to tease out the potential differences across contexts and industries. Additionally, future research could also expand our research scope by distinguishing between a company's environmental performance and its economic/financial performance as indirect and direct results of environmental strategies. Finally, our findings are based on a single sample of companies from a post-transitional economy. Future research should provide a cross-validation with the same instruments and other samples to validate our findings and to check if the model fits beyond the sample used for this study.

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# THE EFFICIENCY OF VARIOUS METHODOLOGIES FOR VENDOR SELECTION AND SUPPLY QUOTAS DETERMINATION

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# ABSTRACT

The selection of vendor and determining the supply quota from selected vendors represents one of the most significant activities in the supply chain. To solve the problem of the selection of vendors and determining the supply quota, numerous methodologies have been developed which use various mathematical methods or a combination of them. Methodologies have been developed which are considered as universal for solving all problems of vendor selection and determining the supply quota from selected vendors.

However, do developed methodologies exist for solving specific problems of vendor choice? This paper deals with the methodologies of supplier selection of flour for businesses producing bakery products. Four methodologies are briefly presented here which use the combination of various mathematical methods: (1) Analytic hierarchy process (AHP) + Linear programming, (2) AHP + Linear goal programming, (3) AHP + Fuzzy linear programming and (4) AHP + new iterative multi-objective programming method based on the idea of cooperative game theory.

The efficiency of the application of the presented methodologies is analyzed on the example of a year's supply of flour for businesses producing bakery products and according to the criteria of decision maker and analyst.

## 1. INTRODUCTION

Vendor selection is one of the most significant problems facing manufacturing companies in order for them to achieve a competitive edge while achieving their business goals. Achieving positive business results directly depends on the quality of raw materials and supplies which must be delivered by vendors, their price as well as the reliability of their periodic delivery of those raw materials and supplies. Given that various vendors are varying in reliability of their periodic deliveries and that they also dispatch raw materials and supplies of varying quality and price, manufacturing businesses must take particular care in vendor selection and supply quotas determination (VSSQD) from chosen suppliers. Only under these conditions manufacturing of high standard readymade products which will be market competitive.

VSSQD is a significant scientific and practical problem numerous scientists deal with. Researchers invest great efforts in order to find the best model to solve this problem. Numerous methodologies have been developed which, for solving of this problem, use several mathematical and statistical methods. Some of the suggested methodologies declare themselves to be universal, while some are aimed at solving the specific problems of VSSQD. In this paper, we will analyze the suitability the application of four methodologies using the AHP method and the methods of linear programming and multi-objective linear programming which are: (1) AHP + Linear programming, (2) AHP + Linear goal programming, (3) AHP + Fuzzy linear goal programming and (4) AHP + New method of multi objective linear programming founded on the idea of cooperative game theory (MP method) (Matejaš & Perić, 2014). The analysis of the applicability of these presented methodologies will be done on the VSSQD example of a one year period of a company producing bakery products.

In many papers on solving the problem of vendor selection AHP methods are used in combination with the methods of linear and multi-objective linear programming (MOLP). Ghodsypour & O'Brien (1998) use the AHP method combined with the method of linear programming (LP). Wang et al., (2004) use the AHP method combined with the method of goal programming (GP). Kumar et al., (2008) combine the AHP method with the fuzzy linear programming method while Kumar et al., (2004) for vendor selection only use the fuzzy linear programming method. Perić et al., (2013) use the AHP method and the fuzzy LP method to solve the VSSQD problem for companies industrially manufacturing bakery products. In a smaller number of papers the revised weighting methods and MOLP methods are used (Perić &Fatović, 2015; Perić, 2016).

The solution of certain problems of vendor selection requires the use of a larger number of complex criteria which has a hierarchical structure. In such situations, this problem increasingly complicates matters. That is, it is necessary in the first stage to first reduce the complex criteria with a hierarchical structure to a simpler form of criteria in order that in the second phase for final VSSQD suitable methods of multi objective programming can be used. For solving the problem in the first phase most favorably demonstrates AHP method. However, to solve the problem in the second phase, numerous methods can be used, among which the most representative are MOLP ones. However, the efficiency of these methods varies in solving the problem of vendor selection, wherein several methods provide solutions. In solving this problem, the role of the decision maker is different and decision maker confidence is different in the solutions gained. Analysis of the efficiency of the proffered methods will be done according to the stated criteria. Therefore, we have set *selection of the most favorable VSSQD methodologies* as the *main aim* of this paper for solving the problem of a year's supply of flour for a bakery.

The rest of the paper is organized as follows: The second chapter presents the stated methodology of vendor selection where the methods that use this methodology are briefly described. In the third chapter, the stated methodologies are applied to solve of the concrete problem of vendor selection and the applicability of presented methodologies to the actual example is analyzed. In conclusion, the most significant results of the implemented research are given. Finally, the list of references used in writing this paper is provided.

## 2. METHODOLOGIES OF SELECTING VENDORS AND DETERMINING SUPPLY QUOTAS FROM CHOSEN SUPPLIERS

Methodologies that will be presented in this paper include the following steps:

- 1. Choice of criteria for selecting vendors,
- 2. Application of AHP method for calculating the total value of purchasing and simplifying complex hierarchical criteria of the vendor selection problem,
- 3. Achieving and solving MOLP models for gaining marginal solutions and
- 4. Solving LP and MOLP models for obtaining preferred solutions.

Here we will present the following four methodologies for choosing vendors and determining supply quotas from chosen vendors: (1) AHP + Linear programming, (2) AHP + Linear goal programming, (3) AHP + Fuzzy linear goal programming and (4) AHP + New MOLP method based on the idea of cooperative game theory.

Methodology (1) in the first phase applies AHP method for calculating the TVP value for the suppliers. In the second phase, this methodology applies linear programming for determining preferred non-dominated solution.

Methodologies (2) (3) and (4) also in the first phase apply the AHP method but for reducing complex criteria to simpler forms of them. Methodology (2) in the second phase applies Linear goal programming, methodology (3) in that phase applies Fuzzy linear goal programming while methodology (4), to that aim, applies the New MOLP method based on the idea of cooperative game theory. Given that the suggested methodologies are different according to the application of operational research methods, here we shall, after considering the problem of the criteria for vendor choice, briefly describe these methods.

#### 2.1. Choice of criteria for selection of vendor

The choice of criteria for selection of vendor represents the first phase in all methodologies of vendor selection. The literature lists numerous criteria for selection of vendor and the choice of them depends on every particular problem of vendor selection (Weber et al, 1991). Most represented are the total costs of supply within a certain period, the quality of offered products from the vendor and the reliability of the vendor for periodic delivery of the contracted amounts of products. Each of these criteria presents itself through a certain number of sub-criteria, etc. This reveals the complexity and hierarchical structure of criteria for selection of vendor which nevertheless points to the application of AHP methods for solving the problem of vendor selection.

In this paper, the problem of selecting a vendor of flour for a one year period for a bakery was considered. As criteria for the choice of vendor, the following were used: 1) total costs of supply of flour over a one year period, 2) the quality of dispatched flour in a given period and 3) reliability of vendor. Criteria for product quality and vendor reliability are complex and have an explicit hierarchical structure. For this reason, for reducing complex criteria to a simpler form, the AHP method was used. Results gained from the AHP method represented the coefficients from the criteria function of quality of dispatched products and vendor reliability which were essential for the second phase of problem resolution. Here the AHP method will be briefly described.

## 2.2. The Analytic Hierarchy Process (AHP)

The Analytic Hierarchy Process (AHP) is one of the most outstanding multi-criteria decision making approaches. It employs a method of multiple paired comparisons of attributes (criteria) to rank order alternatives. The first step of the AHP approach is the formulation of a problem as a hierarchy. The attributes themselves are decomposed into levels. The top level contains only one element which reflects the overall objective of the system. The lower levels usually contain a larger number of elements which are thought to be independent of the elements at the same level. The next step leads to the determination of the relative weights of the elements at each level. For this a method of multiple paired comparisons based on a standardized evaluation scheme (1 = equally important; 3 = slightly more important: 5 = much more important; 7 = very much more important; 9 = absolutely more important) is used.

The result of the pairwise comparisons of n elements can be summarized in a (nxn) evaluation matrix A in which every element  $a_{ij}$  is the quotient of weights of the criteria, e.g.  $a_{ij} = w_i / w_j$ , whereby small errors in consistency of judgments are acceptable.

The next step leads to a combination of the priority weights of the various hierarchies in order to determine the overall priority weight of an alternative. These composite weights are the final measure of importance for each alternative considered in the AHP evaluation process.

The calculations to be made for AHP studies will usually prove to be fairly complex and they will call for the use of special software packages and in this paper Expert Choice was used.

## 2.3. Linear programming

With the help of the linear programming model the problem of decision making was presented in which it is necessary to find the optimal solution of linear objective function on a set of feasible solutions, which is formed as a intersection of constraints expressed in the form of linear inequations and equations as well as the constraints of non-negativities of the decision variables. The problem of linear programming in mathematical form is as follows

$$\max_{\mathbf{x}\in\mathbf{S}} z = \mathbf{c}\mathbf{x} \tag{1}$$

where  $\mathbf{S} = \{(x_1, x_2, ..., x_n) : A\mathbf{x} * \mathbf{b}, \mathbf{x} \ge \mathbf{0})\}$ , **c** is the *n*-component vector of the objective function coefficients, *A* is the matrix of coefficients of the system of constraints of formats  $(m, n), \mathbf{x}$  is the *n*-component vector of variables, **b** is the *m*-component vector of constants (right-hand-side coefficients), **o** is the *m*-component null-vector, while \* is the common symbol which represents one of the relational operators  $\leq n \geq 0$ .

For solving model (1) numerous methods have been developed, among which the simplex method is the most efficient, and many computer programs exist based on the simplex model.

#### 2.4. Multi-objective linear programming

With the help of the MOLP model the problem of decision making presents itself in which it is necessary to find the preferred solution (set of alternatives) in the set of feasible solutions formed with by the linear constraints, and in the case of the existence of several conflicting linear objective functions. The problem of multi objective linear programming in mathematical form looks like

$$\max_{\mathbf{x}\in\mathbf{S}}\left\{z_1 = \mathbf{c}_1 \mathbf{x}, z_2 = \mathbf{c}_2 \mathbf{x}, ..., z_K = \mathbf{c}_K \mathbf{x}\right\}$$
(2)

where  $\mathbf{S} = \{(x_1, x_2, ..., x_n) : A\mathbf{x} * \mathbf{b}, \mathbf{x} \ge \mathbf{o})\}$ ,  $\mathbf{c}_1, \mathbf{c}_2, ..., \mathbf{c}_K$  are *n*-components vectors of the coefficients of objective functions  $z_k, k = 1, 2, ..., K$ , *A* is the matrix of coefficients of the system of constraints,  $\mathbf{x}$  is the *n*-component vector of variables,  $\mathbf{b}$  is the *m*-component vector of constants (right-hand-side coefficients),  $\mathbf{o}$  is the *m*-component null-vector, while \* is the common symbol for the forms  $\leq , =$  or  $\geq .$ 

When solving model (2) the key role is played by the decision maker. For solving the model of multi-objective linear programming numerous methods have been developed which are not as effective from the viewpoint of the decision maker and analyst who prepares and solves the model of multi objective linear programming. Here, we will present the Linear Goal Programming Method, the Fuzzy Linear Goal Programming Method and the New Multi-Objective Linear Programming Method based on the idea of cooperative games.

#### 2.5. Linear goal programming

Linear goal programming is one of the most used methods in solving the problem of MOLP. Mathematical formulation of the linear goal programming model can be written in the following form (Mohamed, 1997):

$$\min_{(\mathbf{x},\mathbf{d}^{-},\mathbf{d}^{+})\in\mathbf{S}} g(d_{k}^{-},d_{k}^{+}), \ k=1,2,..,K$$
(3)

where

 $\mathbf{S} = \{(\mathbf{x}, \mathbf{d}^-, \mathbf{d}^+) : z_k + d_k^- - d_k^+ = \overline{z_k}, k = 1, 2, ..., K, A\mathbf{x}^*\mathbf{b}, \mathbf{x}, \mathbf{d} \ge \mathbf{0}, d_k^- \cdot d_k^+ = 0\}, A \text{ is the matrix of constraints with format } (m,n), \mathbf{x} \text{ is the vector of variables, } \mathbf{d}^-, \mathbf{d}^+ \text{ are k-component vectors of negative and positive deviation variables, } \overline{z_k}$  is the aspiration value of the *k*-objective function determined by the decision maker or is equal to its maximum value on the given set of feasible solutions, **b** is the *m*-component vector of constants (right-hand-side coefficients), **o** is the m-component null-vector, while \* is the common symbol for the form  $\leq$ , = or  $\geq$ .

In dependence on the function  $g(d_k^-, d_k^+)$  we can form many models of linear goal programming. Here, for solving the model of linear goal programming, function  $\sum_{k=1}^{K} (d_k^- + d_k^+)$  will be used.

#### 2.6. Fuzzy linear goal programming

If in the multi-objective linear programming model an imprecise certain aspiration level for every objective function exists, then that 'fuzzy' objective function is expressed as 'fuzzy' (unclear certain) goals. Let  $g_k$  be aspiration level of k function  $z_k(\mathbf{x})$ . Then 'fuzzy' goals are expressed as:

(1) 
$$z_k(\mathbf{x}) > \approx g_k$$
 (for maximizing  $z_k(\mathbf{x})$ );

(2) 
$$z_k(\mathbf{x}) \leq \approx g_k$$
 (for minimizing  $z_k(\mathbf{x})$ ),

where  $\geq \approx$  and  $\leq \approx$  indicate an fuzzy defined aspiration level.

Fuzzy linear programming can be presented as:

Find **x** so that  $z_k(\mathbf{x}) > \approx g_k, k = 1, 2, ..., k_1 i \ z_k(\mathbf{x}) < \approx g_k, k = k_1 + 1, k_1 + 2, ..., K$  on set **S**, where  $\mathbf{S} = \{(x_1, x_2, ..., x_n) : A\mathbf{x} * \mathbf{b}, \mathbf{x} \ge \mathbf{o})\}.$ 

Now the 'fuzzy' goals are characterized by their 'membership' function. 'Membership' function  $\mu_k$  for *k*-'s fuzzy goal  $z_k(\mathbf{x}) > \approx g_k$  can be defined as:

$$\mu_{k}(z_{k}(\mathbf{x})) = \begin{cases} 1 & \text{if} \quad z_{k}(\mathbf{x}) \ge g_{k} \\ \frac{z_{k}(\mathbf{x}) - l_{k}}{g_{k} - l_{k}} & \text{if} \quad l_{k} \le z_{k}(\mathbf{x}) \le g_{k} \\ 0 & \text{if} \quad z_{k}(\mathbf{x}) \le l_{k}, \end{cases}$$
(4)

where  $l_k$  is the lowest limit and  $g_k$  the highest limit for k's fuzzy goal.

That 'membership' function  $\mu_k$  for k's 'fuzzy' goal  $z_k(\mathbf{x}) \leq \approx g_k$  can be expressed as:

$$\mu_{k}(z_{k}(\mathbf{x})) = \begin{cases} 1 & \text{if} \quad z_{k}(\mathbf{x}) \leq g_{k} \\ \frac{u_{k} - z_{k}(\mathbf{x})}{u_{k} - g_{k}} & \text{if} \quad g_{k} \leq z_{k}(\mathbf{x}) \leq u_{k} \\ 0 & \text{if} \quad z_{k}(\mathbf{x}) \geq u_{k}, \end{cases}$$
(5)

where  $u_k$  is the upper limit of tolerance, and  $g_k$  the lower limit for k's goal.

On the basis of calculated 'membership' functions, the model of multi-objective linear programming is transformed into the following problem of linear programming (Pal et al., 2003):

$$\min_{(\mathbf{x},\mathbf{d}^-,\mathbf{d}^+)\in\mathbf{S}_1} g(\mathbf{d}^-,\mathbf{d}^+),\tag{6}$$

where  $\mathbf{S}_1 = \{ (\mathbf{x}, \mathbf{d}^-, \mathbf{d}^+) : \mu_k(z_k(\mathbf{x})) + d_k^- - d_k^+ = 1, k = 1, 2, ..., K, A\mathbf{x} * \mathbf{b}, \mathbf{x} \ge \mathbf{o} \},\$ 

where function  $g(\mathbf{d}^-, \mathbf{d}^+)$  can have various forms. Here for  $g(\mathbf{d}^-, \mathbf{d}^+)$  we will use function  $\sum_{k=1}^{K} (d_k^- + d_k^+), \ k = 1, 2, ..., K.$ 

# 2.7. New method of multi objective linear programming based on the cooperative game theory (MP method)

If several decision makers (*players*) optimize their goaals at the same time and on the same constraint set, they can achieve their aspirations at different optimal points. If only one point should be chosen in those circumstances we have a multiple objective programming problem, which is a problem frequently encountered in practice. It can be stated in the form,

$$\max_{\mathbf{x}\in\mathbf{S}} \left\{ z_1(\mathbf{x}), \, z_2(\mathbf{x}), \, \dots \, z_K(\mathbf{x}) \right\},\tag{7}$$

where  $z_k(x)$ ,  $x \in \mathbb{R}^n$ , k = 1, 2, ..., K is the given objective function for a decision maker (player) k ( $P_k$ ) and  $S \subset \mathbb{R}^n$  is the given set. If the objective functions are linear and S is a convex polyhedron (which means that it is defined as the intersection of linear constraints) then we have a multi-objective linear programming problem. In Matejaš & Perić, 2014, an efficient method (MP-method) for solving such problems is presented. We shall briefly explain this method.

It is natural that each player  $P_k$  has his aspiration  $d_k$  which he wants to achieve  $(z_k(x) \ge d_k)$ . The MP-method fully respects these aspirations under the frame of given possibilities (set **S**). For this purpose the *desired set* **D** is defined,

$$\mathbf{D} = \left\{ \mathbf{x} \in R^n : \ \mathbf{x} \ge 0, \ z_k(\mathbf{x}) \ge d_k, \ k = 1, 2, ..., K \right\}.$$

The players are aware that they will probably fail to realize their aspirations fully. For that reason the *shifted desired set*  $\mathbf{D}_{\lambda}$  is also defined,

$$\mathbf{D}_{\lambda} = \left\{ \mathbf{x} \in \mathbb{R}^{n} : \mathbf{x} \ge 0, \ z_{k}(\mathbf{x}) \ge \lambda d_{k}, \ k = 1, 2, ..., K \right\}, \ \lambda \ge 0.$$

Now, the method can be stated in a very simple form. We are looking for the largest  $\lambda$  such that  $\mathbf{D}_{\lambda} \cap \mathbf{S} \neq \emptyset$  (geometric form) or equivalently,

$$\max_{(\mathbf{x},\lambda)\in\mathbf{G}} \lambda,$$
  
where  $\mathbf{G} = \{(\mathbf{x},\lambda)\in\mathbf{R}^{n+1}: \mathbf{x}\in\mathbf{S}, \lambda\geq 0, z_k(\mathbf{x})\geq\lambda d_k, k=1,2,...,K\},$  (8)

which is a standard linear programming problem. The optimal solution  $\lambda^*$  shows to which (minimum) extent all the players can realize their aspirations. If  $x^*$  is the optimal point then the indicator

$$\lambda_k = \frac{z_k(\mathbf{x}^*)}{d_k}, \ k = 1, 2, ..., K$$

shows to which extent the player  $P_k$  can realize his own aspiration.

Players for whom  $\lambda_k = \lambda^*$  have minimal realization (equal to optimal) and their constraints are active,  $z_k(\mathbf{x}^*) = \lambda^* d_k$ . For  $\lambda_k > \lambda^*$  realization is better than optimal and constraints are passive,  $z_k(\mathbf{x}^*) > \lambda^* d_k$ . Therefore, indicators show to what extent set aspirations are real within the framework of given possibilities so this can serve to improve solutions if not satisfactory.

# **3. APPLICATION OF METHODOLOGY OF VENDOR SELECTION FOR THE PROBLEM OF SUPPLY OF FLOUR**

Selection of vendor and determining the supply quotas from chosen suppliers is a multicriteria problem. The literature offers numerous criteria which can be used to solve this problem. Which criteria the decision maker will choose depends on the type of problem being solved. In this paper the considered criteria has been taken from a paper Perić et al. ,2013.

## 3.1. Data for vendors' selection and determining supply quotas

In the following, an example of vendor selection for companies producing bakery products will be presented. It should be mentioned that procuring flour is usually contracted for a period of one year, from harvest to harvest. After harvest, flour producers have information on the available quality of wheat, the price and the quality which helps them to determine the price, the quality and amount of flour which can be dispatched in the coming one year period.

Over a one year period a bakery company planned to spend 6000 tons of flour type 550. The company contacted 6 potential vendors and defined the upper limit of delivery of flour by a vendor to the amount of 4000 tons. Company management decided to sign a contract on delivery of flour with at least two bidders and that there must be no more than 4 vendors. For the purposes of this paper, data has been taken from a paper Perić, 2016. The proffered prices of flour and transport costs (criteria C1) are shown in Table 1. Potential vendors were obliged to submit analytical indicators which maintained flour quality which they would deliver over the ensuing year (C2). Vendors also had to submit indicators for the quality of flour and vendor reliability.

Vendor	Purchasing price in euros/ton (B1)	Transportation cost in euros/ton (B2)	Total purchasing costs in euros/ton
1	240	20	260
2	215	25	240
3	230	20	250
4	275	15	290
5	200	10	210
6	260	35	295

Table 1. Purchasing costs for flour Type 550

Source: Supplier offers

Ou alita in diastans	Criteria			Ven	dor		
Quality indicators	type	1	2	3	4	5	6
General characteristics of flour (A1)							
Moisture in % (B3)	min	14.2	14.56	13.6	14.1	13.09	14.85
Ash in % (B4)	min	0.56	0.55	0.59	0.51	0.54	0.48
Acidity level in ml/100 grams (B5)	min	1.8	1.8	1.6	1.8	1.5	1.5
Wet gluten in % (B6)	max	26.5	26.8	29.4	24.6	24.7	28.7
Farinograph (A2)							
Water absorption in % (B7)	max	60.2	56.3	57	56	57.8	55.8
Degree of mellowness in FJ (B8)	min	55	30	33	40	80	50
Extensograph (A3)							
Energy in cm <sup>2</sup> (B9)	max	110	102.1	128	104.3	98	133
Elasticity in mm (B10)	max	163	146	167	161	175	165
Resistance (B11)	min	380	400	605	390	330	395
Amylograph (A4)							
Peak viscosity in BU (B12)	max	1110	1015	1255	1610	1126	1460

#### Table 2. Quality indicators for flour Type 550

Source: Supplier analysis

Table 3. Vendor reliability indicators

Poliobility indicators	Tuno	Vendor					
Reliability indicators	туре	1	2	3	4	5	6
Financial stability, indebtedness							
and liquidity (A5)							
Coverage of fixed assets and stocks by capital and long term resources, (B13)	max	1.15	0.90	0.85	0.80	0.99	1.18
Share of capital in source of funds in %, (B14)	max	51.46	20.7	41.0	55.77	40.2	37.6
Indebtedness factor, years, (B15)	min	8	20	15	16	12	15
Total assets turnover coefficient (B16)	max	0.68	0.50	0.55	0.40	0.45	0.60
General liquidity coefficient (B17)	max	7.25	1.2	1.15	0.85	3.13	1.70
Short term receivables collection period, in days (B18)	min	95	111	92	69	80	87
Performance indicators (A6)							
Coefficient of total revenue and expenditure ratio (B19)	max	1.07	1.04	1.03	1.01	1.02	1.05
Profit share of in total income in % (B20)	max	3.95	1.55	2.34	1.12	2.10	1.80
Share of profit in assets in % (B21)	max	3.28	0.99	1.45	1.05	1.30	1.05
Profit per employee in euros (B22)	max	7405	2560	1383	1705	2260	4206

Source: Croatian Financial Agency

## 3.2. Application of AHP method

Considering the data in Tables 1,2 and 3, a hierarchical structure of goals and criteria for choosing vendors was formed. The hierarchical structure from our example contains 5 levels. Level 1 represents general vendor efficiency, level 2 represents criteria for vendor selection (costs, quality and reliability), level 3 represents sub-criteria of the criteria from level 2, level 4 presents the sub-criteria of sub-criteria from level 3, and level 5 presents available alternatives (vendors). This hierarchical structure is presented in Figure 1.



Figure 1. Hierarchical structure of the Vendor Selection Problem

Source: Perić (2016)

With the application of AHP methods total value of purchasing (TVP) coefficients are obtained and they represent coefficients of the objective function for linear programming model in the second phase of solving this problem. These coefficients are presented in Figure 2.

Figure 2. TVP coefficients obtained by Expert Choice



Source: Authors' calculation by using Expert Choice software

Criteria of quality and reliability have a hierarchical structure. The criterion of quality contains 4 sub-criteria and 10 sub-sub-criteria, while the criterion of reliability contains 2 sub-criteria and 8 sub-sub-criteria. From the hierarchical criteria of quality and reliability with the application of AHP methods we will get two simple criteria which contain all of their

significant data. First the criteria and sub-criteria are compared in pairs at their level, separated for both complex and hierarchical criteria. Then comparisons are made compared in pairs from level 2 to level 5, also separated for both complex criteria. At 5 alternatives (vendors) were compared in pairs according to all sub-criteria. Although the values of matching criteria are expressed quantitatively, matching measures of these values were not used as measurement priorities. That is, the preferential grade according to one vendor against another vendor does not only depend on quantitative values, but also on the views of the decision makers and his/her knowledge about that vendor. Due to this in these situations it is justifiable to apply Saaty's scale even with quantitative criteria of quality, that is, reliability. This weighting represents the coefficients of the objective functions of quality and reliability in the multi-objective linear programming models. All necessary comparisons were made by the decision maker. The priorities of the vendors according to the criteria of quality and reliability and reliability obtained by Expert Choice are presented in Figure 3 and 4.

Figure 3. Priorities of suppliers for the quality criteria



Source: Authors' calculation by using Expert Choice software

Figure 3. Priorities of suppliers for the reliability criteria



Source: Authors' calculation by using Expert Choice software

# 3.3. LP model solution

With the application of linear programming we solved the following model:

$$\max_{(\mathbf{x},\mathbf{y})\in\mathbf{S}}\sum_{j=1}^{6}t_{j}x_{j},$$

where

$$\mathbf{S} = \begin{cases} (\mathbf{x}, \mathbf{y}) : \sum_{j=1}^{6} x_j = 6000, \ x_j \le 4000, \ x_j \le M \cdot y_j, \ -x_j + M \cdot y_j \le M - x_j^{\min}, \ 2 \le \sum_{j=1}^{6} y_j \le 4, \ x_j \ge 0; \\ y_j \in \{0, 1\}, \ j = 1, 2, ..., 6 \\ t_j, \ j = 1, 2, ..., 6, \text{ are TVP coefficients.} \end{cases}$$

The following solution was obtained:

Table 4. Solution of the linear programming model

Solution	Variable values	$z_1$	$z_2$	<b>Z</b> 3
LP model	$x_4 = 4000, x_5 = 2000, x_1 = x_2 = x_3 = x_6 = 0$	1580000	846	826

Source: Author's calculation according to the application of Microsoft Excel Solver

#### 3.4. Multi-objective linear programming model

Taking into account the purchasing costs of flour in Table 1, the priority coefficients for the functions of quality and reliability (acquired by the AHP method), the total demand for flour in a given period, limited quantity of procurement from one vendor and the upper and lower limits of the number of vendors, the following multi-objective linear programming model was formed:

$$\max_{\mathbf{x}\in\mathbf{S}}\left\{z_1(\mathbf{x}), z_2(\mathbf{x}), z_3(\mathbf{x})\right\}$$
(10)

where

$$z_1(\mathbf{x}) = -260x_1 - 240x_2 - 250x_3 - 290x_4 - 210x_5 - 295x_6,$$
  

$$z_2(\mathbf{x}) = 0.131x_1 + 0.160x_2 + 0.231x_3 + 0.142x_4 + 0.139x_5 + 0.197x_6,$$
  

$$z_3(\mathbf{x}) = 0.365x_1 + 0.074x_2 + 0.093x_3 + 0.116x_4 + 0.181x_5 + 0.170x_6,$$

and

$$\mathbf{S} = \begin{cases} (\mathbf{x}, \mathbf{y}) : \sum_{j=1}^{6} x_j = 6000, \ x_j \le 4000, \ x_j \le M \cdot y_j, \ -x_j + M \cdot y_j \le M - x_j^{\min}, \ 2 \le \sum_{j=1}^{6} y_j \le 4, \ x_j \ge 0; \\ y_j \in \{0, 1\}, \ j = 1, 2, ..., 6 \end{cases}$$

 $y_j$  are artificial binary variables which show us whether the selected *j*-th vendor is chosen. Those variables are linked to variables  $x_j$  in such a way that if the solution contains variable  $x_j$ , then variable  $y_j$  must be equal to 1, and if in the solution to the problem variable  $x_j$  has value 0, then  $y_j$  must also be 0, and vice-versa. *M* is a very large number, a  $x_j^{min}$  (*j* = 1, 2, ..., 6) is the minimal value which variable  $x_j$  can reach if variable  $y_j$  has a value of 1.

Model (10) is firstly solved with the application of the linear programming method using Microsoft Excel Solver separated optimizing each of 3 objective functions on the given set of constraints. Results are shown in Table 5:

Table 5: Optimal goal function values

Solution	$z_1(x)$	$z_2(x)$	$z_3(x)$
$\max z_1(\mathbf{x})$	-1320000	876	872
$\max z_2(\mathbf{x})$	-1590000	1318	712
$\max z_3(\mathbf{x})$	-1460000	802	1822

Source: Author's calculation applying Microsoft Excel Solver

Table 5 shows us that the values of the objective function are significantly different when the separated is maximized on the given set of constraints. So function  $z_1(\mathbf{x})$  takes the value between–1590000 and–1320000, function  $z_2(\mathbf{x})$  between 802 and 1318, and function  $z_3(\mathbf{x})$  between 712 and 1822. Accordingly, the decision maker has three conflicting objective functions and should determine and choose one preferred non-dominated solution taking into account the gratification of all goals.

Here we will demonstrate the procedure of solving by applying the following methods: a) linear goal programming, b) fuzzy linear goal programming and c) MP method for solving MOLP model.

#### a) Model solution with the linear goal programming method

With the application of linear goal programming we solved the following model:

$$\min_{(\mathbf{x},\mathbf{d}^{-},\mathbf{d}^{+})\in\mathbf{S}_{1}}(d_{1}^{+}+d_{2}^{-}+d_{3}^{-})$$
(11)

where

$$\mathbf{S}_{1} = \begin{cases} (\mathbf{x}, \mathbf{y}, \mathbf{d}^{-}, \mathbf{d}^{+}) : z_{1}(\mathbf{x}) - d_{1}^{+} = 1320000, z_{2}(x) + d_{2}^{-} = 1318, z_{3}(x) + d_{3}^{-} = 1822, \sum_{j=1}^{6} x_{j} = 6000; x_{j} \le 4000, z_{2}(x) + d_{2}^{-} = 1318, z_{3}(x) + d_{3}^{-} = 1822, \sum_{j=1}^{6} x_{j} = 6000; x_{j} \le 4000, z_{2}(x) + d_{2}^{-} = 1318, z_{3}(x) + d_{3}^{-} = 1822, \sum_{j=1}^{6} x_{j} = 6000; x_{j} \le 4000, z_{2}(x) + d_{2}^{-} = 1318, z_{3}(x) + d_{3}^{-} = 1822, \sum_{j=1}^{6} x_{j} = 6000; x_{j} \le 4000, z_{2}(x) + d_{2}^{-} = 1318, z_{3}(x) + d_{3}^{-} = 1822, \sum_{j=1}^{6} x_{j} = 6000; x_{j} \le 4000, z_{2}(x) + d_{2}^{-} = 1318, z_{3}(x) + d_{3}^{-} = 1822, \sum_{j=1}^{6} x_{j} = 6000; x_{j} \le 4000, z_{2}(x) + d_{2}^{-} = 1318, z_{3}(x) + d_{3}^{-} = 1822, \sum_{j=1}^{6} x_{j} = 6000; x_{j} \le 4000, z_{2}(x) + d_{2}^{-} = 1318, z_{3}(x) + d_{3}^{-} = 1822, \sum_{j=1}^{6} x_{j} = 6000; x_{j} \le 4000, z_{2}(x) + d_{3}^{-} = 1822, \sum_{j=1}^{6} x_{j} = 6000; z_{j} = 100, z_{j$$

We obtained the following solution:

Table 6. Solution by the linear goal programming method

Solution	Values of variables	<i>z</i> <sub>1</sub>	$z_2$	<b>Z</b> 3
LGP	$x_1 = 4000, x_5 = 2000,$	1460000	802	1922
model	$x_2 = x_3 = x_4 = x_6 = 0$	1400000	802	1622

Source: Author's calculation with the application of Microsoft Excel Solver

The decision maker should accept the obtained solution as the preferred one.

#### b) Model solution by fuzzy linear goal programming

In order to apply this method, it is necessary with application of relations (4) and (5) to first calculate the membership function  $\mu_1(z_1(\mathbf{x}))$ ,  $\mu_2(z_2(\mathbf{x}))$  i  $\mu_3(z_3(\mathbf{x}))$ :

 $\mu_1(z_1(\mathbf{x})) = 5.889 - 0.000963x_1 - 0.000889x_2 - 0.000926x_3 - 0.0010741x_4 - 0.00077778x_5 - 0.001093x_6 + \mu_2(z_2(\mathbf{x})) = 0.000254x_1 + 0.00031x_2 + 0.000448x_3 + 0.00027519x_4 + 0.00026938x_5 + 0.000382x_6 - 1.554$ 

 $\mu_3(z_3(\mathbf{x})) = 0.000329x_1 + 0.000067x_2 + 0.000084x_3 + 0.00001045x_4 + 0.00016306x_5 + 0.000153x_6 - 0.64$ After that the following linear programming model is solved:

$$\min_{(\mathbf{x},\mathbf{d}^-)\in\mathbf{S}_2} \left( d_1^- + d_2^- + d_3^- \right), \tag{12}$$

where

$$\mathbf{S}_{2} = \begin{cases} (\mathbf{x}, \mathbf{y}, \mathbf{d}^{-}) : \mu_{1}(\mathbf{x}) + d_{1}^{-} = 1, \mu_{2}(\mathbf{x}) + d_{2}^{-} = 1, \mu_{3}(\mathbf{x}) + d_{3}^{-} = 1, \sum_{j=1}^{6} x_{j} = 6000; \ x_{j} \le 4000, \ x_{j} \le M \cdot y_{j}, \\ -x_{j} + M \cdot y_{j} \le M - x_{j}^{\min}, \ 2 \le \sum_{j=1}^{6} y_{j} \le 4; \ x_{j} \ge 0; \ y_{j} \in \{0,1\}; \ j = 1, 2, ..., 6 \end{cases}$$

The following solution is gained, which is offered to the decision maker:

Table 7. Solution by fuzzy linear goal programming model

Solution	Values of variables	$z_1$	$z_2$	Z3
FLGP	$x_1 = 2000, x_5 = 4000,$	1360000	818	1454
	$x_2 = x_3 = x_4 = x_6 = 0$			

Source: Author's calculation using Microsoft Excel Solver

#### c) Problem solution by MP method

After informing the decision maker about the biggest and lowest objective function values, the decision maker determines the initial levels of aspiration for objective functions. In the first stage, the decision maker determined the following acceptable values for objective functions:  $z_1 = -1320000$ ,  $z_2 = 1300$ ,  $z_3 = 1600$ . Of course the decision maker wants to achieve maximum value for all objective functions. However, the decision maker knows that it is difficult in the first step to achieve initial level of aspiration of the objective function. The final acceptable level of objective function should be achieved after steps of application of this method. This demands active decision maker participation in the problem solution process.

In the second stage of the first step of the application of the method, the following linear programming model is solved:

$$\max_{(\mathbf{x},\lambda)\in\mathbf{G}}\lambda$$
(13)

where

$$\mathbf{G} = \begin{cases} (\mathbf{x}, \mathbf{y}, \lambda) : \sum_{j=1}^{6} x_j = 6000; \ x_j \le 4000, \ x_j \le M \cdot y_j - x_j + M \cdot y_j \le M - x_j^{\min}, \ 2 \le \sum_{j=1}^{6} y_j \le 4; \\ z_1 \ge 1150\lambda; \ z_2 \ge 1300\lambda; \ z_3 \ge 1600\lambda; \ x_j \ge 0; \ y_j \in \{0,1\}; \ j = 1, 2, ..., 6 \end{cases}$$

the following solution was gained:

Table 8. Solution after stage 2 step 1

Solution	Values of variables	<i>z</i> <sub>1</sub>	<i>Z</i> <sub>2</sub>	Z3	$\lambda_1$	$\lambda_2$	$\lambda_{3}$
Ι	$x_1 = 2905.37, x_3 = 3094, 63, \ \lambda = 0.84,$	-1529054	985.38	1120.2	0.87	0.84	0.84
	$x_2 = x_4 = x_5 = x_6 = 0,$						

Source: Author's calculation using Microsoft Excel Solver

We calculated indicators  $\lambda_k$  (k = 1, 2, 3) using relation (5).

The decision maker was not satisfied with the obtained solution.

In the second step of the method, the decision maker determined new reduced levels of aspiration (values  $\lambda = \lambda_2 = \lambda_3 = 0.843$  suggest reducing the levels of objective function aspiration  $z_1$  i  $z_2$ ). The decision maker determined new levels of aspiration:  $d_1 = -1309095$ ,  $d_2 = 1200$ ,  $d_3 = 1400$ .

After solving model (11) with replaced constraints  $z_2 \ge 1200\lambda$  instead of  $z_2 \ge 1300\lambda$ ,  $z_3 \ge 1400\lambda$  instead of  $z_3 \ge 1600\lambda$ , the following solution was obtained:

Table 9. Solution after stage 2 step 2

Solution	Values of variables	$z_1$	$z_2$	<i>Z</i> 3	$\lambda_1$	$\lambda_2$	λ3
II	$x_1 = 2115., 40x_3 = 3884.60, \lambda = 0.95,$	-1521154	1174.5	1133.4	0.872	0.979	0,872
	$x_2 = x_4 = x_5 = x_6 = 0$						

Source: Author's calculation using Microsoft Excel Solver

After the second step, the decision maker was not satisfied with the value of objective function  $z_1$ . The decision maker decided that the acceptable level of objective function  $z_2$  should not be less than 1174.46, and that increasing the value of function  $z_1$  be achieved by reducing the acceptable level of function  $z_3$ .

Step 3. In this step, the decision maker reduced the acceptable level of function  $z_3$  to 1200.

After solving model (11) with replaced constraints  $z_2 \ge 1174.46$  instead of  $z_2 \ge 1300\lambda$  and  $z_3 \ge 1200\lambda$  instead of  $z_3 \ge 1600\lambda$  the following solution was obtained:

 Table 10: Solution after stage 2 step 3

Solution	Value of variables	<i>z</i> 1	$z_2$	Z3	$\lambda_1$	$\lambda_2$	λ3
III	$x_1 = 2000, x_3 = 4000, \lambda = 0.8725,$	-1520000	1186	1102	0.873	1.01	0.918
	$x_2 = x_4 = x_5 = x_6 = 0$						

Source: Author's calculation using Microsoft Excel Solver

The decision maker was not satisfied with the obtained function value  $z_1$ , and therefore reduced the acceptable level of function  $z_3$  to 1000.

Step 4. After solving model (12) with replaced constraints  $z_2 \ge 1174.46$  instead of  $z_2 \ge 1300\lambda$  and  $z_3 \ge 1000\lambda$  instead of  $z_3 \ge 1600\lambda$  the following solution was obtained:

#### Table 11: Solution after stage 2 step 4

Solution	Value of variables	<i>z</i> <sub>1</sub>	Z2	Z3	$\lambda_1$	$\lambda_2$	$\lambda_3$
IV	$x_1 = 2000, x_3 = 4000, \lambda = 0.8725,$	-1520000	1186	1102	0.873	1.01	0.918
	$x_2 = x_4 = x_5 = x_6 = 0$						

Source: Author's calculation using Microsoft Excel Solver

However, reduction in the acceptable function level  $z_3$  did not alter the previous solution. Therefore, the decision maker decided to further reduce acceptable levels of function  $z_3$  to 880.

Step 5. After solving model (12) with replaced constraints  $z_2 \ge 1174.46$  instead of  $z_2 \ge 1300\lambda$  and  $z_3 \ge 880\lambda$  instead of  $z_3 \ge 1600\lambda$  the following solution was obtained:

Table 12: Solution after stage 2 step 5

Solution	Value of variables	$z_1$	$z_2$	<i>Z</i> 3	$\lambda_1$	$\lambda_2$	λ3
V	$x_3 = 3700.65, x_5 = 2299.35, \lambda =$	-1408026	1174.46	1102	0.948	1.00	0.864
	$0.864x_1 = x_2 = x_4 = x_6 = 0$						

Source: Author's calculation using Microsoft Excel Solver

The decision maker accepted this solution. Accordingly, after only 5 steps, the decision maker accepted the preferred solution so the process was finished.

#### 4. ANALYSIS OF THE APPLICABILITY OF PRESENTED METHODOLOGIES

Here, brief analysis of the applicability of the four presented methodologies for the selection of vendor and determination of supply quotas from chosen suppliers on the example of one year's procurement of flour for a bakery company will be given.

All four presented and applied methodologies in the first phase apply the AHP method. The methodology (1) uses AHP for calculating TVP coefficients for every vendor, while in methodologies (2), (3) and (4) AHP method is applied for reducing complex hierarchical criteria to simple criteria of quality and reliability. Due to this, analysis will refer only to the methods which are applied to determining procurement quotas from chosen vendors and these are (1) linear programming, (2) linear goal programming, (3) fuzzy linear goal programming and (4) MP method for solving the MOLP model.

(1) This methodology for vendor selection and determining supply quotas applies linear programming and gives a non-dominated solution which is offered for acceptance to the decision maker. This method is not iterative and does not offer the decision maker the opportunity to participate actively in this phase of problem solution. This method does not demand additional efforts from the analyst.

(2) This methodology applies the linear goal programming and provides a non-dominated solution for one form of linear goal programming model, which is offered to the decision maker. However, if the decision maker is not satisfied with the proffered solution, a new model solution is necessary with amended aspiration levels of the decision maker or it is necessary to change the form of linear goal programming model and again solve the model. This method after the application of AHP method and reducing complex criteria of quality and reliability to simpler ones, demands from the decision maker information on the

aspiration levels of objective functions if the decision maker is able to provide this information. The application of this method does not demand active participation in the problem solution process from the decision maker. This method is not iterative and the decision maker in a concrete case has a low level of confidence that the obtained solution truly reflects his/her preferences. This methodology does not demand additional efforts from analysts in the formulation and solution of the model.

(3) This methodology after application of AHP methods applies fuzzy linear goal programming. From the decision maker, it demands determination of the upper and lower acceptable levels of objective function in order that, on the basis of that, membership functions for objective functions are formulated. In concrete cases it was a specific problem for the decision maker. However, if the decision maker for some reason cannot determine the upper and lower acceptable levels of objective functions, then the analyst for the upper level takes the maximum objective function values and for the lower level takes the minimal objective function values from the Table of payoffs, as was the case in our example. As a result of the method, we obtain a non-dominated solution which is offered to the decision maker. In the case it is not accepted, there is the possibility of solving the model again after the decision maker determines new upper and lower acceptable objective function levels and after the analyst calculates objective function membership function. This method is not interactive so it does not demand active participation by the decision maker in the problem resolution process. In the concrete case, the level of decision maker confidence is low in the gained solution. For the analyst, this method is somewhat more complicated because of the possibility of a larger number of calculations of new membership functions and because of resolution of a greater number of models.

(4) This methodology uses the MP method and requires the decision maker to actively participate in problem solution from the beginning right to the acceptance of the preferred solution. The MP method is iterative and clearly shows the decision maker which aspiration level needs to be reduced so that eventually an increase in the value of some other objective function can be expected. This method can also be applied when there are a large number of decision makers. In this case, it directs the decision maker to cooperation, which enables the maximum possible achievement of aspiration levels of feasible solutions in the given set for each decision maker. The decision maker is clearly shown that a reduction in his/her aspiration level is necessary so that finally an increase can be achieved in the aspiration level of other decision makers. This method ensures that in the final number of steps, preferred solution is reached and demands greater effort from the analyst compared to the previous two methods.

On the basis of the presented analyses, we can conclude that application of methodology (4) is significantly more advantageous in comparison to methodologies (1), (2) and (3) in solving the problem of vendor selection and determining the supply quota from the selected vendors.

# 5. CONCLUSION

On the basis of previous observations, we can conclude that in solving the problem of vendor selection and determining supply quotas from selected suppliers, numerous methodologies can be used. These include the AHP method and the linear programming and various methods of multi-objective linear programming.

The AHP method is applied either for calculating the TVP coefficient (priority) for every vendor or for reducing complex criteria with a hierarchical structure to simpler ones. In cases

where the AHP method is used for calculating the TVP coefficient for every individual supplier, in the second phase it forms and solves the linear programming model and in that way calculates the supply quota from selected vendors. In cases where the AHP method is used for reducing complex hierarchical criteria function to simpler ones, in the second phase the MOLP model is formed, the solution of which by applying various methods determines supply quotas from selected vendors.

Efficiency analysis of the application of the presented methodologies points to the significant advantages of the methodology which includes the AHP method and MP method to solve MOLP model. These advantages are contained in the fact that the **MP method is iterative**. In the final number of steps gaining preferred solution is ensured and it can be applied in the case where several decision makers exist, that is, when every decision maker has his/her own goal which aims to optimize on the given set of feasible solutions.

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## FRAMEWORK FOR ANALYSES OF CONSUMERS' BEHAVIOUR IN B2C E-COMMERCE

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## ABSTRACT

This paper presents a framework that can be used as the first step in model-building process and simulation of consumers' behaviour in B2C e-commerce. As a crucial step in a simulation study of B2C stakeholders' interactions, the suggested framework provides detailed insight into all relevant factors of the observed complex system and can be used to analyse different business strategies influencing generated online sales, site visits, income, profit and other success indicators of Internet markets. The model includes a detailed examination of all the important factors influencing consumer's decision-making process. The simulation model that can be generated from the proposed framework (logical model) should be capable of improving the speed, and quality of decision-making of e-commerce website management.

#### 1. INTRODUCTION

A steady development and a growing adoption of Internet-based technologies increase the scope of trade via the Internet on a daily basis. Electronic commerce has been expanding rapidly in the last decade and is now present in almost all industry branches and the majority of developed countries' markets. As a distributed environment, e-commerce involves a significant number of market participants: consumers, traders, mediators and other service providers who communicate, trade and collaborate among themselves using information and communication technology-based applications. In the very beginning, relocation of commerce or even the whole business to the Internet did not mean any significant competitive advantage for trading companies. This is not the case today. A large number of businesses can relatively promptly develop their e-commerce infrastructure and offer their services via the Internet. Hence the emergence itself of a company on the Internet is not a viable enough precondition for success. For e-commerce business to be successful, it is essential to develop and implement high-quality strategies of the entrance to the market. Furthermore, additional services should be offered that provide better purchasing conditions to the consumers, a possibility of service adapting and additional value for consumers (Ahn, 2010). However, despite the fact that the presence of e-commerce nowadays is increasing, one should still bear in mind that the major part of retail remains in the real, physical world. According to data and estimates for the period 2014-2019 published by eMarketer (2015), thanks to a steadily growing rate of an online share of sales worldwide, this channel will reach almost 10% in 2017 (Figure 1).

Figure 1. Retail Ecommerce Sales Worldwide, 2014-2019 (trillions, % change and % of total retail sales)



Note: includes products or services ordered using the internet via any device, regardless of the method of payment or fulfillment; excludes travel and event tickets

Source: eMarketer (2015)

In the initial stages of electronic commerce development, the Internet websites that introduced online sales established new business models, so far unknown and unexplored in the classic trade. The consumers who were among the first to accept this kind of purchase were considered to be those who easily adopt an innovation (Dutta & Biren, 2001; C. Liu, 2004). The ways products and services are offered on the Internet market are continually developed.

The development of the electronic commerce model has for long been a subject of numerous research attempts. The scientific literature often states the implementation of regression analysis as one of the most common approaches in recognizing the impact of key factors on the success of a selected model of electronic commerce (D. J. Kim, Ferrin, & Rao, 2008; Wang, Wang, & Dong, 2010; Zhu, O'Neal, Lee, & Chen, 2009). Besides, neural networkbased models are increasingly developed (Poh, Yao, & Jašic, 1998; Russell & Norvig, 2003). To improve the existing solutions and explore new means to support better business decisions, research has increasingly implemented agent-based models in the analysis of e-commerce business models recently. Railsback and Grimm (2012) have shown that the agent-based simulation model can successfully add a larger number of observed system characteristics to modelling. They have also demonstrated that agents can adapt their behaviour taking into account the current conditions of the environment and other agents. Grimm et al. (2006) have proven that adaptive behaviour is one of the essential properties of agents. Hence, complex and dynamic environments such as online markets can be successfully modelled and simulated using this methodology. One of the best-known models used in practice was developed by North et al. (2010) for the needs of the Procter & Gamble company. Zhang and Zhang (2007) used the agent-based simulation model to present the effect of introducing a new product on the market to serve as a decoy. The authors confined themselves to only explaining the application of the mentioned effect (Marković, Čavoški, & Novović, 2016). However, the model itself is far more comprehensive and deals with psychological mechanisms that govern consumers in choosing a particular product. Okada and Yamamoto (2009) used the agent-based simulation model for investigating the impact of the electronic word of mouth (eWOM) effect upon the habits of consumers purchasing on B2C websites. Particular attention is paid to the exchange of knowledge (useful information on the product) among consumers. Furthermore, the literature describes a large number of agent-based simulation models used in consumer behaviour studies (Roozmand et al., 2011; Said, Bouron, & Drogoul, 2002; Schramm, Trainor, Shanker, & Hu, 2010). An interesting example is the CUBES simulator (Customer Behaviour Simulator) (Said et al., 2002), which studies mechanisms of customer interactions and their effect on different economic phenomena. X. Liu, Tang, Yu, and Lu (2013) used the agent-based simulation model for investigating into the nowadays common continual price reductions on online markets. In recent years, this methodology is successfully used in simulating consumer behaviour on social networks and research into the effect of social networks on viral marketing (Hummel, Kern, Kühne, & Döhler, 2012; Zutshi, Grilo, & Jardim-Gonçalves, 2014).

In this paper, we will present the framework for modeling and analysing the Internet consumer decision-making process. The conceptual model is proposed based on the analyses of papers related to consumer behaviour, from psychology, philosophy, management, economics and other related disciplines in order to provide a holistic approach to the decision-making process. The precondition for the development of a quality model is a thorough apprehension of consumers on the Internet. Consumer behaviour on the Internet significantly differs from the traditional behaviour since the Internet consumers have different habits and needs. The number of papers and research articles on the subject of consumer behaviour in e-commerce today is rather large (Currie & Rowley, 2010; Dyner & Franco, 2004; Furaiji, Łatuszyńska, & Wawrzyniak, 2012). While a number of papers are devoted to socio-demographic characteristics of e-commerce participants, the other group of articles deal with phenomena affecting the consumer trust, privacy and safety as well as their inclination to buying a particular type of product or brand (Bagozzi, Gurhan-Canli, & Priester, 2002). Most of the papers are analysing consumers' behaviour and providing a model for the specific

situation. Our aim is to present a conceptual model and provide instructions for modeling specific system step-by-step.

### 2. MODEL OF CONSUMER BEHAVIOUR

The study of the consumer population, their habits and behaviour serve as the basis for the B2C electronic commerce analysis. This analysis is of vital importance for B2C shop owners and managers, for marketers, salespeople, but also for the consumers themselves. The consumer analysis is to analyse their needs – what, why and how they purchase. Also, its purpose is to help understand why and how consumers make purchase decisions. Data on consumers help marketers define the market and identify threats and opportunities that will primarily affect a consumer's acceptance of products and services. Consumer preferences change and diversify daily, and despite a significant number of similarities, consumers, as a rule, differ significantly.

Consumer behaviour can be described as a set of activities prospective consumers undertake in searching, selecting, valuing, assessment, supplying and usage of products and services in order to satisfy their needs and desires. These also include decision-making processes that both precede and follow the activities mentioned above (Belch & Belch, 1998; Cavoski & Markovic, 2015; Schiffman, Kanuk, & Wisenblit, 2010; Solomon, Bamossy, Askegaard, & Hogg, 2010). Consumer behaviour is a relatively new scientific area emerging from scientific disciplines such as economics, marketing and behaviouristic sciences. The demands of the environment, an increased interest in consumer protection in world economies, the global market growth, the competition growth, development of IC technologies, and especially the emergence of new e-commerce models on the Internet have all brought about continual changes in the consumers' needs and habits.

One of the basic problems in the consumer behaviour analysis refers to the manner in which consumers develop, adapt and use product and service purchase strategies. Making a purchase decision can be defined as a pattern preceding, determining and following the decision-making process when buying a product or a service.

While deciding to make a purchase, online shopping consumers go through different phases. The phases are similar to those present in the traditional shopping, however, the manner in which they are carried out differs. This process may change depending on the type of product, consumers' individual characteristics and the current state – attribute of the product to be bought. Generally speaking, in their decision-making process, consumers go through the following stages (Engel, Blackwell, & Miniard, 1994): (1) problem awareness, (2) information gathering, (3) evaluation of alternatives, (4) the decision on the purchase and (5) post-purchase evaluation. The process itself will differ from case to case. In some situations, specific stages will be skipped, but with growing decision complexity and product price the chance for every stage to be present is higher, and the process will last longer.

Development of the Internet and its services completely changed the way purchase decisionmaking process is conducted. Information exchange on the internet is prompt, and the amount of available data is practically unlimited. Consumers get to know about new products and technologies very fast. Sources of information that consumer can use in the first two phases of decision-making are:

• Internal sources – based on the previous experience, product usage and examination.

- Community sources information gathered from the surroundings (friends, family, colleagues) and other consumers (social networks, forums, specialised websites).
- Marketing sources commercialised information sources placed by companies.
- Public non-commercialized sources information from mass media and Internet, provided by independent entities like consumer organisations, experts from specific fields, etc. These sources are considered highly reliable.
- Experimental sources information gathered from the trial product or service usage, which is very common for the products available online.

The main influencing variables in this phase are product knowledge, previous knowledge and experiences in online shopping. The most important demographic information are gender and age. Many studies proved that males and females browse the Internet differently. On the other side, the age is significant variable as the younger population faster accept the new technologies and easily find wanted information.

In the next phase, evaluation of alternatives, the buyer processes gathered information and makes shortlist of products from which he will choose the needed one. The buyer defines alternatives which are capable of satisfying his needs and wishes. The product list is iteratively getting smaller while the buyer is constantly returning to the previous phase and gathering more information about products. From this point, the buyer can make a decision to give up on shopping or to go to the next step.

In the phase number four, the decision about buying is made by choosing from the alternatives. This phase is iterative, too. Namely, the buyer can return to the previous phases to collect more data and evaluate alternatives. The most important factor on the buyer at this point are price sensitivity, quality sensitivity and environment influence through social networks and other communication channels.

The most significant change Internet has brought is an easier transition from phase to phase, thanks to the fast exchange of information. As presented in Figure 2 with red lines, information gathering, evaluation of alternatives and decision-making are iterative processes.

On websites www.eklik.rs and www.eporodica.rs we followed the flow of buyers through pages and noted that 25% of started orders were not finished. The interesting fact is that buyers went to the other web stores afterwards. This is the proof of previously described decision-making process existing. It is interesting that after each phase buyer can make an impulsive purchase. The buyer may postpone his decision and make it afterwards or even make a purchase using traditional stores (Terpsidis, Doukidis, Moukas, Pergioudakis, & Maes, 1997).

After purchase being made, we have a post-sale evaluation. In this phase, online sellers are delivering goods and providing post-sale support. The Internet has completely changed this phase and significantly improved it by using Internet services. This is a very important phase for achieving consumer satisfaction.

Anderson and Srinivasan (2003) defined e-satisfaction as buyer's satisfaction in terms of his previous experience related to the transaction made with named online store. Satisfaction is a

consequence of buyer's experience from each shopping phase (Kohli, Devaraj, & Mahmood, 2004; McKinney, Yoon, & Zahedi, 2002).





Source: Authors

The following paragraphs will further describe the important factors influencing purchase decision-making: ways in which consumers are becoming aware of their needs, choose products, identify the most important factors in the product evaluation process, but also the most important characteristics of consumers that affect these steps and, finally, the ways in which the decision is made. We will model links among individual consumer characteristics, website characteristics, the online seller business strategies and the purchase decision-making process. According to Chang, Cheung, and Lai (2005), the factors that affect the consumer's decision can be classed as follows:

• Perception of characteristics of the Internet as a sales channel

Literature knows numerous models that take into account the consumers' attitudes, perceptions and beliefs involved in the purchasing process. The best-known models dealing with this subject are the Technology Acceptance Model (TAM) (Davis, Bagozzi, & Warshaw, 1989), the Theory of Planned Behaviour (TPB) (Ajzen, 1985) and the Theory of Reasoned Action (TRA) (Ajzen, 1985). Initially, these theories were not developed for the needs of the online market. However, they are applicable to this method of business doing, too. Attitudes, experiences, risks and trust can be classed as socio-psychological variables related to consumer characteristics.

• Characteristics of the Internet site or product

The aim of the Internet website is to turn general website visitors into buyers. A report on the Internet shopping mall business (Dholakia & Rego, 1998) defined four issues that play key roles in the purchase decision-making process and the acquired feeling of satisfaction or dissatisfaction after the purchase and the visit to an Internet site. Firstly, online shops have to offer both useful and high-quality information presented in a well-structured manner. Secondly, navigation has to be easy and intuitive thus ensuring an easy information and product discovery. Thirdly, the design of the website has to be attractive. Fourthly, the website has to ensure the safety of information and data privacy and thus enable a safe purchase. The characteristics of the Internet website and the product offered significantly affect the consumer's decision to buy a product or a service online.

• Consumer characteristics

Consumer characteristics are about their demographic attributes among which gender and age stand out as most influential (Riedl, Hubert, & Kenning, 2010; Venkatesh, Morris, Davis, & Davis, 2003). The perception of the Internet as a sales channel is developed over time and depends on both positive and negative experiences the consumer gathers during the sales transactions.

Figure 3. Factors of impact upon consumer behaviour in online purchasing



After defining factors influencing consumers' behaviour during internet shopping, the next step in the model building process is connecting buyers and sellers (online shops) and determining the way they communicate. Namely, we are observing buyers with their social and cultural characteristics on the one side and Internet sellers with their e-business and e-marketing strategies on the other side. Model is also taking into account the always growing influence of online community and social networks influence on purchase decision-making. Buyer's decision is considered as an output variable in the model.

The model is built having applicability in mind, but at the same time being able to include as many impact factors as possible. The model is by nature dynamic and models a complex purchasing process in an online environment. It is characterised by a flexible structure that can be adjusted to individual needs and specific phenomena.



Figure 4. Consumer decision-making model in B2C electronic commerce

Source: Authors

The model presented in Figure 4 focuses on three segments: the seller segment, the consumer segment and the communication channel segment. The seller is the Internet site dealing in

B2C sales of products and services. The most important site characteristics contained in the model are the technical specifications: infrastructure, software support, website design and the quality of information on the products offered via the website. The consumer segment observes online consumers. The model monitors the impact factors concerning their attitudes, goals and beliefs (Figure 3). The communication channels are the online and traditional channels of communication. The presented model is confined only to the effects of online communication channels. In addition to the above-described classification, communication channels can also be viewed as pre-sale communication and post-sale communication channels. This classification is not important from the point of view of online commerce since these channels are identical here. Having closed the transaction, the consumer continues communication with the seller and forms his/her attitude towards the seller, towards the product, but also towards the Internet as a channel for online shopping. In case the consumer is satisfied with the service, it is highly likely that he will use the same website to purchase again; hence the post-sales communication can be understood as preparation for the next purchase. One of the changes the Internet brought is a fast exchange of information and an endless amount of information that the Internet supplies. This is one of the reasons our model observes communication between the consumer and the seller and in particular exchange of data among the consumers themselves.

In addition to the three described segments, the model includes business policies created by the seller, whose aim is to increase sales and build consumer trust. The model allows for varying the input variables that simulate the effects of implementation of different business policies, primarily those referring to price changes and product quality attributes. The model also helps track the effects of Internet marketing as a business policy segment.

## 3. BASIC STEPS IN LOGICAL MODEL DEVELOPMENT

In the previous chapter, we identified the key entities of the model and elaborated on the fundamental theoretical concepts related to consumer behaviour, their attributes that play a key role in the online purchase and the decision-making processes are taken into consideration in defining the logical model of B2C online purchase system. To build a simulation model, it is necessary that key entities of the logical model should be presented in a model and to transform their interactions into rules of behaviour. In this process, it is also necessary that a high level of compliance with a real system that is modelled should be ensured, which can be checked by the system validation and verification processes (Radenković, Stanojević, & Marković, 2009). The simulation model implements the 4Ps strategy (product, price, place and promotion) by modelling the marketing mix factors as input variables. The combination of these factors in the model determines the ultimate utility or consumers' satisfaction with the product.

In the observed simulation model, the prospective consumers go through all the stages of online purchase. They first find the B2C online shops of interest, then search for information on the products, form their own opinion about the product and/or service (utility function) and finally make a decision to buy (regardless of whether these are consumers that buy only once or consumers that remain loyal after their first purchase).

Figure 5 shows the basic steps in the simulation model, blue boxes represent the core simulation flow. In the first step, the simulation model forms a virtual market by generating: consumers (*Consumer*), sellers – Internet sites (*Seller*), suppliers (*Supplier*) and advertisers (*Banner*), based on input variables. It is in this way that business policies related to Internet marketing are simulated.



Figure 5. Graph of online purchase flow process in the simulation model

Source: Authors

The *Consumer* represents an individual consumer and his/her purchasing habits. The model can observe the behaviour of each individual consumer or a group of consumers. It is of key importance that we identify consumers with similar behaviours and needs and segment them for the purpose of targeted marketing campaigns (Klever, 2009). Entities that represent consumers in the model are generated by categories (based on classification presented in (Moe, 2003; Moe & Fader, 2002)), and depending on what is their intention when visiting an online sales site:

- 1. **Direct consumers:** they visit the website with the intention to purchase a particular product; they rarely leave the internet site without having purchased.
- 2. **Consumers who search/reason:** they generally intend to buy a product from a certain category; it is possible that they make their purchase after several visits and comparisons with other online stores.
- 3. **Hedonic browsers:** initially, they do not intend to buy a product; if made, a potential purchase is exclusively the result of stimuli from the site.
- 4. **Information gathering visitors:** visit the website collect information without any intention of buying.

The simulation model forms a virtual market where generated entities surf randomly, which is consistent with surfing on the Internet in the real world. *Consumers* form a utility function for all the products they find while surfing. The consumer purchases the product that has

maximum utility. The model allows for setting a utility function threshold so that the goods that do not reach this threshold are rejected. The model implements a number of methods of product selection, i.e. methods of utility function forming.

#### 1. Purchase the best offer

Such a behaviour models a *rational* consumer who attempts to meet his needs, as fully as possible. These are marked yellow in the model.

### 2. Purchase the cheapest offer

The consumers that give priority to the lowest price when forming the product utility function on condition that the product attributes marked as imperative in the simulation experiment are satisfied.

### 3. Loyal consumers

These are consumers with a high level of trust in certain sellers and are satisfied with their services. In the case of small differences in utility functions, these consumers choose the product from the seller from whom they have already purchased and to whom they trust more. The percentage of allowed utility function variation is set as an input parameter into the simulation model. They are marked blue in the model.

The consumers classed as *direct consumers* and *consumers who search* may appear in all three subcategories of consumers related to the method of utility function creation (marked yellow, red and blue). The consumers in the *hedonic browsers* category are marked exclusively white in the model. The utility function threshold for them is set high since it is rare and under specific conditions that they purchase products they see on the website.

In generating Consumers, each entity is assigned characteristics shown in Table 1.

Label	Definition	Value	Distribution
Gi	i-th Consumer gender	input variable	Random 50%
A <sub>i</sub>	i-th Consumer age	input variable	(18 + random 60)
Ii	i-th Consumer income	input variable	(5 + random 10)
$RS_i$	i-th Consumer sensitivity to website rating	input variable	Random (0-1)
K <sub>i</sub>	i-th Consumer sensitivity to product price	input variable	Depends on I <sub>i</sub> – wealthier consumers are less sensitive to price
$\mathbf{W}_{ij}$	i-th Consumer sensitivity to a particular product attribute	input variable	Random (0-1)
$ADS_i$	i-th Consumer sensitivity to advertisements	input variable	Random (0-1)
$Ft_i$	i-th Consumer sensitivity to other consumers' decisions	input variable	Random (0-1)

Table 1. Consumer input parameters

The Internet sellers (B2C e-commerce websites) are modelled as *Sellers* in the observed model. The model presumes that each website sells one brand. When generating at the beginning of the simulation, *Sellers* are randomly assigned attributes shown in Table 2.

Label	Definition	Value	Distribution
brand_seller	type of brand sold by Seller		Random
cbrand-price	initial product price	input variable	Random (0-100)
sales-volume	number of sales	output variable	
		site rating by consumers	
R <sub>i</sub>	site rating	+1 = positive,	
	-	-1 = negative	
Find me	initial search weight	input variable	Random (0-100)

#### Table 2. Seller input parameters

In addition to consumers and sellers, the model includes *Suppliers*, which are also generated at the beginning of the simulation, under the assumption that they have an unlimited storage of products. One supplier is generated for every brand.

The fourth type of entities is *Banners*. They serve to model the effect of Internet advertisements (banners) on purchase decision-making.

Upon generating entities and forming a virtual market, *Consumers* start searching for and evaluating products. The search is carried out via *Consumers'* random surfing through the virtual market where they interact with another *Consumers, Sellers* and *Banners*. With the proposed model, it is possible to observe the effects of different strategies of *Sellers* on the effects of Internet sales. By expanding the model, it is feasible to observe the effects of business strategies related to Internet advertising (purple boxes in Figure 5) and/or related to product prices (green boxes in Figure 5).

Purple boxes in Figure 5 together with the basic model (blue boxes in Figure 5) show the model that takes into consideration different business strategies of Internet advertising. The development of social networks and Google services resulted in B2C e-commerce companies predominantly using these channels to market their products today. Consumers with previous experience with online purchases display a tendency to share both positive and negative experiences about the purchase they made (eWOM effect) (Godes & Mayzlin, 2004). The model employs the following marketing tools:

- eWOM (interaction with other consumers),
- Search weight (weights affecting consumers' search for the websites),
- Advertisements with banners (Banners).

During their surf through the virtual market, *Consumers look for Banners* in a certain radius surrounding them (input variable with the semantics of a number of banners the *Consumer* sees during his search), thus simulating the impact of different marketing strategies upon consumers' attitudes when choosing a product on the Internet. Bearing in mind that not every consumer reacts to banners, in the same manner, one input parameter of each *Consumer* is sensitivity to marketing campaigns. Thus, the consumer's inner sensitivity (perception) to the offered product is modelled. Each *Consumer memorises* a number of reviewed *Banners*, that is, brands they represent.

Surfing on, the *Consumer* randomly finds Internet websites (*Sellers*). Finding different sellers may be entirely random or affected by search weight on certain *Sellers* to which the *Consumer* reacts. The number of websites browsed in this manner makes the input variable set at the beginning of the simulation experiment. The model also allows for simulating a better *visibility* of the website on the Internet by generating the larger number of *Consumers*. The larger number of *Consumers*, the higher likelihood of finding a website selling a particular type of product.

Apart from finding *Sellers* and *Banners*, *Consumers* can conduct interactions among themselves in a given radius while surfing through a virtual market. As mentioned above, it is in this manner that consumers' tendency to imitate (follow) the behaviours of other consumers and their recommendations (eWOM effect) is modelled. *Consumers'* interactions can be classified into two types: direct communication of *Consumers* and *Consumers'* recommendations on websites. *Consumers'* recommendations (positive or negative) regarding some *Sellers* and/or brands are conveyed at the end of the purchasing process.

The basic model presented in Figure 5 (blue boxes) can be expanded for the purpose of observing a business strategy related to a promotional price reduction of product prices (green boxes in Figure 5). Promotional prices are among the most important attributes affecting a consumer's decision to purchase online. Promotional campaigns increase sales significantly and, as a rule, result in an increased profit of the company. The business strategy of reducing prices results in an increase in online sales by attracting a larger body of consumers. The price reduction is a key attribute affecting the consumer decision to purchase, and it significantly increases the volume of online sales (Cavoski & Markovic, 2015; X. Liu et al., 2013).

#### 3.1. Components of utility function

The consumer's utility function is created based on the information *Consumer* collects about a product and in interactions with other consumers. At the beginning of the simulation, it is possible to define the lowest utility function value below which the *Consumer* never makes a pro-purchase decision. Suppose that N brands were present in a virtual market. If we view incentives as independent variables, and character traits as coefficients of these independent variables, we can define the function in the following manner:

$$U_i = P_i + A_i + D + T_i \tag{1}$$

where:

 $U_i$  – function of *Consumer* regarding product *i* (*i* = 1 to *N*).

 $P_i$  – *Consumer* rating of the *i*-th product price and quality.

 $A_i$  – effect of *i*-the product marketing campaign on *Consumer*.

*D* – factors related to demographic attributes of *Consumer*.

 $T_i$  – Consumer rating of the *i*-th online website (Seller).

In product rating consumers usually compromise between what they get by purchasing the product and how much money they give in return. The model observes price as one product attribute and product quality as the other, integrating all the aspects of product quality.

$$P_i = C_i + EQ_i \tag{2}$$

where:

 $P_i$  – Consumer's rating of the *i*-th product price and quality.

 $C_i$  – Consumer's sensitivity to the *i*-th product (brand) price.

 $EQ_i$  – Consumer's sensitivity to the *i*-th product (brand) quality.

The value of coefficient  $C_i$  shows the effect of product price on the *Consumer's* attitude towards purchasing the given product. As a rule, higher prices tend to have a negative effect on consumers' motivation to buy a certain product. The distributed model of sensitivity to price (B.-D. Kim, Blattberg, & Rossi, 1995) suggests that a lower price of a product generates a lower sensitivity to product price in a *Consumer*. Sensitivity to price can be expressed as follows (Zhang & Zhang, 2007):

$$C_i = -\alpha P_{ri} - P_{ei} + k \tag{3}$$

where:

 $\alpha$  – consumer's rating ( $\alpha$  > 1) versus the real price of the observed product;

 $P_{ri}$  – price of the *i*-th product;

k – constant for *Consumer* which depends on socio-economic attributes (better-off consumers are less price-sensitive);

 $P_{ei}$  – expected price of *i*-th product; this parameter is difficult to define so, it will be replaced by a mean value of all the products in the observed category  $P_{ave}$ :

$$P_{ei} = P_{ave} = \frac{1}{N} \sum_{i}^{N} P_{ei} \tag{4}$$

So that after the replacement we obtain:

$$EQ_i = \sum_{j=1}^m \beta_{ij} Q_{ij} \tag{5}$$

where:

 $Q_{ij}$  – *j*-th quality aspect for brand *i*;

 $\beta_{ij}$  – weight of *i*-th quality aspect for brand *j* (value ranging between 0 and 1).

The next element of utility function regarding the *Consumer* sensitivity to eWOM effect as well as sensitivity to marketing campaigns. Analytically, it can be expressed as:

$$A_i = \alpha_i W_i + \beta_i B_i \tag{6}$$

where:

 $A_i$  – effect of *i*-the product marketing campaign on *Consumer*.

 $\alpha_i$  – Consumer's sensitivity to eWOM effect for product *i*;

 $W_i$  – effect of other *Consumers* on decision to purchase *i*-th product.

- $\beta_i$  Consumer's sensitivity to brand *i* marketing (value ranging between 0 and 1);
- $B_i$  number of banners for brand *i* Consumer sees during his Internet surf.

Effect of eWOM on *Consumer* is possible to calculate in two ways. According to equation 3:

$$a) W_i = \frac{N_i}{N} \tag{7}$$

where:

 $N_i$  – number of *Consumers* in the *Consumer's* surroundings who use product *i*;

N – the total number of Consumers in the Consumer's surroundings.

Another way to calculate the effect of eWOM is the following (Aggarwal, Gopal, Gupta, & Singh, 2012):

b) 
$$W_i = \frac{E_p^2 - E_p E_n}{(E_p + E_n)^2}$$
 (8)

where:

 $E_p$  – number of positive rates of interaction.

 $E_n$  – number of negative rates of interaction.

*Consumers* rate their interaction with *Sellers* following each purchase made. The percentage of negative comments is an input parameter into the simulation model and is a subject of calibration in the simulation experiment.

The model also observes the interaction between *Consumers* and *Banners* that represent banners on the Internet. *Consumer's* sensitivity to marketing campaigns (banners) can be determined as follows:

$$B_i = \frac{R_i}{R} \tag{9}$$

where:

 $R_i$  – number of *Banners* of brand *i* in the *Banner*'s surroundings.

R – total number of *Banners* in the *Consumer's* surroundings.

It is obvious that the banner-using Internet marketing and Internet marketing in general increase sales and affect the consumers' attitudes. Banners are usually used to:

- Increase the sales of products and/or services,
- Inform consumers about new products/services or special offers,

• Provide information related to brand development and promotion, etc.

The key problem is how we can measure the performance of the banner on the Internet. Given that there is no universally adopted method for evaluation of online marketing effect on sales of products/services, the following techniques are commonly used in practice:

- **CTR (click-through-rate)** measures the percentage of people who clicked on a perceived banner. It is easy to measure and is successfully used in comparisons between different forms of marketing campaigns.
- **Response rate** tracks the number of e-mails, telephone calls or visits to online shop as a response to the marketing campaign.
- **Incremental sales** measures the increase in sales based on the marketing campaign. It is difficult to quantify. It is necessary that an individual marketing campaign, season, activities carried out by competition, etc. should be isolated.
- Lead generation measures the number of website visitors who made a purchase.
- **Brand awareness** one method of measuring the performance of the Internet marketing. It requires a relatively large budget and a specific methodology of quantification.
- **ROI (Return on Investment)** one of the most important parameters if it is possible to quantify.
- **Increased knowledge of consumers** one of the most important advantages of the Internet is an opportunity to offer prospective clients a large amount of information at one place.
- **Media impression** the number of times a marketing campaign appears online. This data should always be measured. However, it should not be the only one we measure.
- **Redemption rates** measures a number of used coupons that are offered to consumers during the online campaign.
- Length of engagement a reliable success parameter is a time spent on the website. It gives us an opportunity to assess how well the marketing campaign is targeted. In case the majority of visitors remains on the website for only a few seconds, targeting was probably poor.

In the simulation model, the *Consumer* searches his environment in a defined radius (input parameter) and looks for *Banner*. In every contact the *Consumer* memorises the *Banners* he encountered and, based on that and equation 9, a measure of marketing campaign effect on purchase decision is created. A click-through-rate is used as an input parameter into the simulation model. Based on this parameter *Consumer* visits a number of *Sellers* and creates a utility function to be used in purchase decision making. In this way, and not only through the utility function, *Banners* affect the *visibility* of the *Seller* in a virtual market, which is consistent with the real behaviour on the Internet.

The following set of impact parameters in the utility function is related to the consumer attributes. As stated above, the two most influential parameters are the consumer's gender and age:

$$D = \alpha A + \beta P \tag{10}$$

where:

- D factors related to demographic attributes of *Consumer*;
- $\alpha$  sensitivity of *Consumer's* age;

A – Consumer's age;

 $\beta$  – sensitivity of *Consumer's* gender to the choice of product;

P – Consumer's gender.

The effect of the consumer's age is observed through the age group the consumer belongs to. The model uses the following age groups: 18-24 old, 25-34, 35-44, 45-54, 55-64, 65 and older. The sensitivity of each age group is an input parameter into the simulation model. In the simulation experiment, the data on the age of generated consumers can be retrieved from some concrete market research; it is also possible to vary these data for the purpose of testing the effect of age groups on sales on different markets.

The consumers' age is generated randomly in the model, from a uniform distribution. The sensitivity of gender to sales is an input parameter into the simulation model and is of particular importance in the research of markets sensitive to the gender of the consumer population.

The final member of the utility function comprises parameters related to consumers' attitudes and beliefs and their perception of the Internet website quality. It takes into account the perceptions of the quality of information on the products the consumer finds on the website, the quality of payment and ordering of goods, perceptions concerning the website design and advantages offered by online shopping. The last attribute of this member of the utility function describes the risk perception and trust to the Internet website and the Internet as a shopping channel.

According to the mathematical model presented by Forsythe, Liu, Shannon, and Gardner (2006) we can define the *Consumer's* rating for the *i*-th online site (*Seller*):

$$T_i = \beta_1 I_i + \beta_2 P_i + \beta_3 T_i + \beta_4 B_i \tag{11}$$

where:

 $I_i$  – quality of information on *i*-th site;

 $P_i$  – perception of easiness of ordering and payment for *i*-th site;

 $T_i$  – perception of the site design of *i*-th site;

 $B_i$  – trust and advantages of on-line purchase for *i*-th site;

 $\beta_1$ ,  $\beta_2$ ,  $\beta_3$ ,  $\beta_4$  – parameters of sensibility (weights) generated in a random manner from the range 0-1.

### 4. CONCLUSION

This research provides specific guidelines for successful modeling processes in online markets. Investigating the model of decision-making presented in this paper highlights the complexity of consumer's choices and identifies the key elements of his behaviour. The introduced framework uses a wide range of input variables, which is proven to be justified as they explain consumer's behaviour. It is hard to say for a model that all the influencing factors important for decision-making are incorporated, but conceptual model proposed and accepted in this research analysed papers from psychology, philosophy, management, economics and other familiar disciplines in order to provide a holistic approach to the decision-making process.

The rules of behaviour and interactions included into the model stress the complexity of the decision-making process in product evaluation and purchase in the B2C e-commerce segment. The observed simulation model includes a broad range of impact variables whose aim is to model all the relevant aspects of consumer behaviour and explain their method of decision making when purchasing online. Of course, as well as any other model, the observed model does not pretend to take into consideration all the real components affecting the consumer choice. However, a careful choice of the utility function components enables summing up all the key elements that can significantly affect consumers' attitudes and decisions. Such an approach to consumer behaviour modelling is founded on the conceptual model of consumer behaviour established on research and theoretical grounds provided by numerous works in the areas of marketing, psychology, philosophy, management, economics and other related disciplines.

We can conclude that proposed e-commerce simulation model is a tool that ensures a better insight into the problem of consumer behaviour on the Internet, and the companies engaged in e-commerce in the B2C segment now have a tool that can help them better understand their consumers, improve market segmentation, improve the business profitability and test their business policies.

As shown in the above discussions, consumer decision making on the Internet is the subject of continual study. Therefore, new insights and approaches are certainly out there, waiting to be explored, which opens a broad area for further study. With a number of important exceptions, the roles of ethics, social responsibility and altruism which are as a rule ignored in the models and theories discussed here, may also be a target of future research in the elaboration of the existing framework.

For the implementation of the proposed logical model, we suggest agent-based modeling and simulation to be used. Modelling and simulation based on autonomous agents and interactions among them is one of the most appropriate simulation techniques for obtaining quantitative indicators based on the proposed logical model.

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# MACROECONOMIC EFFECTS OF OIL PRICE SHOCKS: EMPIRICAL EVIDENCE FOR SELECTED CENTRAL AND EASTERN EUROPEAN ECONOMIES

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#### ABSTRACT

This paper investigates the effects of oil price shocks on output and prices in Croatia, Czech Republic, Estonia, Hungary, Lithuania, Poland and Slovenia. The empirical effects of the oil price shocks are estimated using the Vector autoregression analysis. The results suggest that in all of these countries the effects of oil price shocks on output appear to be significant only sporadically. The relatively short lived significant effects of oil shocks on prices are found in Croatia, Hungary, Poland and Slovenia. In Czech Republic, Estonia and Lithuania the effects appear to be statistically insignificant. This evidence of the weak impact of oil price shocks is in accordance with the recent empirical literature which suggests that the macroeconomic effects of oil price shocks in developed countries became much weaker with time.

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## 1. INTRODUCTION

This paper contributes to the empirical literature on the effects of oil shocks on output and prices by investigating the short-run effects of oil price shock in 7 selected Central and Eastern European (CEE) economies. Oil price shocks have been viewed in the literature as an important source of economic fluctuations, and thus, this topic deserves considerable attention, especially given the increased volatility observed in the world oil market in recent times.

While empirical studies concentrate mainly on developed countries, there arises a need to complement these findings with investigating the countries from different backgrounds, one of those being CEE countries. This comes particularly important given that this group of countries has gone through large structural changes the effects of which were investigated from different angles, but rarely accounting for the impact of changes in world oil markets.

The macroeconomic effects of the oil price shock in these economies are in this paper estimated using the Vector autoregression (VAR) analysis. In particular, we estimate the structural VAR model for each country and compute the impulse-response functions of output and prices to a one-standard deviation oil price innovation.

The paper is organized as follows. Paper background is provided in Section 2. Section 3 describes the data and the used methodology. Section 4 presents and discusses the results of empirical analysis. Section 5 concludes.

## 2. PAPER BACKGROUND

Oil price shocks have been viewed among macroeconomists as an important source of economic fluctuations. Such a perception is largely due to two periods of low growth and high inflation that characterized most industrialized economies in the mid- and late- 1970s. Conventional accounts of those episodes relate them to the large increases in the price of oil triggered by the Yom Kippur war in 1973, and the Iranian revolution in 1979 (Blanchard and Gali 2009).

In particular, as it can be seen from Figure 1 until the mid-1970s, the oil price was relatively stable around \$3.00 per barrel. From the early 1970s to the early 1980s, the price of oil rose dramatically due to disruptions in the supply of oil from the Middle East countries. In addition, the transition from a regime of administered oil prices to a market-based system of direct trading and the collapse of the Organization of the Petroleum Exporting Countries cartel (OPEC) in late 1985 were accompanied by a large rise in oil price volatility (Baumeister and Peersman 2013, Brini et al. 2016).

An increase in oil price may have an impact on output and prices through various channels. Brown and Yucel (2002) distinguish four channels: a classic supply-side effect; income transfers from the oil-importing nations; a real balance effect and a monetary policy effect. Oil is a basic input in production. Hence, an increase in the oil price leads to a rise in production costs. This may induce firms to buy less energy (oil) and lower their volume of production. Particularly, due to market imperfections and/or imperfect factors substitution firms may find it difficult to reallocate factors of production in the short-run to keep the same volume of production. Second, higher oil price leads to an income transfer from oil-importing to oil-exporting countries. Accordingly, an increase in the oil price is expected to reduce disposable income in oil-importing countries, as economic agents have less money to spend after paying their energy bills, and consequently negatively affect aggregate demand. Third, oil price induced inflation reduces real money balances that may lead to increase in money demand. If the central bank does not react to meet this growing money demand, interest rate will rise causing economic downturn. Finally, exogenous positive oil price shock puts pressure on the price level. In order to control inflation, a central bank responds by rising the interest rate. This monetary contraction leads to a reduction in investment and consumption, and hence to a decline in output.





Source: IMF International Financial Statistics

On the empirical side, the literature boom was initiated by Hamilton's (1983) study that detected the significantly negative relationship between oil prices and US gross domestical product (GDP) since the WWII. The significant effect of oil prices on output and inflation is supported by a number of empirical studies (see, for example, Burbridge and Harrison 1984; Gisser and Goodwin 1986; Mork 1989; Jimenez-Rodriguez and Sanchez 2005; and Cunado and de Gracia 2005). However, from the 1980s the way oil shocks affect economy appears to have changed. Most recent studies find that since 1980's the effect of oil prices on output and inflation began to lose significance (see, for example, Hooker 2002; Kilian 2008; Blanchard and Gali 2009; Chen 2009; Herrera and Pesavento 2009; Baumeister and Peersman 2013).

The literature proposed various explanations for the declining effect of oil price shocks. Blanchard and Gali (2009) focus on the declining real wage rigidities, declining share of oil expenditures in GDP and the improvements in monetary policy. Kilian (2008; 2009) suggests the change in the origins of the oil price shocks as an additional explanation; while Maravalle's (2012) study emphasizes the possible importance of the change in the sectoral composition of production.

The empirical studies concentrate mainly on developed countries. We instead focus on the group of Central and Eastern European economies. Particularly, we focus on the sensitivity of Croatia, Czech Republic, Estonia, Hungary, Lithuania, Poland and Slovenia to the increase in oil price. They are all post-transition economies, small open economies and oil-importing economies, and as such, they are expected to be affected by oil price shocks. To get an insight into the importance of energy as well as oil dependency of these Central and Eastern European economies Table 1 gives average data during the period 1990-2010.

Country	Gross inland consumption of energy (million tonnes of oil equivalent)	Energy imports (% of energy use)					
Czech Republic	44.9	24.11					
Estonia	6.4	29.66					
Croatia	9.0	50.65					
Hungary	26.9	54.73					
Lithuania	9.4	52.75					
Poland	96.7	11.78					
Slovenia	6.6	51.98					

Table 1 Oil and energy dependency

Source: Eurostat

As can be seen from Table 1, Czech Republic, Hungary and Poland have the highest oil dependence. On the other hand, Czech Republic, Estonia and Poland have low energy import dependence. This is due to domestic solid fuel and nuclear energy productions in Czech Republic and hard coal production in Poland (Bayat et al., 2015). Estonia uses primarily solid fuels and renewable energy as the second most important source of energy. Croatia, Hungary, Lithuania and Slovenia, on the other hand, are more energy dependant, with more than 50% imports (which is higher than the EU average). However, for Estonia, Croatia, Lithuania and Slovenia oil import dependency is low.

Figure 2 shows oil consumption in these economies from the 1980s onward.





Total Petroleum Consumption - Million Metric Tons of Oil Equivalent

Note: the data for Estonia was unavailable Source: International energy agency and Knoema

As can be seen from Figure 2, except for Poland and Czech Republic, no country has reached the level of oil consumption that it had in 1990s. In Poland oil consumption was rising steadily since 1990 (it practically doubled until 2010), with a visible decline in the last couple of years. In other countries oil consumption was relatively constant.

#### 3. ESTIMATION METHODOLOGY AND DATA SAMPLE

We use a structural vector autoregressive model (SVAR) model to empirically investigate the effects of oil price shocks on output and prices. The use of SVAR model instead of a relatively simple reduced form VAR based on Choleski decomposition has become a standard in empirical macroeconomic studies (Elbourne and de Haan, 2009). In order to provide a good representation of the economy and account for the oil price shocks we set up a macroeconomic model with the following variables included: GDP (Y), consumer price index (CPI), money (M), domestic interest rate (IR), exchange rate (ER), world price of oil (OIL) and the foreign interest rate (FIR). This sort of a model was applied in Ćorić et al. (2015; 2016) in attempting to identify the monetary policy shocks and their impact on prices and output. Since we are interested in the effects of oil price shocks on output and prices, the

model of the same structure can be used. Thus, following Ćorić et al. (2015; 2016), we use the *p*-th order SVAR model as follows:

$$Ay_t = \Gamma_1 y_{t-1} + \Gamma_2 y_{t-2} + \dots + \Gamma_p y_{t-p} + B\varepsilon_t$$
(1)

where  $y_t$  is a  $(m^*1)$  vector of *m* endogenous variables; *A* represents a  $(m^*m)$  matrix of instantaneous relations between the left-hand-side variables; *I*<sub>js</sub> are structural form parameter  $(m^*m)$  matrices;  $\varepsilon_t$  is a  $(m^*1)$  structural form error that is a zero mean white noise process, and *B* is a  $(m^*m)$  matrix of contemporaneous relationships among the structural disturbances  $\varepsilon_t$ . A reduced form of our *p*-th order SVAR model, then, is:

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \dots + A_p y_{t-p} + e_t$$
(2)

where  $y_t$  is a  $(m^*l)$  vector of m endogenous variables, A represents a  $(m^*m)$  matrix of reduced-form parameters and  $e_t$  is the reduced-form disturbance term. In order to recover the structural shocks from the reduced form parameters the system is restricted through a number of restrictions. Note that considered countries are net-oil-importers and small economies. Due to their economic size and the limited oil production capacities they cannot affect substantially the demand and supply of oil at the world level, but rather they act as price takers on the global oil market. Hence, the price of oil is treated as exogenous in these countries, i.e. not reacting to contemporaneous changes in the variables included in the model, while the system (all the variables) is allowed to react contemporaneously to a shock in the price of oil. Output and foreign interest rate are assumed to be affected only by the price of oil. Prices are, additionally, influenced by the current value of output. Money is assumed to contemporaneously react only to changes in real income (nominal income and prices) and the nominal interest rate, whereas other variables have no impact on it (within a quarter). The interest rate is affected by current values of money, exchange rate, world price of oil and foreign interest rate. As for the exchange rate, we follow the logic of Elbourne and Haan (2006) and Kim and Roubini (2000) who note that, since the exchange rate is a forwardlooking asset price, all variables should have contemporaneous effects on it.

The above explained identification scheme is presented in the matrix form below:

г 1	0	0	0	0	$a_{16}$	ך 0	г e <sub>Y</sub> ј	[b <sub>11</sub>	0	0	0	0	0	ך 0		
a <sub>21</sub>	1	0	0	0	$a_{26}$	0	e <sub>CPI</sub>	0	$b_{22}$	0	0	0	0	0	$\varepsilon_{CPI}$	
<i>a</i> <sub>31</sub>	$a_{32}$	1	$a_{34}$	0	0	0	$e_M$	0	0	$b_{33}$	0	0	0	0	ε <sub>M</sub>	
0	0	$a_{43}$	1	$a_{45}$	$a_{46}$	a <sub>47</sub>	$ e_{IR}  =$	0	0	0	$b_{44}$	0	0	0	$\mathcal{E}_{IR}$	(3)
$a_{51}$	$a_{52}$	$a_{53}$	$a_{54}$	1	$a_{56}$	a <sub>57</sub>	$e_{ER}$	0	0	0	0	$b_{55}$	0	0	$\mathcal{E}_{ER}$	
0	0	0	0	0	1	0	e <sub>OIL</sub>	0	0	0	0	0	$b_{66}$	0	ε <sub>OIL</sub>	
L 0	0	0	0	0	$a_{76}$	1 ]	Le <sub>FFR</sub> J	Lo	0	0	0	0	0	b <sub>77</sub>	$L\varepsilon_{FFR}$	I

where  $e_{Y}$ ,  $e_{CPI}$ ,  $e_{M}$ ,  $e_{IR}$ ,  $e_{ER}$ ,  $e_{OIL}$  and  $e_{FFR}$  represent output shock, price level shock, money demand shock, domestic interest rate shock, exchange rate shock, oil price shock and foreign interest rate (federal funds rate) shock, respectively.

We use this model to obtain the structural form parameters that enable us to impose a shock in the price of oil and then estimate the reaction of the system variables through the impulse response functions. We are primarily interested in the reaction of output and prices. As for the data, we use quarterly observations from the IMF International Financial Statistics (IFS) database between the two largest economic events in recent history of these countries, the end of communism and the recent world economic crisis. This time horizon is used to avoid likely breaks in economic structures and relations associated with these two large economic changes.<sup>2</sup> The periods used for the countries in our sample are as follows: Croatia (94Q2-09Q2), Czech Republic (94Q1-09Q4), Estonia (93Q4-09Q3), Hungary (95Q1-09Q4), Lithuania (96Q4-09Q4), Poland (96Q4-09Q4) and Slovenia (94Q1-06Q4). Table 2 below reports in detail the variables used for our empirical investigation.

Variable	Indicator	Source
Y	Index of GDP volume (based in 2005)	IFS
СРІ	Consumer price index (based in 2005)	IFS
М	Monetary aggregate M1	IFS
IR	Money market rate	IFS
ER	Nominal effective exchange rate index (based in 2005)	IFS
OIL	Petroleum prices in US dollars per barrel	IFS
FIR	US federal funds rate or German money market interest rate	IFS

Table 2. Definition of variables and the source of data

All the variables, apart from interest rates, are transformed into logarithms. Following Kim and Roubini (2000), Mihov (2001) and Elbourne and Haan (2006) we use the data in levels. We use 4 lags for each variable. This number is determined by the autocorrelation Lagrange multiplier (LM) test. In cases where the LM statistics suggests that the null of no correlation can be rejected at 4 lags, we increase the number of lags to 8 in order to solve the problem.

## 4. RESULTS

This section reports the main findings of our empirical investigation. We estimate the structural VAR model for each country separately (this is usually not reported for spatial reasons, but the estimated models are available upon request) and then impose a shock in the price of oil (as represented by one standard deviation increase in the price of oil, amounting to 21 USD) to investigate the reaction of output and prices for each country in our sample. This reaction is estimated through computation of impulse response functions which we report below in Figure 3. We report the impulse responses for all countries in a single figure to allow easier tracking of the findings and comparison between countries. The impulse responses are reported across a horizon of 8 quarters. The first column of the figure (column a in Figure 3)

<sup>&</sup>lt;sup>2</sup> Note also that the quarterly data for these countries are not available before 1990s. Poland managed to avoid most of the negative consequences of the recent world crisis. Yet, we still employ the same time episode for Poland as for the other countries to preserve consistency and comparability of the results.

refers to the reaction of output to an oil shock, while the second column (column b in Figure 3) reports the response of prices.







As for **Croatia**, Figure 3 indicates that output is positively affected in the first 3 quarters and negatively in the remaining 5. Note, however, that none of the estimated effects is statistically significant. At the same time, prices seem to respond with an increase to a shock in the price of oil, and this effect appears to be statistically significant in the first 2 quarters. In the later stages of our 8 quarters horizon the impact turns negative and loses statistical significance. Thus, for Croatia we can conclude that an increase in the oil price has positive and relatively short lived impact on prices.

For the **Czech Republic** we find that the impact on output is first positive (in the first 3 quarters) and then turns negative. Note, however, that this impact is statistically significant only in quarter 6. As for prices, the reaction appears to be positive, but without statistical significance. Thus, it can be concluded for the Czech Republic that increases in the price of oil do not have much relevance.

In the case of **Estonia** our results indicate that output first responds positively (being statistically significant just in one quarter - quarter 2) and then turns negative (without being significant). As for the prices, the estimated impact is positive, but it is not statistically

significant. Therefore, similarly as in the case of Czech Republic, we can conclude that oil price shocks are of not much relevance.

For **Hungary** the reported results suggest that output responds first positively (being only marginally statistically significant in quarter 4) and then turns negative but without statistical significance. The prices, on the other hand, appear to respond positively throughout the whole horizon of 8 quarters with the impact across the first 3 quarters being statistically significant. Thus, we can conclude that oil price increases are important for Hungary and lead to higher prices.

As for **Lithuania** the estimated impulse response function indicates that output responds positively throughout (and being statistically significant in quarters 2 and 3). At the same time prices also respond positively but the effect is only statistically significant in quarter 4. Thus, it seems that oil price increases should be treated as relevant in case of Lithuania, leading to increases in both output and prices, but statistical significance vanishes after a while.

In the case of **Poland** both output and prices appear to increase after a positive shock in the price of oil, and these increases are statistically significant across the first two quarters in both cases (output and prices). These results suggest that oil price increases are relevant for Poland, but the effects are short-lived.

For **Slovenia** the estimated impulse response functions suggest that output responds negatively to an oil price increase (but the effect is not statistically significant), whilst prices respond positively with the effects being statistically significant in the first 3 quarters. Thus, we can conclude for Slovenia that oil price increases are not relevant for output, but prices do increase for much of the first year.

To summarize our empirical findings, it appears that oil price increases suggest much more consistency in their impact on prices. The positive effect of prices is often found to be statistically significant in the first 1-3 quarters. However, in no case the effect is found to be statistically significant throughout the whole period of 8 quarters. On the other hand, no such consistency is found in the case of output. Across countries in our sample the effect of oil price increases appears to be both positive and negative and with much less significance as compared to prices.

If we compare the data presented in Table 1 with the results of our empirical investigation, we can observe that for those countries that were detected as low energy dependent (Czech Republic, Estonia and Poland) increases in the price of oil indeed do not have much relevance (or, in the case of Poland, it is short-lived). On the other hand, oil shocks in countries with higher energy dependence (Croatia, Hungary, Lithuania and Slovenia) exhibit a significant positive impact on prices.

On the whole, our results are consistent with the recent empirical findings for developed countries. In particular, as noted above, a number of studies find that since 1980's the impact of oil prices on output and inflation lost significance in developed countries (Hooker 2002;

Kilian 2008; Blanchard and Gali 2009; Chen 2009; Herrera and Pesavento 2009; Baumeister and Peersman 2013). In addition to being almost always statistically insignificant, the pattern of our results regarding output might be informative with respect to the possible explanation of the weak effects of oil price shocks. Particularly, in most considered countries output first reacts positively to the increase in the oil price and then turns negative after a few quarters. Such output response is in line with the recent explanation developed in Kilian (2008, 2009) and Kilian and Murphy (2012). They argue that the reason for the declining effects of oil price shocks since 1980s is a change in the origins of the oil price shocks. The oil price shocks have been caused not just by the disruptions in oil supply, but by the changes in global aggregate demand (economic activity) that drives the changes in demand for oil as well. The effects of the oil price increases; driven by the rise in global aggregate demand, result in an increase in output during the first few quarters. This positive effect then compensates for the negative effects of the oil price increase. Following this line of reasoning, an attempt to disentangle between the macroeconomic effects of the oil supply and the oil demand shocks in Central and Eastern European countries might be a useful new line of empirical research. In addition, other possible limitations of this paper relate to the relatively short time period used, as well as the fact that the paper does not consider possible effects of changes in gas/petrol taxes on national levels.

## 5. CONCLUSION

This paper extends the empirical literature on macroeconomic effects of the oil price shocks by focusing on 7 Central and Eastern European economies.

We use available quarterly data since the end of communism in the early 1990s until the spillover of the recent world economic crises in the Central and Eastern Europe in 2009 to estimate the structural VAR model for Croatia, Czech Republic, Estonia, Hungary, Lithuania, Poland and Slovenia. The estimated models are used to compute impulse-response function of output and impulse-response function of price to a one-standard-deviation oil price innovation, separately for each country.

The effect of an oil price shock on output and prices is found to be relatively weak. In particular, the impulse-response functions of prices point to the short lived positive effect of oil price increases in Croatia, Hungary, Poland and Slovenia. After the initial increase in prices that lasts from 1 to 3 quarters the effect fades away. In Czech Republic, Estonia and Lithuania the effects appear to be statistically insignificant throughout the whole horizon of 8 quarters. With respect to output, the effect of oil price increases appears to be both positive and negative, but only sporadically significant.

These results are consistent with the recent literature which suggests that the effect of oil price shocks fades away after the 1980's. Accordingly, our results extend the findings of previous literature suggesting that the weaker effect of oil price shocks on macroeconomic variables is not related just to developed countries, but can be seen as a much broader phenomenon.

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# HEALTH TOURISM IN CROATIA – QUESTIONING THE EFFICIENCY OF SPECIAL HOSPITALS AND NATURAL SPAS

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# ABSTRACT

Health tourism has recently been marked as the type of increasing tourism demand. The development of tourism supply in health care raises the tourism attractiveness and consequently tourism arrivals in a destination. Hence, the main aim of this paper is to estimate the efficiency level in Croatian health institutions and to highlight the possibilities for improving the efficiency. The purpose of the paper is to provide insights into the potentials of health tourism in Croatia. The paper brings novelty in: original critical analysis of potential inputs and outputs, decomposition of overall technical efficiency into components and setting targets of potential outputs' addition and inputs' savings in inefficient health institutions.

The data envelopment analysis (DEA) is used to analyse the relative efficiency of special hospitals and natural spas in Croatia. To satisfy the homogeneity of the sample the analysis is performed on a single specialization group in health care i.e. in physical medicine and rehabilitation. According to the results, the average efficiency in the analysed health institution has achieved 71 percent in 2015. In the sample of twelve overall technically inefficient institutions, 33 percent are inefficient due to the scale-size, while others are inefficient as a result of inefficient production operation.

# 1. INTRODUCTION

The participation in tourism has grown over last 60 years whirling tourism into one of the world's most powerful socio-economic forces. Consequently, tourism economic contribution has become increasingly significant for growth globally and in developing countries especially. Parallel with participation in tourism the planning of tourism development becomes practice and process. This process integrates the variety of the actors representing the public, private and not-for-profit sectors. They all try to improve their performance in tourism supply. Finally, one of the major factors that influence quality of tourism supply and the attractiveness of the destination is the level of development and availability of different infrastructure.

Infrastructure can be seen as "... the blood stream which serves the economy as a whole, allowing its functioning and development" (Pašalić 2003, pp. 433). The financing of infrastructure should be treated as an integral part of the financing of economic development. The current increasing infrastructure needs put pressure on budgeting and financing of the infrastructure in future. The role of the government is important in planning infrastructure investments. Those types of investments require all available information on the availability and total effects of the present infrastructure as to ensure the optimal allocation of total available investment funds. This is even more important nowadays since traditional sources i.e. public funding alone is not sufficient anymore. Additionally, according to OECD (2010) evaluation methods for stronger evidence-based policy making should be used more widely.

Bridging the infrastructure investment gap demands innovative approaches in assembling funds and more efficient and effective use of infrastructure. The infrastructure management needs the support of improved basic tools as well as new technologies, demand management strategies and improved planning for infrastructure use. This means that information, data collection, research and analysis need strengthening. Is the present economic policy suitable to keep up with and respond to multiple challenges facing the infrastructure? Such pressure on economic policy arises from specific infrastructure demands i.e. unique solutions that are required for different infrastructure areas. The investments in different infrastructure, i.e. transport, tourism, information and digital sector, education, health care, etc. are widely seen as an effective means of achieving development and growth. Countries/destinations which seek new development paths, with and for tourism, should analyse the tourism infrastructure performance and tourism supply diversification. Hence, the successful development of health tourism in Croatia should be based on the analysis of the performance of health care institutions. This paper is first attempt in doing so.

The purpose of this paper is in analysing the performance of health care sector and, in addition, revealing innovative investment funds' sources. It is expected that health institutions have the potential to achieve higher output with existing inputs and thus become more open to the market. Furthermore, it is expected that health institutions can improve overall technical efficiency by increasing their size i.e. by investing in their infrastructure. This paper analyses one part of the health care system i.e. natural spas and special hospitals. In this specific health infrastructure sector, health tourism can be seen as one of the possible solution to deal with the mentioned infrastructure investment challenges.

Because of all the above mentioned, the aim of this paper is to estimate relative technical efficiency of the selected special hospitals and natural spas in Croatia in 2015. As it is expected that some of the health institutions are inefficient and that the reasons for the

inefficiency can vary, another goal is to set up a benchmark for inefficiency and highlight the possibilities for efficiency improvement.

The paper proceeds as follows. Next section describes multiple challenges facing infrastructure development and the health system as its sub-sector. Furthermore, it discusses possible answer to these challenges and the role of evaluation methods for stronger evidence-based policy making. The third section presents literature review of measuring efficiency in health systems, while the fourth section provides a detailed description of data envelopment analysis (DEA). Empirical model and results are presented in the sections five and six. The conclusions appear in the last section.

# 2. CAN THE HEALTH TOURISM FILL THE GAP IN THE HEALTH INFRASTRUCTURE INVESTMENT?

# 2.1. Challenges facing infrastructure

Infrastructure can be defined as facilities which are necessary for the functioning of the economy and society, i.e. it's not an end in them. It includes economic infrastructure (for example water and electricity infrastructure) and social infrastructure (for example health and cultural infrastructure). Furthermore, hard infrastructure primary involves provision of buildings and other material components of infrastructure, while soft infrastructure includes provision of services (Yescombe 2010).

Future performance of modern economies will depend on the availability of adequate infrastructures to support sustainable growth and social development. Infrastructure investment will be challenged by a range of fundamental long-term trends. The most important trends include (OECD 2007): ageing population, urbanization, increasing constraints on public finances, climate change, rising quality standards, technological progress especially in information and communication technology, decentralization, the expanding role of the private sector and the growing importance of maintaining the existing infrastructure.

Among other things in the coming years, policy makers will need to improve efficiency in the construction and operation of infrastructures but also in the use of infrastructures through better management of demand (OECD 2007).

#### 2.2. Role of health tourism in developing health infrastructure

The potential of health tourism is being widely recognized and often subject to academic and professional discussion among those interested in health tourism investments. Furthermore, health tourism is one of the fastest growing areas of academic research interest in both tourism and health studies (Hall 2011).

Many terms are used to describe the relationship between health and tourism in the framework of special tourism products such as health tourism, medical tourism, wellness tourism etc. Health tourism is a complex tourist product which includes a large number of specialized content and services on journeys motivated by the need to improve health and improving quality of life. The healing tourism (takes place in natural spas and specialized rehabilitation hospitals) means the professional and controlled use of natural healing factors and physical therapy procedures for maintaining and improving health and improving the

quality of life. On the contrary medical tourism is usually curative in focus, while wellness tourism refers to proactive disease prevention as a way of life

Health tourism is growing at a rate between 15% and 20% per year and has the potential to become one of the main travel motives in the future (Tourism Development Strategy of the Republic of Croatia until 2020, 2013). Croatia has a significant comparative advantage for the development of health tourism. This includes: skilled staff and generally good reputation of health services, competitive prices, proximity to major source markets, natural beauty and pleasant climate, high security of the country and a long tradition in tourism. Because of that it is possible to say that this is a product with high growth potential in Croatia.

At the present time Croatia does not utilize the potential for health tourism development based on the natural healing remedies. Tourism development almost completely bypasses the areas with healing mountain climate. Croatian natural spas are far from the optimal health tourism products. Most of them are turned into special hospitals under the state sponsored medical insurance scheme. Those attempting to modernize their tourism product mostly evolve into water-fun parks. (Kušen 2011) According to the Tourism Development Strategy of the Republic of Croatia until 2020 (NN 55/2013) healing tourism is regarded as the holder of health tourism. For further development the ownership transformation is necessary in order to attract new development of capital. Successful market economy assumes content profiling and specialization of natural spas and special hospitals. This will reduce their dependence on contracts with the Croatian Health Insurance Fund (HZZO) with the aim of attracting highpaying tourist demand. In order to become competitive, natural spas and special hospitals have to upgrade their infrastructure. They should provide cost-effective medical services of international standards at an affordable price. Therefore, they need to develop optimizationbased approaches to assess the efficiency of the institutions.

#### 2.3. Measuring efficiency – a precondition for further restructuring

The history of microeconomic efficiency, as quoted by Moshiri et al. (2010), began in 1950 when Koopmans first defined technical efficiency. In 1957 Farrell explored how to measure efficiency, stressing the importance of research into boosting output factors, without changing the amount of input factors. Since then, methodology for measuring efficiency has constantly being improved (Mandl et al. 2008). Nevertheless, a high-quality application in the public sector has still remained a conceptual challenge. In fact, public spending has multiple goals, public products and / or services are often not available on the market, therefore, their market value is not known, and the products / services are not measurable. Hollingsworth et al. (1999) in their work reported that it is especially difficult to measure efficiency and effectiveness in the public sector, due to the uncertainties caused by the lack of information on prices and the cost of providing public services. In such circumstances providers of public services are not required to provide maximum efficiency.

Efficiency is defined as the ratio used for production factors, i.e. the input factors and produced output factors. Some activity is considered efficient if it for a given level of input factors produces a greater amount of output factors or if it for a certain amount of output factors uses less input factors (Mandl et al. 2008).

According to the McPake and Normand (2008), as a result of new trends related to the development of health systems, more and more countries have begun to use the economic analysis of the health system. The first works in the field of health economics came from the countries of northern Europe, Australia, New Zealand, USA and Canada. Knowledge of the

tools of economic analysis forms is the basis for identifying, measuring, understanding and solving problems. The authors point out that all countries, regardless of their tradition in terms of the functioning of health systems, are currently interested in using the tools of economic analysis for better planning and coordination of all public stakeholders and, at the same time, a better understanding of government interventions aimed at improving outcomes in health care system.

Analysing EU countries Mandl et al. (2008) argued that improving the efficiency of health systems has become one of the main political goals. This occurs due to the growing pressure towards a balanced general state budget resulting from changes in demographic trends and globalization. The importance of improving the efficiency and effectiveness of public spending is a necessary precondition for maintaining fiscal discipline as required by the Pact on Stability and Growth. Furthermore, this is an instrument for the promotion of structural reforms under the Lisbon agenda.

Worthington (2004) stated that the dramatic growth of health care costs in developed countries in recent decades is the main reason for the increase in the literature with the empirical measurement of efficiency in health care facilities. He believes that the increase in cost, at least partially, is a result of inefficiency in health care institutions. Furthermore, he points out that the common features of these studies focus on the rising costs, the impact of these costs on public spending and private industry and the impact of growing competition in the health care market.

Moshiri et al. (2010) point out that measuring the efficiency is usually the first step in the analysis of the work of individual units such as hospitals. They state that the view that health institutions do not need to be efficient has changed. The aforementioned happened due to the increase in the cost of treatment and the growing standards of quality. The problem of rising costs of health care has become one of the biggest political problems in both developed and developing countries.

In comparison to the efficiency, effectiveness is difficult to assess, because the outcome is often under political influence, the boundary between the output factor and outcomes is not clear, and these terms often replace one another. Therefore, Mandl et al. (2008) report that the efficiency and effectiveness are not easy to isolate. The authors also point out that politicians often want the results of their political program to be presented in terms of output factors. The outcomes are the result of long-term effects of various public programs and it is difficult to connect them with a single or a set of specific measures.

# 3. EFFICIENCY EVALUATION IN HEALTH CARE

Over the decades, large number of scientists applied a different methodology to measure the efficiency and effectiveness in health care. Over the last two decades, measuring the efficiency has become is one of the most intensively studied areas in the field of health economics (Moshiri et al. 2010). Mandl et al. (2008) reported that diverse approaches to measure the efficiency existed as the consequence of different data use and methodological framework for analysis.

Worthington (2004) stressed the worldwide growing interest in health systems as the subject of analysis aimed at defining, measuring and improving organizational efficiency. He stated that the application of advanced statistical and mathematical approaches to determine the efficiency frontier in the case of hospitals has just recently started. Statistical approach is based on econometric models and has the characteristics of stochasticity (randomness). Conversely, the mathematical approach which is by its nature deterministic is based on the models known as linear programming. He said that the two approaches differ in the way of determining the efficiency frontier and interpretation of the observed deviation units from the border, as explained in greater detail below.

The econometric approach aims to determine the absolute efficiency in relation to the set benchmark. The deviations are result of random error and inefficiency. The assumption is that inefficiency has asymmetric distribution and the random error is normally distributed. It is a developed deterministic frontier approach, DFA and stochastic frontier approach, SFA. First approach interprets all deviations from the border as a result of inefficiency and its major drawbacks are the fact that it is difficult to incorporate more output factors in the analysis and that it requires a large sample. Stochastic frontier approach in assessing the efficiency of the organization takes into account the existence of external factors and thus solves the biggest drawback of the deterministic approach. However, an assumption of normal distribution still remains a problem. According to Worthington (2004) and Moshiriu et al. (2010), the econometric approach, for testing the technical and alocative efficiency in health care systems, among others, was used by Wagstaff 1989, Holfer and Folland 1991, Hofler and Rungeling 1994, Zuckerman et al. 1994, Defelice and Bradford 1997, Chirikos 1998, Linna 1998, Gerdtham et al. 1999, Street and Jacobs 2002.

The objective of mathematical programming is to determine the relative efficiency of the observed unit in relation to other units within the same network, as opposed to an idealized comparison with standards. The most commonly used tool for linear programming is Data Envelopment Analysis (DEA). DEA is methodology which connects operational research, mathematics and economy. It uses linear fractional programming on empirical data on the common input and output factors observed units, i.e. Decision Making Unit (DMU) in order to determine their relative efficiency. In doing so, any deviation from the border is treated as inefficient. (Gardijan and Kojić 2012)

DEA is important in the analysis of health care systems where the process of providing services associated large number of input and output factors and where it is difficult to get information on prices. Its advantage in relation to econometric models is that it does not require specific functions of production or providing services. Non-parametric bases, freedom to define multiple inputs and outputs of different units and formulation production based on inputs and outputs are the reasons for the domination of DEA in measuring the efficiency of health systems. The problem of inaccessibility, or the problem of measurement data needed for an econometric approach, are other reasons for frequent application of DEA in empirical research. DEA are testing the efficiency of the health systems, among others, used by Mangnussen 1996, Staat 2006, Dash et al. 2010, Rabar 2010, De Nicola 2011, Mogha et al. 2012, 2015 and Slijepčević 2014.

Their application finds the above described methodology for measuring the efficiency in a large number of health facilities, such as hospitals, doctors' offices, institutions for the care of elderly and disabled, and other healthcare organizations. Among the medical institutions in empirical research, the most common are hospitals. Among scientists there is no consensus on which is the most appropriate methodology for measuring and monitoring the effectiveness. According to Moshiri et al. (2010) DEA can remove flaws of the regression analysis providing more complete measurement of hospital efficiency The DEA has become the dominant approach for measuring efficiency in health system all over the world, but also in many other sectors of the economy (Mogha et al. 2012).

Despite an extensive and sprawling literature on the health efficiency for developed economies, there have been few studies aiming to analyze the efficiency of the Croatian health institutions using non-parametric frontier approaches (Rabar 2010, Slijepčević 2014).

The contribution of this study to the existing literature on the health efficiency in Croatia stems from several areas: ensuring homogeneity of sample, critical analysis of potential inputs and outputs which resulted in a different final selected inputs and output, decomposition of overall technical efficiency into its components, i.e. pure technical and scale efficiency and targets setting of potential outputs' addition and inputs' savings in inefficient health institutions. Also, this study analysis the efficiency of health institutions within the context of increasing tourism demand and thus their potential role in it, and at the same time the potential contribution of tourism investments aimed at increasing their efficiency.

#### 4. EFFICIENCY ANALYSIS WITH DATA ENVELOPMENT ANALYSIS

The DEA methodology uses mathematical programming to process empirical data on multiple inputs and outputs of a given group of DMUs. As a result, each DMU is assigned a value within interval (0,1]. Value 1 represents relatively efficient DMU, while the DMU with value less than 1 is deemed inefficient. In this way, the efficiency of each DMU is evaluated with respect to other DMUs. The subgroup of relatively efficient DMUs serves as a basis for the determination of the efficiency frontier, and for the establishment of goals for the inefficient DMUs. Basic models within the DEA, named after their founders, are Charnes – Cooper – Rhodes (CCR) model (1978), and Banker – Charnes – Cooper (BCC) model (1984). The CCR model assumes constant returns to the scale (CRS), while the BCC assumes variable returns to the scale (VRS). Both models can be either input or output oriented regarding whether the inefficient units aim to maximize their outputs or minimize their inputs (Gardijan and Kojić 2012).

According to Cooper et al. (2007)in Gardijan and Kojić 2012)  $n DMU_s: DMU_1, DMU_2, \dots, DMU_n$  use m inputs and converts them to s outputs. Input data for  $DMU_i$  is  $(x_{1i}, x_{2i}, \dots, x_{mi})$  and output data is  $(y_{1i}, y_{2i}, \dots, y_{si})$ . For each  $DMU_o$   $o \in$  $\{1, 2, ..., n\}$ , a virtual input is formed by weights  $(v_i)$  and virtual output is formed by weights  $(u_r)$ :  $v_1x_{10} + v_2x_{20} + \dots + v_mx_{m0}$  and  $u_1y_{10} + u_2u_{20} + \dots + u_sy_{s0}$ , respectively. The weight need to be determined using linear programming so as to maximize the ratio  $\frac{virtual output}{virtual input}$ 

Next fractional programming problem for DMUo needs to be solved:

(FP<sub>0</sub>)  

$$\max_{v_1, \dots, v_m, u_1, \dots, u_s} \theta = \frac{u_1 y_{10} + u_2 u_{20} + \dots + u_s y_{s0}}{v_1 x_{10} + v_2 x_{20} + \dots + v_m x_{m0}},$$
(1)  

$$s.t. \quad \frac{u_1 y_{1j} + u_2 u_{2j} + \dots + u_s y_{sj}}{v_1 x_{1j} + v_2 x_{2j} + \dots + v_m x_{mj}} \le 1, (j = 1, 2, \dots, n)$$

$$v_1, v_2, \dots, v_m \ge 0$$

$$u_1, u_2, \dots, u_s \ge 0$$

Fractional problem (1) is equivalent to the linear problem:

(*LP*<sub>0</sub>) 
$$\max_{\mu_1, \dots, \mu_m, \nu_1, \dots, \nu_s} \theta = \mu_1 \nu_{10} + \mu_2 \nu_{20} + \dots + \mu_s y_{so},$$

s.t. 
$$v_1 x_{1o} + v_2 x_{2o} + \dots + v_m x_{mo} = 1$$
 (2)

 $\mu_1 y_{1j} + \mu_2 y_{2j} + \dots + \mu_s y_{sj} \le v_1 x_{1j} + v_2 x_{2j} + \dots + v_m x_{mj}, (j = 1, 2, \dots, n)$  $v_1, v_2, \dots, v_m \ge 0$  $u_1, u_2, \dots, u_s \ge 0$ 

Optimal solution of this linear problem is  $(\theta^*, v^*, u^*)$ .  $DMU_0$  is efficient if  $\theta^* = 1$  and there exists at least one optimal  $(v^*, u^*)$ , with  $v^* > 0$  and  $u^* > 0$ . Otherwise the DMU is called inefficient.

Models (1) and (2) assume constant returns to scale. However, in efficiency analysis, variable returns to scale can also be considered (BCC model). In that case, models need to be rewritten to include a condition of convexity (Rabar and Blažević 2011). For input-oriented BCC model it is  $\sum_{j=1}^{n} \lambda_j = 1$  and for output-oriented model it is  $\sum_{j=1}^{n} \lambda \mu_j = 1$ . Under the constant return to scale assumption (CCR model), the input-oriented efficiency scores are the reciprocal of the output-oriented efficiency scores.

#### 5. DATA DESCRIPTION AND MODEL SPECIFICATION

#### 5.1. Data, input and output variables for computing efficiency scores

The DEA was used to analyse the relative technical efficiency of special hospitals and natural spas in Croatia. To satisfy the homogeneity of the sample of health care services, the analysis is performed on a single specialization group in health care, which is physical medicine and rehabilitation.

The quality or accuracy of the results of measuring the efficiency increases with higher homogeneity of the observed health services (Hollingsworth et al. 1999, Staat 2006). Highlighting the importance of observation homogeneous units, Hollingsworth et al. (1999) in their paper argue that better results can be achieved using disaggregated database or concentrating on a small segment of the health system. According to them, when concentrating on a small segment it is possible to use a smaller number of inputs and outputs, the model can be better defined, which results in more accurate results.

Special hospitals and natural spas have been identified on the basis of data which are collected from the Croatian Health Service Yearbook 2015 (HZJZ 2016). Among other things, the data set consists of the most important indicators concerning the work of health services within the system (organization and human resource structure, operation and utilization of health care facilities). All data are collected from health facilities and practices in Croatia, regardless of their ownership and contracts with HZZO. In 2015 there were 10 special hospitals and three natural spas specialized in physical medicine and rehabilitation. All of them are included in the analysis. The confirmation for the formation of such data was found in the annual report "Benchmarking of natural spas and special hospital 2015" (Faculty of Tourism and Hospitality Management Opatija 2016). Namely, authors of the abovementioned report argue that they are comparable institutions oriented at health tourism.

Technical efficiency shows the use of input factors for the provision of services, in which it implies the maximum possible amount of output factors achieved on the basis of available input factors. Input and output factors are defined in non-monetary terms. According to Worthington (2004) difficulties in defining the cost of input factors in the public sector are the reason for the domination of the measurement of the technical efficiency within the healthcare system. At the same time, measuring the technical efficiency leads to better comparability to international studies. Unlike the private sector, where data are available on a very detailed level, the assessment of the actual costs in the public sector is complex and difficult, especially on lower levels.

According to Worthington (2004), Banker et al. (1986) in their paper made a precedent in the specification of input and output factors of the health system. The inputs factors for the first time are defined in terms of care, additional, administrative and general services, while the output factors are defined for a given hospital treatment. According to the author, most further study analyses health care as the combination of work (expressed through a number of personnel) and capital (often displayed through the number of beds) in order to achieve easily measurable output such as the number of patients, length of treatment, etc.

In the previous studies, there was a heated debate over input factors that present material capital. The measurement problem is most often stressed just for the capital as an input factor. In previous empirical analyses of technical efficiency, equity is usually defined by the number of hospital beds (Staat 2006, Dash et al. 2010, Moshiri et al. 2010, De Nicola et al. 2011).

According to Worthington (2004) due to the problems associated with the measurement of the material capital, a part of the authors decide to show input factors only through the human capital. The decision justifies the position that the health management system usually has control only over the personnel. Number of doctors, nurses / technicians and other staff, as input factors in the empirical research efficiency among other things used Dash et al. (2010) and De Nicola et al. (2011).

Mangnussen (1996), measuring the efficiency of 46 Norwegian hospitals, emphasizes the specification of the output factors affecting the results of ranking hospitals. Unlike most other studies, which use the number of patients or the length of treatment in order to define output factors and put them in proportion to the input factors, Thanassoulis et al. (1996, cited in Worthington 2004) argue that looking at just the length of treatment, in order to increase output factors, could lead to a false conclusion that a larger number of days of care with unchanged input factors means an increase in efficiency. However, if the number of patients also remains unchanged, the described situation actually contributes to increasing inefficiency. Therefore, it is accurate to use the average length of treatment when making calculations.

Data set for measuring efficiency of special hospitals and natural spas oriented at health tourism consist of two inputs (material and human) and two outputs (number of discharged patient and number of bed days). But correlation between these two outputs was 0.99. Therefore, the analysis needs to be continued without one output. Because of the above mentioned and the fact that rehabilitation is specific in terms of length of stay (in comparison to other operations in the hospital) this analysis continues with the number of discharged patient as the output. Thus, finally, the set of inputs consists of the number of doctors and the number of beds, while the number of the patients represents the output.

## 5.2. Specification of the model

The importance of assessing efficiency of special hospitals and natural spas is highly emphasized in the conditions of growing demand pressure. In that context, the objective of selected special hospitals and natural spas is to maximize number of services using existing resources. Hence, the output oriented model was chosen for this analysis.

Furthermore, analyses are obtained from output oriented CCR and BCC model. Namely, overall technical efficiency score (calculate using CCR model) measure combined inefficiency that is due to both pure technical inefficiency and inefficiency that is due to inappropriate size i.e., scale inefficiency. Pure technical efficiency score (calculate using BCC model) devoid the scale effects and provide that all the inefficiencies directly result from managerial inefficiency in organizing the inputs. (Kumar and Gulati, 2008) Calculating these scores and returns to scale for every units form the sample, it is possible to analyze: (i) the improvements in the use of inputs in order to maximize the output and (ii) required changes in the organization's size in order to achieve the efficiency frontier.

# 6. RESULTS

Table 1 presents descriptive statistics for inputs and output of 13 selected special hospitals and natural spas in Croatia for 2015. Statistical data show very large differences in the size of the hospital measured using selected inputs and generating output in this year. Selected spas and hospitals, on average, had 15 doctors and 296 beds. They served an average population of 3059, ranging from min 250 to max 8444 patients.

	No. of doctors	No. of beds	No. of discharged patients
Max	42	920	8444
Min	1	75	250
Mean	15	296	3059
SD	12.75408	230.58223	2412.190

Table 1. Descriptive statistics of inputs and output.

Source: Author's calculation.

Technical efficiency scores, calculated through CCR and BCC models are shown in Table 2. The efficiency analysis was conducted using computer software Frontier Analyst Banxia Software. According to Mogha et al. (2012) overall technical efficiency (OTE) is the efficiency score evaluated from CCR model, while the pure technical efficiency (PTE) present efficiency score evaluate from BCC model. On the basis of their values, it is possible to calculate scale efficiency (SE). Namely, SE is the ration of OTE to PTE and measures the impact of scale size on the efficiency of the DMUs. Selected special hospitals and natural spas having efficiency score equal to 1 are efficient and form the efficiency frontier. Those having efficient score lower than 1 are inefficient in relation to the natural spas and special hospitals on the frontier.

Code	ΟΤΕ		РТ	ГЕ	SE	
	Score	1/Score	Score	1/Score	Score	1/Score
SPA_1	1	1	1	1	1	1
SPA_2	0.812	1.232	0.813	1.230	0.999	1.001
SPA_3	0.087	11.494	0.105	9.524	0.829	1.207
SP_1	0.249	4.016	0.641	1.560	0.388	2.574
SP_2	0.487	2.053	0.719	1.391	0.777	1.476
SP_3	0.777	1.287	1	1	0.882	1.287
SP_4	0.882	1.134	1	1	0.890	1.134
SP_5	0.671	1.490	0.754	1.326	0.998	1.124
SP_6	0.988	1.012	0.99	1.010	0.998	1.002
SP_7	0.998	1.002	1	1	0.998	1.002
SP_8	0.886	1.129	0.888	1.126	0.997	1.002
SP_9	0.76	1.316	0.762	1.312	0.575	1.003
SP_10	0.575	1.739	1	1	0.677	1.739
Mean	0.710	1.408	0.821	1.218	0.847	1.156

Table 2. Overall and pure technical efficiency and scale efficiency natural spas and special hospitals.

Source: Author's calculation.

According to CCR model, one health institutions is efficient. SPA\_1 is considered to be most efficient among the special hospitals and natural spas included in the analysis. The remaining 12 institutions are relative inefficient (observing the third column, those having the score greater than 1). These health institutions can improve their efficiency by augmenting their outputs. This means that on average hospitals have to increase their output by 41 percentages maintaining the existing level of inputs to become efficient (1.408-1).

Due to Mogha et al. (2015), in order to know whether inefficiency in any of DMUs is due to inefficient production operation or due to unfavourable conditions displayed by the size of hospitals, BCC model needs to be applied. It can be observed that, compared with results of CCR model, more institutions are efficient using BCC model. It is therefore possible to conclude that overall technical inefficiency of SP\_3, SP\_4, SP\_7 and SP\_10 is due to the scale-size. Furthermore, measuring scale efficiency (SE) it can be concluded whether the DMU operates at optimal scale size. If the value of the SE score is one, than the DMU operates on optimal size.

In further text, emphasis was placed on pure technical efficiency, analysing managerial inefficiency in organizing the inputs. Table 3 evidences the technical efficiency scores obtained from the output oriented BCC model along with reference set and returns to the scale.

Codo PTE		ТЕ	Dafa	Deerro	DTC
Code	Score	1/score	Reis	reers	KIS
SPA_1	1	1	7	0	1
SPA_2	0.813	1.230		2 (SPA_1, SP_7)	1
SPA_3	0.105	9.524		3 (SPA_1, SP_3, SP_7)	1
SP_1	0.641	1.560		2 (SPA_1, SP_3)	1
SP_2	0.719	1.391		1 (SP_3)	1
SP_3	1	1	5	0	1
SP_4	1	1	2	0	1
SP_5	0.754	1.326		3 (SP_3, SP_4, SP_7)	1
SP_6	0,99	1.010		2 (SPA_1, SP_7)	1
SP_7	1	1	7	0	1
SP_8	0.888	1.126		2 (SPA_1, SP_7)	1
SP_9	0.762	1.312		2 (SPA_1, SP_7)	1
SP_10	1	1	1	0	1

Table 3.	Efficiency :	scores of natu	ral spas and	special	hospitals by	BCC model
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Source: Author's calculation.

According to Table 3, five of 13 special hospitals and natural spas are purely technically efficient, and those are one natural spa and four special hospitals. Observing the third column, those having the score greater than 1, are inefficient. This means that on average hospitals have to increase their output by 22 percentages maintaining the existing level of inputs in other to improve efficiency (1.218-1).

Furthermore, based on the set of reference values, three of them turn out to be leaders with best performance (SPA\_1, SP\_7 and SP\_3). They are on the best practice frontier and thus form the "reference set". Namely, third column (refs) presents number of references. Furthermore, for every inefficient natural spa or special hospital, the model identifies a set of corresponding efficient natural spa/special hospital (peers). They present referent set which can be used as a benchmark for improving the performance of an inefficient natural spa or special hospital. For example, SPA\_1 is a benchmark for seven other institutions in the sample. Further, SP\_1 has to correspond efficient institutions, SPA\_1 and SP\_3.

Table 3 also provides the nature of returns-to-scale for individual health institution in the sample. Namely health institution can operate in the zone of increasing returns to the scale (value 1), decreasing returns to the scale (value -1) or constant returns to the scale (value 0). The results indicate that all units are operate below their optimal scale size and thus, experience IRS (value 1). This means that they can enhance overall technical efficiency by increasing their size.

The DEA allows setting the input and output targets for inefficient DMUs so that they can improve their performance. Target values of chosen inputs and output, for the selected special hospitals and natural spas, are shown in Table 4.

	Inputs					utput
Code	No. of doctors		No. of	fbeds	No. of discharged patients	
	Target	Percentage	Target	Percentage	Target	Percentage
	value	of change	value	of change	value	of change
SPA_1	1	0	75	0	1198	0
SPA_2	8	-4.4	151	0	2408	23.0
SPA_3	5	0	180	0	2379	851.8
SP_1	6	0	221	-52.5	2786	55.9
SP_2	7	0	250	-12.9	3104	39.1
SP_3	7	0	250	0	3104	0
SP_4	42	0	554	0	7807	0
SP_5	13	0	260	0	3694	32.6
SP_6	6	-28.6	137	0	2185	1
SP_7	15	0	235	0	3745	0
SP_8	5	-71.0	120	0	1914	12.7
SP_9	13	-56.1	214	0	3411	31.3
SP_10	35	0	920	0	8444	0
Mean	13	-12.32	274	-5.03	3552	80.57

Table 4. Target values of inputs and output (output based BCC model)

Source: Author's calculation.

Using the example of most inefficient health institution, SPA\_3, it can be concluded that with existing inputs it needs to increase the number of discharged patient by 851.8% to become pure technically efficient. On average 80.54% should increase the number of discharged patient along with 12.32% decrease of doctors and 5.03% decrease of the number of beds, in order to make inefficient special hospitals and natural spas efficient.

#### 7. CONCLUSION

In this paper, we have evaluated the overall technical, pure technical, and scale efficiencies in health institution oriented at health tourism using cross-sectional data for 13 special hospitals and natural spas in 2015. To achieve the research objectives, a DEA framework has been applied, in which the estimates of efficiencies have been obtained by CCR and BCC models. The set of inputs consists of the number of doctors and the number of beds, while the number of the patients represents the output.

The results indicate that, according to overall technical efficiency, on average, the inefficient health institutions have to increase their outputs by 41 percentages maintaining the same level of inputs to become efficient. Only one health institution has made the OTE score of unity. Analysing the sources of overall technical inefficiency, the study finds that overall technical inefficiency in analysing health institution is due to both: poor input utilization (i.e., pure technical inefficiency) and failure to operate at most productive scale size (i.e., scale inefficiency). The policy implication of this finding is that SP\_3, SP\_4, SP\_7 and SP\_10 can enhance overall technical efficiency by increasing their size. However, the overall technical inefficiency. Based on the set of reference values, SPA\_1, SP\_7 and SP\_3 turn out to be leaders with best performance. They represent the benchmark for pure technical inefficient health institution. Furthermore, from the analysis of returns-to-scale, it has been noticed that health institutions operate in the zone of increasing returns-to-scale and, thus, need to increase their operations in order to gain efficiency.

Generally speaking, the study suggests that there is the scope for improvement in the performance of inefficient health institution by choosing a correct input-output mix and selecting the appropriate scale size. This information could be taken as the basis for future policy decisions in terms of taking actions aimed at enhancing the contribution of health infrastructures to economic and social development in the years to come. Furthermore, the research gives the framework for future research in this field based on the limitations of this study. This means that the future research can be extended in using additional inputs and outputs and segmented operations within health institution in order to make it possible to analyse efficiency of one supply segment vis-à-vis another, for example operation based on the HZZO vis-à-vis operations provided on the market.

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# **APPENDIX 1**

Code	Hospital name
SPA_1	Natural spa "Bizovačke toplice"
SPA_2	Natural spa "Topusko"
SPA_3	Natural spa "Veli Lošinj"
SP_1	Special hospital "Biokovka"
SP_2	Special hospital "Daruvarske toplice"
SP_3	Special hospital "Kalos"
SP_4	Special hospital "Krapinske toplice"
SP_5	Special hospital "Lipik"
SP_6	Special hospital "Naftalan"
SP_7	Special hospital "Stubičke toplice"
SP_8	Special hospital"Thalassotherapia", Crikvenica
SP_9	Special hospital "Thalassotherapia", Opatija
SP_10	Special hospital "Varaždinske toplice"

# SMART SPECIALISATION STRATEGY -THE CASE OF SMALL COUNTRY

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# ABSTRACT

The key objective of the strategy of smart specialisation, as defined by the EU, is to set priorities at national and regional level to build competitive advantage by developing and matching research and innovation own strengths with business needs. This paper explores the logic of smart specialisation strategy and it analyses the complexity of designing RIS3 and the risks, associated with selection of priority areas. These derive in particular from the characteristics of the national innovation ecosystem, especially cooperation between business sector and public R&D institutions. Additional risk is present in the countries where the concentration of development funding on the selected priorities is very high. We analyse these issues in the case of Slovenia, as a small, less R&D intensive country, depending to a high extend for development finance on the EU Cohesion funds. The main focus of this article is to explore what are the potential risks aligned to RIS3 in a small member state, from the process of design and adoption of the smart specialisation strategy to its consequent implementation.

# 1. INTRODUCTION

As a response to the challenges of globalization, the growing gap in innovation capability between the USA and the European Union (EU) and transition to knowledge based society/ economy, the Lisbon Strategy (also known as Lisbon I) was launched in 2000. Its main objective was for the EU "to become the most dynamic and competitive knowledge-based economy in the world by 2010 capable of sustainable economic growth with more and better jobs and greater social cohesion and respect for the environment" (European Commission, 2010a). Following the findings of the new growth theories, increased investment in research and innovation, increased participation of youth in higher education and widespread application of information and communication technology (ICT) were seen as the major elements for the implementation of Lisbon Strategy.

During the evaluation of the implementation of the Lisbon strategy the Commission established an Expert Group<sup>1</sup> of prominent economists in the field of Knowledge for Growth to advise on what could be the optimum mix of policies needed to promote the creation, dissemination and use of knowledge. Also, the group was to provide an answer on what role the various actors can play in stimulating a knowledge society and how to enhance the dialogue among these actors. The concept of smart specialisation was introduced to the Commission by the group (Foray, David and Hall, 2009). One of the key objectives of the strategy of smart specialisation, as defined by the EU, is to set priorities at national and regional level to build competitive advantage by developing and matching research and innovation strengths with business needs (European Commission, 2010b). This way the countries are able to address emerging opportunities and market development in a coherent manner, while at the same time they can avoid duplication and fragmentation of efforts. Smart specialisation has been proposed as an *ex-ante* conditionality in the framework of Europe 2020 strategy for the use of the EU Structural Funds from 2014-2020 (Sörvik and Kleibrink, 2015; Paliokaite, Martinaitis, Reimeris, 2015).

This meant that recipients of the structural funds had to design its own RIS3 prior to the acceptance of their Operational Programmes by the European Commission. Smart specialisation strategies were to become the important drivers of technology upgrading and specialisation, providing a unique competitive advantage for the countries and regions of EU13 (Radosevic and Caiampi Stancova, 2015).

Design of a smart specialisation strategy should be, according to its authors, based on socalled entrepreneurial discovery process. But to implement this process properly was a big challenge for many regions, especially for small, innovation less-intensive countries, characterised by low levels of science and business cooperation. The level of the cooperation of these two sectors is essential element of entrepreneurial discovery process: business sector needs to know what the national scientific capabilities are in the areas where they see future business opportunities; while the scientists need to be aware of the future needs of national business to improve their competitiveness.

The paper explores briefly the concept of first Lisbon Strategy, which put in the foreground increased investment in R&D for EU countries. It then moves on to explain the logic of smart specialisation strategy. By looking closely on Slovenia, as a small, R&D less intensive country, we analyse the complexity of designing RIS3 and the risks, associated with selection of priority areas and concentration of development funding on the selection. Our research

<sup>&</sup>lt;sup>1</sup> http://ec.europa.eu/invest-in-research/monitoring/knowledge\_en.htm

points to the fact that while there are potentially important benefits to be derived from RIS3, the process of adopting of a smart specialisation strategy in a small member state carries a much higher level of risk than in the case of more developed regions in a bigger country. We put forward several arguments in this regard, as well as some evidence from other smaller countries.

# 2. EU LISBON STRATEGY AND ITS ACHIEVEMENTS

Lisbon I involved many reforms, including "establishment of an effective internal market, an improved education system, and a more productive innovation and research base" (Europa, 2010). One of the main objectives was to raise overall Research and Development (R&D) investment to 3% of GDP by 2010 from 1.9% in 2000, which was supposed to have a significant impact on long-term growth and employment in the EU (European Commission, 2010a, 3).<sup>2</sup>

The European Commission defined the ways and means to achieve these objectives in its communication 'More research for Europe – Towards 3% of GDP' (European Commission, 2002). This Commission's communication led to the action plan called 'Investing in research: an action plan for Europe', where four set of actions were recognised (European Commission, 2003). First set was aimed at the joint progress, by fostering the coherent development of national and European policies, shaping a common vision for development and deployment of key technologies, enabling all regions to benefit from increased investment in research and designing a coherent mix of policy instruments (European Commission, 2003, 8–10).

Despite the promising start progress, R&D efforts have not been intensified enough and increase in public and private R&D investment remained insufficient to reach the national and EU targets set in the Lisbon I (Europa, 2010). Because the original strategy became too complex in structure with too many goals and actions with very unclear division of responsibilities and tasks, the Lisbon Strategy – the Partnership for Growth and Jobs<sup>3</sup> – was re-launched in 2005 (European Commission, 2010a). Main findings, when evaluating the Lisbon Strategy I and II in 2010, were that both had a positive impact on the EU, but their implementation lacked a good ownership and weak governance structures (European Commission, 2010a).

Because EU's average growth rate has been lower than that of its main economic partners and as a response to the economic crisis, the Europe 2020 strategy<sup>4</sup> was introduced in 2010, where the Commission identified investing more in research, innovation and entrepreneurship as one of the main goals of the strategy (Foray et al., 2012, 7). More pronounced was the need to establish a strong linkage between the Structural funds and R&D investment, especially for the research-less intensive countries, which were far from Lisbon I and II target in terms of the resources allocated to R&D and innovation.

<sup>&</sup>lt;sup>2</sup> According to the studies, made before the preparation of the Lisbon Strategy, raise of the overall R&D investment to 3% GDP by 2010, would bring an additional GDP growth of up to 0.5% and 400.000 additional jobs per year after 2010 (Europa, 2010) 3 Also have a state of the studies of th

<sup>&</sup>lt;sup>3</sup> Also known as Lisbon II

<sup>&</sup>lt;sup>4</sup> The Europe 2020 strategy is the EU's agenda for growth and new jobs. Furthermore, it emphasizes smart, sustainable and inclusive growth for overcoming the structural weaknesses of EU's economy, improvement of its own competitiveness and productivity, and supports sustainable social market economy (The European Semester, 2017)

# 3. SMART SPECIALISATION STRATEGY

Smart specialisation concept was a leading idea of the Knowledge for Growth expert group<sup>5</sup>, which was established in 2005 by the Directorate General Research and Innovation (DG RTD) in order to contribute with knowledge to sustainable growth and prosperity and also to the policies in support of the Lisbon Strategy goals (Foray, David and Hall, 2009; Sörvik and Kleibrink, 2015). Smart specialisation is "the capacity of an economic system (a region, for example) to generate new specialities through the discovery of new domains of opportunity and the local concentration and agglomeration of resources and competences in these domains" (Foray, 2015). It is an innovation policy concept, which through boost of regional innovation, helps countries and regions, to achieve economic growth and prosperity (European Commission, 2017).

Furthermore, the main objective of the strategy of smart specialisation is to set priorities at national and regional level to build competitive advantage by developing and matching research and innovation own strengths with business needs (European Commission, 2016a). "*Smart specialisation approach combines industrial, educational and innovation policies to suggest that countries or regions identify and select a limited number of priority areas for knowledge-based investments, focusing on their strengths and comparative advantages*" (OECD, 2014). It therefore enables countries to coherently address the emerging opportunities and market developments, without any unnecessary duplication (Foray et. al., 2012, 8). In addition, it also represents an important element of the place-based innovation approach, which is based on the specific socio-economic characteristics of a region and a Member State. The process should be aligned with the resources, which are available to the region, with which they can identify their own opportunities that lead to the development and economic growth ((Foray et al., 2012, 8; Charles and Ciampi Stancova, 2015, 7; European Commission, 2016b).

RIS3 was placed at the core of the new EU Cohesion policy, as an *ex-ante* conditionality or legal pre-condition (European Commission, 2014; Sörvik and Kleibrink, 2015), for Member States and European regions to use the European regional Development Fund (ERDF) in the funding period 2014–2020 (Brennan and Rakhmatullin, 2015, 4). Member States therefore had to identify the knowledge specialisations that fit their innovation potential as best as possible and prepare strategy that is based on their assets and capabilities, in order for the Structural Funds to be used more efficiently (Foray et al., 2012; European Commission, 2014; Brennan and Rakhmatullin, 2015, 4).

According to the authors of the concept on RIS3 (Foray et. al., 2012), the national/regional research and innovation strategies for smart specialization (RIS3) are integrated, place-based economic transformation agendas that do five important things:

- policy support and investments on key national/regional priorities;
- build on each country's/region's strengths, competitive advantages and potential for excellence;
- support innovation and aim to stimulate private sector investment;
- get stakeholders fully involved and encourage innovation and experimentation;

<sup>&</sup>lt;sup>5</sup> Expert group was chaired by Commissioner Potočnik (Sörvik and Kleibrink, 2015).

• they are evidence-based and include sound monitoring and evaluation systems.

RIS3 approach requires of the EU Members States and regions to include main innovation stakeholders from the business sector, research centres and universities in order to identify the specialisation areas of key importance (Foray et al., 2012, 8; European Commission, 2014). Each region should identify its best assets and R&D potential in order to concentrate its efforts and resources on a limited number of priorities, where it can really develop excellence and compete in the global economy. However, even more important, Member States and regions should identify their competitive advantages also in relations to other Member States and/or regions and seek for possible patterns of integration with partner regions (Brennan and Rakhmatullin, 2015).

# 4. SMART SPECIALISATION PROCESS IN SLOVENIA

Slovenia adopted smart specialisation strategy in September 2015 It was approved by the European Commission in the first week of November 2015. The process of design and finally, national and EU approval was long and tedious, not only because the approach and the personnel involved in the preparation of RIS3 had changed several times.

After a very slow start caused by internal reorganisation of the government, Slovenia has decided by the end of 2012 on the preparation of the RIS3. The coordination has been entrusted to the Ministry of Economic Development and Technology (MEDT), yet the initial approach was not following sufficiently the EU guidelines, in particular not being treated as an overarching strategy of the country. The working group, established by the government (2012-2013) at the MEDT and MESCS (Ministry of Education, Science, Culture and Sports) had very limited task of the preparation of a draft document on RIS3 as a sort of innovation strategy where closer attention was paid to the research priorities, which could contribute to increased industrial competitiveness. The working group claimed that in the drafting of RIS3 they were taking under the consideration the Research and Innovation Strategy of Slovenia 2011–2020 (RISS, 2011), as well as all different other consultations (technology platforms, preliminary "*mini*" foresight exercise<sup>6</sup>), existing experience of the centres of excellence, competence centres and centres of development<sup>7</sup>. Also, consultations with relevant representatives of scientific community and business sector were carried out, but not in a very structured manner.

With the help of former Technology Agency, a research paper had been commissioned on overlapping/ matching of research and industrial capacity as they can be identified according to standard indicators (value added and export share for industry, patents/ publications for scientific output. Since this effort was assessed as insufficient, the Chamber of Industry and Commerce of Slovenia got actively involved and helped organize a set of panels where the ideas on how the RIS3 should look like were discussed (a process which was to bring bottom-up initiatives and could be called entrepreneurial discovery process). This led to certain duplication of efforts, with the RIS3 draft prepared under the umbrella of the Chamber "winning" the support of business sector, while the text of the Ministry's group was dismissed. Still, neither of the two documents were finalised to the stage of being integrated

<sup>&</sup>lt;sup>6</sup> There were insufficient funds provided for the fully-fledged foresight, so only focus groups in certain fields were organized. Selection of the fields was done based on major export industries.

<sup>&</sup>lt;sup>7</sup> These were the instruments, co-financed by European Regional Development Fund in the financial perspective 2007-2013, aimed at promotion of science –industry cooperation, increased research capacity and improved competitiveness of Slovenian business.

in the Operational Programme (OP) and in the consultation with the Commission's staff, the text was dropped.

Due to yet another round of the changes in the government, the work on RIS stalled. Reid and Stanovnik (2013) observed that Slovenian authorities made a relatively low political commitment to the RIS3 process. It took a while before the government addressed RIS3 again. It seems that the importance of the document had not been understood fully by the new group of the policy makers, so insufficient attention and support to its drafting caused again a significant delay. Due to the fact that structural funds are important for Slovenian development, the government decided in early 2014 to re-establish the special Government Office for Development and Cohesion Policy (GODC) directly responsible for the cohesion policy. A special new group was put in charge of finalising the RIS3 and to engage more actively with the key stakeholders.

Their work resulted in a submission of the now second draft of RIS3 to the Commission; yet again, the text was not approved, with critical remarks focusing mainly on the priority setting. The evaluator on the side of the Commission found Slovenian priorities too broad and the path to their implementation insufficiently backed by relevant data on entrepreneurial and research capability of Slovenia.

This criticism was addressed in the next round of RIS3 design. The team at the Government Office commissioned research study (Burger and Kotnik, 2014), where the research, entrepreneurial and export capabilities were matched to help identify comparative advantage fields. The study looked at technological comparative advantage, taking into account R&D investments in particular sector as well as participation in FP7. Also, added value per sector/ industry was calculated and revealed comparative advantage (growth of productivity and growth of exports) calculated. With this background, a set of open discussions with business sector and research community were organised. GODC published an open call to RDI communities to submit proposals for the entrepreneurial discovery process. This way they received 170 proposals of priority area/projects, which were discussion and expressed interests, the strategic priority areas were developed. Parallel with finalising the document on RIS3, the team at GODC has been developing the implementation process as well as coordination mechanism in cooperation with other ministries and responsible agencies.

The strategic objective of Slovenian Smart Specialisation Strategy (RIS3) is sustainable technologies and services for a healthy life "on the basis of which Slovenia will become a green, active, healthy and digital region with top-level conditions fostering creativity and innovation focused on the development of medium- and high-level technological solutions in niche areas" (Slovenia's Smart Specialisation Strategy, 2015, 8). The goal of the RIS3 is to address "a broad range of development policies related to innovation, in particular the policy of promoting research and innovation, industrial policy, entrepreneurship promotion as well as some parts of the education system, rural development policy, international relations, improved regulatory environment (procedures related to the issuing of permits), etc." (Slovenia's Smart Specialisation Strategy, 2015, 8). In addition, the state will be the one that will provide financial and non-financial support to the identified priority areas (*ibid*).

S4 presents three priorities of the Slovenian economy (Slovenia's Smart Specialisation Strategy, 2015, 13–29):

# 1. Healthy living and working environment

1.1 Smart cities and communities with IT platforms and conversion, distribution and energy management.

2023 objective: raising the value added per employee by 15%.

## Focus areas and technologies

#### Focus areas:

- 1. Systems and IT platform solutions IT ecosystem for hosting (mobile) applications
- 2. Conversion, distribution and energy management

#### Technologies:

- 1. Cloud computing, big, and open data
- 2. Internet of things and future internet
- 3. Embedded smart systems
- 4. High Performance Computing (HPC) infrastructure
- 5. Capture and use of long-distance earth observation data

1.2 Smart buildings and homes including wood-chains with smart building units, building management systems, smart appliances and advanced materials and elements.

2023 objective: raising value added and export of companies by 15%.

#### Focus areas and technologies

- 1. Smart housing units
- 2. Smart environment using intelligent building management systems
- 3. Smart appliances
- 4. Advanced materials and products, including wood composites

#### 2. Natural and traditional sources for future

2.1 Networks for the transition to circular economy.

<u>2023 objectives</u>: 1) raising the material efficiency index of 1.07 (2011) to 1.50 (2020); 2) establish 5 new value chains with closed material cycles.

#### Focus areas and technologies

1. Technologies for sustainable biomass transformation and new bio-based materials

- 2. Technologies for use of secondary and raw-materials and reuse of waste
- 3. Production of energy based on alternative source
- 2.2 Sustainable food production.

2023 objectives: 1) establishing at least three value chains, which will provide a critical mass of consumption and which will be supported by long-term contractual partnership based on economic initiative; 2) raising value added per employee in companies by 20%.

#### Focus areas and technologies

- 1. Sustainable production and processing of food products into functional foods
- 2. Technologies for sustainable agricultural production (livestock and plants)

#### 2.3 Sustainable tourism

<u>2023 objectives</u>: 1) Raising value added of tourism by 15%; 2) increasing the inflow from export of travel services by 4 to 6 % annually; 3) enhancing energy efficiency in tourist facilities by 20%.

#### Focus areas and technologies

- 1. IT-based marketing and networking through the creation of innovative, integrated and sustainable tourism products and services in line with upcoming needs
- 2. Knowledge for enhancing the quality of services -> service design, innovative management, process innovation, branding of basic (catering) and thematic tourism products by taking into account internationally recognised brands, and training
- 3. Technological solutions for sustainable use of resources in accommodation facilities > in relation to activities in the field of smart buildings
- 4. Green Slovenian tourism scheme -> systematic approach to integration, guiding and developing sustainable and integrated solutions at the destination and local level

#### **3.** S(INDUSTRY) 4.0.

#### 3.1 Factories for future

<u>2023 objectives</u>: 1. Comprehensive technological restructuring of tool industry by raising value added per employee by 25%, i.e. on average  $\notin$ 45,000; 2. Raising the level of digitalisation with automation and robotisation in manufacturing. In the framework of demonstration factories value added per employee will rise by at least 20%. 3. Connecting knowledge and creativity of stakeholders in the field of photonics for new impetus and new market opportunities in the global markets with the aim of achieving the average value added of  $\notin$ 75,000; 4. Increasing export of automated industrial systems and equipment by at least 25%.

Focus areas:

- 1. Production optimisation: (distributed) production management and control, quality assurance, regulation and data processing, intralogistics, automation
- 2. Optimisation and automation of production processes: smart machines and equipment, mechatronic systems, actuators and smart sensors.

# Technologies:

- 1. Robotics
- 2. Nanotechnologies
- 3. Modern production technologies for materials
- 4. Plasma technologies and photonics

# 3.2 Health – medicine

<u>2023 objectives</u>: 1. Increasing the export of companies by over 30% of which small and medium-sized enterprises should increase export by at least  $\notin$ 250 million; 2. Promoting the establishment of at least 20 new companies; 3. Attracting at least one foreign direct investment which will employ over 50 people.

# Focus areas and technologies

- 1. Biopharmaceuticals
- 2. Translational medicine: diagnostics and therapeutics
- 3. Cancer treatment diagnosis and therapy
- 4. Resistant bacteria
- 5. Natural medicines and cosmetics

# 3.3 Mobility

<u>2023 objectives</u>: 1) raising value added of companies by 20%; 2) increasing the number of pre-development suppliers from 15 to 22 (45% increase).

#### Focus areas and technologies

- 1. Niche components and systems for internal combustion engines
- 2. E-mobility and energy storage systems
- 3. Systems and components for security and comfort (interior and exterior)
- 4. Materials for the automotive industry

## 3.4 Development of materials as end products

<u>2023 objectives</u>: 1) Raising value added per employee in companies manufacturing alloys by 25%; 2) increasing exports and value added per employee in the field of smart coatings by 20%; 3) increasing investment in development by 15%, value added by 5% and exports of multi-component smart materials by 10%.

#### Focus areas and technologies

- 1. Sustainable production technologies in metallurgy
- 2. Multi-component smart materials and coatings

S4 improves the supportive business-innovation environment in what that its nature should be horizontal with the performance, therefore depending on the competitiveness of priority areas. Moreover, it is also based on a model of "open and responsible innovation, including social innovation" (Slovenia's Smart Specialisation Strategy, 2015, 8–9). Its key principles are (Slovenia's Smart Specialisation Strategy, 2015, 9):

- Consistency of the policy mix in terms of the degree of technological development;
- *Integrated approach* towards RDI, infrastructure, human resources, demand-side measures, regulation and internationalisation;
- *Strategic approach* with clear priorities and tailored governance structure;
- *Complementarity* of measures;
- Supporting emerging industries and areas
- *Tailored response* focusing on the emerging industries and areas.

The implementation part of the RIS3 provides for a new coordinating body – the Implementation Working Group – comprised of representatives of all three main R&D&I policy actors (State Secretaries of Government Office for Development and European Cohesion Policy, Ministry of Economic Development and Technology and Ministry of Education, Science and Sports). The first call under RIS3, to be co-financed by the EISF, was launched in spring 2016, by the Ministry of Economic Development and Technology and the Ministry of Education, Science and Sports (Bučar and Udovič, 2016, 28). A special role is planned for the strategic partnerships, which will enable system-wide and long-term cooperation of stakeholders within an individual area (GODC, 2015).

The call for the establishment of strategic partnerships was published in October 2016, with one main goal to invite business and research community to form the partnerships in accordance with the nine before mentioned priorities (Bučar and Udovič, 2016, 29). In each of the priority areas, one strategic partnership is being established, pooling together business and research entities in the area, with important task of coordinating the development efforts within the priority. The instruments to be funded by the European Structural and Investment Funds will be discussed by the strategic partnerships, who will have the opportunity to suggest to the respective government offices topics of relevance. While the government states clearly that the membership in the strategic partnership is not to automatically guarantee the funding through the new instruments, the members still expect to have important influence on

their thematic focus. One of the most important tasks of the strategic partnerships is to provide a platform for the discussion among its members on the future scientific and commercial developments within the priorities, identified by RIS3. As can be observed by the listing above, the priorities are still relatively broad and do not specify the exact focus of R&D. The strategic partnerships should also enable joint market research, assessment of competition abroad and possibilities of formation of value chains.

At the same time as the strategic partnerships were being formed, the GODC itself is intensively engaged in pushing the RIS3 priorities in all other support instruments to be funded through structural funds, especially in the area of entrepreneurship promotion and education/ training. They insist that in each and every public call, where structural funds are applied, the priority is given only to the fields of RIS3, which in practice could mean that no activity outside RIS3 is funded. This means that for the current financial period, RIS3 determines the development path of Slovenia.

# 5. RISKS OF SMART SPECIALISATION FOR A SMALL COUNTRY

Even if the basic concept of the smart specialisation is relatively straight forward, it implies a very complex process in practice, and it is this complexity that academics have tried to better analyse and comprehend in order to help policy makers understand what is possible, what is feasible, what should be a useful and effective policy towards smart specialisation, what are the objectives and what are the tools (Foray et al., 2011). The rationale of smart specialization involves both the fact that the logic of specialization is intact, particularly for small economies and the argument, that the task of identification of what should be prioritized is multidimensional and sophisticated (Foray and Goenega, 2013). While we agree with this logic, we still have to acknowledge a number of authors who point out the fact that there is a growing gap between the policy practice and the theory and that the theoretical framework, developed so far, is too modest to guide RIS3 application.

What seems to be particularly lacking, is the reflection on what RIS3 means for smaller, R&D less intensive countries, with insufficiently developed national innovation system. Here we refer in particular to Central and Eastern European (CEE) countries. It was presumed that governments and policies in these economies function quite similarly to more developed economies, or that their governance capacities can be easily developed during the process of RIS3 implementation. In fact, RIS3 as a EU conditionality-based policy concept provided legitimacy and created policy space for more focused and targeted policies in CEE. Yet, this process had happened faster than domestic political processes could accommodate to such approach. The concept has entered the policy arena through relatively strong rhetoric of innovation and with its own budget (structural funds). With limited guidance for practical policy design and implementation, the concept itself has taken different forms across CEE and as a consequence, in several instances deviated from the original concept. Thus, in the countries and regions that lack previously established policy and administrative routines for functional public-private coordination, sectoral (and regional) analysis and implementation of RDI policies - factors lacking in most CEE regions - RIS3 processes seem to be shaped into forms fitting existing routines of state-led planning and top-down implementation (Karo and Kattel, 2015). It remains to be seen how this will be reflected in the results of RIS3, in particularly measured through increased competitiveness of the countries/ regions from CEE countries.

Within the process of selecting the priorities, close cooperation between all stakeholders is one of the prerequisites for successful outcome. Even if the purpose of smart specialisation is understood, the methods of selecting specialisation priorities are far from clear. Already the authors of RIS3 concept stressed that the discovery process is thus an issue in its own right. Foray et al. (2011) wrote: »If accomplished properly through an entrepreneurial process of discovery, such a process should logically identify not necessarily the hottest domains in nanoscience or biotechnology but rather the domains where new R&D and innovation projects will complement the country's other productive assets to create future domestic capability and interregional comparative advantage.«

Entrepreneurial discovery process requires a wide involvement of stakeholders in setting of priorities, yet this approach runs counter to the established practice in national innovation governance efforts of CEE countries to date. Much of policy-making has for a long time been top-down, and changing this around requires fundamental change. In principle, RIS3 can considerably improve the policy making and implementation practice and sets new requirements for the policy governance. In many CEE countries, we see similar problems as in Lithuania's case: the governance of R&I policy is non-systemic, characterised by limited synergies. It lacks cross-departmental cooperation and is mirrored by ineffective and process-oriented policy implementation (Paliokaite, Martinaitis, Reimeris, 2015). In several instances, we were able to observe the problems arising from poor cooperation of different government offices also in Slovenian preparation of RIS3. The weak innovation governance has been a barrier to more effective innovation policies in CEE (Bučar and Stare, 2010) and it is unrealistic to expect that simply entering into RIS3 process situation will change.

At least two additional problems appear in discussing the policy risks of RIS3. First, entrepreneurial discovery in principle encourages experimentation and risk-taking. This suggest that the process itself has imbedded risk-taking. Not every choice will necessarily be a successful (smart) one. Karo and Kattel (2015) thus point out that encouraging risk taking in prevailing risk averse public administrations poses a major challenge for smart specialisation. This could be especially problematic in the process of designing the instruments for RIS3 implementation, since we expect it would be a challenge to award the financial support to a project of high experimentation and risk-taking.

Closely tied to this is a question of how to know, what/ which are "smart" policies. Do we have criteria to judge, which specialisation is smart and which is not and consequently, which targets are smart (Giannitsis and Krager, 2009). Smart policies can be acknowledged as such only after their success becomes visible, while ex ante it is very difficult to define success criteria and to assess the combined outcome of market and policy processes (Giannitsis and Krager, 2009). In contrast to advanced technology systems (in developed countries/ regions), the absence of co-evolutionary processes between technologies, institutions, business activities and public policies in technologically weaker players (i.e. CEE countries) increases the policy risks and uncertainties, in particular in the case of more targeted interventions. For technology specialisation to be transformed into competitive advantages there is a need of a sufficient level of expertise over the broader scope of the related technological base.

A question is, how to bring forward this type of knowledge. Several authors point to difficulties in this field in CEE countries: Woronowicz et al (2017) observed that there are considerable interregional gaps regarding the potential for smart specialisation, due to differences in knowledge generation and its dissemination by research institutes, innovation centres, educational units etc. as well as to knowledge application and exploitation factors by business sector. Jucevičius and Galbuogienė (2015) state that technology specialisation would be problematic for small economies like the Baltic or other CEE countries due to limited

resources possessed: "Their strategies should be focused on identification of the unique characteristics and assets of each country and region, highlighting competitive advantages."

On the other hand, the specialisation is a reasonable path to choose when you are a small country, due to the limited human and financial resources. It is also relatively risky path to choose, since the focus on the priorities, which prove to be wrong in the long run, may have a much more dramatic consequences for a small economy. Picking the winners is never easy and building competitive advantage by developing and matching research and innovation strengths with business needs is a complex and politically sensitive process.

The very fact that Slovenia needed officially three rounds (and unofficially even a few more) before the convincing document was produced, already demonstrates how difficult it is to decide on the focus of RIS3. The way the process was implemented – the verification of the priority areas through public discussion – is better than if the priorities would be set only by the public officials. Still, in the environment like Slovenian (or for that matter, in most CEE countries) with relatively poor tradition of cooperation between public research sphere and business sector<sup>8</sup>, the question of matching the research capabilities with the ability of business sector to successfully commercialise the scientific break-troughs is very complex. The entrepreneurial knowledge, needed in the process of defining the priorities, involves also the knowledge about science, technology and engineering capabilities in public research organisations.

The low involvement of the top research capacities from the public research organisations (PROs) in the industrial sector, so characteristic of Slovenia, means that on one hand the business has highly limited knowledge and trust in the capabilities of PROs, while on the other, the researchers have limited knowledge of the needs and focus of the business entities. The Slovenian public R&D system has been focused over the years on scientific excellence, since the allocation of the public financing of research was decided on the basis of bibliometric results (see Bučar and Stare, 2014 and Bučar and Udovič, 2016 for the description of Slovenian R&D system). The few instruments that Slovenia had, which stimulated more intensive cooperation between the PROs and business sector, like centres of excellence, centres of competence, joint research and investment projects, young researchers from industry, have all ended in spite of positive evaluations. They were funded during the financial perspective 2007-2013 and not carried over into the current financial perspective 2014–2020. This means that established cooperation formally no longer exist – of course unofficially some contacts remain, but the dynamics of these contacts is a lot lower than it was during the life of the mentioned instruments. In this environment, the public discussion on RIS3 priorities took place.

The quality of industrial discovery process during the public discussion is difficult to assess. In some industrial fields, there were many participants, pulling together the SMEs, big companies and public research. In other fields, the participation was less active and maybe more dominated by the larger players. Slovenian officials believe that the requirement of co-financing is a sufficiently good "elimination" criteria to exclude partnerships, which formed with sole purpose to access the public resources: every instrument to be funded by the ESIF is designed so as to expect certain percentage of own contribution of the applicants<sup>9</sup>, even the

<sup>&</sup>lt;sup>8</sup> More on science and business cooperation see in Bučar and Rojec, 2014.

<sup>&</sup>lt;sup>9</sup> In most cases, the level of co-financing is set to 50%, but some gradation is also possible: lesser percentage for public research organisations and SMEs, or for the partners from less developed cohesion region.

formation of the strategic partnerships. The assumption is that the business company will not be investing its own money in the field where they do not see a realistic path to succeed.

Additionally, one of the key risks, which is not addressed sufficiently in our opinion, is the external environment. RIS3 cannot dispense without regional macro level analysis, context of neighbouring regions, EU strategies and global trends (Rusu, 2013). The challenge for less developed regions is to move towards international market segments with innovative products leading to technological catch-up and economic convergence. At the end of the day, the smart specialisation success will be measured by the improved competitive position of national economy. So already in the process of selection of the priorities, the ability to access effectively external markets should be one of the criteria.

If we look at the Slovenian case, it is difficult to say, how much attention was paid to this element in the nationally- based discussion. The background analyses (Burger and Kotnik, 2014) looked at the export focus, but as the element of the current competitive advantage. Predicting the future is much more difficult, especially since smart specialisation is part of development strategies in other EU member states. For a small country, competing in new products/ technologies is very difficult. The investment in R&D is increasingly costly, which puts additional pressure on selecting the right path. With this in mind, linking to the global value chains is probably the most realistic path for Slovenian manufacturing. Therefore, it is important to pay sufficient attention to the developments globally in R&D field as well as actively pursue participation in the global value chains. This should be then translated in timely adjustments within selected priorities.

# 6. CONCLUDING THOUGHTS

We claimed in the beginning of our paper that while there are potentially important benefits to be derived from RIS3, the process of adopting of smart specialisation strategy in a small member state carries a much higher level of risk than in the case of more developed regions in a bigger country. A small country has limited means, both human as well as financial. For the research less-intensive regions/countries, it is also true that the links established between the science and business sector are weak. The recognition of the possible positive contribution of science to economic growth and competitiveness is weak among the enterprises as well as among the government officials.

These realities make the implementation of dynamic entrepreneurial discovery process, which is the very basis of smart specialisation, very difficult. Both sides, public science as well as private companies tend to think of their own capabilities insufficiently critical and believe that the only constraint is the lack of money – which is going to be provided from the structural funds now, and thus no longer representing any constraint. Yet, realistic assessment and proper comparison to the level of knowledge, financial resources and available personnel in the competing countries is often missing from the entrepreneurial discovery process.

RIS3 that ignores country-specific economic and institutional context is bound to fail (Paliokaite, Martinaitis, Reimeris, 2015). For CEE countries, it is important to know whether the existing governance structures are equipped to apply specific methods and derive and implement proper policy choices based on them (Karo and Kattel 2015). Sandu (2012) thus suggests that the policy makers need assistance from academic community in order to fully understand the content and the application options, to design and apply effective and relevant smart tools for the assessment and measurement of the smart potential of a region, of the real opportunities to support new competitive areas, and to integrate these new opportunities into

the existent sectorial structure. Yet, Komninos, Musyck and Reid (2014) have analysed the entrepreneurial discovery process in Greece, Slovenia and Cyprus and warned that the overall RIS3 is poorly understood in technical terms, both downstream with respect to business opportunities and niche market perspectives and upstream with respect to innovation support of selected activities. In their view, RIS3 is not viewed as an economic and productive transformation agenda, nor have options for industrial diversification through related variety been taken on board. To overcome this, they stress that it is important to remember that specialisation is not justified *per se*, rather specialisation should be considered from a growth perspective (shift towards higher productivity) and specialisation priorities should focus on diversification of industry and services towards higher added-value activities. (ibid., 466).

In addition, the risks for CEE countries are higher also due to high dependency on the EU funds for the implementation of RIS3. In many less developed countries/ regions who embark on RIS3, the funding is nearly exclusively external and in entirety focused on a limited set of priorities given by RIS3. While one line of the argument is that in the case of weaker R&D capabilities prioritisation is necessary, we need to also consider the costs of potential mistake in the process of selecting the priorities: what if through time it becomes obvious that the RIS3 put forward the sector/ activity, which later cannot achieve international competitiveness? With no money going to the R&D areas outside selected priorities, the country is left with "double nothing". Who will be responsible for such a case? Can RIS3 eventually lead to a growing gap between knowledge-intensive regions and those less fortunate? This, we hope, was not the idea of the designers of the concept.

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# BALANCING EFFICIENCY AND EFFICACY BY SEGMENTATION: THE CASE OF TOURISM DESTINATION SPLIT

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# ABSTRACT

The aim of this paper is to theoretically and empirically investigate the relation between the characteristics of tourism market segments and satisfaction with the destination's attributes as well as with the destination as a whole. Namely, optimizing the relation between these two aspects is seen as crucial in achieving the much desired efficiency-efficacy balance in destination marketing and management. To achieve the set research goals, the paper starts with defining the main concepts and their relevance in the contemporary tourism and marketing. Next section presents the existing literature on the subject, discussing the segmentation criteria and destination attributes. It also provides insights of existing studies focused on the relation between the two concepts. In the empirical part of the paper, the results of research conducted on 496 tourists in the town of Split are presented. The differences in overall and destination's attributes satisfaction between various criteria segments justify the need to look into these concepts' relations. Based on the results, practical implications as well as limitations of the study are given, followed by suggestions for future research.

# 1. INTRODUCTION

Globalization, accompanied by constantly growing market and technology dynamics, continuously increases information and products availability and enhances competition. Consequently, two main business imperatives – to deliver greater value/satisfaction to customers, i.e. efficacy and to rationalize operations/reduce cost, i.e. efficiency – are constantly intensifying in their conflict. This basically boils down to the conflict between differentiation and standardization in the offer, or in doing business in general.

Therefore, nowadays more than ever, the sustainable business focus should be on the "silver bullet" business balance - reaching maximum standardization without jeopardizing competitive advantage and customers' satisfaction achieved through customization. Namely, it is necessary to adjust the delivered value to specific customers' requirements, their needs, motives and purchasing behavior in order to increase the value and customers' satisfaction. A prerequisite for that is as good an insight as possible into customers' characteristics which affect the subjectivity of delivered value assessment and satisfaction, as well as into specific attributes of the delivered value that represent the true value/quality for the customers. Customers' characteristics and delivered value's attributes that result in a significant level of value assessment subjectivity indicates the necessity for customization, while insignificant levels are indicative of standardization. Through implementation of each to an appropriate measure, the "silver bullet" efficiency and efficacy balance can be achieved.

All previously elaborated, raises two key challenges for successful management of balancing business efficiency and efficacy:

- Identification of customers' characteristics i.e. segmentation criteria regarding their impact on the subjectivity in assessing the delivered value and customers' satisfaction;
- Identification of the delivered value attributes according to their susceptibility to subjectivity of customers' quality assessment and satisfaction.

Like any other industry, tourism is confronted with a highly competitive environment. Furthermore, besides single businesses the competition involves destinations which, in order to be successful, must recognize and proactively respond to the changes occurring in the marketplace. Over the past two decades, tourism destinations have implemented segmentation, product differentiation and branding strategies in response to market challenges (Soteriades, 2012; Lazzeretti and Petrillo, 2006). For these reasons, the identified key challenges for balancing efficiency and efficacy have been examined on the case of the town of Split as a tourism destination.

#### 2. LITERATURE REVIEW

#### 2.1. Market segmentation in tourism

Consumer behavior is a key element for the marketing strategy definition, and it includes conceptual dimensions such as decision-making, values, motivations, self-concept and personality, expectations, attitudes, satisfaction and loyalty (Cohen et al., 2013). Market segmentation, as a strategic tool, groups tourists into market segments based on their similarities inside a segment and dissimilarities between the segments. Segmentation can be seen as a three-part process, consisting of market segmentation, market targeting and market positioning. This allows tourism destinations to develop a capacity to differentiate and
address the particular needs of selected segments, thus gaining a competitive advantage (King et al., 2012; Ho et al., 2012; Konu, 2010; Dolnicar, 2008; Kotler and Keller, 2006; Lu, 2003; Aaker, 2001).

Four different types of segmentation bases/criteria are found both in literature and research studies: demographic (gender, age, education, income, occupation), geographic (country/city of origin), behavioral (benefit sought, activities sought, travel duration, expenditure, life style) and psychographic (trip purpose, motivation, perceptions, personality) (Molina et al., 2015; Prayag et al., 2014; Chen et al., 2013; Brida et al., 2012; Ho & McKercher 2012; Pesonen et al., 2011; Pike et al., 2010; McKercher et al., 2008; Brey et al., 2007; Kim et al., 2007; Kotler, 2000). Literature review on tourism market segmentation research (Tkaczynski et al., 2011, 2010, 2009) does not provide any conclusive results on the selection of segmentation bases/criteria. Actually, the selection of segmentation criteria seems highly dependent on the researcher's judgment in most of the studies. Literature review done by Dutta & Bhattachary (2015) shows that tourism segmentation studies have mainly employed the combination of 3 or all 4 types of segmentation criteria, from which 3 to 11 segments have been derived, and most frequently based on motives, benefits and activities sought. Some studies even give an indication that there is no correct way to segment the market due to its complexity, particularities of each destination, external factors, marketing efforts and subjectivity present in most of criteria (Rondan-Cataluña & Rosa-Diaz, 2014; González and Bello, 2002; Kotler 2000).

There are two different ways of doing segmentation: common sense and data-driven. A combination of the two may also be used (Dolnicar, 2008). In common sense segmentation criteria are known in advance (age, country of origin, type of vacation etc.).Haley (1968) criticized common sense approach as merely descriptive and proposed data-driven segmentation as an approach that is based on the actual cause of differences, so that consumers' groups are formed on the basis of more than one characteristic. However, definition of their socio-demographic characteristics would be beneficial for the efficient identification and communication with those segments (Dolnicar, 2008). Additionally, it has to be noted that many of data-driven segmentation studies treat segmentation as a separate issue and do not relate the derived results to the positioning of the tourism destination (Dolnicar, 2008; Smith, 1956).

## **2.2.** Tourism destination attributes

Literature reviews (Pike, 2008; Mazanec et al., 2007) point out that no widely accepted causal model of tourism destination competitiveness exists. However, from the most comprehensive academic (Crouch, 2011; Dwyer & Kim, 2003; Ritchie & Crouch, 2003) and major industry modelling (WTTC and World Economic Forum, 2011, 2013) it can be concluded that sustained destination competitiveness requires two fundamental elements: resources representing sources of comparative advantage and effective destination management. This is a challenging task bearing in mind that the main product in tourism is a series of experiences achieved through the combination of various aspects, services and products offered by different operators (Pike & Page, 2014; Soteriades, 2012; Poon 2002).

Furthermore, Pike proposes in his literature review (2008) that a competitive destination is the one that features a balance between an effective market position, profitable tourism businesses, an attractive environment, positive visitor experiences, and supportive local residents. According to Middleton and Clarke (2001), the overall tourism offer might be defined in terms of five main components: destination attractions; destination facilities and

services; accessibility of the destination; images, brands and perceptions; and the price to the visitor. In Pike's (2011) survey, out of 22 destination attributes (rated for their importance and performance), ten found as most important are: 'Suitable accommodation', 'Good value for money', 'Safe destination', 'Affordable packages', 'Beautiful scenery', 'Pleasant climate', 'Within a comfortable drive', 'Uncrowded', 'Good cafes and restaurants', and 'Friendly locals' (the remaining ones being: 'Lots to see and do', 'Good beaches', 'High levels of service', 'Places for swimming', 'Not touristy', 'Places for walking', 'Family destination', 'Good shopping', 'Historical places', 'Marine life', 'Water sports', 'Trendy atmosphere'). In the Future Brand Country Brand Index one of the five elements measured is Tourism examined through value for money, attractions, resort and lodging options and food (FutureBrand, 2013).

Destination studies typically measure the perceived performance of a destination through common attributes, thus enabling the comparison with competitive destinations. However, this approach to destination surveying is disadvantageous for identification of destination's unique attributes (Pike, 2011). Measuring the attributes' importance is equally as important as measuring of their perceived performance, but it is overlooked in many of destination measurement studies (Pike 2007b, 2008a). Namely, it is essential to identify those attributes that determine the product choice, to form the basis for product/destination positioning (Lovelock 1991, Ritchie & Zins 1978). The ideal for any product/destination is to be perceived favorably in those attributes that are important to the target segment/s.

## 2.3. The interaction of segmentation and satisfaction with tourism destination attributes

Tsiotsou and Vasioti (2006) find that, in tourist segmentation, satisfaction has not received due attention from researchers and marketers although it has been found to differ among segments (such as in Yuksel & Yuksel, 2002; Petrick, 2002).

A solid body of literature that does consider satisfaction is focused on its interaction with travel motives in different tourism contexts - cultural, rural and ski destinations, events, restaurants, marinas, different countries, etc. (cf. Birdir, 2015; Park & Yoon, 2009; Devesa, Laguna and Palacios, 2009; Yüksel & Yüksel, 2003; Miaragia & Martinis, 2014; Prayag and Hosany, 2014; Lee, Lee and Wicks, 2004). The relation between segmentation based on other tourist characteristics and destination satisfaction is not as fruitful research area. Several studies on the subject can be found applying the data driven approach, mostly using clustering and/or factor analysis or similar techniques. For example, Kozak (2000) focused on possible differences in destination satisfaction levels among nationalities (Germans, and British tourists) and found British tourists are more likely to be more satisfied with almost all destination attributes. Huh, Uysal and McCleary (2006) have segmented cultural/heritage destination tourists and revealed differences in the respective segments' satisfaction according to gender and decision time to travel. Andriotis et al (2008) have found that Cretan tourists clustered according to their satisfaction with destinations attributes are statistically different in relation to several characteristics - age, marital status and type of accommodation used while Tsiotsou and Vasioti (2006) have used demographics, preferred physical activities and perceived level of competence in these activities to see if satisfaction segments differ. They found the low and highly satisfied tourists' clusters to have statistically significant difference in terms of education, age and family status as confirmed in their other study (Tsiotsou and Vasioti, 2006a). Miaragia and Martinis (2014) have analyzed the same relation in ski resort context and found to the satisfaction clusters to be different in several tourist characteristics: reasons for the trip, length of stay and visit to other resorts. In fact, Bernini and Cagnone (2012) stress that several studies have found customer heterogeneity to affect relations between overall satisfaction and destination attributes as well as the destination choice (Bigne' & Andreu, 2004; Castro et al., 2007; Hui et al., 2007; Ryan & Glendon, 1998; Yuksel & Yuksel, 2003). However, in their multi-year study of tourists in a mature and multi-product destination (Rimini, Italy) they find evidence that tourists, segmented with respect to trip activity, do not exhibit different evaluation of destination attributes. So, it is obvious that still many inconclusive results in this area exist, calling for further investigation. Among the studies with common sense segmentation, to our best knowledge, none have been found to include interaction between the tourists' characteristics and satisfaction with destination attributes. In order to contribute to the ongoing debate on the subject, our study embraces common sense segmentation. In defining variables though, the variables considered relevant in common sense and date-driven studies have been incorporated.

## 3. METHODOLOGY AND RESEARCH RESULTS

### 3.1. Objectives and methodology

The research objective of the study is to determine possible connection between different types of tourist segments and their overall satisfaction with destination as well as satisfaction with specific attributes of tourism destination. Furthermore, determined differences, based on several segmentation criteria, are used as the basis for recommendations in standardization and/or customization of tourism destination attributes, in order to achieve the balance between efficiency and efficacy.

The population of the study consisted of tourists who visited Split during 2016 summer (high) season. Dispersion and diversity of the sample is ensured by conducting the data collection during different times of day and different days of the week. Research was conducted with a questionnaire translated into five languages, distributed by trained surveyors at frequent locations in the old city. The questionnaire consisted of questions related to general information (gender, age, education, economic status); main motives for travel; overall satisfaction with Split and satisfaction with specific attributes of Split as a tourism destination. Additionally, respondents were asked to select five most important attributes of ideal tourism destination among the 22 proposed. In total, 496 questionnaires were collected, which made it possible to conduct the statistical analysis and reach some indicative results, as presented in the following section of the paper. Statistical analysis of the obtained data was conducted by SPSS software package.

## 3.2. Empirical results and discussion

Respondents' general characteristics are presented in Table 1.

		Count	Column N %
1 Gender	Male	221	44.6%
	Female	275	55.4%
	Total	496	100.0%
2 Age	16-25	163	32.9%
_	26-40	180	36.3%
	41-60	114	23.0%
	61+	39	7.9%
	Total	496	100.0%
<b>3</b> Education	Primary	4	.8%
	Secondary	68	13.8%
	Tertiary	271	55.0%
	Postgraduate/doctoral	150	30.4%
	Total	493	100.0%
4 Economic	Missing	6	1.2%
status	Lower than average	34	6.9%
	Average	331	66.7%
	Higher than average	125	25.2%
	Total	496	100.0%

#### Table 1. Respondents' general characteristics

Source: Research

Male and female respondents are equally represented, while the in age structure a relatively small portion of respondents older than 41 years is found (23% from 41 to 60 years, and 7.9% older than 61). Most of the respondents have higher level of education (55% tertiary and 30.4% postgraduate/doctoral level) and are of average economic status (55.7%). Selected respondents' most common motives are shown in Table 2.

		Responses		Percent of	
		Ν	Percent	Cases	
Travelling	Active holiday	287	22.0%	60.8%	
motives	Passive holiday	212	16.2%	44.9%	
	History & culture	251	19.2%	53.2%	
	Gastronomy	131	10.0%	27.8%	
	Visiting family & friends	93	7.1%	19.7%	
	Natural beauties	230	17.6%	48.7%	
	Night life	101	7.7%	21.4%	
Total		1305	100.0%	276.5%	

Source: Research

The motives scale initially consisted of 10 items with multiple choices (maximum 3), as it is closer to "real life" and contemporary travelling trends. The threshold for including particular motive in further analysis was set at minimum 5% of responses. Accordingly, three motives were excluded: health&wellness, business and other unspecified motives. This is quite expected owing to the stage of development of these products in the destination. Most frequent travelling motives are active holiday (22%), history&culture (19.2%) and natural beauties (17.6%), illustrating the current perception of Split among visitors.

Overall satisfaction with Split and satisfaction with specific attributes of Split as a tourism destination were measured with a 5 point Likert scale. All items, means and standard deviation of satisfaction are given in Table 3.

	N	Moon	Std.
	N Mean   488 4.26   367 3.87   359 3.88   406 4.32   349 3.89   341 3.84   297 3.36   305 3.60   240 3.53   262 3.68   310 3.70   228 3.38   185 3.21   160 2.99   355 3.69   312 3.55   278 3.71   345 3.96   307 4.09   354 4.07   391 4.34   290 3.69   25 3.56	Deviation	
Overall satisfaction	488	4.26	.7964
Accommodation quality	367	3.87	.95021
Kindness and affability of service provider	359	3.88	.94338
Richness of cultural-historic heritage	406	4.32	.89544
Variety of cultural contents	349	3.89	.92516
Quality of gastronomic offer	341	3.84	.95506
Authenticity of souvenirs, crafts	297	3.36	1.01370
Shopping possibilities	305	3.60	.97535
Variety of fun content for youth	240	3.53	1.05070
Variety of other fun content	262	3.68	.93274
Orderliness of beaches (cleanness, contents)	310	3.70	1.05680
Variety of sports-recreational contents	228	3.38	.95678
Availability of medical, wellness & beauty services	185	3.21	.92307
State of equipment for business and scientific gatherings	160	2.99	.96150
Corresponding value for money	355	3.69	.91678
Traffic connectedness of destination	312	3.55	1.14127
Availability of other services (guides, public transport, taxi, rent-a-car)	278	3.71	1.04929
Cleanness of the city, orderliness of public surfaces	345	3.96	.88828
The offer in destination surroundings is interesting	307	4.09	.91367
Hospitality of local citizens	354	4.07	.91097
Atmosphere and spirit of destination	391	4.34	.80981
Availability of information in destination (signposts, apps)	290	3.69	1.02509
Conformance to specific needs	25	3.56	1.44568

Table 3. Satisfaction with the Split as tourism destination

Source: Research

Applying a threshold of 45% minimum responses (i.e. 225 respondents), marked items were excluded from the scale. A resulting, "new" scale consisting of 19 items obtained satisfactory reliability level with Cronbach's alpha coefficient of 0.87. As the purpose of this study was to determine suitability of general segmentation criteria for determination of differences in satisfaction among different groups and its potential impact on standardization and/or customization of tourism destination offer, exclusion of least represented attributes and motives was justified. Additionally, for all travelling motives main attributes of tourism destination, ranked by importance, are shown in Table 4.

<sup>&</sup>lt;sup>1</sup>respondents were asked to select 5 most important attributes of an ideal destination among proposed 22 attributes

	RANK	Attribute					
5. ves	1	Atmosphere and spirit of destination					
. to loti	1	Richness of cultural-historic heritage					
1 u 1 m	1	Corresponding value for money					
r al	1	Orderliness of beaches (cleanness, contents)					
F fo	1	Accommodation quality					
	2	Quality of gastronomic offer					
5.to all es	2	Hospitality of local citizens					
n ( for	2	ndness and affability of service provider					
roi [0. j mc	2	The offer in destination surroundings is interesting					
<u> </u>	2	Cleanness of the city, orderliness of public surfaces					
	3	Variety of cultural contents					
	3	Authenticity of souvenirs, crafts					
	3	Shopping possibilities					
H	3	Variety of fun content for youth					
othe	3	Variety of other fun content					
0	3	Variety of sports-recreational contents					
	3	Traffic connectedness of destination					
	3	Availability of other services (guides, public transport, taxi, rent-a-car)					
	3	Availability of information in destination (signposts, apps)					

#### Table 4.Attributes of ideal tourism destination by ranks

Source: Research

For determining differences in satisfaction based on selected segmentation criteria (gender, age, education, economic status), analysis of variance (ANOVA) and descriptive comparison of means of the attributes among travelling motives were conducted. Even though cluster and factorial analysis are common procedures in researches of segmentation in different aspect of tourism (Dolnicar and Kemp, 2008; Park and Voon, 2009; Birdir, 2015), as Dolnicar (2008) argues, a priori commonsense approach has significant practical value. Thus, the final choice was segmentation focused on specific demographic and socio-economic characteristics used in other studies: gender (Kim et al., 2007); age (Reece, 2004); education (Veisten et. al., 2015); household income (Dolnicar et al., 2008). It should be noted that those criteria are mainly used as a basis for segmentation, as they are indirectly related to purchase behaviour (Park and Yoon, 2009). Main purpose of this study is to determine possible relation between segmentation and satisfaction with various attributes of tourism destination in order to achieve the balance between efficiency and efficacy in the peak season period. Accordingly, other common criteria for segmentation in tourism (Birdir, 2015); like country of origin, travel duration, accommodation, expenditures, were not included. Furthermore, correlation analysis was used to determine possible relations between satisfactions with all proposed attributes of tourism destination in-between as well as related to overall satisfaction, as a support tool in identification of destination attributes which need to be customized or those that could be standardized.

Testing assumptions prior to the analysis showed that dependent variables were normally distributed, without significant outliers, while homogeneity of variances (Levene's test) was conducted separately for each general segmentation criteria. For seven items which failed the assumption of homogeneity of variances (Levene's test p<0.05) based on gender, Welch

robust test of equality of means was performed. Significant differences by one-way ANOVA and Welch robust test of equality of means for gender are shown in Table 5.

Table 5.	One way	ANOVA	and	Welch	test for	<sup>.</sup> gender
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ANOVA		Sum of Squares	df	Mean Squar e	F	Sig.
Variety of cultural	Between	3.753	1	3.753	4.428	.036
contents	Groups					
	Within Groups	294.110	347	.848		
	Total	297.862	348			
Authenticity of souvenirs,	Between	6.857	1	6.857	6.804	.010
crafts	Groups					
	Within Groups	297.311	295	1.008		
	Total	304.168	296			
Variety of fun content for	Between	4.241	1	4.241	3.888	.050
youth	Groups					
	Within Groups	259.609	238	1.091		
	Total	263.850	239			
Availability of other	Between	19.849	1	19.849	19.214	.000
services (guides, public	Groups					
transport, taxi, rent-a-	Within Groups	285.129	276	1.033		
car)	Total	304.978	277			
Atmosphere and spirit of	Between	7.116	1	7.116	11.133	.001
destination	Groups					
	Within Groups	248.644	389	.639		
	Total	255.760	390			
We	elch test		Statistic <sup>a</sup>	df1	df2	Sig.
Accommodation quality		Welch	6.876	1	321.712	.009
Kindness and affability of s	ervice provider	Welch	6.220	1	295.381	.013
Traffic connectedness of de	stination	Welch	14.609	1	271.647	.000
Cleanness of the city, order	liness of public	Welch	10.666	1	294.591	.001
surfaces						
Availability of information	in destination	Welch	6.798	1	251.220	.010
(signposts, apps)						

Source: Research

Results of one-way ANOVA for difference in satisfaction by age are presented in Table 6. Assumption of homogeneity of variances (Levene's test p<0.05), is violated solely for item "Kindness and affability of service providers" but as Welch robust test indicates significant effect (p=0.019), the result is also presented.

ANOVA		Sum of Squares	df	Mean Square	F	Sig.
Overall satisfaction	Between Groups	1.484	3	.495	.779	.506
	Within Groups	307.415	484	.635		
	Total	308.900	487			
<b>Richness of cultural-</b>	Between	16.841	3	5.614	7.329	.000
historic heritage	Groups					
	Within Groups	307.891	402	.766		
	Total	324.732	405			
Variety of cultural	Between	9.001	3	3.000	3.583	.014
contents	Groups					
	Within Groups	288.861	345	.837		
	Total	297.862	348			
Variety of fun content for	Between	12.806	3	4.269	4.013	.008
youth	Groups					
	Within Groups	251.044	236	1.064		
	Total	263.850	239			
Variety of other fun	Between	11.845	3	3.948	4.733	.003
content	Groups					
	Within Groups	215.223	258	.834		
	Total	227.069	261			
Availability of	Between	9.760	3	3.253	3.166	.025
information in destination	Groups					
(signposts, apps)	Within Groups	293.926	286	1.028		
Total		303.686	289			
We	elch test		Statistic <sup>a</sup>	df1	df2	Sig.
Kindness and affability of s	ervice provider	Welch	3.447	3	113.565	.019

Table 6. One way ANOVA and Welch test for age

Source: Research

Furthermore, the analysis based on differences related to education was conducted. Levene's test indicates two items with equal variances: "Accommodation quality" (p=0.033) and "Shopping possibilities" (p=0.038), and for these Welch robust test was performed with no significant results.

Table 7. One way ANOVA for education

		Sum of Squares	df	Mean Square	F	Sig.
Availability of information	Between	8.450	3	2.817	2.724	.045
in destination (signposts,	Groups					
apps)	Within Groups	294.754	285	1.034		
	Total	303.204	288			

Source: Research

Levene's test for difference in satisfaction between groups of different economic status indicates two items with equal variances: "Quality of gastronomic offer" (p=0.001) and "Interesting offer in destination surroundings" (p=0.025), but Welch robust tests indicates no significant effect of economic status on those items.

		Sum of Squares	Df	Mean Square	F	Sig.
Kindness and affability of	Between	8.316	2	4.158	4.775	.009
service provider	Groups					
	Within Groups	308.261	354	.871		
	Total	316.577	356			
Quality of gastronomic	Between	8.448	2	4.224	4.734	.009
offer	Groups					
	Within Groups	298.939	335	.892		
	Total	307.388	337			
Authenticity of souvenirs,	Between	8.726	2	4.363	4.333	.014
crafts	Groups					
	Within Groups	295.028	293	1.007		
	Total	303.753	295			
Atmosphere and spirit of	Between	5.438	2	2.719	4.207	.016
destination	Groups					
	Within Groups	249.447	386	.646		
	Total	254.884	388			

Table 8. One way ANOVA for economic status

Source: Research

Summary of significant effects of general tourists' characteristics on satisfaction, with regard to the rank of attributes' importance in "the ideal tourism destination" is presented in Table 9.

	Gender	Age	Education	Economic status
		Overall satisfaction		
	Atmosphere and spirit of destination			Atmosphere and spirit of destination
NK 1		Richness of cultural- historic heritage		
RA)	Accommodation quality			
				Quality of gastronomic offer
K 2	Kindness and affability of service provider			Kindness and affability of service provider
RANI	Cleanness of the city, orderliness of public surfaces			
	Variety of cultural contents	Variety of cultural contents		
	Authenticity of souvenirs, crafts			Authenticity of souvenirs, crafts
	Variety of fun content for youth	Variety of fun content for youth		
К3		Variety of other fun content		
RAN	Traffic connectedness of destination			
	Availability of other services (guides, public transport, taxi, rent-a- car)			
	Availability of information in destination (signposts, apps)	Availability of information in destination (signposts, apps)	Availability of information in destination (signposts, apps)	

#### Table 9. Significant differences based on general characteristics

Source: Research

Data presented in Table 9, indicate that widest range of differences in satisfaction with attributes of tourism destination offer are found for gender. This is quite logical but of little practical value as it is quite hard to implement different approaches for male and female. However, this finding can be used for "fine" tuning of promotional messages toward targeted markets. Differences between segments based on age are logical and can be derived from their interests and travelling habits and also support findings of previous research (Tsiotsou and Vasioti, 2006; Andriotis et al., 2008). Education didn't play significant role in diversifying attributes, while economic status showed differences which are commonly connected with purchasing power of tourists in destination. But, when those attributes and their differences among segments are observed through ranks of importance in ideal destination, some interesting findings can be noticed. For example, atmosphere and spirit of destination are one of the most important attributes for all tourists, but are their satisfaction level varies among

different gender and economic status tourists segments. Richness of cultural-historic heritage is important in targeting different segments based on their age, while accommodation quality is important when segmenting tourists by gender. Finally, quality of gastronomic offer is differently evaluated regarding the economic status of tourist segments. Attributes ranked as less important should be prioritized in shaping the tourism offer accordingly. In this stage, the results have revealed which attributes could be customised according to segments characteristic, while attributes with no significant difference regarding the segmentation criteria can be easily standardised.

Additionally, even it was not objective of this study, descriptive analysis of destination attributes' satisfaction according to the tourists general travelling motives was conducted. Results are showed in Table 10.

	Active	Passive	History & culture	Gastrono	Visiting family & friends	Natural	Night life	Total
	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Overall satisfaction	4.3	4.3	4.2	4.2	4.2	4.3	4.3	4.3
Accommodation quality	3.85	3.94	3.97	3.84	3.97	3.88	3.89	3.89
Kindness and affability of service provider	3.87	3.98	3.90	3.97	3.90	3.92	3.96	3.90
Richness of cultural-historic heritage	4.37	4.31	4.37	4.37	4.32	4.45	4.26	4.33
Variety of cultural contents	3.90	3.90	3.92	3.99	3.86	3.93	3.75	3.89
Quality of gastronomic offer	3.80	3.94	3.86	3.99	3.78	3.89	3.53	3.84
Authenticity of souvenirs, crafts	3.38	3.45	3.40	3.27	3.19	3.34	3.40	3.37
Shopping possibilities	3.57	3.62	3.57	3.51	3.54	3.60	3.53	3.60
Variety of fun content for youth	3.54	3.44	3.54	3.45	3.33	3.47	3.53	3.51
Variety of other fun content	3.72	3.68	3.67	3.71	3.53	3.71	3.81	3.69
Orderliness of beaches (cleanness, contents)	3.69	3.80	3.68	3.73	3.63	3.74	3.67	3.72
Variety of sports- recreational contents	3.39	3.40	3.30	3.49	3.18	3.45	3.38	3.39
Corresponding value for money	3.66	3.75	3.66	3.83	3.79	3.57	3.72	3.68
Traffic connectedness of destination	3.49	3.75	3.59	3.62	3.69	3.44	3.64	3.57
Availability of other services (guides, public transport, taxi, rent-a-car)	3.67	3.88	3.74	3.85	3.91	3.63	3.71	3.74
Cleanness of the city, orderliness of public surfaces	3.94	4.05	3.98	4.09	3.90	3.96	4.02	3.98
The offer in destination surroundings is interesting	4.11	4.20	4.11	4.18	4.00	4.16	4.18	4.12
Hospitality of local citizens	4.07	4.13	4.17	4.18	4.16	4.11	4.00	4.10
Atmosphere and spirit of destination	4.34	4.43	4.33	4.32	4.37	4.38	4.38	4.35
Availability of information in destination (signposts, apps)	3.67	3.78	3.76	3.82	3.66	3.55	3.75	3.70

Source: Research

According to the results in Table 10, there is no large oscillation in satisfaction with tourism destination attributes among tourists with different travelling motives. But, comparing mean

for travelling motives and total mean, some slight differences and trends can be noticed. The highest negative difference mean from total is found in "Quality of gastronomic offer" for tourists motivated by Night life (0.31) while the highest positive mean difference is found "Availability of other services (guides, public transport, taxi, rent-a-car...)" for tourists motivated by Visiting family & friends (0.17) and "Corresponding value for money" for tourists motivated by Gastronomy (0.15). Generally, motive Visiting family & friends is the most critical one, with highest negative difference in following attributes: "Authenticity of souvenirs, crafts"; "Variety of fun for youth"; "Variety of other fun content"; "Variety of sports/recreational content", "Availability of other services"; "The offer in destination surroundings is interesting" and "Availability of information in destination". A possible explanation might be that due to their motive, these tourists are in many cases repeated visitors so their satisfaction is formed from previous experiences as well. Accordingly, several highest positive differences are found for tourists' motivated by passive holiday, specifically for; "Kindness and affability of service provider"; "Orderliness of beaches" and "Atmosphere and spirit of destination". It could be explained by their travelling habits and expectations of vacation directly related to nature, as that particular attribute is very attractive/competitive in this destination. Accordingly, while satisfying their primary expectation, other attributes are evaluated more positive due to the "halo" effect (Pizam, 1978).Interestingly, the highest positive difference in attribute "Value for money" is found for gastronomy motive (0.15), which can be interpreted by quality and relatively low prices of gastro offer comparing to other tourism destinations.

Finally, in order to determine relation among overall and tourism destination attributes' satisfaction, Spearman correlation analysis was conducted, as presented in Table 11.

Spearman's rho		Variety of cultural contents	Shopping possibiliti es	Variety of fun content for youth	Variety of other fun content	Orderline ss of beaches	Traffic connected ness of destination	Availabili ty of other services	Cleanness of the city	Atmosph ere band spirit of destinatio n
Rank (in ideal		3	3	3	3	1	3	3	2	1
I ion	Corr	,185	,135	,211	,281	,269	,074	,149	,125	,368
<b>Overa</b> satisfact	Sig.	,001	,020	,001	,000	,000	,196	,013	,021	,000
	Ν	343	300	236	257	306	306	274	340	386
Accommodati on quality	Corr	,156	,136	,067	,159	,199	,389	,317	,277	,306
	Sig.	,007	,023	,319	,014	,001	,000	,000	,000	,000
	N	301	277	221	240	267	280	258	303	320
Kindness and affability of service provider	Corr	,275	,106	,134	,177	,197	,176	,201	,233	,380
	Sig.	,000	,082	,049	,006	,001	,003	,001	,000	,000
	Ν	308	269	215	236	263	281	258	302	323
Variety of cultural contents	Corr	,596	,240	,144	,091	,195	,132	,141	,212	,353
	Sig.	,000	,000	,031	,149	,001	,022	,021	,000	,000
	N	326	291	224	251	283	298	269	327	360
Authenticity of souvenirs	Corr		,412	,221	,192	,064	,247	,245	,212	,239
	Sig.		,000	,001	,003	,318	,000	,000	,000	,000
	N		265	210	233	245	258	248	271	280
Variety of fun content for youth	Corr			1,000	,626	,228	,237	,301	,161	,171
	Sig.				,000	,001	,001	,000	,018	,011
	N			240	207	206	212	200	216	223
Variety of sports- recreational contents	Corr						,260	,292	,121	,240
	Sig.						,000	,000	,079	,000
	N						208	199	211	215
Traffic connectedness of destination	Corr						1,000	,607	,303	,273
	Sig.							,000	,000	,000
	N						312	260	287	293
Interesting offer in destination surroundings	Corr									,532
	Sig.									,000
	N									293

Table 11. Spearman rho correlation coefficient for overall and attributes of tourism destination satisfaction

Source: Research

Results reveal a weak positive correlation among all tourism destination attributes' satisfaction, except ones marked light grey. These are: "Overall satisfaction" and "Traffic connectedness of destination"; "Accommodation quality" and "Variety of youth entertainment"; "Kindness and affability of service provider" and "Shopping possibilities"; "Richness of cultural-historic heritage" and "Variety of other entertainment"; "Authenticity of souvenirs, crafts" and "Orderliness of beaches"; "Variety of sports-recreational contents" and "Cleanness of the city, orderliness of public surfaces". When rank of importance for ideal destination is put in this context, it can be concluded that all main and supported attributes (rank 1 and 2) are correlated, which was expected and in accordance with "real life" situation in destination. Additionally, the results have confirmed the importance of destination

attributes' adjustments in the process of tourism offer development for targeted market segments. Simultaneously, they have confirmed the possibility of certain destination attributes standardization without the producing negative impact on perceived tourist satisfaction.

Among all significant positive correlations between attributes, the strongest ones, marked dark grey (correlation coefficient  $r_s$  higher than 0.500) are: "Richness of cultural-historic heritage"/rank 1 and "Variety of cultural contents"/rank 3 ( $r_s$ =0.596, p=0.000); "Variety of entertainment for youth" and "Variety of other fun content"/rank 3 ( $r_s$ =0.626, p=0.000); "Traffic connectedness of destination" and "Availability of other services (guides, public transport, taxi, rent-a-car)"/rank 3 ( $r_s$ =0.607, p=0.000); "The offer in destination surroundings is interesting"/rank 2 and "Atmosphere and spirit of destination"/rank 1 ( $r_s$ =0.535, p=0.000). Those correlations are logical as those attributes are strongly connected and dependent by their nature, particularly the first two. We find one finding particularly interesting and of high practical value - strong correlation of "Interesting offer in destination surroundings" with "Atmosphere and spirit of destination", by their rank of importance in ideal destination (2 and 1). Namely, this linkage is often neglected and underestimated in practice, as key stakeholders and DMO's generally view destinations within their administrative borders and do not focus enough on bundling their offer with the one in surroundings. This finding indicates such practices are very much affecting their own destination i.e. customer satisfaction.

# 4. CONCLUSION

Numerous tools are used in tourism marketing and destination management in order to find the "silver bullet" of business balance i.e. customer satisfaction and organizational rationalization. Key challenges for balancing business efficiency and efficacy in tourism are even bigger due to the complexity and number of destination attributes. Accordingly, the focus of this paper was not on providing a new method of balancing efficiency and efficacy in tourism, but rather on enabling the identification of what to standardize and what to customize through utilization of adequate segmentation criteria. Taking the opportunity to standardize rather than customize specific destination attributes, without jeopardizing customer satisfaction, results in efficiency-efficacy balance. Therefore, the primary objective of this paper, evaluation of suitability of the proposed approach, can be considered accomplished.

The time frame in which research was conducted should be born in mind when analyzing the results. Namely, during the peak season the demand is very high and in some aspects it even surpasses the offer so that the results are probably influenced by "reduced" tourists' expectations. And the results show that the necessity for customization in the peak season is minimal, which leads to a conclusion that the destination can be positioned successfully without taking into consideration specific characteristics or needs of various tourists' segments. However, due to the scarcity of research on this topic, this should be further researched. Moreover, the proposed response to key challenges for balancing business efficiency and efficacy in tourism should be investigated in other periods of time/seasons, where the influence of certain segments' characteristics could impact upon satisfaction with destination attributes quite differently.

Although the connection and interdependency of efficiency and efficacy are obvious, their optimal balancing remains elusive in all business sectors, including tourism. Therefore, all studies that can improve their balancing are most welcome and needed in businesses/tourism research, but even more so, in business practice. The ultimate goal is to identify the key segmentation criteria and specific tourism destination attributes that need to be adapted and those that can be standardized in order to achieve the desired tourists' satisfaction level.

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