CONTENTS

STATISTICAL ANALYSIS OF THE MACROECONOMIC INDICATORS INTERDEPENDENCE OF SELECTED COUNTRIES IN WESTERN BALKANS 1
Slobodan Subotić
Goran Mitrović
Vitomir Starčević

INTRODUCTION OF EURO IN THE VISEGRAD COUNTRIES 15
Balázs Ferkelt
Tünde Gergics

DUAL EDUCATION AS A DIRECTION OF STAFFING FOR AGRARIAN AND INDUSTRIAL COMPLEX 23
Natalia Anisimova
Petr Maidanevich
Vadim Belik

PROVIDING ENERGY SYSTEMS OF THE ARCTIC TERRITORIES OF THE REPUBLIC OF SAKHA (YAKUTIA) WITH RESOURCES: PROBLEMS AND PROSPECTS 35
Tatiana Egorova
Anna Delakhova

ANALYSIS OF SELECTED INDICATORS OF THE TAX BURDEN ON ENTREPRENEURS IN THE EU 45
Jaroslav Korečko
Ivana Ondrijová

BANKRUPTCY DETERMINANTS IN TIME VARIANT SETTINGS 53
Elena Lancosova

COMPARISON OF EUROPEAN UNION PUBLIC HEALTH SYSTEMS 65
Nenad Vretenar
Jelena Gojković

THE ECONOMETRIC ANALYSIS OF THE TAXES AND TRANSFERS DEPENDENCE ON THE DIFFERENT GOVERNMENT LEVEL ON THE EXAMPLE OF VISEGRAD COUNTRIES 79
Nadiya Dubrovina
Oleksandr Nestorenko
Kristina Sirenko
Olena Vasylenko

LOW CODE PROGRAMMING WITH ORACLE APEX OFFERS NEW OPPORTUNITIES IN HIGHER EDUCATION 91
Alenka Baggia
Robert Leskovar
Blaž Rodič

PERSONALITY TRAITS AND BUYING BEHAVIOR FROM THE VIEWPOINT OF SELECTED SOCIO-DEMOGRAPHIC CHARACTERISTICS – PRELIMINARY FINDINGS 99
Tatiana Lorincová
Ivana Ondrijová
Jana Kovaľová

ANALYSIS OF THE ECONOMIC TERMS OF THE INTERNET MEDIA IN THE SLOVAK REPUBLIC 107
Marcel Lincényi
Michal Fabuš

EXPLORING THE USE OF DIGITAL DATA IN THE AGRI-FOOD CONTEXT 117
Moreno Frau
Francesca Cabiddu

ELECTRONIC WORD OF MOUTH ACTIVITIES IN THE HOTEL INDUSTRY 125
Emel Yarimoglu
Tugrul Gunay
Yigit Sebahattin Bozkurt

OPPORTUNITIES AND RESTRICTIONS OF INNOVATION IN BULGARIA 131
Vera Pirimova

THE ROLE OF TOP MANAGEMENT IN ANALYZING THE PROFITABILITY OF A COMPANY 141
Silvana Pašovska

APPLICATION OF FUNDAMENTAL ANALYSIS IN INVESTMENT DECISION MAKING: EXAMPLE OF A DOMESTIC BUSINESS ENTITY 149
Pavle Dakić
Luka Filipović
Marko Starčević

THE IMPACT OF KNOWLEDGE INDICATORS ON THE COUNTRY'S COMPETITIVENESS 157
Elena Širá

A STUDY ON ETHICAL COMMUNICATION IN BUSINESS 165
Nicoleta Dospinescu

INDEX OF AUTHORS

A

Alenka Baggia, 91
Anna Delakhova, 35

B

Balázs Ferkelt, 15
Blaž Rodič, 91

C

Elena Lancosova, 53
Elena Širá, 157
Emel Yarimoglu, 125

F

Francesca Cabiddu, 117

G

Goran Mitrović, 1

I

Ivana Ondrijová, 45, 99

J

Jana Kovaľová, 99
Jaroslav Korečko, 45
Jelena Gojković, 65

K

Kristina Sirenko, 79

L

Luka Filipović, 149

M

Marcel Lincényi, 107
Marko Starčević, 149
Michal Fabuš, 107
Moreno Frau, 117

N

Nadiya Dubrovina, 79
Natalia Anisimova, 23
Nenad Vretenar, 65
Nicoleta Dospinescu, 165

O

Oleksandr Nestorenko, 79
Olena Vasylenko, 79

P

Pavle Dakić, 149
Petr Maidanevich, 23

R

Robert Leskovar, 91

S

Silvana Pašovska, 141
Slobodan Subotić, 1

T

Tatiana Egorova, 35
Tatiana Lorincová, 99
Tugrul Gunay, 125
Tünde Gergics, 15

V

Vadim Belik, 23
Vera Pirimova, 131
Vitomir Starčević, 1

Y

Yigit Sebahattin Bozkurt, 125

INDEX

A

Accounting Statement, 53
Agrarian economy sector, 23
Agrarian Education, 23
Analysis, 107
Arctic Zone, 35
Assets, 53
Autonomy Energy Supply, 35

B

Behavior, 117
Belgrade Stock Exchange, 149
Booking Websites, 125
Brain Drain, 65
Business, 141
Business Ethics, 165
Buying behavior, 99

C

Change from Previous Period, 53
Cluster Analysis, 45
Convergence, 15
Correlation, 1
Cross-Subsidies, 35
Customer, 99
Czech Republic, 15

D

Development., 157
Digital Transformation, 117
Digitization, 117
Dual Education, 23
Dynamic, 53

E

e-WOM, 125
Econometric Model, 79
Economic Efficiency, 23
Electronic Positive Word of Mouth, 125
Electronic Word of Mouth Intensity, 125
Entrepreneur, 45
Equity, 53
Ethical Communication, 165
Euro, 15
Euro Area, 15
European Union, 45
eWOM, 125

F

Financial Analysis, 141
Fiscal Decentralization, 79
Fiscal Policy, 79
Food Processing, 117
Fundamental Analysis, 149

G

Gender, 99
Generation, 99

H

Health Economics, 65
Health Management Systems, 65
Heat Supply Objects, 35
Higher Education, 91
Hungary, 15

I

ICT study programs, 91
Innovation, 131
Innovation Firms, 131
Internet Advertising, 107
Internet Media Traffic, 107
Investments, 149

K

Kernel Smoothing, 53
Knowledge Economy, 157

L

Low Code Development Environment, 91

M

Management, 141
Manipulation, 165

N

National projects, 23

O

Oracle APEX, 91

P

Patents, 157
Personality traits, 99
Persuasion, 165
Poland, 15
Portfolio Investment, 141
Product Development, 117
Profitability, 141
Public Health, 65

R

R&D Expenditures, 131
Regression, 1
Renewable Energy Sources., 35
Russian Federation, 23

S

Sales, 53
Scientific Publications, 157
Slovakia, 15
Social efficiency, 23
Statistical methods, 1
Stocks, 149
Survival Analysis, 53

T

Tax and Contribution Rate, 45
Time Dependent, 53
Transport Component, 35
Trends, 107

U

User Interface, 91

V

Vertical and Horizontal Relation, 79
Visegrad Countries, 15, 79
Visegrad Group, 15

W

Web Applications, 91

STATISTICAL ANALYSIS OF THE MACROECONOMIC INDICATORS INTERDEPENDENCE OF SELECTED COUNTRIES IN WESTERN BALKANS

Slobodan Subotić[1]
Goran Mitrović[2]
Vitomir Starčević[3]

DOI:

Abstract: *The research conducted and included in this paper applies to the peculiarities in applying certain methods for the purpose of assessing the trends of quantitative and qualitative macroeconomic indicators in the Western Balkan countries. The research focuses particularly onto certain Western Balkan countries such as Albania, Bosnia and Herzegovina and Serbia. Contemporary statistical methods have been applied in analyzing the conjunction and mutual dependency of these countries' economies, by indicating certain unique macroeconomic indicators of their efficiency and effectiveness. In that context, indicators of gross domestic product, exports, imports and foreign direct investment have been presented both graphically and in tables, including their trend over the period from year 2000 to 2016. The analysis is based on the implementation of the econometric statistical methods of correlation and regression, as well as on the following statistic software packages: IBM SPSS ver. 21, Microsoft XLSTAT and 3B Stat ver. 1.01. A particular segment of the analysis of unique macroeconomic indicators is dedicated to the comparison of the operational effectiveness of analysed countries' economies and their rankings on the basis of each of the relevant parameters. In that respect, respective unique indicators, in addition to absolute amounts, have also been provided as „per capita" calculations, for the purpose of obtaining more realistic insight into the relative capacity of each of the countries surveyed..*

Keywords: *Statistical methods, Regression, Correlation*

1. INTRODUCTION

Correlation is a mutual relation of different phenomena presented by values in two or more random variables. This connection means that it is possible, with a certain degree of probability, to predict the value of a variable on the basis of the known value of another variable, the results (values) obtained can be presented in a chart (scatter plot) or by correlation coefficient. *Regression analysis* is one of the most commonly used statistical techniques and is considerably more complex than the correlation analysis as it represents its further elaboration. This analysis is a set of analytical techniques that are used for a more comprehensive understanding of the interdependence of observed phenomena, which further results in a regression equation (Mikić, Ralević, 2006).

This paper contains a correlation and regression analysis of macroeconomic indicators in the Western Balkan countries (Albania, Bosnia and Herzegovina, Serbia), particularly focusing on the following: 1) Gross domestic product (GDP), 2) export, 3) import and 4) Foreign Direct Investment (FDI). Research and statistical analyses cover the time period from the year 2000 to 2016, whereas the respective data had been initially appropriated based on certain economic

[1] University of East Sarajevo, Faculty of Transportation Doboj, Doboj, Republic of Srpska, B&H
[2] Drina Insurance a.d. Milici, Republic of Srpska, B&H
[3] University of East Sarajevo, Faculty of Business Economics Bijeljina, Republic of Srpska, B&H

and statistical methods, in order to become suitable for generating specific conclusions. Namely, all of the data observed did demonstrate a remarkably unsteady trend, which was verified by means of the *Augmented – Dickey – Fuller* test, which is a violation of the premises for application of the regression analysis. One of the methods for resolving this issue was through logarithmic differentiation of data from successive time series. This method is used to observe the relative growth of observed phenomena instead of their specific levels. The initial data were acceptable for calculation and graphic displays of descriptive indicators, whereas the appropriated data were used for regression and correlation analysis. The analyses have been performed by means of the following statistic software packages IBM SPSS ver. 21, Microsoft XLSTAT and 3B Stat ver. 1.01.

2. ANALYTICAL APPROACH TO RELATIONSHIP AND LINKS BETWEEN MACROECONIMC INDICATORS IN WESTERN BALKAN COUNTRIES

2.1. Macroeconomic indicators of Albanian economy

The values of certain macroeconomic indicators in **Albania** are the basis for the analytical approach that includes the period from the year 2000 to 2016.

Table 1. Macroeconomic indicators in Albania (billions of USD)

Year	GDP	EXPORT	IMPORT	FDI
2000	3,680	0,657	1,418	0,140
2001	4,090	0,754	1,570	0,210
2002	4,440	0,870	1,968	0,140
2003	5,650	1,150	2,547	0,180
2004	7,460	1,640	3,310	0,340
2005	8,370	1,910	3,973	0,260
2006	9,130	2,276	4,430	0,330
2007	10,700	2,707	5,861	0,650
2008	12,880	3,251	6,716	1,240
2009	12,040	3,368	6,002	1,340
2010	11,920	3,485	5,788	1,090
2011	12,890	3,730	6,699	1,050
2012	12,340	3,545	5,865	0,920
2013	14,770	4,167	6,935	1,250
2014	13,220	3,730	6,239	1,140
2015	11,330	3,103	5,068	0,910
2016	11,860	3,436	5,434	1,080

Source: The World Bank, http://data.worldbank.org/indicator

The data from the Table 1 have been used as the basis for calculating the descriptive indicators (shown in Table 2) such as arithmetic mean and standard deviation, as well as minimum and maximum values. Based on the values obtained, it is evident that the average GDP was 9,81 billion USD, the average export was 2,575 billion USD, import 4,69 billion USD, whereas the average FDI amounted to 0,722 billion USD. All of the given indicators share a common feature, which is the fact that all of the respective minimum values were noted the first years of observation, only to reach their maximum values in later years.

Table 2. Descriptive indicators – Albania

Stats	GDP	EXPORT	IMPORT	FDI
No. of observations	17	17	17	17
Minimum	3,680	0,657	1,418	0,140
Maximum	14,770	4,167	6,935	1,340
Median	11,330	3,103	5,434	0,910
Mean	9,810	2,575	4,695	0,722
Standard deviation (n-1)	3,560	1,184	1,885	0,454

Source: Authors

The growth pace of all the indicators is best discernible from the chart (Chart 1) which clearly shows that the GDP is growing faster in comparison to other indicators, but also that the decline of imports and exports is accompanied by a sudden decline in GDP. Likewise, based on the data shown, it can be concluded that the significant growth of the FDI came in 2006 and 2007, which was then followed by a significant GDP growth.

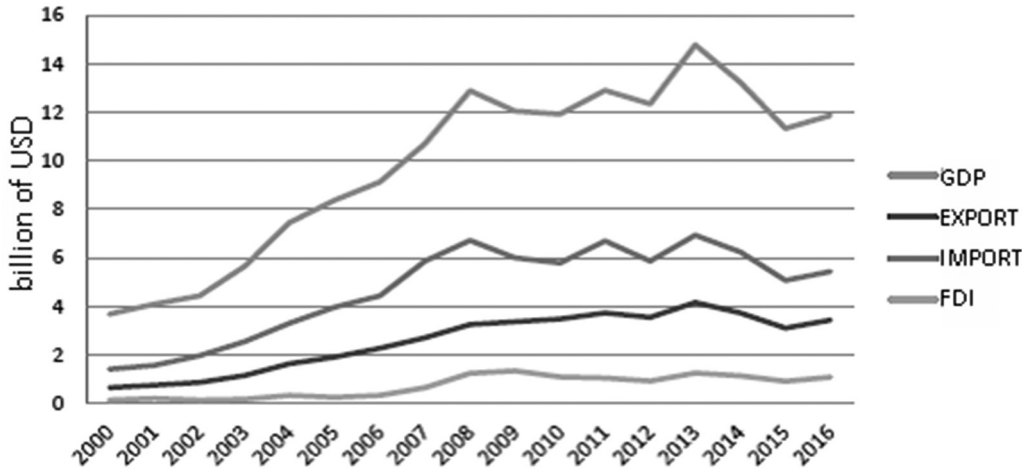


Chart 1. Macroeconomic indicators – Albania

Source: Authors

A correlation and regressive analyses were performed after the descriptive analysis. Upon checking the data through the statistic software package 3B Stat, it was found that the data were not distributed normally, therefore making it necessary to use the Spearman correlation coefficient instead of Pearson correlation coefficient. The values of these coefficients are shown in Table 3.

Table 3. Spearman correlation coefficient – Albania

Correlations					
		GDP-ALB	EXPORT-ALB	IMPORT-ALB	FDI-ALB
Spearman's rho	GDP-ALB	1,000	0,950**	0,853**	0,656**
	EXPORT-ALB	0,950**	1,000	0,829**	0,650**
	IMPORT-ALB	0,853**	0,829**	1,000	0,424
	FDI-ALB	0,656**	0,650**	0,424	1,000

Source: Authors

The coefficients generated indicate a direct and statistically significant conjunction of GDP to all the variables analysed. The most intensive link is between GDP and export (rho = 0,950), while the weakest link is between GDP and FDI (rho = 0,656). All of the coefficients are statistically significant, whereas the direct link, or connection indicates that a growth of a variable

causes a growth of another variable, which is logical in the case of exports and FDI, but it also indicates that the GDP growth also contributed to the import increase which was conditioned by the increase in expenditure, and therefore in the import as well.

The regression analysis allowed for the verification of the direction and potency of the impact of independent variables (exports, imports, FDI) onto the dependent variable (GDP).

Table 4. The value of coefficient of determination – Albania

Model Summary[b]				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	0,975[a]	0,951	0,939	0,0133647
a. Predictors: (Constant), DDI-ALB, IMPORT-ALB, EXPORT-ALB				
b. Dependent Variable: GDP-ALB				

Source: Authors

Indicators presented in Table 4 bring us to the conclusion that a 93,9% variation of a dependent variable is explained by the common influence of dependent variables involved in the model. The obtained F Test value (F = 77,361; *p value = 0,000*), indicates a statistical significance of coefficient of determination (R^2), i.e. of the adjusted coefficient of determination (adjusted R^2).

Further analysis provided data of the standardized and unstandardized β coefficients, as well as the regression equation as well.

Table 5. Multiple linear regression coefficients - Albania

Coefficients								
Model B		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.** Tolerance	**Collinearity Statistics**	
		Std. Error	Beta				VIF	
1	**(Constant)**	-0,004	0,004		-0,827	0,424		
	EXPORT-ALB	0,485	0,148	0,535	3,273	0,007	0,153	6,521
	IMPORT-ALB	0,295	0,117	0,371	2,517	0,027	0,188	5,316
	FDI-ALB	0,052	0,030	0,146	1,764	0,103	0,600	1,667
a. Dependent Variable: GDP-ALB								

Source: Authors

Data presented (Table 5) indicate the impact of every single independent variable onto GDP, and consequently, it is therefore visible that the export variable (β = 0,535) has the largest impact to GDP, followed by the import variable (β = 0,371) and finally by FDI (β = 0,146). It is important to note that the export and import variables provide a unique and statistical contribution to the regression equation (*p values of 0,007 and 0,027*), whereas that is not the case with the variable FDI (*p value of 0,103*). The generated regression equation is as follows:

$$Y=-0,004+0,485\times X_1+0,295\times X_2+0,052\times X_3 \quad (1)$$

The regression equation can be interpreted as follows: the increase of export of 1 billion USD would increase GDP growth by 0.485 billion USD on the condition that other variables remain unchanged. B2 and B3 coefficients are interpreted in an identical manner.

2.2. Macroeconomic indicators of economy of Bosnia and Herzegovina

Analysed macroeconomic indicators of Bosnia and Herzegovina are presented in the table 6 and represent various levels of a certain phenomenon per year.

Table 6. Macroeconomic indicators in Bosnia and Herzegovina (bn. USD)

YEAR	GDP	EXPORT	IMPORT	FDI
2000	5,500	1,578	4,153	0,150
2001	5,740	1,630	4,358	0,120
2002	6,650	1,619	4,716	0,270
2003	8,370	2,534	6,960	0,380
2004	10,002	3,230	7,764	0,890
2005	11,220	3,548	8,036	0,620
2006	12,860	4,502	8,103	0,850
2007	15,770	4,274	8,902	1,840
2008	19,330	5,188	11,465	1,000
2009	17,610	4,403	8,581	0,140
2010	17,170	5,098	8,803	0,440
2011	18,640	5,970	10,401	0,470
2012	17,220	5,569	9,617	0,400
2013	18,470	6,232	9,998	0,310
2014	18,580	6,315	10,529	0,550
2015	16,210	5,604	8,629	0,370
2016	16,910	5,988	8,842	0,270

Source: The World Bank, http://data.worldbank.org/indicator

The descriptive analysis of Bosnia and Herzegovina's macroeconomic status is fairly similar to previously analysed Albania, i.e. the minimum values were noted at the very beginning of observed period, only to reach their maximum values in later years, in the middle of the monitored period. The average GDP is somewhat higher than the Albanian and it amounts to 13,898 billion USD, while the average value of export and import amounts to 4,311 USD, i.e. 8,227 billion USD, respectively. The average amount of FDI per year is 0,534 billion USD.

Table 7. Descriptive indicators – Bosnia and Herzegovina

Stats	GDP	EXPORT	IMPORT	FDI
No. of observations	17	17	17	17
Minimum	5,500	1,578	4,153	0,120
Maximum	19,330	6,315	11,465	1,840
Median	16,210	4,502	8,629	0,400
Mean	13,898	4,311	8,227	0,534
Standard deviation (n-1)	4,948	1,673	2,133	0,426

Sources: Authors

The movement of observed macroeconomic indicators is more clearly shown by the graphic illustration of presented data (Chart 2) derived from Table 7. The chart shows that FDI reached their maximum in year 2006, and consequently the value of FDI, exports and imports reached their peak value in the following year. The world economic crisis, which struck afterwards, significantly influenced the decline of all macroeconomic parameters, as clearly shown on chart 2.

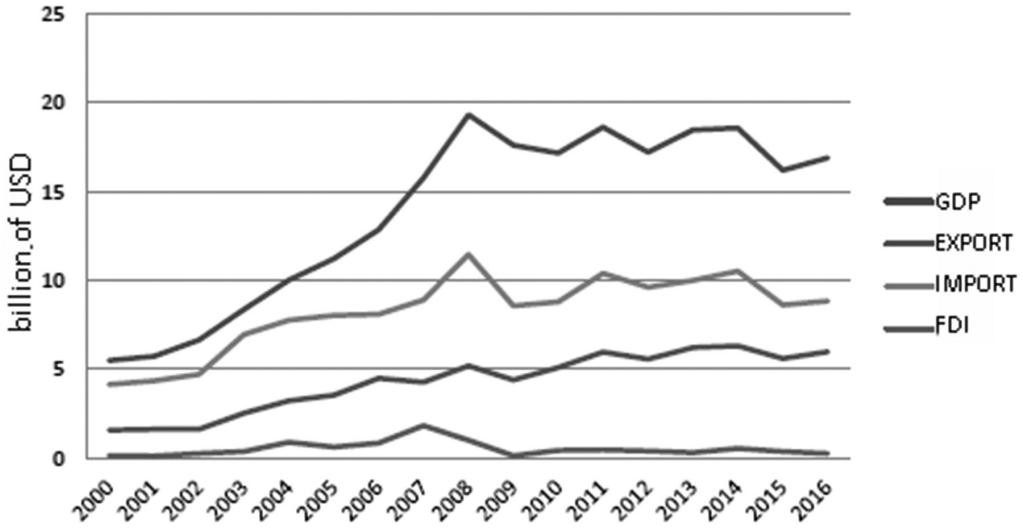


Chart 2. Macroeconomic indicators – Bosnia and Herzegovina

Source: Authors

The results of the correlation and regression analyses have been shown in the following tables. On the basis of the data from the Table 8, it is evident that there is a statistically significant correlation link between GDP and exports and GDP and imports (*Rho = 0,626 and rho = 0,809*), whereas there is no statistically significant link between FDI and GDP. Both of the correlation coefficients are positive, thus indicating that the subject relationship is direct, i.e. that the growth of one dependent variable consequently increases the value of the other one.

Table 8. Spearman's correlation coefficients – Bosnia and Herzegovina

Correlations					
		GDP-B&H	**EXPORT-B&H**	**IMPORT-B&H**	**FDI-B&H**
Spearman's rho	**GDP- B&H**	1,000	0,626**	0,809**	0,344
	EXPORT-B&H	0,626**	1,000	0,597*	0,309
	IMPORT- B&H	0,809**	0,597*	1,000	0,388
	FDI- B&H	0,344	0,309	0,388	1,000

Source: Authors

The regression analysis showed that 61,7% of GDP variability is determined by the variability of other assessed macroeconomic indicators, i.e., by a respective model. This outcome is statistically significant, as confirmed by the F test (*F=9,069; p value=0,002*).

Table 9. The value of the coefficient of determination – Bosnia and Herzegovina

Model Summary[b]				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	0,833[a]	0,694	0,617	0,0303978
a. Predictors: (Constant), FDI-BIH, EXPORT-BIH, IMPORT-B&H				
b. Dependent Variable: GDP- B&H				

Source: Authors

Further analysis was used to calculate and present the B and β coefficients, as well as the regression equation.

Table 10. Multiple linear regression coefficients – B&H

Coefficients [a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig. Tolerance	Collinearity Statistics	
	B	Std. Error	Beta				VIF	
1	(Constant)	0,018	0,009		2,010	0,067		
	EXPORT-B&H	0,019	0,201	0,026	,093	0,927	0,332	3,016
	IMPORT-B&H	0,578	0,209	0,805	2,758	0,017	0,299	3,343
	FDI- B&H	0,002	0,027	0,013	0,072	0,944	0,762	1,313
a. Dependent Variable: GDP- B&H								

Source: Authors

Table 10 shows the results obtained. It should be noted that only B2 value is statistically significant, that is, that only "import" variable provides a unique statistically significant contribution to the regression equation. The values of standardized β coefficients speak in favour of the above, as it is clear that the impact of import is 0,805, of export 0,026, and of FDI only 0,013. The regression equation is as follows:

$$Y=0,018+0,019\times X_1+0,0578\times X_2+0,002\times X_3 \quad (2)$$

The regression equation is interpreted in the same way as in the previous case, a 1 billion USD increase in export will cause the GDP growth of 0,578 billion USD.

2.3. Macroeconomic indicators of the economy of Serbia

The data of the macroeconomic indicators of Serbia are shown in the following table, on the basis of which a detailed analysis has been performed.

Table 11. Macroeconomic indicators in Serbia (bn. USD)

YEAR	GDP	EXPORT	IMPORT	FDI
2000	6,540	0,644	0,936	0,050
2001	12,260	2,751	4,627	0,180
2002	16,170	3,337	6,261	0,500
2003	21,180	4,651	8,377	1,460
2004	24,860	6,019	12,587	0,960
2005	26,250	7,124	12,372	1,580
2006	30,60	9,260	15,481	4,250
2007	40,290	11,426	21,217	4,420
2008	49,260	14,340	26,664	4,050
2009	42,610	11,437	18,212	2,920
2010	39,440	12,988	18,900	1,700
2011	46,460	15,782	22,937	4,930
2012	40,700	15,026	21,811	1,270
2013	45,520	18,754	23,625	2,060
2014	44,210	19,174	23,971	2,000
2015	37,460	17,483	21,135	2,340
2016	38,300	19,158	22,011	2,300

Source: The World Bank, http://data.worldbank.org/indicator

The same features of the two countries previously analysed are also notable in descriptive indicators of Serbia, as displayed in Table 12. The average GDP amounts to 33,065 billion USD, the average export over the monitored period amounts to 11,138 billion USD, import 16,537 billion USD, and the average amount of FDI is 2,175 billion USD. Minimum values were registered in the first observed year, only to continue their increase in each subsequent year and to reached their maximum right before the world economic crisis (apart from the FDI).

Table 12. Descriptive indicators– Serbia

Stats	GDP	EXPORT	IMPORT	FDI
No. of observations	17	17	17	17
Minimum	6,540	0,644	0,936	0,050
Maximum	49,260	19,174	26,664	4,930
Median	38,300	11,437	18,900	2,000
Mean	33,065	11,138	16,537	2,175
Standard deviation (n-1)	12,973	6,159	7,704	1,495
Stats	0,381	0,536	0,452	0,667

Source: Authors

Graphic display of data from the Table 12 shows that GDP, export and import reached their maximum values in year 2008, whereas the FDI variable reached its maximum in 2001. Likewise, a notable increase of all the indications is evident until year 2008, followed by a two-year decline of the same indicators.

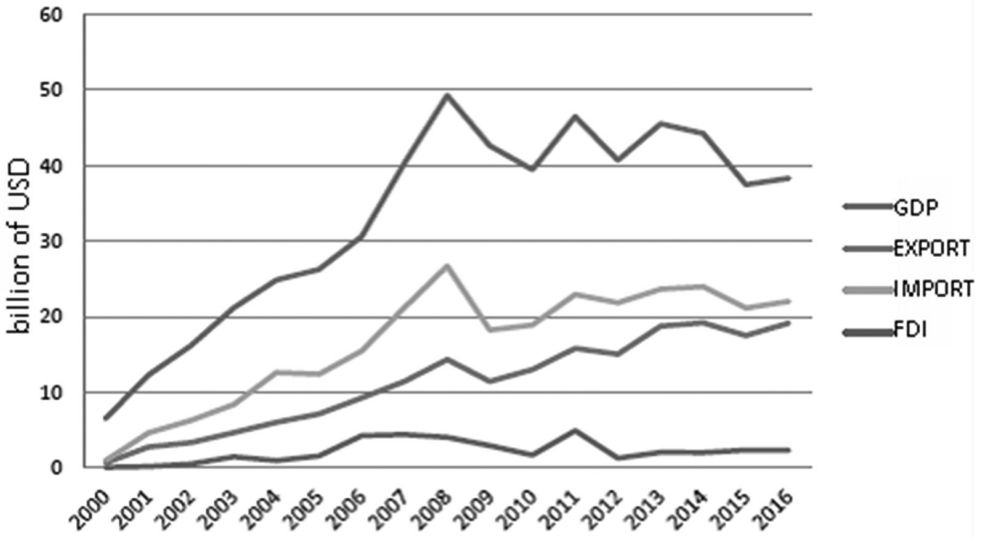


Chart 3. Macroeconomic indicators - Serbia

Source: Authors

The results of correlation and regression analyses are shown in the following table. By means of correlation analysis (Table 13), it was found that there was a strong and direct correlation link between GDP, export and import (*rho=0,818 and rho=0,924*), while the link between GDP and FDI is somewhat weaker, but statistically significant nevertheless (*rho=0,621*). Likewise, a strong correlation link was found between export and import (*rho=0,818*).

Table 13. Spearman's correlation coefficients – Serbia

Correlations					
		GDP-SRB	**EXPORT-SRB**	**IMPORT-SRB**	**FDI-SRB**
Spearman's rho	**GDP-SRB**	1,000	0,818**	0,924**	0,621*
	EXPORT-SRB	0,818**	1,000	,862**	0,544*
	IMPORT-SRB	0,924**	0,862**	1,000	0,432
	FDI-SRB	0,621*	0,544*	0,432	1,000

Source: Authors

In order to avoid multicollinearity among the independent variables, the export variable has been excluded from the regression analysis, as it is in a strong correlational link with the import variable. This relationship has led to multicollinearity where two independent variables generate the same or similar contribution to determining a dependent variable. By means of regression, it was found that 86,00% of GDP variability is determined by the variability of independent variables (imports, FDI). The F test (*F = 32,022; p value = 0,000*) has shown that the contribution of independent variables in explaining GDP changes is statistically significant.

Table 14. The value of coefficient of determination – Serbia

Model Summary[b]				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	0,937[a]	0,879	0,860	0,0332835
a. Predictors: (Constant), FDI-SRB, IMPORT-SRB				
b. Dependent Variable: GDP-SRB				

Source: Authors

By observing data from the Table 15, it can be concluded that B2 and B3 coefficients (import and FDI) provide a unique and statistically significant contribution to the elaboration of GDP (*t = 6,645; p value = 0,000; t = 2,733; p value = 0,017*).

Table 15. Multiple linear regression coefficients – Serbia

Coefficients[a]								
Model B		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.** Tolerance	**Collinearity Statistics**	
		Std. Error	Beta				VIF	
1	**(Constant)**	0,008	0,009		0,876	0,397		
	IMPORT-SRB	0,361	0,054	0,744	6,645	0,000	0,743	1,346
	FDI-SRB	0,086	0,032	0,306	2,733	0,017	0,743	1,346
a. Dependent Variable: GDP-SRB								

Source: Authors

By comparing values in beta column, we come to the conclusion that the influence of import is more than twice of that of FDI (0,744 > 0,306). The regression equation generated based on the data obtained is as follows:

$$Y=0,008+0,361\times X_1+0,086\times X_2 \quad (3)$$

And it is interpreted identically as with the previous countries.

3. COMPARATIVE ANALYSIS OF MACROECONOMIC INDICATORS IN WESTERN BALKAN COUNTRIES

Comparative analysis of the gross domestic product indicators *per capita* is performed on the basis of indicators taken from the World Bank website, as shown in Table 16.

Table 16. GDP per capita in Western Balkan countries and the EU (USD)

Year	Albania	B&H	Serbia	EU
2000	1,175	1,462	870	18,244
2001	1,327	1,524	1,524	18,407
2002	1,454	1,762	2,150	20,018
2003	1,891	2,215	2,832	24,278
2004	2,417	2,651	3,331	27,922
2005	2,709	2,968	3,528	29,093
2006	3,005	3,404	4,130	30,923
2007	3,603	4,180	5,458	35,594
2008	4,370	5,078	6,702	38,136
2009	4,114	4,701	5,821	33,979
2010	4,094	4,614	5,412	33,677
2011	4,437	5,054	6,423	36,409
2012	4,248	4,722	5,659	34,253
2013	4,413	5,211	6,354	35,388
2014	4,579	5,204	6,200	36,760
2015	3,953	4,584	5,237	32,207
2016	4,132	4,808	5,426	32,260

Source: The World Bank, https://data.worldbank.org/indicator

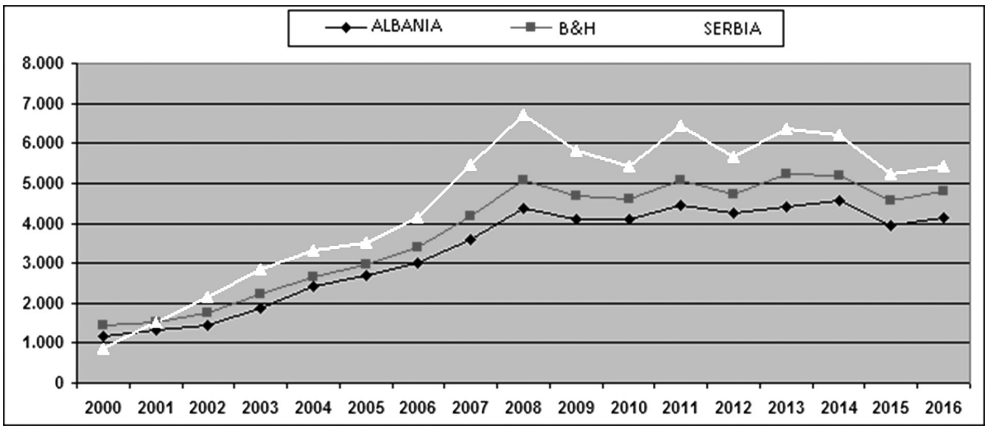


Chart 4. Movement of GDP per capita of the Western Balkan countries

Source: Authors

By monitoring movement of GDP per capita of three Western Balkans countries, and based on the indicators from Table 16, it can be said that the trend of GDP per capita of all countries had rising-falling properties. All of the countries recorded GDP per capita decline in years 2009, 2010, 2012 and 2015. **Albania** had the largest decline of GDP per capita in 2015 by 13,67% compared to the year before. **Bosnia and Herzegovina**, unlike **Albania**, registered a less severe decline in GDP per capita in 2015, amounting to 11,91%. A similar situation was also in **Serbia**, that registered the largest GDP decline per capita in 2015 (15,33%) that was somewhat more intense than the one in **Bosnia and Herzegovina**.

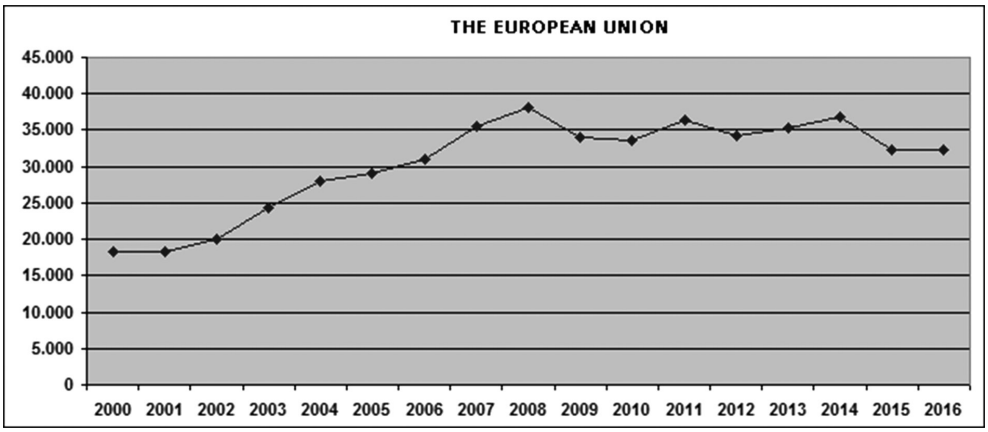


Chart 5. Movement of GDP per capita of the EU

Source: Authors

If we were to analyse the movement of GDP per capita of the **European Union** (Table 16), it becomes evident that the decline of this macroeconomic indicator has been recorded several times. The drastic decline of GDP per capita was notable in year 2009 by 10,90% compared to 2008. The mild decline of this indicator was recorded in year 2010 (0,88%), whereas in 2012 the decline of GDP per capita amounted to 5,92%, and in 2015 it was 12,38%. It is important to point out that the decline of GDP per capita in the European Union was followed by the decline of this particular indicator in all of the Western Balkan countries, with the most pronounced effect in 2015 as it was the case with the European Union. This indicates the existence of a cause and effect link of the European Union economies and of the Western Balkan countries' economies. The movements of GDP per capita of the European Union have also been presented in the Chart 5.

4. CONCLUSION

The countries observed share several distinctive macroeconomic indicators. It should be noted that the subject countries were under the great influence of the recession factors to 2000. The cause of a ten-year recession in the assessed countries was a very unfavourable political and security situation, which caused a major decline in economic activity, a decline in social and individual standards, a reduction in consumption and investment, and nearly the complete exclusion of foreign direct investment. All of the above factors resulted in a massive decline in GDP.

Consolidation and establishment of elementary economic conditions have created preconditions for the significant growth of GDP percentage, which in some of the subject countries amounted even up to 20%, which is very uncommon in stable and developed economies. The common feature for all the given countries was that they all registered a high percentage of GDP growth in the first part over the period from 2000 to 2007, whereas in the second part of the assessed period (2008-2016), their GDP growth rates were significantly lower, sometimes stagnant, and even registering a few cases of recession, triggered by the one occurring on the global scale. The above is a completely normal sequence of events, given the fact that in the first period, up to year 2007, the subject countries had used up their natural and comparative advantages in raising their economic activity. The reason for the slower GDP growth in the second part of the monitored period (2008-2016) lies in much greater exposure to the impacts of the world market, competitiveness, insufficient technological development, traffic infrastructure conditions, level of education system and other macroeconomic indicators.

The final conclusion related to the GDP growth of these countries is that all of them recorded a high level of growth expressed in absolute indications.

The next common feature of the observed countries is that each of them had a high foreign trade deficit that was the highest at the beginning of the monitored period (import coverage by export was 40%), only for the foreign trade deficit to be significantly reduced in the following years (with some countries reaching up to 85%). The reason for the high foreign trade deficit lies in the fact that in the beginning of the assessed period there was a great increase in demand for goods that the local economy was not able to provide, i.e. the inability of the local economy to enable better import coverage by export.

By analysing the set model from the aspect of FDI influence onto the GDP growth, it can be stated that in the initial observed period, the influence on GDP growth was less notable, as the predominant was the influence of the consolidation of the economic system and growth of the economic activity, as well as that the FDI had a positive effect initially. Over time the FDI had a growing impact on GDP growth in terms of enhancing the competitiveness of the assessed countries. Based on the research results, it can be concluded that in the upcoming period, FDI will have a continuously growing impact on GDP growth, as well as on the reduction and elimination of the foreign trade deficit.

The importance of FDI growth does not only lie in the fact that it positively affects GDP growth, but it also has a positive impact on the balance of payments as well as on the chronic issue of the countries suffering from a budget deficit. The FDI ultimately have a positive impact on the balance of entire public finances of the observed states. It can be said that the influx of FDI is not nearly at a level that is possible to be achieved by utilising comparative advantages of this region. It should be noted that the observed countries are still in the process of transition with currently ongoing risks (security risks, political risks, rule of law, corruption, implementation of international standards and other risks) that have an unfavourable impact on FDI. The elimination of those risks will manifest the most important preconditions that attract the FDI, particularly referring to the cheap labour, unused natural resources, geostrategic position, traffic infrastructure, market proximity, etc.

Generally speaking, in all three assessed Western Balkan countries, regardless of their unequal level of economic development, descriptive indicators point to the conclusion that the changes in export and import significantly affect the value of GDP. The correlation analysis indicates a significant statistical link of GDP with the exports and imports in all of the subject countries, while only Serbia has registered somewhat weaker statistical link between GDP and the FDI variable. The results of the multiple linear regression coefficient show that the import variable, in all three countries, has the greatest statistical impact onto the regression equation, i.e., on the value of GDP. Unlike the other countries, in Albania, the export variable also has a statistical influence on the regression equation, while this statistical significance in Serbia is somewhat less pronounced with the FDI variable as well.

5. REFERENCES

http://www.bg.ac.rs/files/sr/studije/studije-uni/Uvod_statisticke_metode_istrazivanja.pdf
http://www.ef.uns.ac.rs/Download/statistika/
http://www.e-statistika.rs/Article/Display/korelacija-i-regresiona-analiza
https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=AL-BA-RS
https://e-statistika.rs/Article/Display/korelacija-i-regresiona-analiza
https://unctad.org/en/PublicationsLibrary/wir2012_embargoed_en.pdf,
https://unctad.org/en/PublicationsLibrary/wir2018_en.pdf
Lovrić, M., Komić, J., Stević, S. (2017). Statistics Analysis - Methods and Application (orig. Statistička analiza-metodi i primjena), 2nd abridged edition, *Public Institution – National and University Library of the Republic of Srpska, Banja Luka*.
Malešević, Đ., Starčević, V. (2010). Business Analysis (orig. Poslovna analiza), *University of East Sarajevo, Faculty of Business Economics in Bijeljina*.
Mikić, Đ., Ralević, N. (2006). Statistics Methods in Management (orig. Statističke metode u menadžmentu), *PanEuropean University Apeiron, Banja Luka*.
The World Bank, http//data.worldbank.org/indicator

INTRODUCTION OF EURO IN THE VISEGRAD COUNTRIES

Balázs Ferkelt[1]
Tünde Gergics[2]

DOI:

Abstract: *Regarding to the European Union law, all member states are obliged to introduce the euro and to make efforts to fulfil the economic and legal convergence criteria. One country of Visegrad Group, Slovakia has already introduced the common currency, while the three remaining countries, outside the euro area do not have a target date of accession yet. The aim of the study is to determine the readiness of these countries for Economic and Monetary Union membership by analysing macro- and micro-level economic indicators. The Czech Republic approaches the Euro Area average for most indicators, while Hungary and Poland show significant backlogs. This paper highlights fulfilment of the inflation criterion will be the greatest challenge among the Maastricht criteria. In addition, the Visegrad countries need a detailed long-term catching-up strategy, especially for Hungary and Poland.*

Keywords: *Euro, Euro Area, Convergence, Visegrad Group, Visegrad Countries, Czech Republic, Hungary, Poland, Slovakia*

1. INTRODUCTION

According to the European Union law, all member states, except the opt-out Countries (United Kingdom, Denmark), are obliged to introduce the euro and to make efforts to fulfil the economic and legal convergence criteria. There is no fixed timetable for the introduction of the euro in these countries, the European institutions do not urge the member countries. While seven out of thirteen "new EU member states" have already introduced the common currency, three countries (Bulgaria, Croatia and Romania) have indicated their intention to join last year. The three remaining Visegrad countries, outside the euro area do not have a target date of accession yet. Since joining the EU, Czech Republic and Poland have drawn up euro introduction strategies, however they have not actualized their strategies in the previous years.

The main aim of the study is to assess the readiness of these countries for Economic and Monetary Union membership by analysing macro- and micro-level economic indicators. Along with the legal and economic (nominal) convergence criteria, the study analyses the following indicators:

- gross domestic product per capita in purchasing power standards,
- the rate and balance of trade with the Euro Area,
- employment and unemployment rates,
- unit labour costs,
- general level of prices,
- development in labour productivity,
- intensity of research and development,
- current account balance.

1 Budapest Business School – University of Applied Sciences, Faculty of International Management and Business, Hungary

2 University of Pécs, Hungary

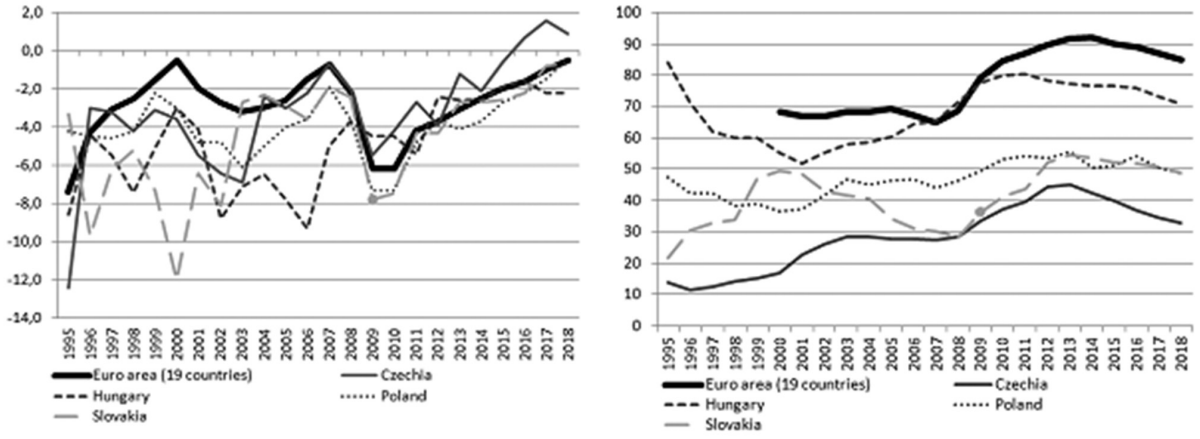
Based on the analysis of these real economic indicators, the study examines the level of development of the Visegrad countries in comparison to the average data of euro area. In the case of Slovakia, the pre- and post-accession levels are presented too, while for Czech Republic, Hungary and Poland, directions of development are displayed.

Through these examinations, the paper looks for the answer to the question how much risk will introduction of euro pose for Czech Republic, Hungary and Poland. In that regard, which nominal criteria will be difficult to accomplish for these countries in the subsequent years, and what should countries do to fulfil all criteria, in addition to what time horizon should they plan with.

In economics, nominal and real convergence can be distinguished. In the European Union, nominal convergence means compliance with the Maastricht criteria, while real convergence means reducing the gap with developed countries. In this way, the structure of the article is similar, as in the first part nominal convergence and in the second part real convergence will be expounded, followed by future research directions and conclusion.

2. FULFILLMENT OF THE CONVERGENCE CRITERIA (NOMINAL CONVERGENCE)

All of the three Visegrad countries standing before the euro introduction display a government deficit less than 3 percent of the GDP. On top of that Czechia exhibits a budget surplus for the past three years. The fulfilment of the budget criteria will not cause any problems for the Visegrad countries. The Visegrad countries show a decreasing debt ratio, Hungary can achieve the 60% reference rate in 2022. (European Commission, 2019a) Regarding the debt ratio, the Visegrad countries show a significantly better performance than the average of euro area. The European Commission diagnosed in its Fiscal Sustainability Report that Hungary was deemed at high fiscal sustainability risk in the medium and in the long term, while Czech Republic and Poland belong in the medium term to the low risk countries and in the long term to the medium risk member states. (European Commission, 2019b)



* Points indicate the year of EA entry

Figure 1. Government deficit/surplus (left) and Public debt (right) (percentage of GDP)

Source: based on Eurostat Database (2019A-B), own editing

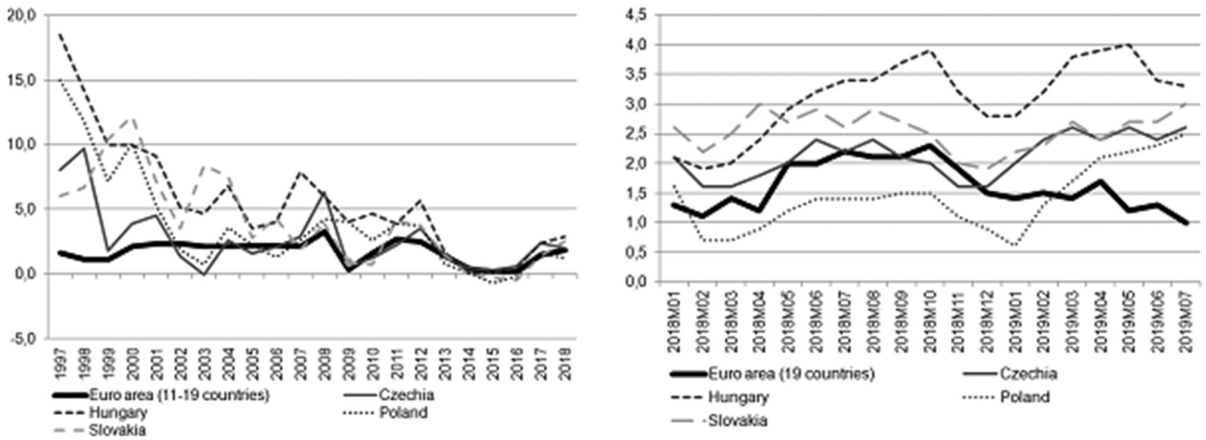
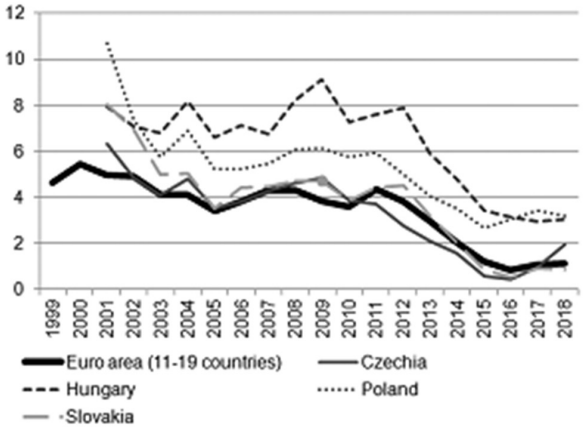


Figure 2. Annual (left) and Monthly (right) inflation
(HICP (2015 = 100), average index and rate of change)
Source: based on Eurostat Database (2019C-D), own editing

After the transition period following the regime change, the Visegrad countries could reduce the inflation rate successfully, but they have to calculate with a relatively high inflationary pressure and we suppose that the fulfilment of the inflation criteria will cause the biggest problem for this country group.

It is worth glancing at the evolution of the actual monthly inflation data. The values for the three countries vary between 2,5 and 3,3% in May 2019. We must take into account the Balassa-Samuelson effect, as well. It was estimated in several publications, e. g. Égert (2007) defined it 1,5-2,0 % for Hungary and Poland, Konopczak (2013) estimated 1,6-2,2% for Czechia, 1,2-1,6% for Hungary, 1,9-3,3% for Poland, while Bauer (2015) calculated an effect less than 1% for the Country group.



* Point indicates the year of EA entry

Figure 3. EMU convergence criterion bond yields (percentage, annual data)
Source: based on Eurostat Database (2019E), own editing

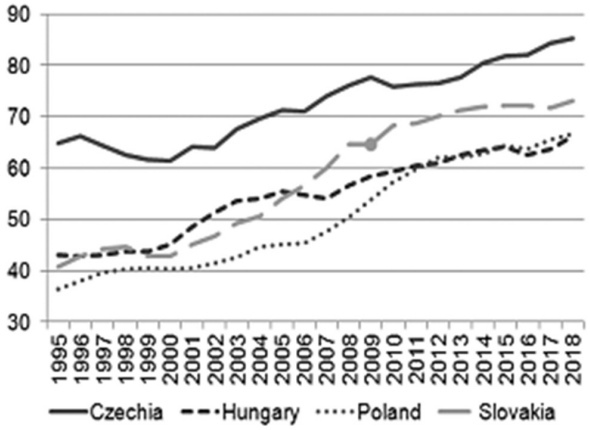
The interest rate of long-term bonds shows a decreasing tendency in Poland and Hungary but the bond yields are significantly higher than in the eurozone. The Czech yields were lower than in the eurozone between 2011 and 2016, but last year it showed a moderate increase. If we observe the exchange rate criterion, none of the currencies of the three Visegrad countries

showed a fluctuation of more than 10 percent in the last two years, but they aren't members of the Exchange Rate Mechanism.

In the last two decades, the convergence criteria of Maastricht were more and more criticized, questioned. Most of criticisms intend to express the need for a certain degree of economic development beyond fulfilling the nominal convergence criteria. Accordingly, in the frame of our research we analysed some important indicators of real convergence.

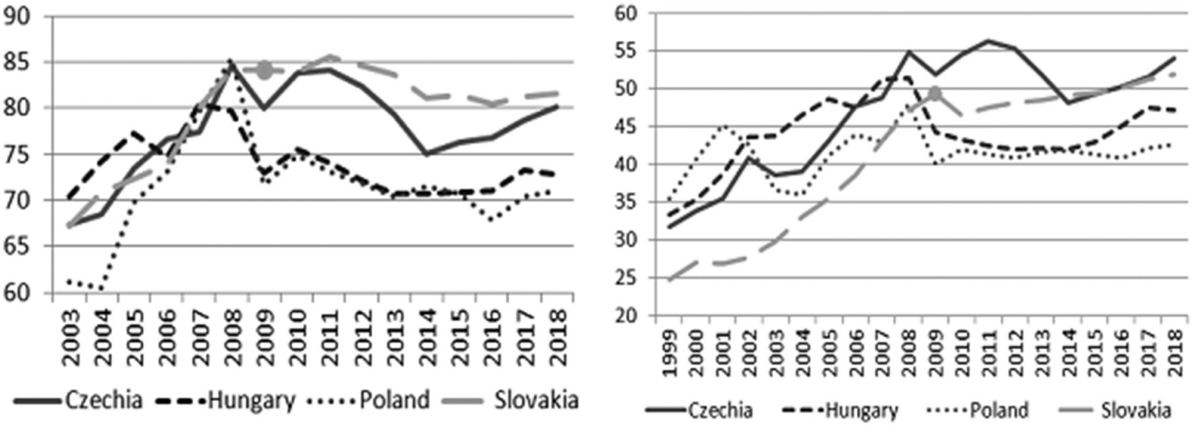
3. REAL CONVERGENCE

The real GDP per capita data show significant disparities within the Visegrad Group and in relation to the eurozone average as well. Only Chechia is capable to overtake the level at the accession of Slovakia. The Hungarian National Bank defined a criterion for an ideal euro introduction: the GDP per capita in PPS of the country should achieve 90% of the euro area (Nagy-Virág, 2017). (In this case, Hungary would probably need more than 10 years to fulfil this criterion.)



* Point indicates the year of EA entry

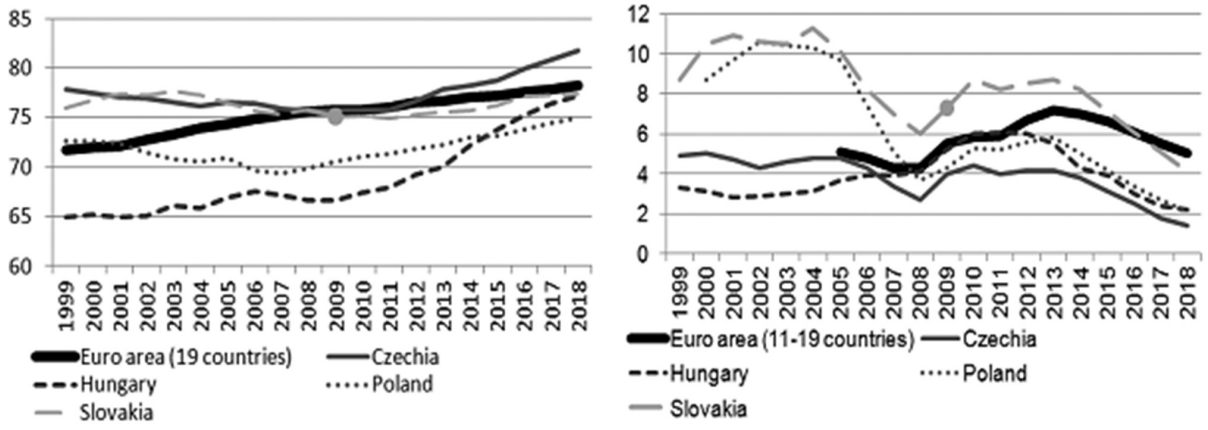
Figure 4. Real GDP per capita (in PPS, percentage of EA)
Source: based on Eurostat Database (2019F), o*wn editing*



* Points indicate the year of EA entry

Figure 5. Price level indices – total goods (left) and total services (right) (EA=100)
Source: based on Eurostat Database (2019G-H), own editing

We mentioned the possible consequences of the Balassa-Samuelson effect. The price level indices show enormous discrepancies in the field of goods and services, as well. The three Visegrad countries stand before a noticeable price level catching-up process. The differences of the price level indices in the case of the total services are more significant.



* Points indicate the year of EA entry

Figure 6. Employment rate (from 20 to 64 years, percentage of total population) (left) and Unemployment rate (percentage, LFS) (right)

Source: based on Eurostat Database (2019I-J), own editing

The labour market situation can be found as favourable in the countries, the employment rate in the population from 20 to 64 years is achieving the 75% target of the Europe 2020 strategy. The unemployment rate shows a similar tendency, while in Czechia we can observe the shortage of labour. Regarding the labour market situation, we can't observe any disparities between the Euro area and the Visegrad countries.

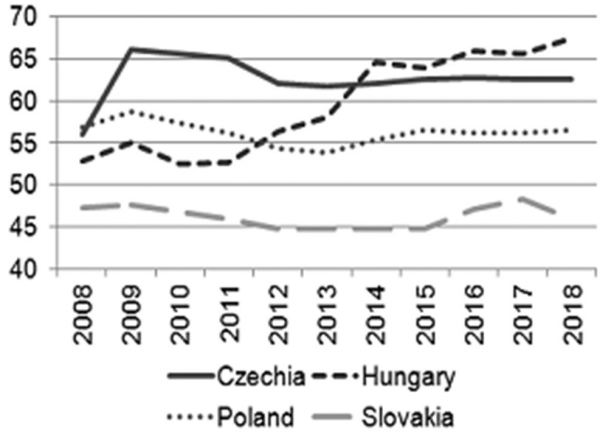
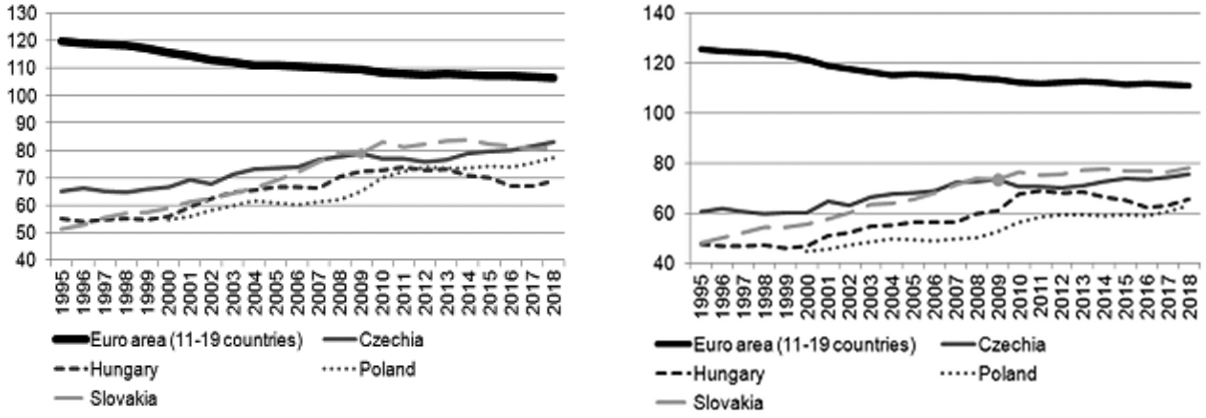


Figure 7. Share of Euro Area in exports of goods and services (percent)

Source: based on Eurostat Database (2019K), own editing

The trade integration of the three countries into the euro area is specifically strong, in all countries the share of Euro Area in exports of goods and services achieve 55 %, moreover in Hungary it is 67 %. Actually, in the eurozone Portugal shows the highest level of trade integration with 60%. In 2018 all Visegrad countries displayed a positive balance of products and services with the Euro Area, especially Czechia with a surplus nearby 19 billion euro. All three countries displayed a current account balance in equilibrium in 2018, but with a decreasing surplus.

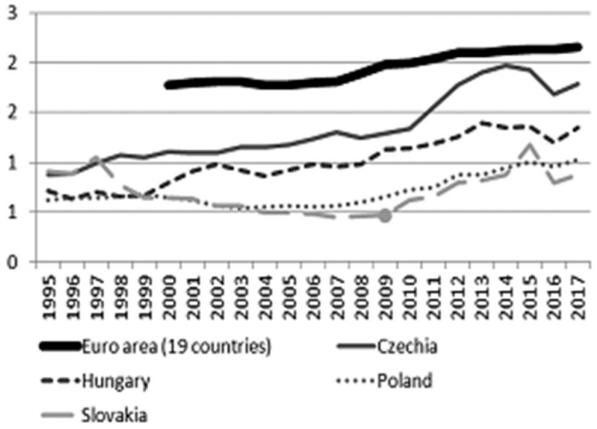


* Points indicate the year of EA entry

Figure 8. Nominal labour productivity per person (left) and per hour worked (right) (Percentage of EU28 total (based on million purchasing power standards), current prices)

Source: based on Eurostat Database (2019L-M), own editing

The productivity indicators show a significant discrepancy from the average of the euro area, a backlog of 25-40 percentage point. We must mention, that the discrepancy is continuously shrinking.



* Point indicates the year of EA entry

Figure 9. Gross domestic expenditure on R&D (GERD, percentage)

Source: based on Eurostat Database (2019N), own editing

In all compared countries we can observe a very low-level GERD indicator. We have to add that the EU would like to achieve 3% until 2020 (and wanted to achieve 3 % until 2010, as well), while e. g. South-Korea shows 4,55 %.

4. FUTURE RESEARCH DIRECTIONS

Current research focuses exclusively on the Visegrad countries and their development compared to the euro area. In the future, it is worth expanding the research with comparative analysis of several certain Member States which had previously joined the Monetary Union. In the first place, the southern European countries (Spain, Portugal and Greece) can provide an appropriate basis for this comparison.

5. CONCLUSION

Reviewing at the nominal and real convergence of the Visegrad countries, three main conclusions can be drawn in relation to the research questions raised in the introduction.

1. Based on the analysis of the real economic indicators, the Visegrad countries do not show a unified picture. The Czech Republic approaches the euro area average for most indicators, overtakes several the level of South European countries at the time of accession, while Hungary and Poland show significant backlogs. For this reason, the introduction of the euro may pose much less risks to the Czech Republic, while in the other two countries, real economic convergence in the coming years is at least as important as fulfilling the nominal criteria.
2. Due to differences in average prices and wage levels, the Balassa-Samuelson effect is expected to result in serious inflationary pressures in the Visegrad countries. Fulfilment of the inflation criterion will be the greatest challenge among the Maastricht criteria.
3. In addition to the convergence programs, the Visegrad countries need a detailed long-term catching-up strategy, especially for Hungary and Poland.

REFERENCES

Bauer, P. (2015): *Az árfelzárkózás tényezői és mértékének becslése Magyarországra*. MNB-tanulmányok 119. Magyar Nemzeti Bank, Budapest.

Égert, B. (2007): *Real convergence, price level convergence and inflation differentials in Europe*. CESifo Working Paper no. 2127.

European Commission (2019a): *Hungary Convergence Programme 2019-2023* https://ec.europa.eu/info/sites/info/files/2019-european-semester-convergence-programme-hungary_hu.pdf (last time of download: 08.11.2019)

European Commission (2019b): *Fiscal Sustainability Report 2018. Volume 1.* Brussels

Eurostat Database (2019A): *Government deficit/surplus, debt and associated data [gov_10dd_edpt1]* https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=gov_10dd_edpt1&lang=en (last update: 15.07.2019)

Eurostat Database (2019B): *Government deficit/surplus, debt and associated data [gov_10dd_edpt1]* http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do (last update: 15.07.2019)

Eurostat Database (2019C): *HICP (2015 = 100) - annual data (average index and rate of change) [prc_hicp_aind]* https://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do (last update: 19.08.2019)

Eurostat Database (2019D): *HICP (2015 = 100) - monthly data (annual rate of change) [prc_hicp_manr]* https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=prc_hicp_manr&lang=en (last update: 19.08.2019)

Eurostat Database (2019E): *EMU convergence criterion series - annual data [irt_lt_mcby_a]* https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&pcode=tec00097&language=en (last update: 12.08.2019)

Eurostat Database (2019F): *Purchasing power parities (PPPs), price level indices and real expenditures for ESA 2010 aggregates [prc_ppp_ind]* https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=prc_ppp_ind&lang=en (last update: 01.08.2019)

Eurostat Database (2019G): *Purchasing power parities (PPPs), price level indices and real expenditures for ESA 2010 aggregates – total goods* https://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do (last update: 01.08.2019)

Eurostat Database (2019H): *Purchasing power parities (PPPs), price level indices and real expenditures for ESA 2010 aggregates – total services* https://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do (last update: 01.08.2019)

Eurostat Database (2019I): *Employment and activity by sex and age - annual data [lfsi_emp_a]* https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=lfsi_emp_a&lang=en (last update: 10.07.2019)

Eurostat Database (2019J): *Unemployment by sex and age - annual average [une_rt_a]* https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=une_rt_a&lang=en (last update: 01.08.2019)

Eurostat Database (2019K): *Exports and imports by Member States of the EU/third countries [nama_10_exi]*
https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_10_exi&lang=en (last update: 09.04.2019)

Eurostat Database (2019L): *Labour productivity and unit labour costs [nama_10_lp_ulc] - Nominal labour productivity per person* https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&pcode=tec00116&language=en (last update: 20.08.2019)

Eurostat Database (2019M): *Labour productivity and unit labour costs [nama_10_lp_ulc] - Nominal labour productivity per hour worked* https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&pcode=tesem160&language=en (last update: 20.08.2019)

Eurostat Database (2019N): *Gross domestic expenditure on R&D (GERD) [T2020_20]* https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&pcode=t2020_20&language=en (last update: 21.06.2019)

Konopczak, K. (2013): The Balassa-Samuelson effect and the channels of its absorption in the Central and Eastern European Countries. NBP Working Paper No. 163. Narodowy Bank Polski, Warszawa. https://doi.org/10.2139/ssrn.2361415

Nagy, M. – Virág, B. (2017): *Felzárkózás az eurozónában – csakis megfelelő felkészültséggel teljesíthető*

https://www.mnb.hu/letoltes/nagy-marton-virag-barnabas-felzarkozasi-az-eurozonaban-frissitett.pdf (last update: 03.08.2019)

DUAL EDUCATION AS A DIRECTION OF STAFFING FOR AGRARIAN AND INDUSTRIAL COMPLEX

Natalia Anisimova[1]
Petr Maidanevich[2]
Vadim Belik[3]

DOI:

Abstract: *The article conducted a comprehensive analysis of the state of staffing for agrarian and industrial complex of Russia, including the system of agrarian education as an integral element of the formation of personnel potential of the industry. Problematic issues of qualitative and quantitative imbalance of labor resources in the agricultural sector of the economy have been identified, and possible ways to solve them are reflected. Based on the study of national and foreign experience, the role and importance of dual education for specialists of different professions and levels of qualification are determined, the values of possible socio-economic effect are modeled with recommendations for state and municipal authorities. The results of the research show that the dual education system can not only be an effective way to provide human resources for the agrarian business, but also can adjust the imbalance of jobs, bring into compliance employment programs and actual employment indicators, improve the standard of living of the rural population and the efficiency of agrarian business in general.*

Keywords: *Agrarian Education, Dual Education, Agrarian economy sector, Russian Federation, National projects, Social efficiency, Economic Efficiency.*

1. INTRODUCTION

Staffing for the agricultural sector of the economy is the most important resource element of the production process in agriculture. In its formation and use it is possible to highlight a number of specific problems of both practical and theoretical-methodological nature. On the one hand, agrarian labour and the goods produced by it are always in demand, this labour doesn't require special education, and access to the market is deprived of many barriers existing in other industries. On the other hand, price parity for agricultural products, high risks of unfavourable weather conditions and the severity of physical work offset the positive factors of agricultural business. In the current conditions, the task of practice is to increase the attractiveness and efficiency of work in agriculture, and the purpose of science is to find and justify optimized directions of staffing.

The term «peopleware» was first introduced in 1987 by Tom De Marco and Timothy Lister (1987), who studied the problem of the human factor in terms of its impact on software development (p. 86). Over the past decades, two subject areas have been identified in human resources research. The first group of scientists considers it as a process of quantitative and qualitative formation of labour resources at different management levels, the second group review it as one of the resources necessary for the functioning of a certain economic system.

[1] V. I. Vernadsky Crimean Federal University, Institute of Economics and Management, Sevastopolskaya St. 21/4, Simferopol

[2] V. I. Vernadsky Crimean Federal University, Institute of Economics and Management, Sevastopolskaya St. 21/4, Simferopol

[3] V. I. Vernadsky Crimean Federal University, Humanitarian and Pedagogical Academy, Sevastopolskaya St. 2, Yalta

Despite widespread recognition of the second point of view among both domestic (Zorin, Zorina, Safrygin, 2017; Lyula, Divina, 2019), and foreign authors (Strijus, Kravchenya, 2017; Teruyama, Goto, Lechevalier, 2018; Stathakopoulos, Kottikas, Theodorakis, Kottika, 2019), in this context it will be more appropriate to use the term «staff supply». This formulation makes it possible to attribute to this field of research both staff problems of functioning of individual business entities, as well as social and psychological issues of motivational mechanisms and improvement of working conditions of employees (Ecirli, Dobre, Dobrescu, Daniiu, 2014; Salehi-Isfahani, Mostafavi-Dehzooeic, 2018).

At the same time, the process approach to the interpretation of «staff supply» is broader not only from a quantitative point of view, but also from a qualitative point of view, linking its three mandatory components: education, industry and region. Thus, M. A. Kopylova and V. G. Novikov (2008) mean by it «the level of compliance between the quantitative and qualitative labor potential demanded in the labor force market at a particular moment and the activities of organizations providing appropriate programs of staff training and recruitment (system of multilevel general and professional education, retraining and skills improvement of human resources services of enterprises and other institutional structures)» (p. 138).

A similar opinion is expressed by H. H. Iskandarov (2017), describing staff supply as «a system of interaction of methods, forms, resources and tools as well as technologies aimed at reproduction and effective use of work force capital of enterprises, industries, territories and the country, capable of ensuring sustainable and stable development of the economy on the basis of high return of investments» (p. 8).

To sum up staff supply in the frame of the present research denotes a cross-branch process of work force formation and its effective functioning aimed at a quantitative and qualitative balance between the labour market and its participants. At the same time education as a separate system and branch of the economy should participate in the process of staff supply not only at the stage of obtaining basic professional knowledge, but also in increasing the personnel potential of the employee throughout his/her employment. The forms of such interaction can range from skills improvement training courses and internships to additional or second vocational education.

2. MATERIAL AND METHODS

The practical application of the acquired skills of employees requires knowledge of the industry in which their enterprise or organization operates. It is noteworthy that most scientific publications of domestic authors, both in specialized periodic editions and dissertations, are devoted to research of staffing for agrarian and industrial complex and agriculture (Anfinogentova, Dudin, Lyasnikov, Protsenko, 2018; Belokopytov, 2015). This indicates both the importance of this industry for the economy of the Russian Federation and the existence of significant problems in the staff supply for the agrarian and industrial complex that have to be settled down.

Staff training for the agricultural sector of the economy in the Russian Federation is provided by 60 higher education institutions of the III-IV level of accreditation (26 universities, 33 academies, 1 institute) located in 52 territorial subjects of the Russian Federation and 25 institutions of additional vocational education (institutes and academies of skills improvement training). It should be noted that agrarian universities, along with medical, sports and art educational estab-

lishments dominate in the structure of industry affiliation of higher educational institutions of Russia with the state ownership (Figure 1). At the same time the largest number of domestic universities (34.0%) is subordinate to the Ministry of Science and Higher Education of the Russian Federation which is not always appropriate from the point of view of realization of professional competences of training of future specialists.

Figure 1. Structure of higher education institutions of the Russian Federation by industry affiliation and subordination in %, 2018.

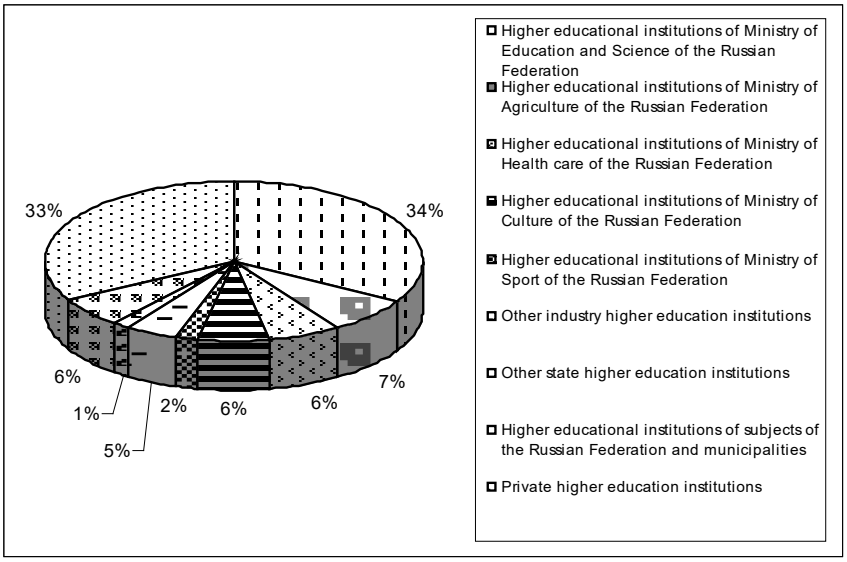


Figure 1. Structure of higher education institutions of the Russian Federation by industry affiliation and subordination in %, 2018.

Source: Formed by authors according to the Federal Service of State Statistics of the Russian Federation

In the composition of students of higher educational institutions of Russia, students of agrarian areas of training occupy from 3.95 to 6.15% average, depending on the educational level they choose. According to the statistical data of the Federal Service of State Statistics of the Russian Federation (Table 1) in general, over the last five years from 275546 (2013) to 2,14970 (2018) people have received agricultural qualifications in Russia. Comparison of these indicators demonstrates a decrease in the number of students by 60.6 thousand people or 22.0% respectively, among them Bachelor's degree – by 2.5 thousand people (1.6%), by specialization – by 81.5 thousand people (73.7%). At the same time the number of students of the Master's degree of agrarian Specialization has increased by 23.4 thousand people (246.2%) during the 2013-2018 periods.

Analyzing the data presented in Table 1, it can be stated that the dynamics observed in the system of Russian agrarian education corresponds to the general trend of significant decrease in number of students studying the Specialization programs and relatively small decrease of students for Bachelor's degree with simultaneous increase in the number of students for Master's degree. It occurs due to the gradual transition of domestic education system to the European standards of the Bologna system which doesn't contain such educational level as Specialization. At the same time the features of some areas of training including agrarian education (veterinary science, landscape design, garden and park economy etc.) do not allow to abandon this educational level completely.

The study of the agrarian education's role in the general system of higher education institutions of the Russian Federation is also important because about 13.0% of the total number of students of agrarian higher education institutions of Russia are trained in non-agricultural specialties, but receive professions necessary for the development of rural areas and their infrastructure. They are engineers, economists, financiers, accountants, public civil employees, lawyers, teachers and other necessary specialists in the agricultural sector. In general, staff training with higher vocational education in the agrarian and industrial complex of Russia suggests 122 specialties and 70 directions of Bachelor's degree and Master's degree together with 51 specialties in secondary vocational education.

Thus, it is possible to talk about a rather diverse system of agrarian education both in the Russian Federation as a whole and in its agrarian-oriented regions. However, even with the annual graduation of more than a million agricultural students, Russia's agriculture continues to experience a shortage in the labor force. This is due both to the failure to execute the budget order for certain areas of student training and to the inefficiency of the agricultural educational institutions themselves.

Table 1. Dynamics of changes in the number of students in higher education institutions of the Russian Federation, 2013-2018.

Educational level	2013	2014	2015	2016	2017	2018
Bachelor's degree, in total, people, including:	2994807	3516093	3530896	3263421	3032738	2902225
- agrarian profile, people	155319	165231	194125	167506	169877	152841
- specific weight, %	5,19	4,70	5,50	5,13	5,60	5,27
Specialization, in total, people, including:	2453545	1465932	904868	689194	703722	723278
agrarian profile, people	110705	71066	38472	27604	27807	29163
- specific weight, %	4,51	4,85	4,25	4,01	3,95	4,03
Master's degree, in total, people, including:	198319	226934	330715	446872	509425	536169
- agrarian profile, people	9522	9503	13211	21958	29137	32966
- specific weight, %	4,80	4,19	3,99	4,91	5,72	6,15
Total, people, including:	5646671	5208959	4766479	4399487	4245885	4161672
- agrarian profile, people	275546	245800	245808	217068	226821	214970
- specific weight, %	4,88	4,72	5,16	4,93	5,34	5,17

Source: compiled by authors according to the Ministry of Science and Higher Education of the Russian Federation

The Ministry of Education and Science of the Russian Federation refers to the following indicators as signs of inefficiency of higher education institutions: the average score of the unified state examination (not less than 60 score), financing of scientific research (not less than 50 thousand rubles per teacher), number of foreign students among graduates (not less than 0.7%), financing from all sources (not less than 1100 thousand rubles per teacher), area of educational buildings per 1 student (not less than 11 sq.m.). Among agrarian universities the Ministry of Education and Science of the Russian Federation identifies 46.0% of educational institutions as «having signs of inefficiency». Such a high percentage of inefficiency (higher - only in pedagogical universities) is partly due to industry specificity:

- all agrarian universities have lower indicators according to the unified state examination (EGE). This is due not to their inefficiency, but to the low prestige of agricultural professions, as the wage level in agriculture is 50.0% of the average in the economy

of the country and rural territories are not socially developed. Therefore, agricultural universities receive graduates of rural schools (more than 60.0%) who have an average USE score lower than those of urban school graduates;

- agrarian universities have lower indicators on financial criteria due to long ago settled underfinancing (on average 25.0-30.0% less financial resources are spent per student in agrarian universities from the federal budget than in other universities). The low profitability of agricultural organizations does not allow them to attract funds for scientific research.

In addition, one of the most problematic issues of the modern education system is the imbalance of theoretical and methodological training and practical skills of professional activity. While recently the academic knowledge base was the basis for obtaining a demanded profession and a high-paid position, today for employees of intellectual labor spheres it is rather an exception to the rules. The quantitative growth of higher education institutions has led to the devaluation of the idea of higher education itself, as the availability of a diploma has ceased to guarantee decent employment opportunities. This has also affected the attitude of all participants in the educational process as the students do not understand the link between the knowledge received and the future reward, teachers do not have time to adapt to the rapidly changing conditions of practice.

Scientific research shows that this problem is relevant not only in Russia but also in many foreign countries. One of the directions of its solution is the introduction into the education system the principles of dual education which involve coordinated interaction of educational and industrial environment in training of personnel of a certain profile and level of qualification in accordance with the needs of a specific enterprise. Nowadays dual education as the main training system has been introduced in 60 countries of the world, including Germany, Austria, Serbia, Slovenia, Macedonia, Montenegro, Switzerland, the Netherlands, Denmark, France and some Asian countries.

The dual model of higher vocational education combines classical higher education with vocational education or with practical professional activity in the enterprise. In other words, dual learning takes place at the formal (university) and informal (workplace) levels. The features of dual learning are first of all, not just mastering a set of technical skills and abilities but formation of critical thinking and learning through experience. Secondly, the dual education model regards learning as the result of action and problem-solving in the working environment, that is focused on living projects and situations. Third, dual learning also produces knowledge in a collaborative and collective process that involves discussing different ideas, finding and making optimal decisions. And finally, fourthly, dual education requires the learner not only to acquire new knowledge but also develop such a target competence as the ability to learn.

Despite the fact that Germany is considered the pioneer of the dual education system, it cannot be said that this educational concept is innovative for Russia. As early as 1920 a network of factory apprenticeship schools (FZU) was formed in our country as a unified national system of technical and vocational education. Such schools operated in large enterprises to train skilled workers and were the main type of vocational and technical school in the USSR pre-war time. In later periods, the fundamentals of dual education were included in the principles of the functioning of factory and plant training schools, vocational technical schools and technical institutions of higher education in factories (VTUZ). In industrial enterprises training workshops were established and even in the upper secondary schools, one school day per week was given

for practical training in production plants. After the collapse of the Soviet Union this system was abolished although in recent years several steps have been taken to resume it, for example, the launch of the project «Training of workers of high-tech industries on the basis of dual education» in 2014. At the same time, today as before agrarian education is involved in this process partially and superficially.

3. FUTURE RESEARCH DIRECTIONS

Together with industrial enterprises interested in a high level of practical training of graduates due to the complexity of technological processes, agricultural producers also consider dual education a perspective and promising system. The agricultural sector of the economy works closely with biologically active objects of the plant and animal world, and it's impossible to learn this work within the framework of just theoretical training. Not only agronomists and vets need constant practice in fields and farms, but the economists, accountants, marketers and lawyers engaged in the field of agrarian and industrial complex also require knowledge of features of agricultural production. The possibilities of this highly specialized training are provided by the dual education system.

Today the participation of agrarian and industrial enterprises in professional training of specialists is limited to signing of contracts on targeted training, during which the student is given a workplace to practice and perform graduation qualification work and employment after graduation from the higher education institution. The enterprise can pay the student a scholarship and provide other benefits specified in the contract however, it can demand from him reimbursement of the full cost of training in case of refusal of the graduate to work in the enterprise for at least 3 years after graduation from university. Besides, with targeted training, it is impossible to change a specialty, and the enterprise that sent a student to study and paid the full cost of it does not guarantee him/her a high level of wages and career promotion.

The dual education system is devoid of these shortcomings however it is associated with some others. First, its implementation will require changes in the legal and regulatory documents in the field of higher education, both at the federal and regional levels. In particular, the best management solution of an organizational and administrative nature in this case will be the transfer of agrarian universities in agricultural-oriented regions to the jurisdiction of regional Ministries of Agriculture that will allow to co-finance staff training programs for a specific workplace by commercial enterprises interested in qualified personnel and regional authorities interested in development both economy and rural territories.

Secondly, dual education programs are intended for students with a high level of labour motivation that is not inherent in most of modern applicants. This situation can be corrected by a social and psychological system of professional self-determination, introduced at the national level in school education with using modified techniques of personal management and marketing.

In general, the process of reorganization of the agrarian education system on the principles of dual education can be reflected in the scheme in Figure 2:

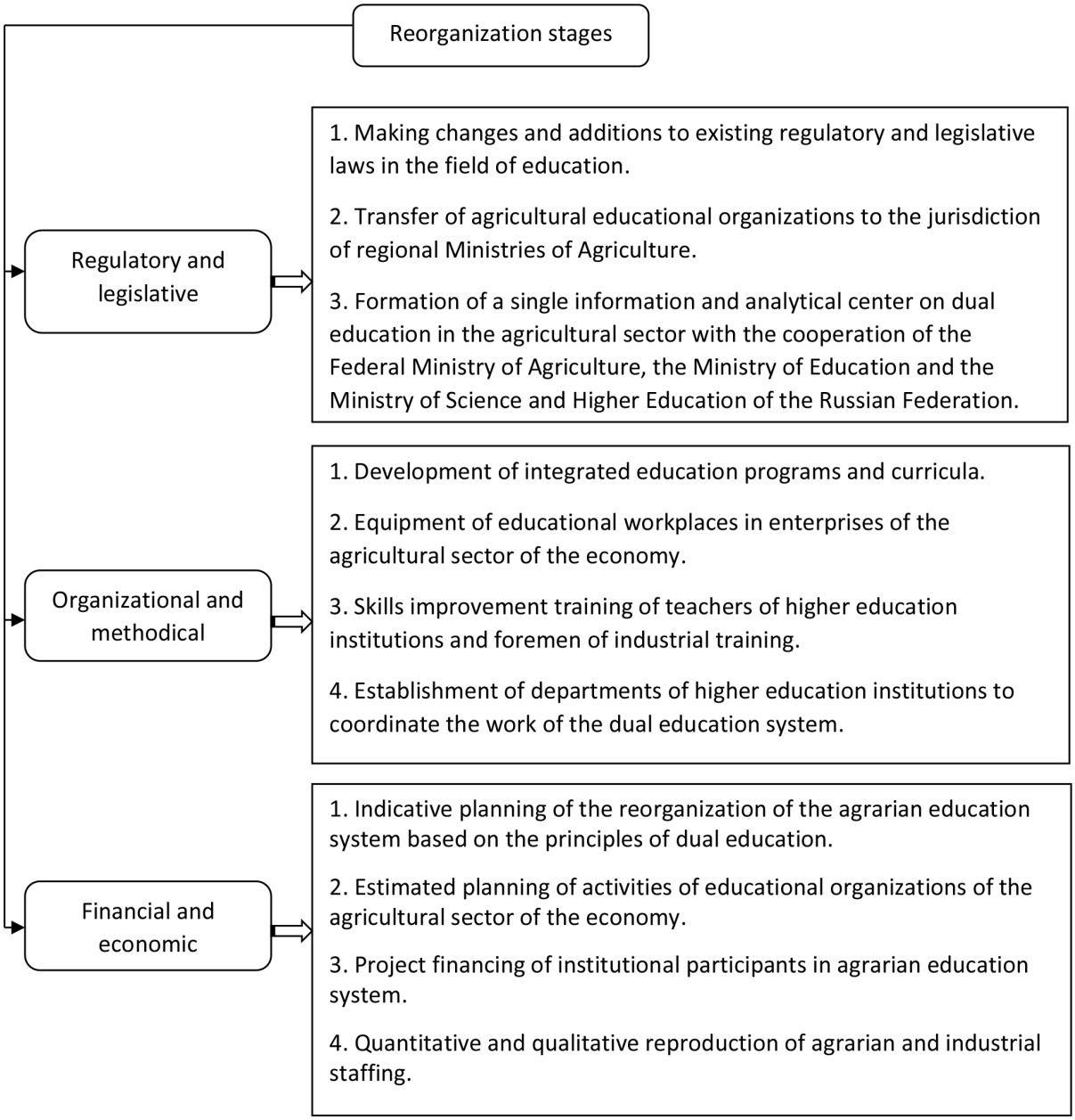


Figure 2. Stages of reorganization of the agrarian education system of the Russian Federation on the principles of dual education

Source: developed by authors

Analysing the proposed stages of reorganization, it should be noted that at present the concept of «dual education» is not regulated in Russia either by the Federal Law «On Education in the Russian Federation» or by other regulatory and legislative laws. At the same time according to the Decree of the President of the Russian Federation «On national goals and strategic tasks of development of the Russian Federation for the period up to 2024», one of the national projects of Russia is «Education», within the framework of which it is possible to distinguish such a separate subprogram as «Dual education».

The reforming of the agrarian education system within the framework of the already existing national project will allow to minimize both organizational and financial risks of the introduction of dual education. Separate subprograms of this project such as «Young Professionals»,

«New Opportunities for Everyone», «Social Elevators for Everyone» contain funds which by their content reflect the stages of reorganization of agrarian education on the principles of dual education. It should be noted that their volume is so sufficient (Table 2) that allows to predict the possible economic results of the proposed changes.

Table 2. Dynamics of financial support volumes for the implementation of the national project «Education» in 2019-2024, million rubles

The title of subprogram	2019	2020	2021	2022	2023	2024
«Young Professionals»	28872,23	25490,84	25465,39	25465,39	25465,39	25485,79
«Social Elevators for Everyone»	230,00	890,00	900,00	900,00	900,00	900,00
«New Opportunities for Everyone»	1080,00	1080,00	1660,00	1660,00	1660,00	2080,00
Total	30182,23	27460,84	28025,39	28025,39	28025,39	28465,79

Source: made by the authors according to the Passport of the national project «Education»

The main goal of any national programs and projects is to achieve certain public or socially significant indicators. At the same time the current conditions of the market economy make it necessary to maximize efficient use of spent resources at any management level including the state level.

During various studies (Koudahl, 2010; Remington, 2017) it was found out that the labour productivity of students in dual education programs including the agricultural sector increases from 5.0 to 7.0% average. At the same time the percentage of employment of graduates of higher education institutions in the specialties chosen by them increases, the qualitative imbalance of labor resources decreases, and in general the situation in the agricultural labour market is now stabilizing. The financial and economic indicators assessment of the functioning of the agricultural education system of the Russian Federation in the dynamics until 2022 is presented in Table 3.

Table 3. Forecast assessment of dual education in the agricultural sector of the Russian Federation

Indicators	2015	2016	2017	2018	2019	2020	2021
Produced gross domestic product of the industry, billion rubles	3214,8	3212,2	3270,3	3268,6	–	–	–
Number of employees in the industry, thousand people	5418,0	5374,0	5074,5	4936,6	–	–	–
Labor productivity, thousand rubles/person	593,4	597,7	644,5	662,1	–	–	–
Number of students in dual education, thousand people	–	–	–	–	105,2	210,8	211,0
Costs of implementing and operating dual education, million rubles	–	–	–	–	5260,0	6324,0	6330,0
Additional gross domestic product of the industry, million rubles	–	–	–	–	3482,0	8719,9	8730,0
Discount multiplier (Central Bank of the Russian Federation discount rate), units	–	–	–	–	1,065	1,134	1,208
Program Net Present Value (NPV)	–	–	–	–	(1669,48)	443,31	2430,1
Profitability Index (PI)	–	–	–	–	0,66	1,04	1,15

Source: made by the authors according to the Passport of the national project «Education»

As it is shown in Table 3, the forecast indicators of dual education implementation in the agrarian and industry complex of the Russian Federation are based on the actual indicators of its gross domestic product, the number of employees in the industry, productivity of their labor and the number of students of agricultural programs. Despite the existing historical and foreign experience, at the first stage it is not reasonable to introduce dual training in all educational organizations of the agrarian sphere, that's why calculations have been made for 10.0% of actual students at the moment.

The integrated curricula provide that in the system of dual education the acquiring of the working profession takes place after the first two years of study together with receiving the theoretical knowledge. Respectively, the number of agricultural students that are planned to be transferred to the dual education system is 105.2 thousand in 2019, and their number will increase to 211.0 thousand people by 2021. Their productivity was also calculated on the basis of professional skills in the first (50.0%), second (75.0%) and third (100.0%) years of work.

The costs of introduction of the dual education in agrarian universities of Russia will mainly include the form of reward for teachers engaged in the development and testing of new integrated curricula. In the following years the amounts of this type of expenditure will decrease, in proportion to the time of actual use of the new methodological support. With regard to enterprises that are the bases of practice, their material and technical re-equipment for dual education will be minimal as training in real production conditions that is the main goal of the system. It should also be noted that additional payment of specialists of enterprises for working with students can be made by redistributing the wage fund of students in proportion to the skills and abilities acquired by them.

Analysing the data presented in Table 3, it can be stated that despite its public and social importance the introduction of dual education in the agricultural sector of the Russian Federation can bring tangible economic effect. The use in the calculations of generally accepted indicators of the efficiency of investment projects (net present value and profitability index) has showed that since the second year of implementation of the proposed measures, the economy of the industry can receive an additional volume of products forming not only food, but also national security of the state.

4. CONCLUSION

In general, the system of dual education in the agrarian and industrial complex of the Russian Federation has reasonable prerequisites not only for the introduction but also for effective interaction with the existing educational structures in order to achieve the uniform purpose of improving the efficiency of the agrarian economy as a whole. Dual training can become not only an effective direction of providing staff support of agrarian and industrial complex but also eliminate the imbalance of jobs, bring in compliance the state, regional, branch employment programs and actual employment indicators, increase the standard of living of rural population and efficiency of agrarian business in general.

As a direction of providing staff supply for the agrarian and industrial complex dual education has all prospects for development not only in the Russian Federation but also in agrarian-oriented regions of other countries, which have not yet implemented its fundamentals in the national educational process. Future specialists studying at specific workplaces are more adapted to the

conditions of agricultural production and are less dependent on the unfavourable situation in the labour market which makes it possible to speak about the synergetic effect of dual education for the agrarian and industrial complex.

The social or technical effect of the introduction of dual education is evident in the stabilization of the process of staffing of the agrarian and industrial complex; the economic effect is noticeable in the growth of gross domestic product and staff productivity. In the national economy of Russia, the minimum possible effect can constitute up to 2.5 billion rubles annually, and the calculation methodology itself can be used as a basis for determining the efficiency of the reorganization of the agricultural education system on the principles of dual education.

REFERENCES

DeMarco, T., & Lister, T. (2013). *Peopleware: Productive Projects and Teams*. New York: Addison-Wesley Professional.

Zorin, A. S., Zorina, N. A., & Safrygin, P. A. (2017). Theoretical and methodological approaches to evaluating the impact of staff development on labour efficiency. *Upravlenets [The Manager],* 1(65), 2-8.
https://elibrary.ru/download/elibrary_29317458_58371102.pdf

Lyula, V. V., & Divina, T. V. (2019). Staffing as one of the components of the resource saving process. *Economics and Business: Theory and Practice,* 7, 119-121.
https://doi.org/10.24411/2411-0450-2019-11088

Strijeus, L. V., Kravchenya I. V. (2017). Theoretical and applied aspect of intelligent and staff supply management of the enterprise. *Economic Forum*, 3, 222-227.
https://elibrary.ru/download/elibrary_29901194_68330209.pdf

Stathakopoulos, V., Kottikas, K. G., Theodorakis, I. G., & Kottika E. (2019). Market-driving strategy and personnel attributes: Top management versus middle management. *Journal of Business Research*, 104, 529-540.
https://doi.org/10.1016/j.jbusres.2018.09.020

Teruyama, H., Goto Y., & Lechevalier S. (2018). Firm-level labor demand for and macroeconomic increases in non-regular workers in Japan. *Japan and the World Economy,* 48, 90-105.
https://doi.org/10.1016/j.japwor.2018.08.006

Ecirli, A., Dobre, E.-M., Dobrescu, E., & Danetiu, M. I. (2014). Human Resources in European Market in the Past Decade – A Sociological Overview. *Procedia – Social and Behavioral Sciences*, 150, 320-329.
https://doi.org/10.1016/j.sbspro.2014.09.070

Salehi-Isfahani, D., & Mostafavi-Dehzooeic M. H. (2018). Cash transfers and labor supply: Evidence from a large-scale program in Iran. *Journal of Development Economics*, 135, 349-367.
https://doi.org/10.1016/j.jdeveco.2018.08.005

Kopylova, M. A., & Novikov, V. G. (2008). Methodological principles of human resources management. *Vestnik Rossijskogo gosudarstvennogo agrarnogo zaochnogo universiteta [Journal of the Russian State Agrarian Correspondence University]*, 2, 138-139.

Iskandarov, H. H. (2017). *Improvement of the motivational mechanism of staff supply of the agricultural sector of the economy (on the materials of the Republic of Tajikistan).* Dushanbe: Tajik National University.
http://tguk.tj/failes/sovet/zashita/iskandarov-hofiz-hak/

Anfinogentova, A. A., Dudin, M. N., Lyasnikov, N. V., & Protsenko, O. D. (2018). Providing the Russian Agro-Industrial Complex With Highly Qualifi ed Personnel in the Context of the Global Transition to a «Green Economy». *Ekonomika regiona [Economy of Region]*, 14(2), 638-650.
https://doi.org/10.17059/2018-2-24

Belokopytov, A. V. (2015). Improving retention of young professionals in the agricultural sector of the regional economy. *Ekonomika truda [Russian Journal of Labor Economics]*, 2(4), 255-266.
https://doi.org/10.18334/et.2.4.1919

Statistical information in research and development and higher education. *Official statistics of the Ministry of Science and Higher Education of the Russian Federation.*
https://minobrnauki.gov.ru/ru/activity/stat/highed/index.php

Education. *Official statistics of the Federal State Statistics Service of the Russian Federation.*
https://www.gks.ru/folder/13398

Passport of the national project «Education». Approved by the Presidium of the Council under the President of the Russian Federation on Strategic Development and National Projects (Protocol No. 16, 24th December 2018). http://www.consultant.ru/cons/cgi/online.cgi?req=doc&base=LAW&n=319308&fld=134&dst=1000000001,0&rnd=0.8046021527064344#012749859705917688

Koudahl, P. D. (2010). Vocational education and training: dual education and economic crises Procedia - Social and Behavioral Sciences, *9, 1900-1905.* https://doi.org/10.1016/j.sbspro.2010.12.421

Remington, T. F. (2017). Public-Private Partnerships in VET: Translating the German Model of Dual Education. *The Journal of the New Economic Association*, 4(36), 182-188. http://www.econorus.org/repec/journl/2017-36-182-189r.pdf

PROVIDING ENERGY SYSTEMS OF THE ARCTIC TERRITORIES OF THE REPUBLIC OF SAKHA (YAKUTIA) WITH RESOURCES: PROBLEMS AND PROSPECTS

Tatiana Egorova[1]
Anna Delakhova[2]

DOI:

Abstract: *This article presents analysis of the energy system of the Arctic zone of the North-East of Russia - the Republic of Sakha (Yakutia): by heat supply objects and production of electricity. This system in question features autonomy and dependence on provision of resources during short navigation periods of cargo delivery through complex transport schemes. The main problem expressed of transportation of resources, a high transport component in cost of production is designated. This causes energy companies to use mechanisms of cross-subsidies, which fact in general affects the price policy of public utilities in the region. Development of Russian Arctic territories requires reliable sources of electricity, thus in connection with the geographical features the region needs new solutions and technologies. It is necessary to provide measures of state support for the formation of pricing policy aimed at stimulating the use of renewable energy sources.*

Keywords: *Arctic Zone, Autonomy Energy Supply, Heat Supply Objects, Transport Component, Cross-Subsidies, Renewable Energy Sources.*

1. INTRODUCTION

Challenges and threats to Russia's national interests in Arctic region raise the need for a rethinking of position and role of the country's Arctic territories in ensuring its strategic economic and social development, in strengthening its defense capability and national security. The Arctic zone of the Russian Federation (Russian Arctic) is a special, very specific combination of regions and parts thereof, which differs from the rest of the country's territorial entities not only by a well-known set of natural factors (climate severity, lack of insolation and oxygen, sudden changes in atmospheric pressure, polar night and day, widespread permafrost, several-fold reduced ability of landscapes and ecosystems to self-repair, including effects of techno genic impacts), but also by uncertainty of the legal status.

Supplies to isolated energy systems of Arctic Territories are characterized by a high production cost, which entails increased expenditures from regional budgets for subsidizing electric power supply, subsidizing transportation costs for the resources delivery, companies' implementation of "cross subsidizing" mechanisms to cover the transport costs. One of the principal factors affecting the high cost of energy production in Arctic is the transport factor. Basis of the Arctic territories' energetics is imported fuel. Necessary resources are supplied via complex transport schemes within short navigation periods twice a year (for example in the Republic of Sakha (Yakutia)), including in connection with the need to deliver oil products for diesel power plants

[1] North-Eastern Federal University, Scientific-Research Institute of Regional Economy of the North, 678000, 8 Builders str, Yakutsk, Russian Federation

[2] North-Eastern Federal University, Scientific-Research Institute of Regional Economy of the North, 678000, 8 Builders str, Yakutsk, Russian Federation

and boiler stations from other nearby territories. Therefore, uninterrupted heat supply and electricity supply to population and budgetary enterprises depends on smooth functioning of „the northern deliveries" system and on level of transport infrastructure development. During the short period of the Arctic navigation from August to October months are delivered about 400 thousand tons of life-supporting freights from which:

- Coal of 182 thousand tons;
- Crude oil of 58 thousand tons;
- Gas condensate of 13 thousand tons;
- Oil products of 107 thousand tons;
- Food products of 1,3 thousand tons;
- Production of PTN of 24 thousand tons;
- Construction materials of 4 thousand tons;
- Production of agricultural – 0,5 thousand tons.

Delivery of cargoes in the navigation season in the Arctic and Northern areas is made from Dzhebariki-Huy's mine, the item of Handyga (24%), across the Northern Sea Route (21%), from Ust-Kut (16%), from the Zyrian coal mine (14%), from the Lensk oil depot, Olekminsk (14%), from Yakutsk, with the item Nizhny Bestyakh (5%), with the item Kysyl-Syr Vilyuyskogo of the area, the item Taas-Yuryakh (4%) and from other points (2%).

Figure 1. Distribution of cargo flows of energy resources in the Republic of Sakha (Yakutia)
Source: authors, calculations

Development of Russian Arctic territories requires reliable sources of electricity, thus in connection with the geographical features the region needs new solutions and technologies. Taking into account the remoteness of settlements, using of standalone power supply facilities and of renewable sources are of particular importance.

The high potential of solar energy exists in the Republic of Sakha (the amount of solar energy is comparable to southern parts of Russia and Germany). Other parts of the region are perspective for effective seasonal use of solar energy. Geographical and climate conditions of the Arctic require special adaptive design for solar plants (low sun declination angles, wide ranges of azimuth, low temperature, energy accumulation, etc.).

Currently 13 municipal districts of the Republic of Sakha (Yakutia) with total area of 1 620.8 thousand sq. km (52.2% of the republic's territory) are assigned to the Russian Federation Arctic zone territories. Number of permanent residents of the territories at the beginning of 2019 has made 67 674 people (7% of the republic's population). The population density makes 0,04 people per 1 sq. km. (for reference: population density in Canada makes 3.5 people per 1 sq. km, Alaska - 0.4). Duration of heating season in the Arctic municipal areas ranges from 265 to 312 days per year (table 1). It means that almost throughout a year, heat supply enterprises of the Arctic territories provide heat, light and water to the population and budgetary-financed organizations. In order to ensure occupational and vital safety of the population under the existing transport scheme for the resources supply within the short navigation periods, permanent state stocks of coal and oil products are reserved in fuel and energy complex enterprises of the Republic.

One of the main factors hampering social and economic development of Arctic and northern territories of the Republic of Sakha (Yakutia) is a sparsely populated and vast territory with a complex transport scheme for cargo delivery, low level of transport accessibility and severe geographic and climatic conditions. Due to the growing interest in the development of territories and natural resources of Arctic regions, issues of integrated development of the energy infrastructure, providing comfort level of living and working conditions, are becoming increasingly relevant. Complexity of supplies of resources to fuel and energy complex of Arctic territories of the Republic of Sakha (Yakutia), due to high transport costs, determines the need to find radical solutions and change approach to the energy supply to the region. The main step towards solving this problem may become elaboration of the Small Energy Development Strategy for Arctic.

Table 1. Duration of the heating season and indicators of climatic parameters in the Arctic regions of Yakutia

		Area of the territory 1000.km^2	**Number of population**	**Air temperature of the coldest five-day week, °C**	**Absolute minimum air temperature, °C**	**Duration of a heating season, days**
Yakutia`s Arctic districts		**1620,5**	**67 674**			
1	Abyysky	69,4	3979	-53	-58	284
2	Allaikhovsky	107,3	2708	-52	-61	297
3	Anabar	55,6	3597	-55	-60	308
4	Bulunsky	235,1	8340	-56	-62	295
5	Verkhnekolymsky	67,8	4049	-51	-59	265
6	Verkhoyansk	137,4	11133	-61	-68	272
7	Zhigansky	140,2	4178	-54	-60	275
8	Momsky	101,7	3973	-58	-62	267
9	Nizhnekolymsky	86,8	4290	-53	-63	274
10	Oleneksky	318,1	4148	-57	-60	284
11	Srednekolymsky	125,2	7424	-52	-58	277
12	Eveno-Bytantaysky	120,3	2827	-58	-65	275
13	Ust-Yansky	55,6	7028	-53	-62	312

Source: Sleptsov, 2015.

2. ENERGY SYSTEM OF THE ARCTIC ZONE OF THE REPUBLIC OF SAKHA (YAKUTIA)

The Republic of Sakha (Yakutia) is one of the Russian Federation regions, featured by decentralized system of energy zones, i.e. on its territory there are several energy regions with energy sources different by types and in terms of fuel used. Arctic municipal areas of the republic belong to the northern energy area, where small diesel power plants are used, and now the zone is energy-excessive.

2.1. Electric power industry

Power system of Arctic municipal regions of the Republic of Sakha (Yakutia) by electric power generation includes 85 diesel power plants of JSC Sakhaenergo.

Total installed capacity of diesel power plants is 162 MW. To generate electricity to ensure vital activity of population of Arctic territories of the region, it is necessary to provide 56,569 th. tons of diesel fuel and 1,031 th.tons of crude oil (table 2).

Table 2. Annual fuel consumption on power production in the Arctic regions of Yakutia, 2018.

		Number of diesel power plants, piece	Rated capacity, MW	The average annual fuel consumption on production of electricity, ton	
				diesel fuel	crude oil
Yakutia`s Arctic districts		**85**	**162**	**56 569**	**1 031**
1	Abyysky	7	7,6	3 190	0
2	Allaikhovsky	5	9,4	2 526	0
3	Anabar	2	6,6	2 773	0
4	Bulunsky	8	20,7	8 150	785
5	Verkhnekolymsky	5	15,9	5 453	0
6	Verkhoyansk	20	20,7	9 249	0
7	Zhigansky	4	8,8	3 592	246
8	Momsky	4	5,8	3 156	0
9	Nizhnekolymsky	4	11,7	2 084	0
10	Oleneksky	3	6,5	2 904	0
11	Srednekolymsky	10	11,6	5 136	0
12	Eveno-Bytantaysky	3	4,1	1 376	0
13	Ust-Yansky	10	32,6	6 980	0

Source: authors, calculations

2.2. Heat supply

Currently 155 boiler stations for heating and water supply operate on the territory of Arctic municipal regions of the Republic of Sakha (Yakutia), 83 of which are heated on coal and 72 - on oil products (crude oil, diesel). Total length of the main heat supply network is 577 km. In 2018, boiler stations of Arctic territories produced 1394.1 thousand Gcal, of which 25% were lost (Table 1). All boiler stations of Arctic settlements of the republic belong to SUE „Housing and community amenities of RS (Ya)" - the leading monopolist in the utility services market of the republic by territorial presence and number of served heat generation sources as well as by coverage of budgetary institutions. According to the enterprise's investment program, annually, in order to up-

grade heat supply facilities and develop fundamentally new low-energy technologies, production branches replace boiler, combustion equipment, as well as replace utility heat supply networks.

Table 3. Annual fuel consumption on power production for heat supply of the Arctic of Yakutia

		Quantity of boiler rooms of heat supply		The average annual need for resources for heat supply, ton		The volume of the developed heat for 2018, thousand Gcal
		coal	crude oil	coal	crude oil	
Yakutia`s Arctic districts		**83**	**72**	**241 191**	**59 868**	**1394,1**
1	Abyysky	11	3	18 000	3 350	96,5
2	Allaikhovsky	0	10	-	9 238	69,6
3	Anabar	0	8	-	-	73,7
4	Bulunsky	0	11	-	16 264	153,2
5	Verkhnekolymsky	12	0	36 914	-	114,4
6	Verkhoyansk	24	0	66 189	320	203,4
7	Zhigansky	7	1	20 763	320	81,7
8	Momsky	4	9	4 762	9 000	105,7
9	Nizhnekolymsky	4	2	22 413	4 198	97,8
10	Oleneksky	0	17	-	6 254	75,7
11	Srednekolymsky	13	1	36 860	494	133,3
12	Eveno-Bytantaysky	3	6	-	4 550	38,2
13	Ust-Yansky	5	4	35 290	5 880	150,9

Source: authors, calculations

3. METHODOLOGY

Purpose of the study is to develop practical recommendations for improving the mechanisms of provision of fuel and energy resources to Arctic municipal regions of the Republic of Sakha (Yakutia).

To achieve the purpose, the following tasks were set: to analyze current state of the energy system in Arctic municipal regions of the republic; identify economic problems associated with the specifics of the region; to offer practical recommendations for improving the mechanisms of provision of fuel and energy resources in Arctic conditions of the Republic of Sakha (Yakutia). The main study methods include system approach, analysis and synthesis, comparative analysis, analysis of statistical data, expert method. The study information base included annual reports of fuel and energy complex enterprises of the Republic of Sakha (Yakutia), such as PJSC Yakutskenergo, JSC Sakhaenergo, SUE „Housing and community amenities of RS (Ya)", as well as tariff plans for transportation of oil products of JSC Sakhaneftegazsbyt.

4. ANALYSIS OF PROBLEMS OF PROVIDING RESOURCES TO ENERGY SYSTEM OF ARCTIC OF THE REPUBLIC OF SAKHA (YAKUTIA)

4.1. Provision of resources to electric power industry facilities

The following contractors deliver diesel fuel for the production program: PJSC AK Yakutskenergo, OJSC NK Tuymaada-neft, OJSC Vostek, JSC Sahaneftegazsbyt, JSC Artikoil and SUE „Housing and community amenities of RS (Ya)". CJSC Irelyakhneft, JSC Teploenergoservis, JSC Teploenergo supply crude oil. In 2018, 56,569 t. tons of diesel fuel and 1,031 t. tons of crude oil were transported.

Annual delivery of diesel fuel for the needs of Arctic small diesel power plants is carried out by complex transport schemes using points of long-term storage until the next navigation. For example, let us consider the scheme for provision of resources for electricity generation in Srednekolymsky Municipal Region: 1 transport scheme „Ust-Kut river port – oil depot in Nizhnekolymsk – storage within 107 days – delivery by motor transport through winter snow road – Srednekolymsk oil depot".

The price of transportation of diesel fuel consists of the cost of transportation by river tankers and road transport in the winter period from nearby oil depots. The average cost of delivery of diesel fuel to the Arctic regions exceeds the cost of delivery to the southern regions of the Republic by 8-11 times. Thus, share of transport component in the cost of electricity production makes 36% - 48%.

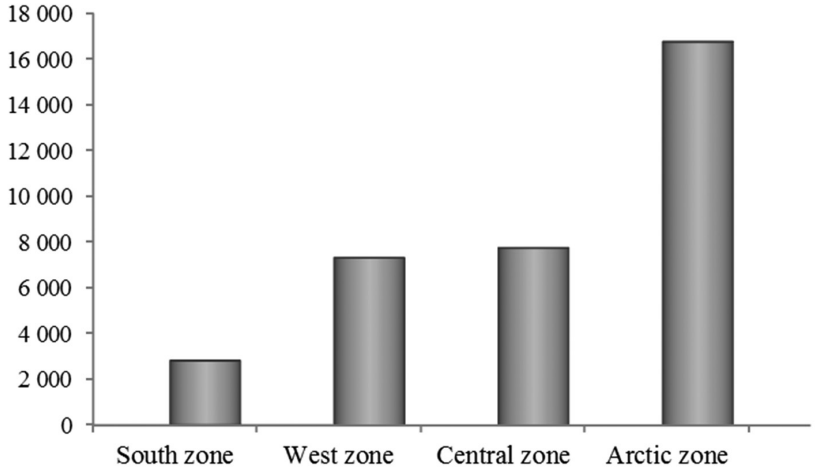


Figure 2. Cost of delivery of diesel fuel, RUB / ton, calculations 2018 year

Source: authors, calculations

In order to avoid high electricity tariffs for the population of the Arctic municipal districts the Government of the republic use subsidization of power supply at the expense of the large industrial enterprises. Thereby, using the unique instrument of „cross subsidizing" in region power industry. Economic reasonable price of production of electricity in the Arctic of Yakutia goes above the established tariffs by 10 times. The half-received profit is compensated for the account of overestimate of tariffs in the central part of the republic and financial investments of large industrial companies.

4.2. Provision of resources to heat supply facilities

To ensure uninterrupted operation during the heating season 2018, totally 709,551 t. tons of resources were delivered, of which 437,726 t. tons of coal and 186,551 t. tons of oil products. Currently, SUE „Housing and community amenities of RS (Ya)" independently organizes delivery of fuel and energy resources and provision of non-reducible reserve of fuel and energy resources. Department of Fuel Supply of the Enterprise organizes management of fuel and energy resources supply to the regional branches and distribution thereof. Coal for the needs of SUE „Housing and community amenities of RS (Ya)" is transported from Zyryansky coal mine and from Verkhnekolymsky branch storage base. Oil products supplied during the short navigational period are being delivered from oil depots of JSC Sakhaneftegazsbyt. Principal transport services providers are local shipping and transportation companies. At the same time, JSC Sahaneftegazsbyt provides storage services to SUE „Housing and community amenities of RS (Ya)" in its oil depots in Arctic territory for RUR 11.17 per ton per day.

Since the main supply of oil products is carried out during navigation period, the enterprise does not have enough own funds to purchase annual volume of fuel. In this regard, the enterprise has to tap a credit facility, interest on which is included into sale prices. Taking into account the policy of government support for providing fuel and energy resources to areas with local energetics, the enterprise receives publicly funded loans. Also, transportation costs for delivery of fuel and energy resources for Arctic municipal needs are annually subsidized from the republican budget.

5. FORECAST OF DEVELOPMENT OF ARCTIC ENERGY SYSTEM IN THE REPUBLIC OF SAKHA (YAKUTIA) BASED ON RENEWABLE ENERGY SOURCES AND LOCAL FUELS.

Renewable energy sources (RES) due to high capital intensity thereof at present time and in the immediate future can be effectively used only in decentralized power supply zone. The main objective of applying renewable energy sources is to reduce consumption of diesel fuel, reducing the cost of its delivery. The electric power generated by the Batagai station allows to save up to 300 tons of diesel fuel annually. The Republic of Sakha (Yakutia) has a significant potential for renewable natural energy resources, which makes it possible to effectively apply them in local energy facilities. In this regard, use of renewable energy sources is extremely relevant.

As at beginning of 2019, 10 renewable energy sources with total capacity of 2125 kW operate in the arctic municipal territories, including 8 solar power plants (SPP) with total capacity of 1225 kW and 1 wind power plant (WPP) with capacity of 0.9 MW. Forecast of development of the energy sector in terms of renewable energy sources is currently based on investment plans of JSC Sakhaenergo and PJSC Yakutskenergo. Until 2022 it is planned to introduce a complex of wind power plant in the settlement of Tiksi (Bulunsky district) with total capacity of 3 MW, as well as power storage and automatic control systems, commissioning of new generating equipment at 13 diesel power plants to replace the old units with total capacity of 8,65 MW.

Table 4. Installed capacity of renewable energy sources in the Arctic zone of the Republic of Sakha (Yakutia)

Municipal district	Human settlement	Total installed capacity, kW	Diesel fuel economy, tons / year
Solar power plant			
Abyskiy	Cyberganja	20	6,39
Verkhoyansk	Dulgalah	10	8,53
	Batagay	1000	230,4
	Betankes	40	12,15
	Yunkyur	40	14,15
	Stolby	10	4,1
Zhigansky	Cystatyam	40	14,15
Oleneksky	Ayk	40	13,05
Eveno-Bytantayskiy	Djargalah	15	5,86
	Subtotal	1225	313,22
Wind power stations			
Bulunskiy	Tiksi	900	250
	Total	2125	563,22

Source: Ivanova, 2018.

Prospective use of local fuels is planned due to construction and commissioning in 2020 of Zyryanskaya midget power plant for power supply to nearby settlements. Coal from Zyryanskoe

field will be used as fuel. Rated output power capacity of the midget power plant will be 10 MW, the thermal one - 25 Gcal / h. Russian Arctic possess vast local resources of renewable energy, which can be widely utilized for the industrial and household needs. Still, the use of combined and renewable power plants is limited in the Arctic region both in Russian and worldwide due to the specific climate conditions and corresponding challenges. The analysis of several years of operation of solar power plants in the Arctic regions of the Republic showed that the generation of electricity by solar power plants during the year has a spring maximum and is almost zero in the winter, regardless of the latitude of the terrain. The latitudinal location also does not influence the payback period, but the dependence on the price of substituted diesel fuel is traced. The payback period on average is about 10 years. The appearance of an additional source of energy increases the reliability of the power system of isolated settlements.

6. CONCLUSION

Within the framework of spatial development and strengthening of energy security of the regional energy systems of the Arctic zone, the long-term objectives are to implement a set of measures to ensure:

- formation of coal mineral resource centers in the Arctic zone;
- territorial and production optimization of coal mining and transportation of coal products;
- optimization of transport logistics and development of transport infrastructure.

In order to create favorable conditions for the use of renewable energy sources on the territory of the Arctic municipal districts of the Republic of Sakha (Yakutia), state support measures should be provided:

- formation of pricing policy aimed at promoting the use of renewable energy sources, as well as energy produced from renewable energy sources;
- formation of mechanisms to stimulate investment activity by attracting credit resources for the implementation of renewable energy projects, including the creation of profitable conditions for investors.

The high cost of production and annual costly measures to ensure the resources of the energy system of the Arctic municipal regions of the Republic of Sakha (Yakutia) cause the need for a state policy to increase the share of renewable energy sources. Creation of a system of legal and financial and economic mechanisms that provide economic incentives on part of public authorities for operations in the sphere of renewable energy sources use will ensure environmental protection and rational use of natural resources.

ACKNOWLEDGMENT

The article was prepared as part of the project by order of the Ministry of Education and Science of the Russian Federation No. 26.8327.2017/8.9

REFERENCES

Annual reports of JSC «Sakhaenergo» 2011– 2016. [Electronic resource]. – Access mode: http://sakhaenergo.ru/index.php. (Date of issue: 29.09.2019).

Biev, A. (2019). Formation of territorial infrastructure for fuel and energy resources supply in the Russian Arctic zone. *North and Market: Shaping the Economic Order*. 3(65), 43-51. https://elibrary.ru/item.asp?id=41286368

Balashova, E., Gromova, E. (2017). Arctic shelf development as a driver of the progress of the Russian energy system. MATEC Web of Conferences, 106, (pp. 06008), International Science Conference On Smart City, Saint-Petersburg: SPBWOSCE 2016., 15-17 November's 2016 г. EDP Sciences. https://doi.org/10.1051/matecconf/201710606008

Bodrova, E., Dolgosheev, V., Kirpichnikova, I., Korobatov, D., Martyanov, A., Sirotkin, E., Solomin, E. (2017). Comparative Analysis of Solar Modules Operation in the Arctic Climate of Russia and Canada. *International Scientific Journal Alternative Energy And Ecology.* 28-30, (240-242). https://doi.org/10.15518/isjaee.2017.28-30.012-024

Elyakov, A., Elyakova, I., Pakhomov, A., Darbasov, V. (2018). Economic and legal mechanism for the development of renewable energy sources in the Arctic zone of the Russian Federation/ *International Journal of Civil Engineering and Technology*. 9(10), 1072-1083. https://elibrary.ru/item.asp?id=38666022

Frolov, I. (2015). Development of the Russian Arctic zone: Challenges facing the renovation of transport and military infrastructure. *Studies on Russian Economic Development*. 26 (6), 561-566. https://doi.org/10.1134/S1075700715060040

Gavrilyeva, T., Juror, M., Tabata, Sh., Stepanova, N., Bochkarev, N., Sivtseva, T. (2016). Territorial differentiation in ensuring the availability of electricity and heat in Yakutia / *The Arctic of the XXI century. Humanities sciences.* 2 (8), 42-56. https://elibrary.ru/item.asp?id=27219079

Ivanova, I., Nogovitsyn, D., Tuguzova, T., Sheina, Z., Sergeyeva, L. (2018). An Analysis of Solar Power Plants Operation in the Off-Grid Area of the Republic of Sakha (Yakutia*). International Scientific Journal Alternative Energy and Ecology.* 10-12 (258-260), 12-22. http://doi.org/10.15518/isjaee.2018.10-12.012-022.

Kirsanova, N., Lenkovets, O., Nikulina, A. (2018). The role and future outlook for renewable energy in the Arctic zone of Russian Federation. *European Research Studies Journal*. 21, 356-368. https://elibrary.ru/item.asp?id=38673173

Kiseleva, S.V., Ermolenko, G.V., Popel O. S. others (Ed.). (2015). Atlas of renewable energy resources in Russia. Moscow: Lomonosov MSU, Joint Institute of HT of RAS.

Larchenko, L., Kolesnikov, R. (2018). Regions of the Russian Arctic zone: state and problems at the beginning of the new development stage. *International Journal of Engineering and Technology (UAE)*. 7(3.14), 369-375. http://doi.org/10.14419/ijet.v7i3.14.17028.

Leksin, V., Porfiriev, B. (2018). Russian Arctic today: Substantive novelties and legal collisions. *Economy of Region*. 14(4), 1117-1130. DOI: 10.17059/2018-4-5

Morgunova, M., Solovyev, D. (2017). Challenges to overcome: energy supply for remote consumers in the Russian Arctic. Journal of Physics: Conference Series Cep. „International Conference „Problems of Thermal Physics and Power Engineering", November 2017. 891(1), (p.p. 012157). Moscow: Institute of Physics Publishing. https://iopscience.iop.org/article/10.1088/1742-6596/891/1/012157

Pavlenko, V., Melamed, I., Kutsenko, S., Tutygin, A., Avdeev, M., Chizhova, L. (2017). The foundations of balanced socio-economic development of the territories of Arctic zone of the Russian Federation. *Vlast'* 25(6), 7-17. https://elibrary.ru/item.asp?id=29449536

Pitelis, A., Vasilakos, N., Chalvatzis, K. (2019). Fostering Innovation in Renewable Energy Technologies: Choice of policy instruments and effectiveness. *Renewable Energy, Journal Pre-proof.* https://doi.org/10.1016/j.renene.2019.11.100

Popel, O., Kiseleva, S., Morgunova, M., Gabderahmanova, T. and Tarasenko, A. (2015). The use of renewable energy sources for power supply to consumers in the Arctic zone of the Russian Federation. *Arctic: Ecology And Economy.* 1(17), 64-69. https://elibrary.ru/item.asp?id=23525035

Proskuryakova, L., Ermolenko, G. (2019). The future of Russia's renewable energy sector: Trends, scenarios and policies. *Renewable Energy.* 143, 1670-1686. https://doi.org/10.1016/j.renene.2019.05.096

Scheme and program of development of electric power industry of the Republic of Sakha (Yakutia) for 2019-2023 [Electronic resource]. – Access mode: http://docs.cntd.ru/document/553273832. (Date of issue: 29.09.2019).

Sleptsov, A. (2015). Russian Arctic regional development aspects by the example of the Republic of Sakha (Yakutia). *Arctic and North.* 19, (115-133). https://elibrary.ru/item.asp?id=23529463

Tatarkin, A., Loginov, V., Zakharchuk, E. (2017). Socioeconomic problems in development of the Russian Arctic zone. *Herald of the Russian Academy of Sciences*. 87(1), 12-21 https://link.springer.com/article/10.1134%2FS101933161701004X

Tysiachniouk, M., Petrov, A. (2018). Benefit sharing in the Arctic energy sector: Perspectives on corporate policies and practices in Northern Russia and Alaska. *Energy Research & Social Science*. 39, 29–34. https://www.sciencedirect.com/science/article/pii/S2214629617303420?via%3Dihub

ANALYSIS OF SELECTED INDICATORS OF THE TAX BURDEN ON ENTREPRENEURS IN THE EU

Jaroslav Korečko[1]
Ivana Ondrijová[2]

DOI:

Abstract: *The idea of gradually converging the tax systems of the Member States of the European Union is as old as the Union itself. It can be stated that the achievement of tax harmonization objectives has progressed in many areas. The main objective of this process is to facilitate the movement of goods and services in the common European market and to remove administrative barriers to cross-border trade within the Union. The paper aims to examine and analyze similarities, respectively the diversity of Member States' tax systems in different respects. Priority analysis is focused on business entities. It can be stated that the tax or administrative burden on entrepreneurs in EU countries varies to a large extent.*

Keywords: *Tax and Contribution Rate, Entrepreneur, European Union, Cluster Analysis*

1. INTRODUCTION

Specifics in each country's development have led to the fact that the tax systems applied in each country have evolved and are still evolving in a different way, in line with the specific circumstances and objectives of each country. The structure and content of an optimal tax system depends on who, when and where it will create or apply it. The European Union endeavors to create a harmonized structure of the Member States' tax systems, thus promoting a better functioning of the internal market.

2. THEORETICAL BACKGROUND

The second half of the 20th century was characterized by a relatively rapid process of globalization and internationalization in many social areas, including international economic cooperation. Of course, the European Union and its Member States, with their own tax systems, could not avoid this from the outset. Tax systems need to respond to the systems of their trading partners as a result of increasing international trade.

The convergence of tax systems is often associated with different terms to express this process. To explain these terms, we use the Council of Economic Analysis (2014) definitions:

"Cooperation" refers to joint optimization: countries A and B jointly determine the tax bases and rates so as to maximize some common social objective. In the European union, the common external tariff policy is an example of cooperation. "Coordination" refers to commitment: since the choices of country A depend on those of country B and vice versa, there might be multiple equilibria (for instance one with high tax rates and another one with low tax rates). Coordination then consists in a reciprocal commitment to a specific behavior. Coordination includes infor-

[1] University of Prešov in Prešov, Faculty of Management, Konštantínova 16, 08001 Prešov, Slovakia
[2] University of Prešov in Prešov, Faculty of Management, Konštantínova 16, 08001 Prešov, Slovakia

mation exchange, for instance on savings income. "Harmonization" refers to an equalization of tax bases and/ or tax rates. A variant of harmonization is to impose minimum bases or rates. Harmonization is one form of coordination. "Convergence" refers to a narrowing of base differentials or of tax differentials. Convergence may arise from coordination or from competition.

Harmonization will in general refer to full equalization of tax rates, while tax coordination will encompass rate harmonization as well as other less sweeping measures, such as minimum tax rates or unified tax bases. (Zodrow, 2003, Široký, 2010).

Proponents of the unification of tax systems argue that harmonization is a prerequisite for the functioning of the single market, while opponents are convinced that, in the case of direct taxes, sovereignty in individual countries should be maintained (tax competition). Keen (1993, p. 16) explain that "there may exist collective gains from limited measures of harmonization in particular areas or, more flexibly still, from mutual adherence to some simple rules in tax-setting."

Mintz (2004) points to corporate tax consolidation. He says, it would reduce the need for European governments and businesses to comply with complicated rules such as the allocation of overhead costs (especially interest expense), transfer pricing, transferability of losses, financial derivative trading and cross-border mergers and acquisitions. Even with consolidation, individual European states could still operate with a great deal of autonomy by providing special treatment to business activities through state-specific tax rates, credits and allowances.

One of the reasons for the need for tax harmonization is international juridical double taxation. OECD (2019) defines international juridical double taxation as the imposition of comparable taxes in two (or more) States on the same taxpayer in respect of the same subject matter and for identical periods. It has harmful effects on the international exchange of goods and services and cross-border movements of capital, technology and persons. In recognition of the need to remove this obstacle to the development of economic relations between countries, as well as of the importance of clarifying and standardizing the fiscal situation of taxpayers who are engaged in activities in other countries, the OECD Model Tax Convention on Income and on Capital provides a means to settle on a uniform basis the most common problems that arise in the field of international juridical double taxation (OECD, 2019).

The Convention establishes two categories of rules. There is determined regarding different classes of income, the respective rights to tax of the State of source or situs and of the State of residence and it is done the same regarding capital. In the case of several items of income and capital, an exclusive right to tax is conferred on one of the Contracting States. The other Contracting State is thereby preventing from taxing of those items and double taxation is avoided. As a rule, this exclusive right to tax is conferred on the State of residence (OECD, 2019).

3. MATERIAL AND RESEARCH METHODS

Despite significant rises since 2010, EU-28 income tax revenue as a percentage of GDP reached a plateau in 2015, with euro area following a broadly similar trend. The structure of taxation varies quite significantly across the Member States. When it comes to the share of direct taxes in total tax revenues, Denmark has the highest share (66%), followed by Ireland, the United Kingdom, Sweden and Malta with shares lying between 40% and 50% of revenue. (Genschel, Jachtenfuchs, 2018)

Figure 1 shows the evolution of Total Tax and Contribution Rate (TTCR) over the period 2012 to 2017 in the Member States. The graph clearly shows that the evolution of TTCR for 5 years long period was diverse. The most significant drop in the rate was recorded in Italy (-12.7%), followed by Spain (-11.6%) and Hungary (-9.4%). On the other hand, the largest rate increase was recorded in Greece (+ 7.9%). The tax burden on businesses has not changed only for Bulgaria. The EU-27 average (excluding Croatia) was 41% in 2017, while France recorded the highest TTCR (60.4%).

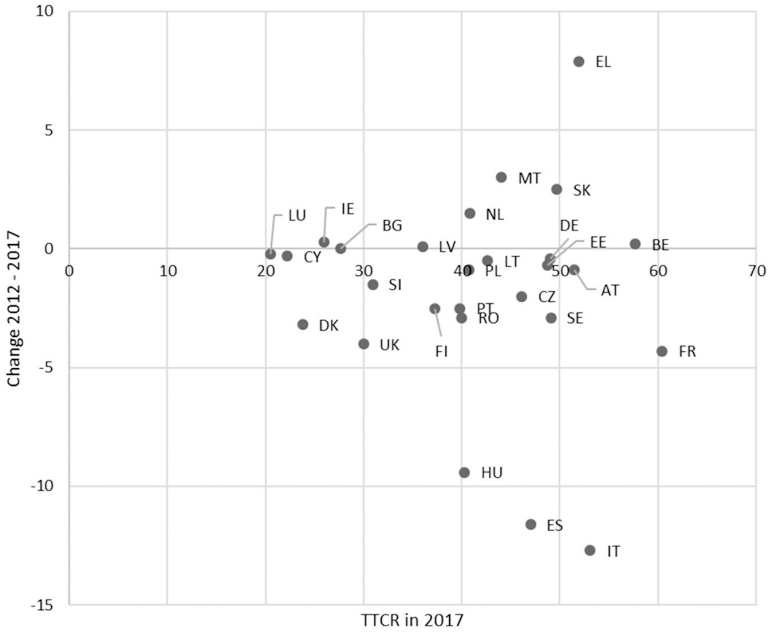


Figure 1. Total Tax and Contribution Rate (TTCR) in 2012 and 2017 (%)

Source: authors according PWC, 2019

Another indicator that indicates the difficulty of the business environment is the number of payments made during the year.

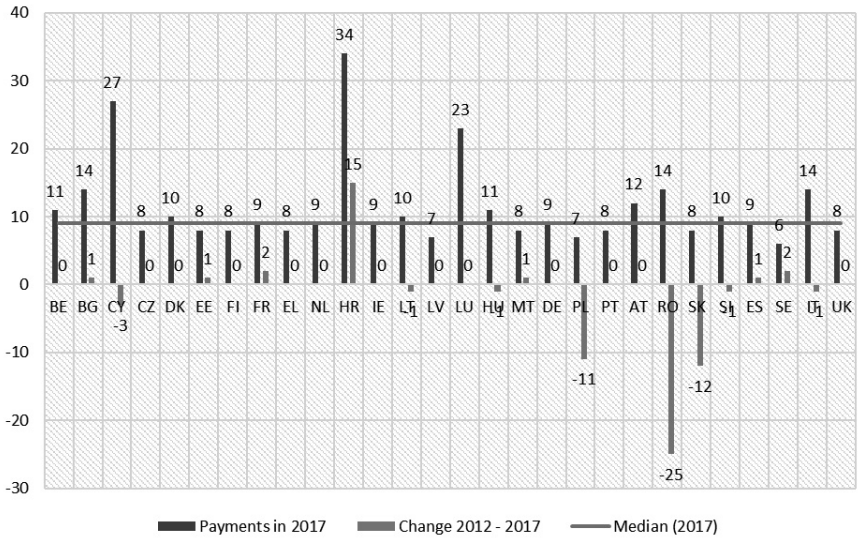


Figure 2. Number of payments in 2012 and 2017

Source: authors according PWC, 2019

It is the number of all payments (taxes and levies) that an entrepreneur must make in a year. For score clarity, the values are shown in a bar graph (Figure 2). Romania recorded the largest decrease in the number of payments compared to 2012 (from 39 payments to 14 in 2017), followed by Slovakia and Poland. The highest number of payments made by entrepreneurs was declared in 2017 in Croatia. The median within the EU-28 was at the level of 9 payments.

The following Figure 3 shows the number of hours an entrepreneur spends completing compulsory payment forms and visiting offices. The graph indicates that the highest-burdened on the tax administration in 2017 were entrepreneurs in Bulgaria (up to 453 hours). Most countries, in this case, are in the range of 50-250 hours. Poland recorded the highest increase in this indicator compared to 2012 (+ 48 hours). Clearly, the most significant drop in the hours in the period under review was achieved by the Czech Republic (-183 hours).

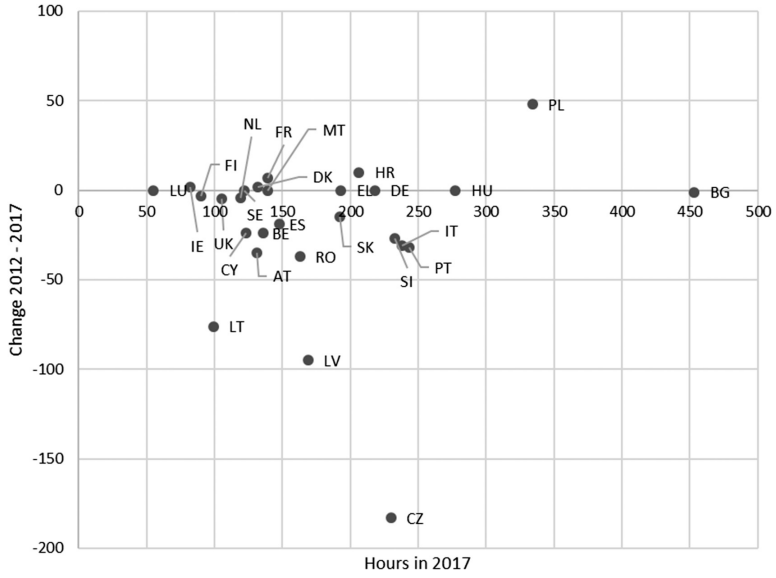


Figure 3. Number of hours spent by the tax administration in 2012 and 2017

Source: authors according PWC, 2019

Previous graphical data processing indicated similarity in the evolution of the indicators in space and time. Therefore, we decided to use multidimensional cluster analysis for further analysis.

Imputed variables for cluster analysis were secondary data from PWC database. Research method was cluster analysis conducted in statistical software R 3.4.1. There were used two clustering methods – hierarchical agglomerative clustering and non-hierarchical clustering. Three imputed variables for Member States were TTCR, HOURS spent by the tax administration and the Number of PAYMENTS in 2017. The objective of cluster analysis was to achieve such groups of states, which would be characterized by certain homogeneity in case of selected tax indicators. Cluster analysis sorted data into sets with the greatest possible similarity within the group and the largest difference between groups. (Farley et al., 2012)

4. RESULTS

Hierarchical clustering methods are based on sequentially joining of clusters, their number decreases continuously until finally all clusters are combined into one. The result is graphically displayed as tree diagram respectively cluster dendrogram. Ward's method we've used involves an

agglomerative clustering algorithm. It looks for groups of leaves that it forms into branches, the branches into limbs and eventually into the trunk. Ward's method starts out with n clusters of size 1 and continues until all the observations are included into one cluster. (Meloun et al., 2012, p. 324)

Ward's method use the Euclidean distance defined by the formula:

$$d_{ij} = \sqrt{\sum_{k=1}^{K} (x_{ik} - x_{jk})^2} \tag{1}$$

Where x_{ik} is the value of „*k"* variable for *i-th* object and x_{jk} is the value of „*k"* variable for *j-th* object. For calculated distance is than determined the rule of linking statistical units into clusters. There were „*p"* objects in the analyzed group, namely 28 countries in which were pursued „*k"* quantitative characters (3 variables), the distance d_{ij} between *i-th* element and *j-th* element was Euclidean distance.

The assumption of cluster analysis is that the characters examined do not correlate with one another. We used Spearman's correlation coefficient to determine the tightness of the relationship between the variables studied. Histograms of interval variables confirmed the condition of normality distribution. Spearman's correlation coefficient has confirmed low correlation between variables.

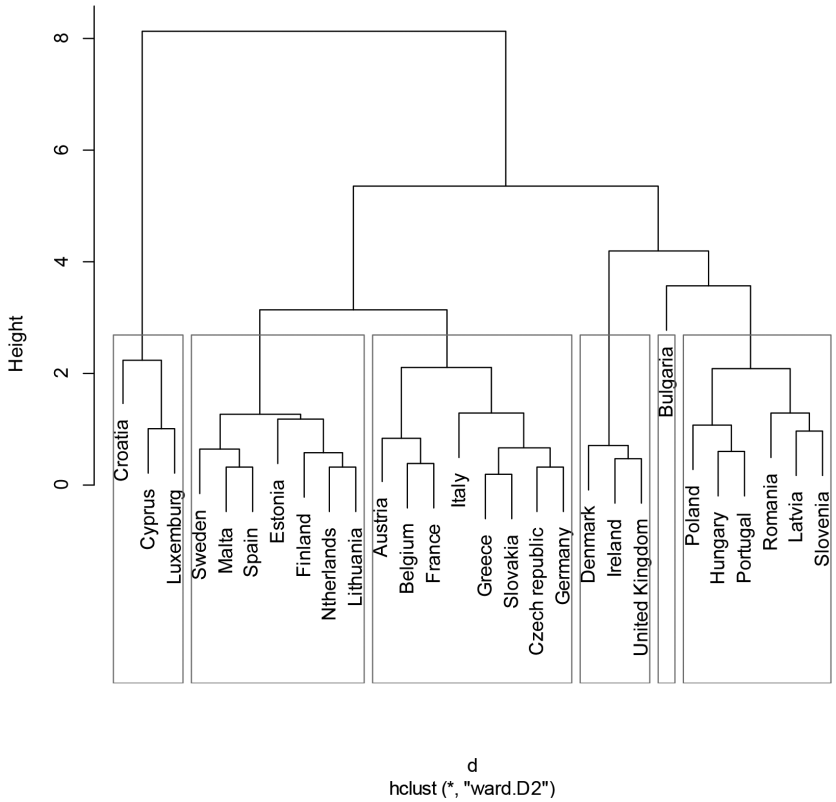


Figure 4. Cluster dendrogram according Ward's method (2017 data)
Source: authors

In the dendrogram we can identify six groups of countries with similar characteristics. These groups are highlighted. There are two larger clusters with 7 or 8 countries. Outside of clusters remained only Bulgaria. In order to draw conclusions that consider the exact distances, we have also used a non-hierarchical clustering method, the output of which is scatterplot.

If we consider two variables (components), clusters can be visualized by using non-hierarchical method K-means. Based on previous hierarchical method, it is considered similar number of clusters. K-means clustering is the most popular partitioning method. It requires the analyst to specify the number of clusters to extract. There are two components, which explain 85,21 % of the point variability.

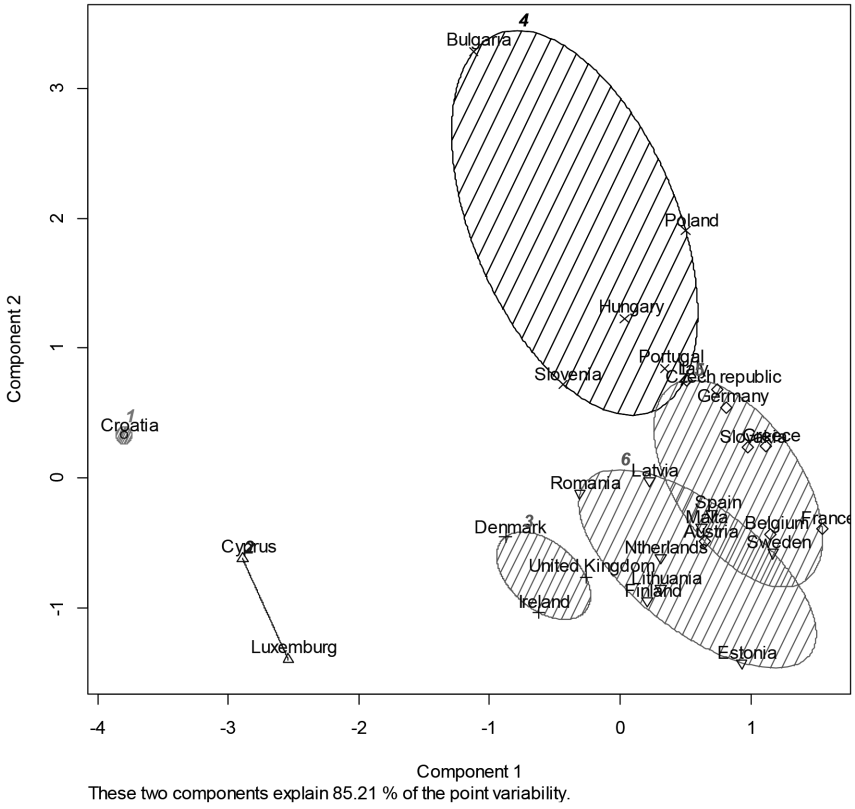


Figure 5. Scatterplot according K-means method (2017 data)
Source: author*s*

Due to testing we have chosen 6 clusters as an imputed command for K-means clustering. We consider the data set, which contains n=28 objects, and partition it into k=6 clusters. The ellipses are based on the average and the covariance matrix of each cluster, and their size is such that they contain all the points of their cluster. The ellipses sizes of clusters 5 and 6 are similar. Cluster no. 6 displays less variability of Component 1. Cluster no. 4 is quite extensive because of object on boundaries of the ellipse. The larger shading intensity indicates the largest density of divided objects in ellipses.

5. CONCLUSION

The analysis carried out in the paper shows that the different economic, political and social developments in Europe have also been reflected in the working of the tax systems in individual countries. The European Union has constantly initiated efforts to bring the tax systems of Member States closer together. The analysis of selected business taxation indicators has shown that the Member States differ significantly from one another. In the paper we examined the development of Total Tax and Contribution Rate, the Number of Hours spent by the tax administration and the Number of Payments made by entrepreneurs in a year.

The level and the evolution of indicators have shown that the business environment in terms of paying taxes and contributions is constantly changing across countries. Only a few countries remained at the level of five years ago. France recorded the highest TTCR in 2017, the tax administration took the most hours to entrepreneurs in Bulgaria and the most payments per year were made by businesses in Croatia. The research has shown that the Member States differ not only in the level of tax rates but also in other indicators that contribute to the creation of business environment.

The unification of tax systems could begin with their gradual convergence. The idea of harmonizing taxes in all Member States at once is unrealistic. Cluster analysis that can evaluate multidimensional data can be a way of gradual coordination. The process could start at first in clusters and later at the EU level.

In future research, we would like to add indicators from the research area and subject them to a similar statistical analysis.

ACKNOWLEDGEMENT

Scientific paper was elaborated within the framework of the project **VEGA 1/0887/17**: „Increasing the competitiveness of Slovakia within the EU by improving efficiency and performance of production."

REFERENCES

Council of Economic Analysis. (2014). *Tax Harmonization in Europe: Moving Forward*. http://www.cae-eco.fr/IMG/pdf/cae-note014-en.pdf

Fraley, Ch., Raftery, A. E., Murphy, B. T., & Scrucca, L. (2012). *Mclust Version 4 for R: Normal Mixture Modeling for Model-Based Clustering, Classification, and Density Estimation Technical Report No. 597.* Washington: University of Washington, Department of Statistics.

Genschel, P., Jachtenfuchs, M. (2018). H*ow the European Union constrains the state: Multilevel governance of taxation*. European Journal of Political Research. 50 (3), 293-314. doi: 10.1111/j.1475-6765.2010.01939.x.

Keen, M. (1993). The Welfare Economics of Tax Co-ordination in the European Community: A Survey. *Fiscal Studies* 14, 15–36.

Meloun, M., Militký, J., & Hill, M. (2012). *Statistická analýza vícerozměrných dat v příkladech.* Praha: Academia.

Mintz, J. (2004). Corporate Tax Harmonization in Europe: It's All About Compliance*. International Tax and Public Finance, 11(2), 221–*234.

OECD. (2019). *Model Tax Convention on Income and on Capital 2017 (Full Version).* https://doi.org/10.1787/g2g972ee-en.

PWC. (2019). *Interactive tax data explorer.* https://www.pwc.com/gx/en/services/tax/ publications/paying-taxes-2019/explorer-tool.html?WT.mc_id=CT13-PL1300-DM2-TR2-LS1-ND30-TTA4-CN_payingtaxes-2019-data-explorer-button

Široký, J. (2010). *Daně v Evropské unii*. Praha: LINDE.

Zodrow, G. R. (2003). Tax Competition and Tax Coordination in the European Union. *International Tax and Public Finance*, 10(6), 651–671.

BANKRUPTCY DETERMINANTS IN TIME VARIANT SETTINGS

Elena Lancosova[1]

DOI:

Abstract: *This paper aims to assess importance of widely used bankruptcy discriminants in dynamic, time dependent environment as opposed to more traditional, static methods used in bankruptcy models. Such setting gives way to new, process oriented, point of view on companies nearing their bankrupt. Subsequently, new simple discriminants with stronger relationship to bankruptcy are proposed while strictly using only widely available information from accounting statements. Behaviour of both proposed and traditional discriminants is examined through kernel smoothing and discriminant's evolution before bankruptcy and thus the reasons behind their respective predictive powers are uncovered.*

Keywords: *Survival Analysis, Time Dependent, Dynamic, Assets, Equity, Sales, Change from Previous Period, Kernel Smoothing, Accounting Statement.*

1. INTRODUCTION

The ability to correctly predict company's future development is very desired among every investor, manager, owner or creditor. To this end, knowledge of the process of bankruptcy and its determinants is of the utmost importance.

There are two main approaches to company's financial situation assessment, horizontal analysis with its focus on changes in time and vertical analysis using ratio indicators. Since each such indicator offers limited information on its own due to its focus on single aspect of overall financial and economic situation, complex systems of these indicators, so called bankruptcy models, were created. Should we wider our focus even more and incorporate time into our estimate, we would gain additional dimension to insolvency risk estimation, time, and effectively connect vertical and horizontal financial analysis.

In the past, discriminant analysis and logistic regression were used for bankruptcy model creation, but development of computer technology and company databases have allowed for inclusion of different methods, some of them with potential of incorporating time into insolvency risk assessment, such as survival analysis.

Survival analysis comprises several statistical methods exploring time until event, event being for example credit default or company bankruptcy as in our case. It perceives bankruptcy as a process happening in time. Thus, its prime aim is not to estimate bankruptcy risk but rather to estimate time left until bankruptcy inevitably happens. This point of view is, in our opinion, closer to economic reality and can provide us with richer information regarding bankruptcy as a process.

Ratios like return on assets are widely used with methods without time dimension but would they be just as influential when dynamic method is used? If not, then where should an analyst really look when assessing company's health? This paper aims to answer these questions by survival model estimation and significance of individual bankruptcy determinants assessment.

[1] Masaryk Univesity, Faculty of Economics and Administration, Lipová 41a, 602 00 Brno-střed, Czech Republic

2. SIGNIFICANT WORKS ON DYNAMIC BANKRUPTCY PREDICTION

The first to describe relationship between insolvency and ratio indicators was W. H. Beaver (1966). His research was later evolved by I.E. Altman (1968, p. 193) whose models are among the most used for bankruptcy prediction. In his research, Altman used discriminant analysis which consequently, along with logistic regression, became widely used tool for bankruptcy modelling.

The idea of both methods is to classify companies as heathy and in danger of bankruptcy. As opposed to this view, survival analysis models time until bankruptcy thus all companies are considered to be in danger of bankruptcy. Thus, the question of interest is when will this bankruptcy occur rather than whether it will occur. Results of such models therefore significantly differ from more traditional approach.

Table 1 offers overview of works of authors who used survival analysis to model bankruptcy probability.

Table 1. Most influential bankruptcy prediction works based on survival analysis

Author	Country of interest	Publication year	Sample size / out of which bankrupted	Method	Focus
Lane et al.	Not available	1986	464/130	Proportional Cox	Banks
Laitinen a Luoma	Finland	1991	72/36	Proportional Cox	General
José Pereira	Not available	1994	27/11	Collet and parametrical Cox	Textile companies
Shumway	USA	1999	33621/291	Hazard model of own design	General
Chava a Jarrow	USA	2004	Most quoted companies /1461	Discrete logistic hazard model	Industry
Kadri Männasoo	Estonia	2007	Not available	Log-log hazard function, i.e. = Discrete proportional hazard model	General, limited to non-financial companies older than 3 years
Gepp a Kumar	Not available	2015	189/72	Semi-parametrical Cox	Manufacture and sales
Taylor a Svec	USA	2016	8664/546	Accelerated Failure Time	General, non-financial and no real estate companies

Source: Own processing

Lane et al. (1986, pp. 511-531), Laitinen and Luoma (1991, pp. 673-678), José Pereira (2014) and Shumway (1999) were the first authors to use survival analysis in bankruptcy analysis. Shumway showed that dynamic models can have better results than static methods and survival analysis became not so scarce alternative to logistic regression and discriminant analysis. The most influential authors to use it since were Kadri Männasoo (2007) and Chava and Jarrow (2004). Lately, survival analysis in bankruptcy prediction was employed in particular by Ming-Chang Lee (2014, pp. 103-119), Gepp and Kumar (2015, pp. 369-404) and Taylor and Svec (2015).

The first author to have used survival analysis for bankruptcy prediction was Lane (1986, pp. 511-531). Data from 130 banks gone bankrupt between years 1978 and 1984 were used. Lane's results suggest that prediction abilities of Cox model are equal to those of discriminant analysis.

Laitinen and Luoma (1991, pp. 673-678) applied survival analysis on sample of 36 bankrupt companies which were paired with 36 comparable heathy companies. Results were compared to logistic regression and discriminant analysis; survival analysis evinced slightly worse prediction abilities.

Pereira (2014) used Collet methodology and parametric Cox model on 11 bankrupt companies and 16 comparable heathy companies, all of which operating in textile sector. It is interesting that only 3 determinants out of 28 widely used determinants for insolvency prediction were proven to be significant showing just how much can inclusion of time change our view on bankruptcy.

Shumway (1999) offers further arguments for use of dynamic methods; closer fit to reality being the most prominent one. It is worth noticing that Shumway, in accordance with Pereira's findings, rejects statistical significance of variety of widely used bankruptcy indicators, including those suggested by Altman. In order to further support his statements, prediction model created in this paper was showed to have same or better results than Altman's model. Shumway renew his focus on survival analysis in his work with Bharath (2008, pp. 1339-1369) were his previous findings were confirmed. Chava and Jarrow (2004) verified Shumway's findings on exceptional sample size comprising monthly data from all American quoted companies.

Männasoo (2007) states that approaches based purely on data such as neural networks can outperform survival analysis in prediction power but admits that they lack additional information such as hazard function. Thus, Männasoo argues that survival analysis is more suitable for bankruptcy process explanation than other methods. Similar comparison was carried out in a paper by Gepp and Kumar (2015, pp. 369-404). Prediction abilities of semi-parametric Cox, non-parametric classification and regression trees and more traditional methods were compared. They conclude that both Cox and classification and regression trees draw level to more traditional methods and in accordance with Männasoo argue that the main advantage of survival analysis consists in additional information provided by survival analysis and time inclusion.

The only authors to use Accelerated Failure Time model were Taylor and Svec (2016). They argue that their model outperforms models created by both Shumway and Altman.

3. SURVIVAL ANALYSIS STRENGTH AND WEAKNESSES

In the middle of the first page of the paper, write the title. Use font Times New Roman Bold 14pt, capital letters. Authors' names (bold) should be written in Times New Roman 12pt, in the middle of the page. Institutions' names, addresses and e-mail addresses in the footnote should be typed in Times New Roman 10 pt. An abstract with key words follows after the title and author's name written in Times New Roman bold and italic 12 pt.

To conclude their findings, main advantages of survival analysis are:

- **Reality:** Correspondence to reality as all companies will eventually bankrupt, bankruptcy is a function of time.
- **Robustness:** Ability to comprise information varying in time; therefore, it makes use of more data in order to create more robust estimates and in addition, there is no bias caused by choosing only one year to be considered by the model. (Shumway, 1999)
- **Relaxed assumptions:** Absence of multi-dimensional normality assumption, which is often violated, as opposed to e. g. discriminant analysis (Laitinen and Luoma, 1991, pp.

673-678) and also absence of assumption requiring that the hidden process leading to bankruptcy does not change in time, as opposed to logistic regression. (Blossfeld, 2016)
- **Additional information:** Prediction of bankruptcy time, not only bankruptcy probability

Absence of division of companies into two populations (bankrupt and non-bankrupt), all companies are considered to be in danger of bankruptcy and thus belong to one population, only their bankruptcy probability differs (Keasey, 1990, pp. 85-94).

In our opinion, although survival analysis might not be more effective at prediction than other methods, it still is more than suitable for bankruptcy process description because of its dynamic approach being much closer to reality than more static classification approaches. Thus, its findings may be more reliable in uncovering bankruptcy process than traditional methods and may offer new insight. While aforementioned authors focused on prediction model creation, the aim of this paper is rather on uncovering hidden reasons for bankruptcy since we think that the potential of survival analysis has not been fully fulfilled in this area yet.

4. METHODOLOGY

Time modelled can be expressed as both hazard function and survival function. Several approaches to survival analysis can be employed, many of them are based on regression and thus suitable for predictions (Gepp and Kumar, 2015, pp. 369-404)). Often used model is Cox semi parametric model, Cox full parametric model and fully parametric Accelerated Failure Time model.

May X be time prior to an event, i.e. non-negative continuous and discrete quantify. In order to describe this quantity, survival function, hazard function, event density and cumulative hazard function are being used. (Moore, 2016)

If at least one of these characteristics is known, rest can be calculated. Other characteristics used include mean, average, standard deviation and quantiles.

Survival function models probability of company surviving given time if it did not bankrupt before this time. It is defined as (1):

$$S(t) = P(T > t) \tag{1}$$

I.e., it is probability that survival time will be higher than x. The lifetime distribution function, conventionally denoted *F*, is defined as the complement of the survival function,

$$S(t) = 1 - F(t) = 1 - P(T \leq t) \tag{2}$$

Survival function can also be expressed as event density integral. Event density *f(t)* is the rate of bankruptcy events per unit time.

$$S(t) = \int_x^\infty f(t)\, dt \tag{3}$$

If time is measured in discrete units as in the case of accounting data, survival function is modified to form number 4:

$$S(t) = \sum_{t_j < t} p(t_j) \tag{4}$$

where $j = 1,2, \ldots$ with probability function $p(t) = P(T = t_j)$ and where $t_1 < t_2 < \ldots < t_n$.

Hazard function *h(t)* calculates probability that company will go bankrupt at time *t* given that it had survived until time *t*. It is defined as non-negative function:

$$h(t) = \lim_{\Delta t \to \infty} \frac{P[t \leq Y < t + \Delta t | T \geq t]}{\Delta t} \tag{5}$$

Should time be measured in discrete units, hazard function can be modified to:

$$h(t) = P(T = t_j | T \geq t_j) = \frac{p(t_j)}{S(t_{j-1})}, \text{ where j = 1,2, … and } S(xt_0) = 1. \tag{6}$$

Thus, hazard function can be defined through survival function modification:

$$h(t) = 1 - S(t_j)/S(t_{j-1}) \tag{7}$$

Cox model is one of proportional hazard models. Hazard function for company I can be expressed as:

$$h(t, x_i) = h_0(t) \exp(x_{i1}\beta_1 + x_{i2}\beta_2 + \cdots + x_{ip}\beta_p) = h_0(t) \exp(\boldsymbol{x_i'}\beta) \tag{8}$$

where x_i are independent regressors for company i, p is number of regressors, β denotes regressors coefficients and $h_0(t)$ is baseline hazard function common for all companies.

Influence of independent variable on insolvency risk can be expressed through regression coefficients β_k, $k \in (1, \ldots, p)$, which denote change of risk connected to change of value of independent variable *k*. (Blower, 2004)

Partial likelihood method is used to coefficient estimates. Partial function is independent on baseline hazard $h_0(t)$, it depends on regression coefficients β, therefore:

$$L(\beta) = \prod_{Y_i \, not \, censored} \frac{e^{X_i\beta}}{\sum_{Y_j \geq Y_i} e^{X_j\beta}} \tag{9}$$

Regression coefficients estimates $\widehat{\beta} = (\hat{\beta}_1, \ldots, \hat{\beta}_p)$ can be connected to model results interpretation, in other words to hazard ratio. Hazard ratio estimate, $\widehat{HR}$, for subject *i* and *j* can be obtained $\hat{\beta}$ by substituting into following relationship:

$$\widehat{HR} = exp\left((x_i - x_j)'\hat{\beta}\right) \tag{10}$$

Cox model in its original form assumes that values of regressors do not change in time. If varying data for each year are available (as in the case of accounting data), it is necessary to use generalization of Cox model, Cox model with time dependent variables. Such model assumes risk function for subject *i* with vector of independent variables $x_i(t)$ to be:

$$h\big(t, x_i(t)\big) = h_0(t)\exp(x_{i1}(t)\beta_1 + \cdots + x_{ip}(t)\beta_P = h_0(t)\exp(x_i'(t)\beta) \quad (11)$$

where $x_{ik}(t)$ are independent regressors for company i in time k, p is number of regressors, β denotes regressors coefficients and $h_0(t)$ is baseline hazard function common for all companies. (Blower, 2004)

Proportional hazards model input usually contains one record for each company together with censorship indicator, but it can be reformulated as computer process where with growing time we observe new events for each company, thus for each company we have multiple observations. (Andersen and Gill, 1982)

Multiple companies are very likely to go bankrupt at once since we have discrete observations, therefore Breslow modification of maximum likelihood function will be used. (Grambsch, 2016)

In order to compare models among each other, Akaike information criterion will be used. In survival analysis context, this criterion is also used for variable selection. (Moore, 2016)

$$AIC = 2 * number\ of\ estimated\ parameters - 2ln(L) \quad (12)$$

Cox model assumes proportional hazards. In order to test this assumption, ZPH test with standardized Schoenfeld residues is used. (Grambsch, 2016)

5. BANKRUPTCY DETERMINANTS

Our sample consists of 52 931 active Czech companies and 10 752 Czech companies in different states of insolvency process. Data were download from Amadeus database. For each company, records from one to ten years and different financial statement information are available.

When examining bankruptcy process, determinant selection is very important, especially since based on literature review, survival analysis tends to favour different discriminants than static methods like logistic regression and discriminant analysis.

Table 2 presents determinants which will be considered in this paper. Changes between periods are computed as follows:

$$\Delta\ balance\ sheet\ entry = \frac{present\ value\ - last\ year\ value}{last\ year\ value} \quad (13)$$

With exception of indicators of changes between periods, table 2 presents mostly static view on bankruptcy determinants. However, main advantage of survival analysis consists in accounting for time, therefore it would be interesting to see changes of bankruptcy determinants few years before bankruptcy event.

Focusing on movements of above-mentioned determinants in years before bankruptcy, it turns out that total assets and equity ratio remain relatively stable through years even for companies nearing their bankruptcy with larger drop 3 years before bankruptcy event.

As opposed to this behavior, sales show high sensitivity to upcoming bankruptcy with steep drop each year. Decrease in sales and total assets ratio seems to be much more gradient than

sales and equity ratio which drop quickly to zero. This is probably caused by simultaneous occurrence of low equity and low sales cancelling each other out.

Out of return ratios considered, upcoming bankruptcy had smallest effect on return on equity. This is caused by negative equity as a result of negative profit; therefore, we divide two negative values and get very positive outcome. For this reason, in our opinion, return on equity is not suitable for bankruptcy prediction modeling.

The last group of indicators considered are ratios based on current assets. These indicators remain relatively stable through observed period for non-bankrupt companies but slowly and steadily decrease for companies nearing bankruptcy.

Therefore, it is obvious that values of determinants considered vary drastically between non-bankrupt and bankrupt companies. In addition, we can observe change in values when bankruptcy is nearing, not only in the last year or year before bankruptcy as accounted by method logistic regression and discriminant analysis which make use only of one year.

Table 2. Considered bankruptcy determinants and their characteristics

Determinant	Mean	Standard deviation	Employed in papers
Current assets and short-term liabilities ratio	1.801	2.51	Zmijewsky (1984), Pereira (2014), Beaver (1966)
Working capital and total assets ratio	0.207	0.181	Altman (1968), Shumway (1990), Beaver (1966), Taylor (2016)
Working capital and total liabilities ratio	0.364	0.839	Pereira (2014)
Total assets and total liabilities ratio	1.871	1.838	Beaver (1966), Taylor (2016)
Equity and total assets ratio	0.384	0.159	Quick test (Kralicek), Laitinen a Luoma (1991)
Sales and total assets ratio	1.450	1.793	Altman (1968), Index bonity, Taffler, Zmijewsky (1984), Shumway (1990), Ming-Chang Lee (2014), Taylor (2016)
Return on short term liabilities	0.103	0.092	Taffler (2016)
Return on total assets	0.037	0.009	Altman (1968), Index bonity, Quick test (Kralicek), Beaver (1966), Shumway (1990)
Return on equity	0.151	0.068	Taylor (2016)
Sales and equity ratio	2.181	12.044	Ming-Chang Lee (2014)
Total assets change between periods	0.007	0.045	Gepp a Kumar (2015)
Cash Flow	0.031	0.476	Gepp a Kumar (2015)
Tax change between periods	-0.10	1.040	Gepp a Kumar (2015)
Sales change between periods	-0.002	0.077	Gepp a Kumar (2015)
Equity change between periods	0.058	0.060	Gepp a Kumar (2015)
Short term liabilities change between periods	-0.035	0.167	Gepp a Kumar (2015)
Current assets change between periods	0.007	0.103	Gepp a Kumar (2015)
Profit change between periods	-0.349	1.037	Gepp a Kumar (2015)
Boolean indicator of positive equity	0.793	0.164	None
Boolean indicator of positive profit	0.604	0.239	None
Boolean indicator of drop in total assets higher than 20 %	0.141	0.121	None

Source: own processing

6. STATISTICAL MODELING

The correct specification of determinants is of the utmost importance for any prediction model. First, Akaike criterion as a cross validation approximation suitable for survival analysis will be employed for automatic variable pre-selection. Second, recursive variable selection based on significance and stability under different configurations will be applied.

Determinants which prove to be relevant in previous two steps will be subjected to kernel smoothing through natural cubic spline. This method allows us to uncover nonlinearity in determinant's effect on bankruptcy probability and subsequently include such modification that would work in linear settings of survival analysis.

It seems that working capital ratios as a group have lower strength than profitability ratios, on the other hand, sales ratios seem to be very closely connected to bankruptcy probability. It is interesting to note that under all configurations, the most influential ratio was always created using total assets. Thus, if an analyst was to choose only one ratio as a company health indicator, it should probably contain information about total assets. Significant determinants will be examined more closely through kernel smoothing.

Kernel smoothing through natural cubic splines helps in uncovering possible reasons for statistical insignificance in linear models by inclusion of knots and higher order polynomials while still not being too prone to overfitting thanks to linear constraints imposed on its parameters.

Figure 1 shows that the effect of change in sales is linear, i.e. twice as high growth in sales lowers the risk twice as much. Therefore, decrease in risk is very steady and bigger difference can be seen only at more extreme values where it seems that truly high increase in sales decreases more than proportionally risk of bankruptcy. However, the frequency of values at these extreme changes is not high enough to support this claim, i.e. confidence intervals are too wide.

We can see that change in equity effect is not monotonic; risk grows with high growth in equity in between periods. This is caused by calculation method when decrease in equity size from negative to even more negative value leads to very positive value of this indicator. That is the reason why determinants computed from two negative values like for example widely used return on equity (ROE) need to be used only in interaction with binary variable of positive equity.

Change in total assets shows exactly opposite behaviour from change in sales. Steep decrease in total assets from previous period has severe consequences on bankruptcy risk while moderate decrease lower than 20% or increase in assets have almost no effect. Thus, we might conclude that while sales might fluctuate naturally, severe decrease in total assets happens only when company is in serious distress. In addition, while increase in sales lowers the probability of bankruptcy, increase in total assets lacks this effect. Since total assets value seems to have only two main outcomes; negative when decrease is higher than 20% and neutral otherwise, it seems reasonable to create Boolean variable indicating whether between periods decrease in total assets was higher than 20%.

Sales and total assets ratio influences bankruptcy risk only at very low values when. As soon as sales increase, further growth seems to have no effect on bankruptcy probability. However, this stands only as long as total assets are twice as big as sales because after this limit, number of observations is too scarce. Sales and equity ratio is not statistically significant.

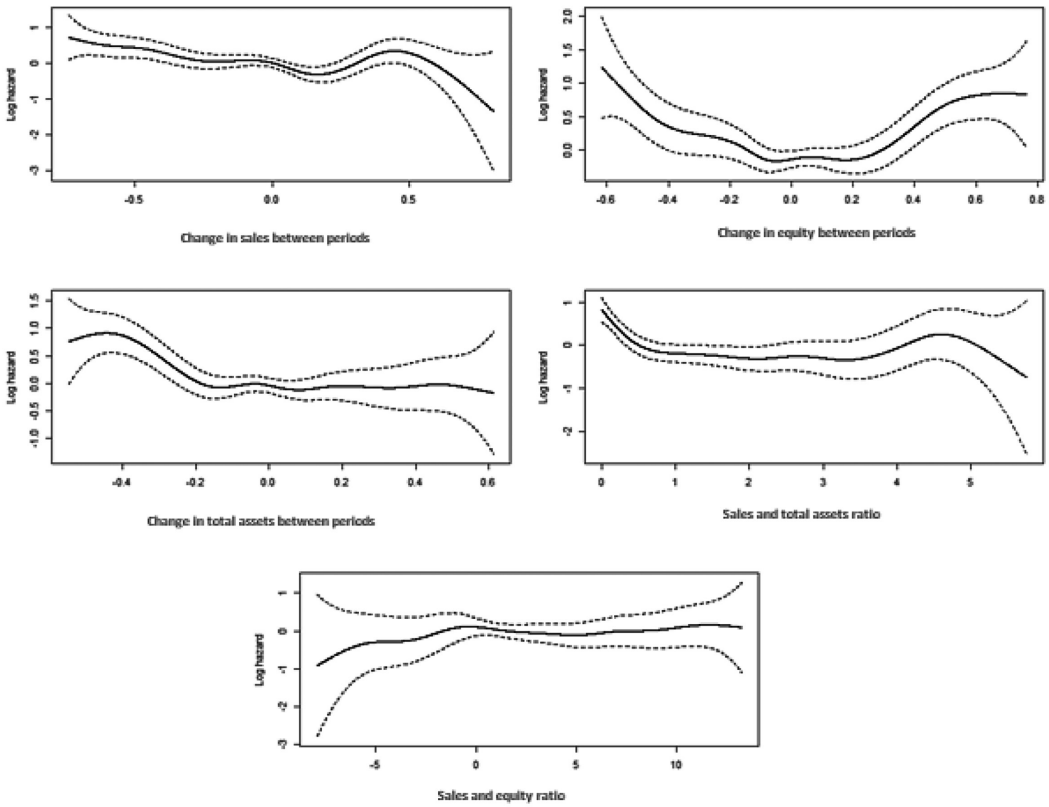


Figure 1. Influence of chosen determinants on bankruptcy risk
Source: Own processing

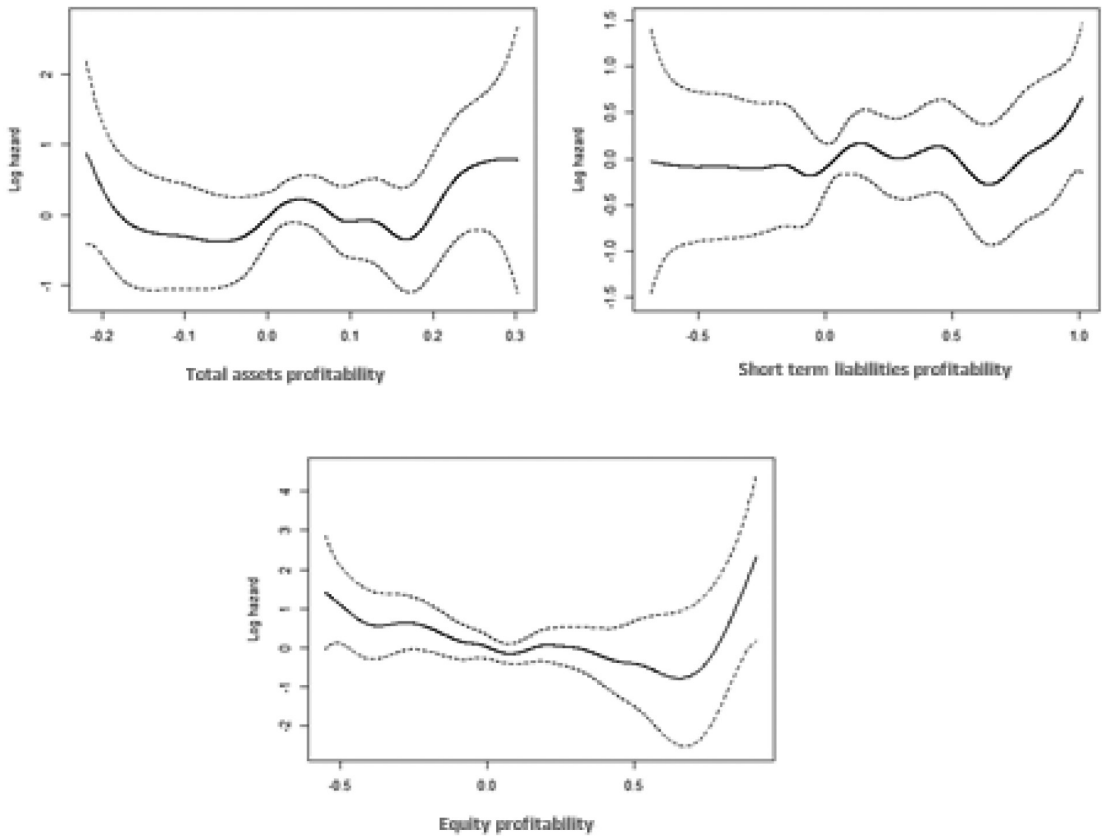


Figure 2. Effect of profitability ratios on bankruptcy risk
Source: Own processing

Profitability is part of vast majority of bankruptcy models, see table 2, therefore it is surprising that profitability determinants have such poor properties to be part of statistical models. Monotonic decreasing line is to be expected but the empirical line is very uneven and ambivalent with wide confidence intervals. In the light of these findings, binary indicators of profit or loss seem to be a suitable alternative.

Table 3. Optimal survival model specification

Variable	Coefficient	Exp (coefficient)	SE (coefficient)	P-value
Sales and total assets ratio	-0.273	0.761	0.041	0
Change in equity between periods	0.766	2.152	0.353	0.030
Binary indicator of positive equity	-0.502	0.605	0.117	0
Binary indicator of drop in total assets more than 20 %	-0.674	0.510	0.117	0
Change in sales between periods	-0.573	0.564	0.173	0.001
Binary indicator of positive profit	-0.443	0.641	0.106	0
Interaction of binary equity indicator and change in equity	-0.901	0.406	0.471	0.056

Source: own processing

Table 4 aims to interpret these values in economic terms. It is interesting that binary variable of drop in total assets higher than 20 % is so influential, especially compared to binary variable of positive profit where the effect seems rather small.

Table 4. Coefficient interpretation in economic terms

Variable	Applied at	Change in value of variable	Changes insolvency risk by
Sales and total assets ratio	All	Decrease of 50 %	Increase of 25 %
Change in equity in between periods	Positive values	Decrease of 50 %	Increase of 56 %
	Negative values	Decrease of 50 %	Increase of 47 %
Change in total assets in between periods	All	Decrease higher than 20 %	Increase of 96 %
Change in sales between periods	All	Decrease of 50 %	Increase of 25 %
Binary variable of positive profit	All	Positive PROFIT	Decrease of 36 %

Source: own processing

Survival analysis model presented can uncover 65 % of companies about to go bankrupt next year. This result is satisfactory since most bankruptcy models have similar prediction power and the strength of survival analysis is rather more realistic view on insolvency than in prediction power.

7. CONCLUSION

The aim of this paper was examination of bankruptcy determinants from the time dependent survival analysis point of view.

Percentual changes from previous period have proven to be very powerful alternative to ratio indexes, out of which changes in equity from previous year, change in sales and change in assets seem to most closely connected to bankruptcy risk.

In addition, change in total assets acts very differently than change in sales. More significant decrease in total assets has severe influence on bankruptcy risk while moderate decrease lower than 20 % or even increase seem to have none or very small impact. On the other hand, effect of sales is lineal; increase in sales lowers the bankruptcy risk, decrease in sales causes a steady growth in said risk. Therefore, it seems that while total assets might decrease naturally up to 20% without higher probability bankruptcy, any decrease in sales does increase bankruptcy risk.

In comparison to truly high influence based on change in between periods, one may be surprised at insignificance of profitability and working capital indexes. Profitability indexes seem to be quite unstable and unresponsive to nearing bankruptcy event, this behaviour is probably caused by simultaneous decrease in profit and assets or sales of distressed companies cancelling each other out. Working capital indexes might still be influential at short term prediction while our prediction horizon was in years. Out of most commonly used determinants, only one was able to compete with percentual changes from previous period and that was sales and total assets ratio.

The true benefit of this paper lies in empirical broadening of knowledge we have regarding processes in companies nearing their bankruptcy. Survival analysis is a method which sees bankruptcy as a dynamic process happening in time, therefore the determinants of bankruptcy which were marked by this method as significant could be much closer to real reasons or symptoms of bankruptcy than determinants commonly used. Therefore, when assessing company's bankruptcy risk, one should focus on changes from previous year, especially decrease in equity, sales and total assets higher than 20% rather than looking at profitability and working capital ratios.

ACKNOWLEDGMENT

Support of the Masaryk University grand No. MUNI/A/1092/2017 is gratefully acknowledged.

REFERENCES

Altman, E. (1968). The Prediction of Corporate Bankruptcy: A Discriminant Analysis. *The Journal of Finance*, 23(1), pp.193.

Beaver, W. (1966). Financial ratios as predictors of business failure.

Bharath, S. & Shumway, T. (2008). Forecasting Default with the Merton Distance to Default Model. *Review of Financial Studies*, 21(3), pp.1339-1369.

Blossfeld, H. (2016). *Event History Analysis,* Psychology Press.

Chava, S. & Jarrow, R. (2001). Bankruptcy Prediction With Industry Effects, Market Versus Accounting Variables, And Reduced Form Credit Risk Models. *SSRN Electronic Journal*.

Gepp, A. & Kumar, K. (2015). Predicting Financial Distress: A Comparison of Survival Analysis and Decision Tree Techniques. *Procedia Computer Science*, 54, pp.396-404.

Grambsch, P. & Therneau T. (2016), Proportional hazards tests and diagnostics based on weighted residuals. *Biometrika,* 81.

Keasey, K., McGuinness, P. & Short, H. (1990). Multi logit approach to predicting corporate failure—Further analysis and the issue of signal consistency. *Omega*, 18(1), pp.85-94.

Lane, W., Looney, S. & Wansley, J. (1986). An application of the cox proportional hazards model to bank failure. *Journal of Banking & Finance*, 10(4), pp.511-531.

Lee, M. (2014). Business Bankruptcy Prediction Based on Survival Analysis Approach. *International Journal of Computer Science and Information Technology*, 6(2), pp.103-119.

Luoma, M. (1991). Survival analysis as a tool for company failure prediction. *Omega*, 19(6), pp.673-678.

Männasoo, K. (2007). *Determinants of firm sustainability in Estonia*. [Tallinn]: Eesti Pank.

Moore, D. (2016). *Applied survival analysis using R*.

Pereira, J. (2014). Survival Analysis Employed in Predicting Corporate Failure: A Forecasting Model Proposal. *International Business Research*, 7(5).

Shumway, T. (1999). Forecasting Bankruptcy More Accurately: A Simple Hazard Model. *SSRN Electronic Journal*.

Taylor, William & Svec J. (2016) Distress Risk: An Accelerated Failure Time Survival Analysis Approach.

Zmijewski, M. (1984). Methodological Issues Related to the Estimation of Financial Distress Prediction Models. *Journal of Accounting Research*, 22, p.59.

COMPARISON OF EUROPEAN UNION PUBLIC HEALTH SYSTEMS*

Davor Mance[1]
Nenad Vretenar[2]
Jelena Gojković[3]

DOI:

Abstract: *This paper deals with public health systems of European Union Member States. We try to analyse and compare the public health budget allocation systems in existence in the EU. We analyse their differences and try to explain where the differences come from. We concentrate on the impact of differences in economic estimates in decision making on the allocation of scarce funds. We try to answer the question whether countries with lower income per capita compensate the lack of funds, lower capital endowment, and the impossibility to invest in equipment with larger labour endowment or improvement in human capital. On contraire, we find that some of the former transition countries experience a strong brain drain of medical personnel. Thus, former transition countries with relative stronger health personnel endowments tend to lose their qualified labour force to the more capital-endowed developed nations confirming the brain-drain hypothesis and refuting the hypothesis that labour is a relatively immobile production factor.*

Keywords: *Public Health, Health Management Systems, Health Economics, Brain Drain.*

1. INTRODUCTION

Research questions we wished to answer were: what are the similarities and differences in health management systems in European Union Member States (EU MSs), what policies caused those differences, and are there any reasons for concern because of these differences. Our main question is concentrated around the problem of brain drain of health care personnel. Lower income, mostly Central and Eastern European Countries (CEECs) that underwent the process of political and economic transformation still unable to provide higher wages comparable to the higher income old EU MSs, risk the process of brain drain on their qualified health care personnel. We look for discrepancies in the number of newly issued qualifications for such personnel, the number of newly employed personnel and from the differences between them, we conjecture the migration of qualified health care personnel from lower income EU MSs to the higher income EU MSs. The ultimate question is that of labour mobility in the health care services sector, and the resulting brain drain of these highly trained professionals, ultimately leading to a "beggar-thy-neighbour" policies with poorer countries financing the fixed and sunk costs of personnel education and training of the richer ones.

Health, and its inverse: illness are phenomena of certain medical content with an economic and financial dimension. Healthcare is a subsystem of the whole socio-economic system, from which their conditionality and interdependence arise. Healthcare, forms an integral part of the economic system, which regulates the scope of the delivery and structure of health services. Health sys-

* This paper was financially supported by the University of Rijeka project: uniri-drustv-18-284-1456.

1 University of Rijeka, Faculty of Economics, Ivana Filipovića 4, Rijeka, Croatia
2 University of Rijeka, Faculty of Economics, Ivana Filipovića 4, Rijeka, Croatia
3 University of Rijeka, Faculty of Economics, Ivana Filipovića 4, Rijeka, Croatia

tem, because of its risky nature, and spillover effects on the entire economy, is usually organised under governmental control (Arrow, 1963). „In relation to health, the economic system should ensure: (1) the optimal amount of resources allocated to health care, (2) the optimal use of these resources, (3) the optimal distribution of health care, (4) the optimal allocation of resources between current and investment spending in health " (Santerre and Neun, 2007). The goal of social health care policies is to extend life expectancy and to improve the quality of life by introducing new or improved treatments and standards of care, by promoting prevention and lower morbidity through healthier lifestyles, national screening programmes, regular and free check-ups, and improving the quality of life for chronic patients. Health economics is an interdisciplinary field of scientific research and integral part of modern management in any health care system as it deals with rational allocation of resources in healthcare. At the forefront of health economics is the creation of conditions for optimal use of a limited health care budget. EU MSs have different measures of success at allocating their scarce budgetary resources. One has to bear in mind that these differences are compared by using different benchmarks as the countries that are compared have different GDPs, living standards, demographics and consequently opportunity costs.

2. ALTERNATIVE HEALTH SYSTEMS IN EU MEMBER STATES

Two radically different health management systems are present in the EU: the mixed public-private system as present today in Germany and the pure single-payer centralised system as present in the UK. The pure private health management system is nowhere in existence, not even in the USA, where large governmental Medicare and Medicaid schemes are put in place.

2.1. The mixed public-private health management system

Germany is the country of origin of the system of socialised medical care. It is based on the foundations laid down by the original Bismarck social security system. After the Second World War, the system was modernized in the direction of subsidiarity, largely under the reminding negative experience of National Socialism and the new influence of the ordo-liberal ideas of Walter Eucken. Therefore, the health care system is relatively autonomous from the federal state but kept and improved the full coverage for health care services and sickness benefits. The German system is organised as a parallel system of on the one side a privatised insurance, hospitalisation and care, and on the other a social Statutory Insurance System organized around regional (*Länder*) insurances, the so-called *Allgemeine Ortliche Krankenkassen* (AOKs). People are allowed to opt out of the state system and into the private insurance. The public health care sector still provides the majority of health care services and produces the majority of healthcare costs. Hospitals are mostly managed by local or regional authorities. Private health expenditures include public sector co-payments. The public-private mix in the German health care system is more pronounced than in any other EU MS. The private health care sector provides for market prices that do not exist in a pure single-payer system and thus for a possibility to compare costs and outcomes of alternative health technologies. Market systems provide for common denominators and under right circumstances may entice competition with resulting cost savings and increases in effectiveness. Multi-payer systems call for much more diverse health technology assessments (HTA) comparing not only costs of different treatments for a certain outcome, but also comparing different outcomes. Multi-payer systems use the patient co-payment system to strengthen patients' decision-making role by giving them direct information on prices and "skin in the game". Multi-payer systems use health technologies in a decentralized fashion, reflecting individual preferences, as opposed to applying a population-wide decision rule of single-payer systems. (Santerre and Neun, 2007; Ottewill, 1996)

2.2. Pure single-payer systems of socialised medicine

The pure single-payer system such as the United Kingdom National Health Service (NHS) and its Scandinavian counterparts, take decisions about acceptance of health technologies and reimbursements on behalf of the population. It is thus necessary to have an informationally centralized process in which available evidence is considered and a decision is made according to a given decision rule. Economic evaluations are a necessity for single-payer systems. The UK National Institute for Health and Care Excellence (NICE) assesses clinical outcomes and cost-effectiveness of a wide range of health technologies before issuing guidance for their use in the National Health Service (Drummond, 2015). Currently, NICE uses the Quality Adjusted Life Years (QALY) that simultaneously capture gains from reduced morbidity (quality gains) and reduced mortality (quantity gains), and combine these into a single commensurable measure. The trade-off between quantities and qualities must exhibit constant proportionality for the QALY to be a viable measure at least in theory. Unfortunately, this is not the case (Drummond, 2015). As in any socialist system deprived of market prices, the only way to introduce prices is to acquire them from a market system. All market prices regarding health technologies, and especially pharmaceuticals, are imputed from the US market, and other market systems.

3. PUBLIC HEALTH SYSTEM DIFFERENCES IN EU MEMBER STATES

The differences in opportunity costs of health are best seen by looking at total health expenditures in % of GDP. Countries with higher GDPs also have a higher health expenditure relative to their GDP. The poorest among the countries are also among the countries with the lowest relative expenditure on health, and the countries with the highest GDP are among the ones with the highest relative health expenditures (Table 1). The difference in opportunity costs of health is due to a complex set of differences spanning from differences in system effectiveness, over the ability to pay, to the willingness to pay ultimately resulting in different social preferences with higher income countries having absolutely and relatively higher health expenditures. One needs to bear in mind that absolute differences are even greater than the relative ones once per capita incomes are taken into account. An even larger difference exists between prices of non-tradeable health services, especially those involving specialised labour. According to economic theory, a country will have a comparative advantage in producing goods that are intensive in the factor with which it is relatively abundant. Accordingly, it is expected the poorer EU MSs to compensate for the lack of capital endowment with specialised labour in health services. But human capital endowed labour in the EU is ultimately a mobile factor.

Table 1 tries to stress out the correlation between relative GDP per capita and relative health expenditure as a percentage of GDP. Wealthier countries have higher health expenditures.

Comparable countries in GDP p.c. have comparable results in health expenditures. One needs to bear in mind the even more exacerbated differences in absolute (not relative) health expenditures in richer EU MSs. As per capita incomes grow, relative health expenditures also grow due to increasing opportunity costs of health and Baumol-Bowen effects, resulting in an even larger total health expenditure. The Baumol-Bowen effect represents the rise of salaries in jobs producing untradeables experiencing low increase of labour productivity, in response to rising salaries in other jobs that experienced higher labour productivity growth. Since health services are non-tradeable and human capital intensive, they are well suited to demonstrate this effect (Table 1). If a production factor is mobile, it flows where it earns greater rewards, and consequently, capital rich countries end up with

the required complementary human capital. To this migration contribute both push factors in form of low wages, low social status and scarce future prospects of emigration countries as well as pull factors in form of high wages, better social status and future prospects of immigration countries. The results are best seen in the number of practicing nurses per 100.000 inhabitants of EU MSs (Figure 1).

Table 1. GDP per capita in € and health expenditures as % of GDP

	Country	GDP p. c. in 2011	Health exp. as % of GDP in 2011	GDP p. c. in 2016	Health exp. as % of GDP in 2016
1	Austria	€ 36.300	10,0 %	€ 36.430	10,4 %
2	Belgium	€ 33.590	10,0 %	€ 34.810	10,0 %
3	Bulgaria	€ 5.300	7,1 %	€ 6.050	8,2 %
4	Croatia	€ 10.480	7,8 %	€ 11.050	7,2 %
5	Czechia	€ 15.200	7,0 %	€ 16.520	7,1 %
6	Cyprus	€ 22.900	6,6 %	€ 22.360	6,9 %
7	Denmark	€ 44.240	10,2 %	€ 46.720	10,4 %
8	Estonia	€ 12.010	5,8 %	€ 13.650	6,7 %
9	Finland	€ 35.810	8,9 %	€ 35.280	9,5 %
10	France	€ 31.210	11,2 %	€ 31.770	11,5 %
11	Germany	€ 33.200	10,7 %	€ 34.700	11,1 %
12	Greece	€ 18.500	9,1 %	€ 17.110	8,5 %
13	Hungary	€ 10.110	7,5 %	€ 11.410	7,4 %
14	Ireland	€ 36.760	10,7 %	€ 50.710	7,4 %
15	Italy	€ 27.020	8,8 %	€ 26.010	8,9 %
16	Latvia	€ 9.200	5,6 %	€ 11.030	6,2 %
17	Lithuania	€ 9.790	6,5 %	€ 12.040	6,7 %
18	Luxembourg	€ 79.310	6,1 %	€ 82.880	6,2 %
19	Malta	€ 16.060	8,6 %	€ 20.090	9,3 %
20	Netherlands	€ 38.880	10,5 %	€ 39.810	10,4 %
21	Poland	€ 9.860	6,2 %	€ 11.260	6,5 %
22	Portugal	€ 16.720	9,5 %	€ 17.010	9,1 %
23	Romania	€ 6.350	4,7 %	€ 7.720	5,0 %
24	Slovakia	€ 12.980	7,4 %	€ 14.550	7,1 %
25	Slovenia	€ 17.870	8,6 %	€ 18.540	8,5 %
26	Spain	€ 22.770	9,1 %	€ 23.760	9,0 %
27	Sweden	€ 40.820	10,7 %	€ 42.910	10,9%
28	UK	€ 29.960	8,4 %	€ 32.050	9,8 %

Sources: EUROSTAT, WHO.

The largest number of nurses per hundred thousand inhabitants is found in Denmark (over 1,600), Finland (over 1400), Germany (over 1200) and Luxembourg (about 1200) as well as Sweden (about 1100). The lowest relative number of nurses is found in Greece, Bulgaria and Cyprus. Data for France, Ireland, Portugal and Slovakia were not available.

The obvious question is the one regarding the disproportionately high number of nurses in Denmark, Finland, Germany and Luxembourg. These numbers correspond to the growing share of elderly people in these countries. Certainly, this is not the only reason as Italy, Greece, Croatia, as well as some other countries have a requirement for a higher number of nurses due to a high share of elderly people and nevertheless have only about 500 nurses per 100.000 inhabitants. Besides the requirement for nurses, a stronger determinant is the ability to pay which is higher in the former than in the latter countries. Also, this profession in terms of living and working conditions as well as the salary, has still much to wish for in the latter countries. Thus, push factors for these practitioners are as much as important as the pull factors.

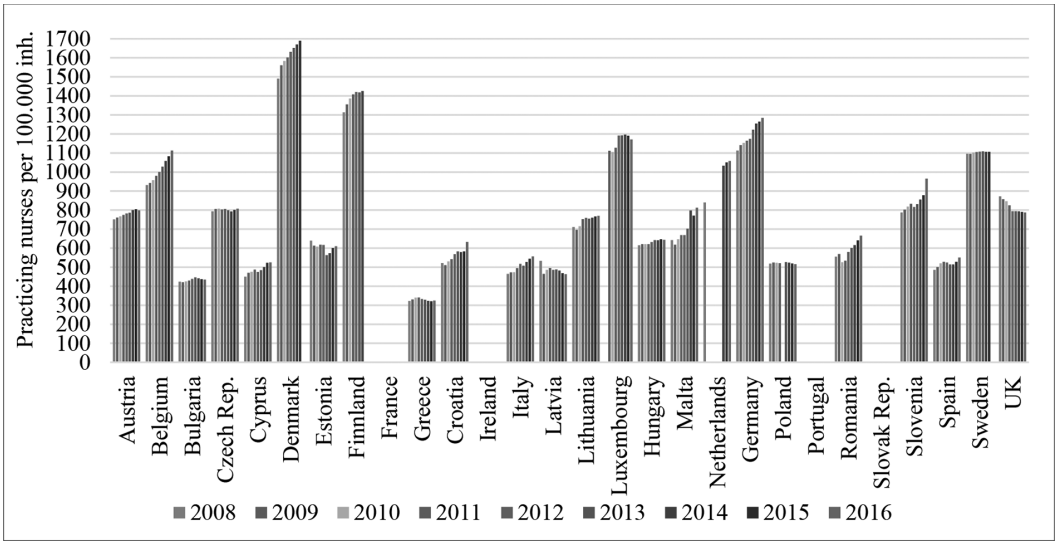


Figure 1. Number of practicing nurses per 100.000 inhabitants
Source: EUROSTAT.

There is an increasing interest from medical students, nurses and technicians to emigrate, and the obvious immigration countries are those with better working and living conditions. Greece has the lowest number of nurses, although at the same time one of the highest requirements for them. Budgetary reductions due to the Greek debt crisis contributed to poor working conditions in Greek hospitals. The Greek national health system copes with these reductions with a policy of „open hours" for hospital visits, which is why family members stay with patients for many hours and provide informal assistance and care.

The following two charts are of special interest as they show differences between the number of graduate physicians per 100.000 inhabitants and the actual number of employed physicians per 100.000 inhabitants. From these differences we might conjecture the migration trend.

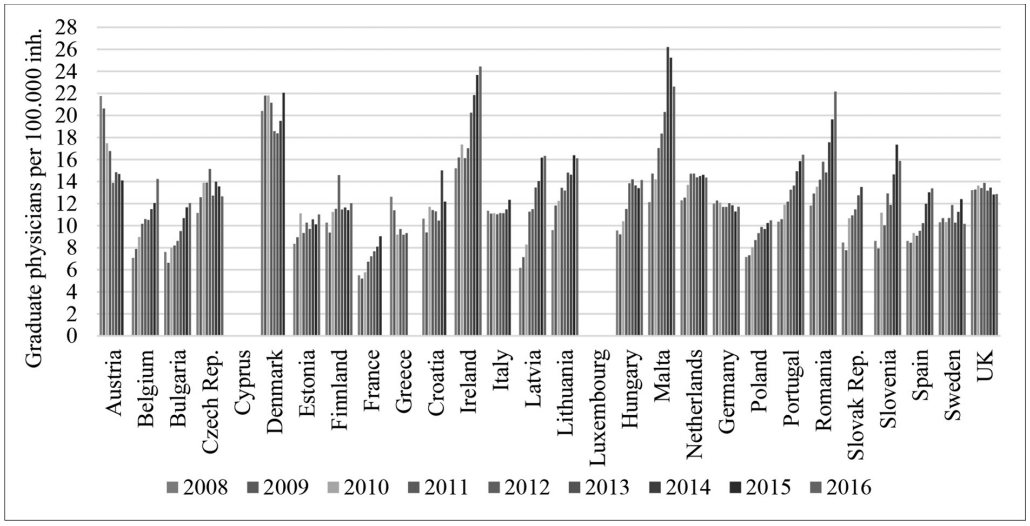


Figure 2. Number of graduate physicians per 100.000 inhabitants
Source: EUROSTAT

Assuming a minimal number of 30 working years for a practising physician, a country like Romania with some 22 graduate physicians per 100.000 inhabitants could expect to have at least 600 practising physicians per 100.000 inhabitants. We find this number to be less than 300

(Figure 3). Where did Romanian graduate medical doctors emigrate to? Some of high-income EU MSs show a growing number of physicians per 100.000 people while at the same time the number of graduate physicians in their medical schools decreased. An example is Austria where the number of physicians increased from 420 to over 500, while the number of graduate medical doctors has decreases from 21 per 100.000 inhabitants to just 14. Countries increasing the relative number of practicing physicians while decreasing the relative number of graduates need to fill the gap by immigration.

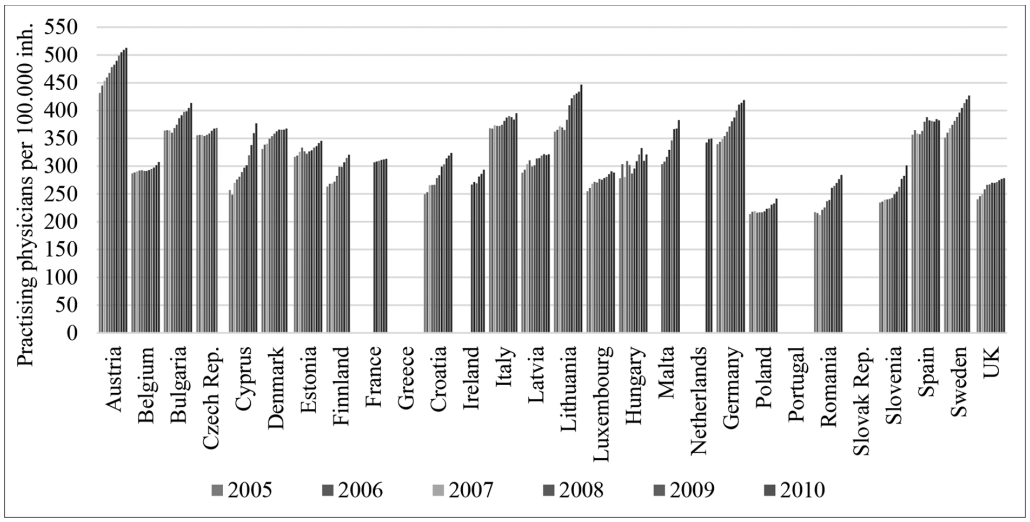


Figure 3. Number of practising physicians per 100.000 inhabitants
Source: EUROSTAT

Medical studies are extremely costly in terms of time and money. By immigrating to higher income countries, while the burden of tuition fees is still socialised, the brain drain of specialised medical workforce imposes additional costs on the already poorer CEECs.

The number of employed doctors is highest in Austria, followed by Lithuania, Sweden and Bulgaria, and the lowest in Poland, the United Kingdom, Slovenia and Romania. Data for Greece, Portugal and Slovakia were not available. An upward trend can be observed in all charted countries. The upward trend is mostly due to the eldering population with simultaneous increasing incomes and growing standards of living. The resulting changes in opportunity costs require a rising share of medical care expenses within the overall distribution of the GDP.

What is peculiar when comparing the results of Figure 3 and Figure 4 is the fact that countries with the highest number of practising physicians per 100.000 inhabitants do not correspond to countries having the highest number of specialists' or generalists' consultations per inhabitant. This makes us conclude that the physicians' workload across countries is not similar. So, for example, Austria is a country with the highest number of practising physicians per 100.000 people: more than 500, and only 7 specialists' or generalists' consultations per inhabitant per year. Hungary, on the other side of the spectrum, has 11 physicians' consultations per year, and only 300 physicians per 100.000 people. Obviously, physicians' workloads are not similar across EU MSs. This might lead us to investigate the differences in quality of such diverse practices. One of the factors determining the quality of health care services besides the well qualified and experienced personnel are health care facilities and diagnostic technology.

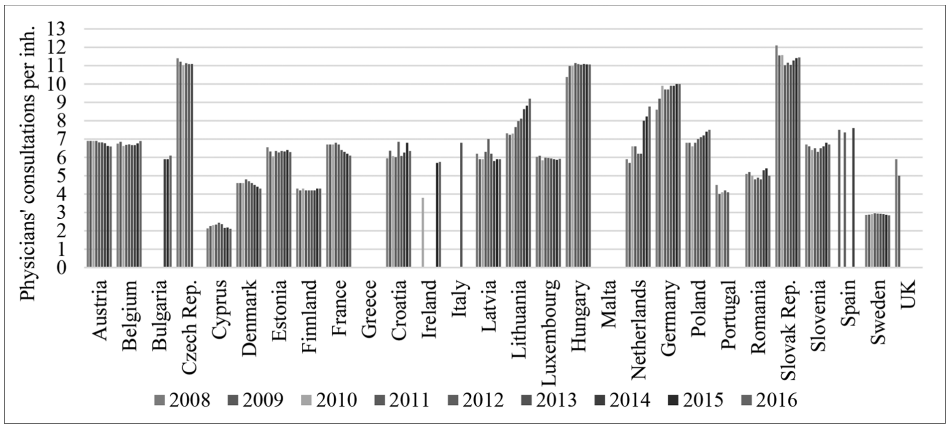


Figure 4. Number of specialists' or generalists' consultations per inhabitant
Source: EUROSTAT

Health care facilities among other include hospitals, laboratories, hospices, and health centres. They are equipped with hospital beds (Figure 5), medical technology (Figures 7 and 8) and other equipment that helps to provide medical assistance to patients.

Self-reported unmet needs for diagnostics (in %) is shown in Figure 9. As already mentioned, the country with booming unmet needs is Greece, mostly due to its financial crisis and budgetary cuts across all budgetary items. Not surprisingly, Greece does not provide us with reliable statistics on the number of medical doctors or the number of their consultations.

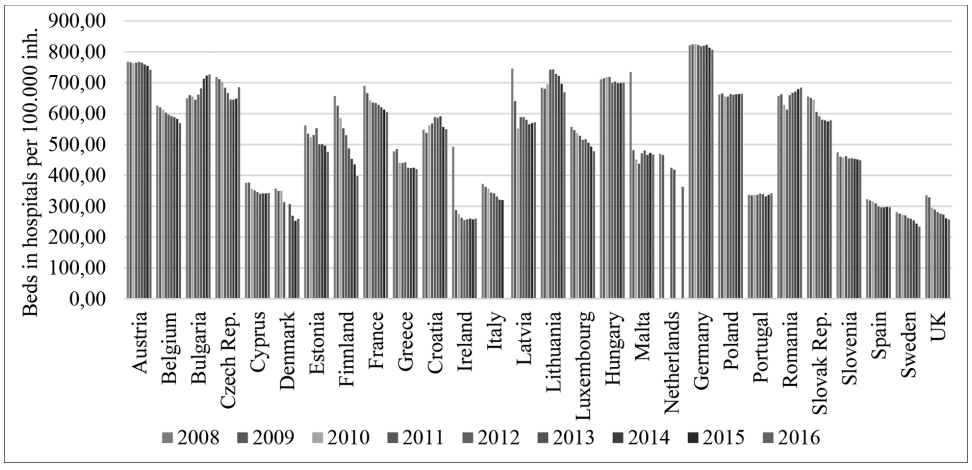


Figure 5. Number of available beds in hospitals per 100.000 inhabitants
Source: EUROSTAT

The number of hospital beds is the main indicator of hospital capacity. The number of available beds in hospitals per 100.000 inhabitants is the highest in Germany and Austria, and the lowest in Ireland, Sweden, Denmark and the United Kingdom. The number of hospital beds is showing a constant downward trend in almost every country. By reducing the number of hospital beds, attempts are made to reduce health care costs while increasing quality and efficiency. Such cost reductions could generate huge savings. Hospitals keep some beds vacant for emergencies, but too many vacancies are "sunk" costs. Hospital beds' occupancy rate shows the ability of HMOs to plan and micromanage costs at hospital level. An ideal average occupancy rate is between 80-90%. It seems that countries with lower relative number of hospital beds have managed to gain a higher occupancy rate, thus increasing efficiency by decreasing "sunk" costs.

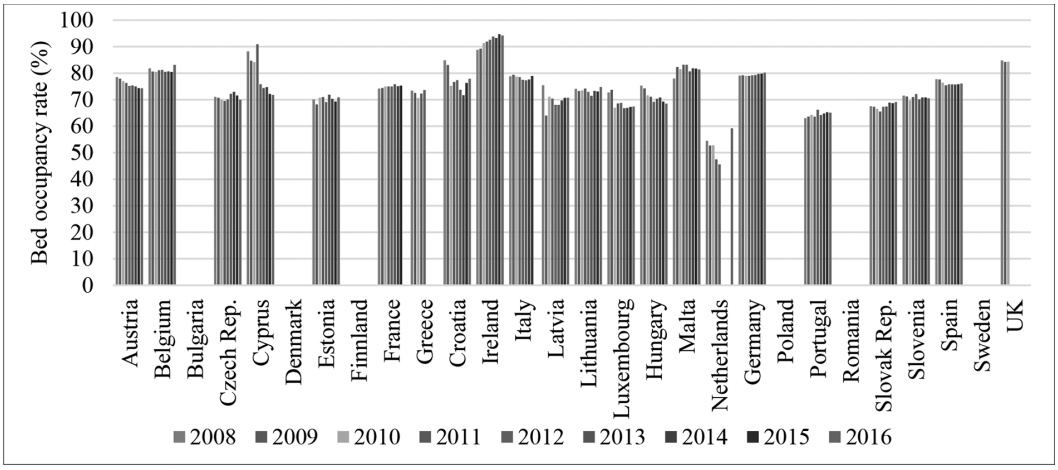


Figure 6. Curative care hospital beds' occupancy rate
Source: EUROSTAT

The highest bed occupancy rate is in Ireland (about 95%), Cyprus (91%) and the United Kingdom (85%), and the lowest in Portugal (about 65%) and the Netherlands (about 45%). The cases of Netherlands and Portugal are examples of „poor" utilization, with large "sunk" costs. Data for Bulgaria, Denmark, Finland, Poland, Romania and Sweden are not known.

Indicators of medical technology equipment show capital endowment of HMO's and the overall trend of a country towards new technologies. CT scanners improve diagnostics significantly in a fast and cost-effective way by reducing further needs for diagnostics and surgical procedures.

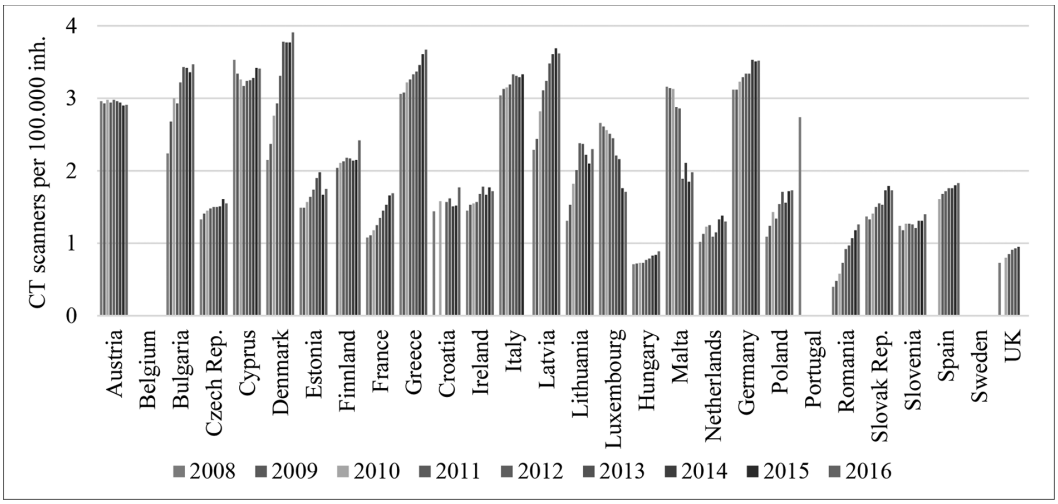


Figure 7. Number of Computed Tomography (CT) scanners per 100.000 inhabitants
Data source: EUROSTAT.

The countries leading the way are: Denmark, Latvia, Germany, Greece, Cyprus, and Bulgaria, followed by Italy, Austria, and Malta. A higher number of CTs does not mean they are used optimally, so these statistics needs to be complemented by waiting list and unmet needs statistics.

Countries are rather diverse in their medical technology equipment endowments, and it seems that these endowments (or lack thereof) are not the main reason for the differences in unmet needs for diagnostics (Figure 9).

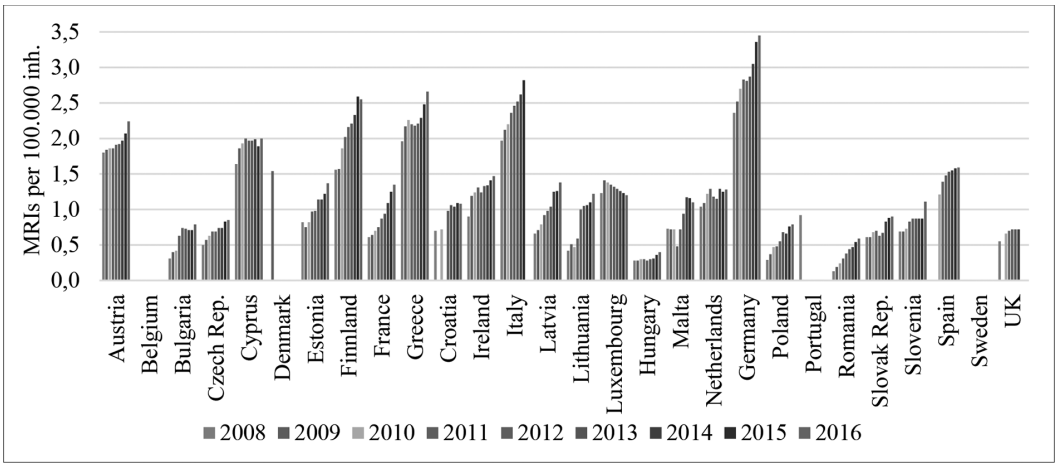


Figure 8. Magnetic Resonance Imaging (MRI) units per hundred thousand inhabitants
Data source: EUROSTAT.

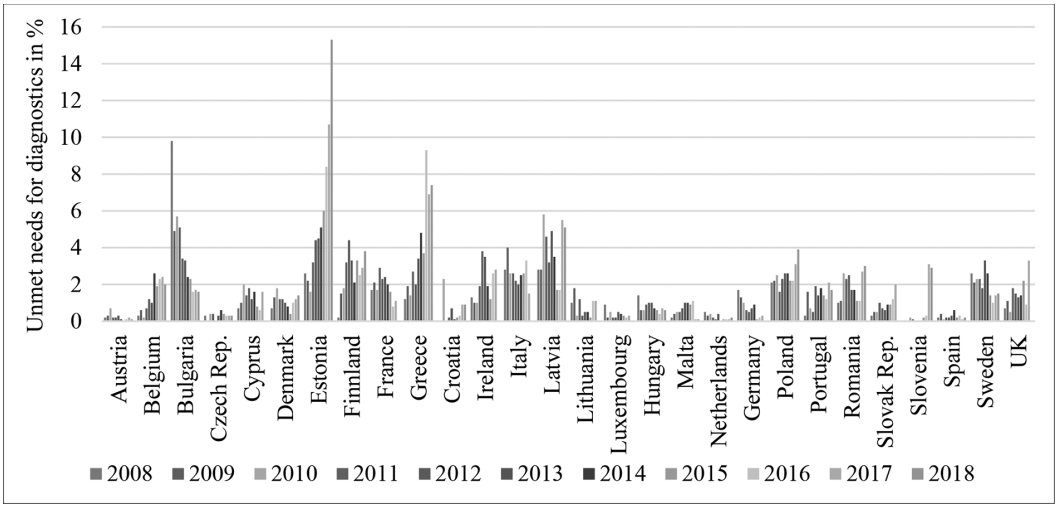


Figure 9. Self reported unmet needs for diagnostics in %
Data source: EUROSTAT.

As we could not see any correlation between medical technology endowment and self-reported unmet needs for diagnostics, we conjecture a relationship with the only other factor at hand: the complementary labour factor.

4. PROBLEMS ARISING FROM COUNTRY DIFFERENCES

Health expenditures represent a growing share of GDP in both developed and transition countries. These expenditures in former Central and East European (CEE) transition countries typically range from 6% to 8% of GDP, while in highly developed countries, they range from 8% to 11% of the GDP. As health is a superior good, and opportunity costs of health are higher in richer countries than in poorer ones, it is expected the outlays for health care in richer countries to be higher. In 2016, France and Germany had the highest share of health expenditure per capita (private and public), and Romania and Luxembourg the lowest one. Luxembourg being the obvious outlier regarding its extremely high GDP of over €100,000 per capita. The possible reasons for Luxembourg stepping out of the line are: overrated GDP (and thus overrated denominator) over the National Income (NI) because of a heavy concentration of industries actually not contributing to the NI such as international financial services, large number of EU institu-

tions, their employees having separate health care arrangements not being covered by domestic health care policies, and thus not being covered by the domestic statistics, and lastly, a relatively low number of performed health care interventions due to a relatively high level of health care condition of Luxembourgish citizens. Also, being a relatively small country, Luxembourg uses a lot of specialist medical services of the surrounding countries, statistically encompassed as services performed in these countries, all undervaluing the numerator.

4.1. The impossibility of price discriminatory practices

One of the most problematic consequences of public health system differences is the price discriminatory behaviour by the pharmaceutical industry and governmental or EU policies prohibiting such behaviour. Let us consider two examples: the first of a cure against cancer Trastuzumab (herceptin), and the second of a cure against Hepathtis C virus (HCV) Viekirax (a ombitasvir / paritaprevir / ritonavir combination therapy). Both therapies cost around 50.000 EUR, are very effective, and have lower priced lower effectiveness alternatives on the market (Mance et al. 2016). In low income EU MSs, people are forced to go to such lengths to get the extremely expensive medical treatment as to sell their own homes (Paun, 2016). Because of EU common market, differential prices are strictly prohibited. Any discrimination of first, second, third or even fourth degree is strictly prohibited. Nevertheless, pharma industry has come about some new non explicit methods of granting discounts to counties with a lower ability to pay.

Table 2. Four degrees of price discrimination

quality		**The seller targets:**	
		quantity	
The seller targets:	***individuals***	1st degree price discrimination: individually tailored price-quality combinations are perceived as different qualities.	2nd degree price discrimination: rebates are given on incremental sales and follow the slope of the demand curve.
	groups	4th degree price discrimination: group-tailored price-quality differentials.	3rd degree price discrimination: prices are equal to the group mean unitary elasticity of demand.

Source: Mance et al. (2019), p. 178.

If prohibited to price discriminate by group and quantity (3rd degree of price discrimination) pharmaceutical industry may attempt to discriminate by group and quality. The danger of such discrimination schemes is that lower income countries may end up with lower quality health technologies. Prohibition of price discrimination originally meant to close the differences between countries on the EU common market. It was one of the ideas of the common market. Prohibition of price discrimination of third degree eliminates the possibility of low-income countries achieving prices commensurate to their ability to pay, and ultimately sentences them to pharmaceutical therapies of lower quality (price discrimination of fourth degree). For example, this leads to the purchase of lower quality antivirals with a lower sustained virological response. The same goes for chemotherapies, leading to a lower survival rate. Pharmaceutical therapies of lower quality ultimately lead to higher morbidity and mortality. Price discrimination is of mutual benefit to both producers and consumers in situations where the ability to pay is the major reason for not being able to purchase the pharmacological therapy. Pharmaceuticals are an industry characterised by extremely large irreversibilities in production: high fixed and sunk costs of research and development protected by patent rights. Production of pharmaceuticals is also characterised by huge cost subadditivities: economies of scale and scope, relatively small and decreasing variable and marginal costs of production. Ultimately, this leads to a natural monopoly (table 3).

Table 3. Market classification according to irreversibilities and cost subadditivities

		Irreversibilities in production (*"sunk costs"*)	
		large	***negligible***
Cost subadditivities *("economies of scale/ scope")*	***large***	Natural monopoly	Disciplined monopoly
	negligible	Market with imperfections	Normal market

Source: Mance et al. (2015) based on Baumol et al. 1982.

Marginal cost pricing would ultimately mean the last buyer would pay a negligible price based on marginal cost. Profit maximisation requires the supplied quantity to be set as to the point where the marginal revenue intersects with marginal costs. As pharmaceutical companies do not specifically target quantities, they will set the price to be equal to the point on the demand curve where after subtracting marginal costs its elasticity of demand is assumed to be minus unity (E_d=-1) on every separate market. The definition of a separate market is crucial. The basic idea of an EU common market is not commensurate with separate national markets for pharmaceutical therapies. But the single payer systems of EU MSs are organised on national basis and not at EU level. Less wealthy EU MSs require their prices to reflect their lower ability to pay as unitary elasticity of demand is found at a lower price level. To hide from explicit price discounts, producers enter into implicit or hidden discount practices. Several discount mechanisms have been envisaged: pay for performance (success fee) with either no cure - no pay system or a system of paybacks. Lately, pharmaceuticals are also purchased by bundling them into complex multiple therapies so that no price of a single therapy can be identified from the bundle. Also, governmental single payer HMO's reserve the right to withhold information from price negotiations with pharmaceutical industries.

4.2. Brain drain

The problem of physicians' brain drain from lower income EU MSs to high income EU MSs is something that is talked about, but these claims have not yet been substantiated by viable econometrics. For example, according to Ifanti et al. (2014) the main cause generating the brain drain of Greek physicians is the financial crisis resulting in austerity measures in the public sector with the consequent public sector job insecurity, income reduction, and over-taxation, together with limited budgets for research institutes (Ifanti, 2014). According to Boncea (2014) between 2007 and 2010, 8131 medical doctors left Romania, the EU MS with some of the poorest health indicators. She confirms one more time that the gap in levels of payment is significant, but not the only cause of emigration. The main reasons behind the decision to emigrate are: poor working conditions and absent opportunities for career development and continuing education (Boncea, 2014). We constructed a Panel Ordinary Least Squares (OLS) correlation analysis of differenced data represented in Figures 2 and 3. We differenced the data to achieve strong stationarity that would permit us to conduct the OLS. Firstly, we conducted a correlation between all EU MSs (Table 4). Cyprus, Greece, Luxembourg, Netherlands, Portugal, and Slovakia were omitted because of missing comparable data.

Our first correlation shows no adverse effects between changes in practicing and graduate medical doctors. The sign of the coefficient remains positive, although the R^2 is rather low, a mere 0.06 (p=0.0005). This shows that at the overall EU level, no adverse beggar-thy-neighbour "brain drain" consequences occur. To test these effects at the level of particular countries, a sample of countries was selected that show an increase in the number of practicing doctors and simultaneously a falling number of graduate medical doctors (Table 5). These countries are: Austria, Denmark, Germany, Sweden, and UK.

Table 4. Panel OLS of FD
between practising and graduate physicians of EU MSs

Dependent Variable: D(PRACTICING) Method: Least Squares Sample (adjusted): 2 198				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GRADUATES)	3.027618	0.848260	3.569208	0.0005
R-squared	0.060315	Mean dependent var		-0.920254
Adjusted R-squared	0.060315	S.D. dependent var		33.45267

Data source: EUROSTAT. Own calculation in Eviews 9.

Table 5. Panel OLS of FD
between practising and graduate physicians of selected EU MSs

Dependent Variable: D(PRACTICING) Method: Least Squares Sample (adjusted): 2 45				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GRADUATES)	-8.836878	2.482133	-3.560195	0.0009
R-squared	0.214163	Mean dependent var		-4.120227
Adjusted R-squared	0.214163	S.D. dependent var		37.71665

Data source: EUROSTAT. Own calculation in Eviews 9.

The panel OLS shows statistically significant (p=0.0009) results, with an expected negative sign and a relatively high coefficient value of -8.84 meaning that for every single graduate medical doctor less exiting the medical schools, there is an increase in the number of practising physicians equal to almost 9. If we define the „brain drain" effect as a number of physicians missing from the domestic workforce not complemented by domestic medical schools, but by immigration instead. The effect explains 21% of the increase of the number of physicians.

5. CONCLUSION

We identified several problems occurring at the level of individual EU MS health management systems. Firstly, there is a problem of different opportunity costs among the MSs. Different opportunity costs require different policies, and differentiated prices.

The second problem is one of labour mobility in the health care services sector, resulting from a variety of push and pull factors leading to the brain drain of skilled professionals from poorer to richer countries, and ultimately leading to a "beggar-thy-neighbour" policies with poorer countries being on the losing end.

Each EU MS has a default system of budget allocation for specific areas based on standards of care that are ultimately dependent on available health technologies. Health expenditures represent a growing share of GDP in both developed and transition countries. These expenditures in transition countries typically range between 6% and 8% of GDP, while in high-developed countries, they range from 8% to 11%. These results are commensurate with rising opportunity costs of health with rising income.

Nevertheless, because of organisational issues, some countries manage to achieve better results with less medical technology endowment. It seems that the human capital was an unaccounted factor.

REFERENCES

Arrow, KJ (1963), *Uncertainty and the welfare economics of medical care.* American economic review, 53(5), 941-973. https://web.stanford.edu/~jay/health_class/Readings/Lecture01/arrow.pdf

Baumol, W. (1982). *Contestable Markets: An Uprising in the Theory of Industry Structure.* American Economic Review, 72(1), 1-15. https://www.jstor.org/stable/1808571

Boncea, I. J. (2014) *Brain Drain in Romania: Factors Influencing Physicians' Emigration*. Journal of Community Positive Practices. Issue No. 1/XIV, pp. 064-074.

Delamaire, ML, Lafortune, G (2010), *Nurses in Advanced Roles: A Description and Evaluation of Experiences in 12 Developed Countries*, OECD Health Working Paper, No. 54, OECD Publishing, Paris. doi: http://dx.doi.org/10.1787/5kmbrcfms5g7-en

Devaux, M, de Looper, M (2012), *Income-related Inequalities in Health Service Utilisation in 19 OECD Countries*, OECD Health Working Papers, No. 58, OECD, Paris. doi: http://dx.doi.org/10.1787/5k95xd6stnxt-en

Drummond, MF, Sculpher, MJ, Claxton, K, Stoddart, GL, Torrance, GW (2015), *Methods for the Economic Evaluation of Health Care Programmes*, 4th edition, Oxford University Press, Oxford.

Ifanti, A. A.; Argyriou, A. A.; Kalofonou, F. H.; Kalofonos, H. P. (2014) *Physicians' brain drain in Greece: A perspective on the reasons why and how to address it.* Health Policy, 117(2), pp. 210-215. doi: https://doi.org/10.1016/j.healthpol.2014.03.014

Mance D, Vretenar N, Katunar J (2015) *Opportunity cost classification of goods and markets*. International Public Administration Review, Vol. 13(1):119–134. doi: 10.17573/ipar.2015.1.06

Mance D, Mance D, Vitezić D (2016) *Incremental cost-effectiveness pharmacoeconomic assessment of hepatitis C virus therapy: an approach for less wealthy members of the common market*. Croat Med J 57(6):582–590.

Mance D., Mance D., Vitezić D. (2019) *Personalized Medicine and Personalized Pricing: Degrees of Price Discrimination*. In: Bodiroga-Vukobrat N., Rukavina D., Pavelić K., Sander G. (eds) Personalized Medicine in Healthcare Systems. Europeanization and Globalization, vol 5. Springer, Cham. doi: https://doi.org/10.1007/978-3-030-16465-2_14.

Ottewill, R (1996), *Health Care Systems in Liberal Democracies*, London and New York: Routledge.

Paun, C. (2016) *Skyhigh drug prices made Romania mull unusual path.* Politico, Europe edition. https://www.politico.eu/article/high-drug-prices-romania-changes-patents-hepatitis/

Santerre, RE, Neun, SP (2007), *Health economics, theories, insights, and industry studies*, 4th edition, Steve Momper, Thomson, South-Western.

THE ECONOMETRIC ANALYSIS OF THE TAXES AND TRANSFERS DEPENDENCE ON THE DIFFERENT GOVERNMENT LEVEL ON THE EXAMPLE OF VISEGRAD COUNTRIES

Nadiya Dubrovina[1]
Oleksandr Nestorenko[2]
Kristina Sirenko[3]
Olena Vasylenko[4]

DOI:

Abstract: *The features of the financial decentralization are closely connected with the public administration and self-governance systems in the separated countries. It should be mentioned that the problem of efficient allocation of the financial resources between social and economic institutions from the different territorial levels is not clearly solved in many EU countries, and in Visegrad countries particularly. It is important to study the relations between taxes and transfers on the different government level. In this work we presented one of the possible approaches to study relationship between taxes and transfers on the different government level in Visegrad countries. By means of econometric analysis and regression models we showed essentially strong vertical and horizontal relations for some countries of EU between their fiscal indicators on central and local government level. Nevertheless, we had the different estimations of the parameters for factor variables, as well as for trends, which can be explained by important differences in the policy of these V4 countries-neighbors in the policy of fiscal decentralization, social and economic development.*

Keywords: *Fiscal Decentralization, Fiscal Policy, Vertical and Horizontal Relation, Econometric Model, Visegrad Countries.*

1. INTRODUCTION

One of the important problems of the fiscal policy of EU countries is to improve the transparency and efficiency of the taxes and budget systems as the means of the realization of the main social and economic functions of the state and self-governing units (Buček et all, 2010; Crook, 2003; Crook & Manor, 2000). The features of the financial decentralization are closely connected with the public administration and self-governance systems in the separated countries. It means that if the number of self-governing regions is bigger the opportunity to introduce the financial decentralization mechanism is more. Nevertheless, taxation mechanism and budget systems differ in EU countries and this reflects the historical traditions and different structure of administrative systems (Dubrovina et all, 2016).

In the Visegrad countries, and Slovakia particularly, the problem of the regional disproportions is acute (Buček et all, 2010; Maaytová, 2015; Morvay, 2002; Ochrana et all, 2010). These significant regional disproportions in the social and economic development have negative impact to the budget systems, their financial stabilities and efficiency. The regional parts of gross do-

[1] School of Economics and Management in Public Administration in Bratislava, Slovakia
[2] University of Economics in Bratislava, Slovakia
[3] Academy of the State Penitentiary Service, Ukraine
[4] National Transport University, Ukraine

mestic product, gross value-added formation in the regions and incomes of the local inhabitants create the bases for taxation and collection of the different taxes for the budget system. Especially the necessity of reforms in public administration and budget systems is clearly visible for the former socialist countries of EU, where the traditions of the centralized systems and control were significant and experience of the financial decentralization is quite short (Crook, 2003; Crook & Manor, 2000; Markowska-Bzducha, 2006).

It should be mentioned that the problem of efficient allocation of the financial resources between social and economic institutions from the different territorial levels is not clearly solved in many EU countries, and in Visegrad countries particularly. For example, in Slovakia this problem is also actual, this is highlighted in many domestic reports and research papers (Buček et all, 2010, Morvay, 2002; Schultzová et all, 2009). The mechanism of tax system and taxation, the perspectives of their development, taxes and transfers are studied in the papers of Schultzová (2009), Zubaľová (2008), Morvay (2002), etc.

Nevertheless, one of the problems of public and local finances is to study the relations between taxes and transfers on the different government level. In this work we presented one of the possible approaches to study relationship between taxes and transfers on the different government level in Visegrad countries.

2. THE PURPOSE, DATA AND METHODOLOGY

The purpose of this work is to study relations between taxes and transfers on the different government level in Visegrad countries by means econometric approach and to compare the results of estimation to reveal some differences of fiscal policy in Czech Republic, Slovakia, Hungary, Poland and Slovakia.

For the evaluation of the position of EU countries we used available data from Eurostat for period of 2002-2017. For the purpose of the analysis of the vertical and horizontal relations between selected indicators characterized financial decentralization and local autonomy in SR and other Visegrad countries we used correlation matrices and multiple regression models. The analysis of the correlation matrices showed the existence of the essential relationship between indicators characterized financial decentralization and local autonomy on the vertical and horizontal levels.

As tools we used multiple regression model because the period of time series and limited number of countries (4 countries of Visegrad group) followed to some limitations in the selection of other, more advanced econometric methods.

3. THE MAIN RESULTS

In this work the analysis of the taxes and transfers dependence on the different government level is carried out on the example of Visegrad countries. We tested the hypothesis about relationship of the taxes and transfers on the different government level by means the econometric models.

For the analysis we used such set of the indicators:

V1_C – share of the capital and current transfers in the revenue on the central government level [(Capital transfers, receivable + Other current transfers, receivable)/Revenue]×100%;

V2_C – share of the capital and current taxes in the revenue on the central government level [(Capital taxes, receivable + Current taxes on income and wealth, receivable)/Revenue]×100%;

V3_C – share of the net social contributions in the revenue on the central government level [Net social contributions/Revenue]×100%;

V4_C – share of the subsidies, transfers and investment grants in the expenditure on the central government level [(Subsidies, payable + Other current transfers, payable + Investment grants, payable)/ Expenditure]×100%;

V5_C – share of the social benefits in the expenditure on the central government level [Social benefits other than social transfers in kind, payable/Expenditure]×100%;

W1_L – share of the social benefits other than social transfers in kind in the expenditure on the local government level, [Social benefits other than social transfers in kind, payable/ Expenditure]×100%;

W2_L – share of the social transfers in kind, purchased market production in the expenditure on the local government level [Social transfers in kind, purchased market production, payable/Expenditure]×100%;

W3_L – share of the social benefits and social transfers in kind in the expenditure on the local government level [(Social benefits other than social transfers in kind, payable+ Social transfers in kind, purchased market production, payable)/Expenditure]×100%;

W4_L – share of the capital transfers, investment grants and current transfers in the expenditure on the local government level [(Capital transfers, payable + Investment grants, payable + Other current transfers, payable)/Expenditure]×100%;

W5_L – share of the taxes in the revenue on the local government level [(Taxes on production and import, receivable + Current taxes on income and wealth, receivable + Capital taxes, receivable)/Revenue]×100%;

W6_L – share of the transfers in the in the revenue on the local government level [(Capital transfers, receivable + Other capital transfers and in investment grants, receivable)/Revenue]×100%.

For the analysis of the horizontal and vertical relations between taxes and transfers on the different government level we used such hypothesis given below.

For central government level and analysis of the horizontal relations we used such indicators:

1. Dependence of the share of the capital and current transfers in the revenue from share of the capital and current taxes in the revenue or V1_C=f(V2_C);
2. Dependence of the share of the social benefits in the expenditure from share of the net social contributions in the revenue or V5_C=f(V3_C);
3. Dependence of the share of the subsidies, transfers and investment grants in the expenditure from the share of the capital and current taxes in the revenue V4_C=f(V2_C).
4. Dependence of share of the capital transfers, investment grants and current transfers in the expenditure from share of the transfers in the in the revenue or W4_L =f(W6_L);
5. Dependence of the share of the transfers (social transfers and benefits, current transfers, investment grants and capital transfers) in expenditure from or the share of the taxes and transfers in revenue or W34_L=f(W56_L);
6. Dependence of the share of the taxes and transfers in revenue on local government level from the share of taxes and transfers in revenue on the central government level or W56_L=f(V12_C);

7. Dependence of the share of the transfers (social transfers and benefits, current transfers, investment grants and capital transfers) in expenditure on the local government level from the share of the social benefits, subsidies, transfers and investment grants in the expenditure on the central government level or W34_L=f(V45_C).

Because we used time series data which have some tendencies and correlated each other for the specification of the linear econometric model time as additional independent variable was included.

In table 1 the results of the econometric model were given for the analysis of the horizontal relations between taxes and transfers on the central government level.

Table 1. The results of the econometric model for the analysis of the dependence of the share of the capital and current transfers in the revenue (V1_C) from share of the capital and current taxes in the revenue (V2_C)

Variable	**Czechia**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
Intercept	25,1509	8,4205	2,9868	0,0105	F(2,13)=1.9106 p<0.18731	0.4766
V2_C	-0,7651	0,3928	-1,9477	0,0734		
T (time)	-0,2505	0,1663	-1,5061	0,1509		
Variable	**Hungary**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
Intercept	18,7964	4,0896	4,5961	0,0005	F(2,13)=54.840 p<0.00000	0.9455
V2_C	-0,4986	0,1281	-3,8908	0,0019		
T (time)	0,5385	0,1191	4,5196	0,0006		
Variable	**Poland**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
Intercept	17,7861	3,5209	5,0516	0,0002	F(2,13)=24.034 p<0.00004	0.8871
V2_C	-0,573	0,1673	-3,4261	0,0045		
T (time)	0,2338	0,052	4,4933	0,0006		
Variable	**Slovakia**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
Intercept	44,2298	9,5038	4,6539	0,0005	F(2,13)=8.3059 p<0.00474	0.7489
V2_C	-1,367	0,3552	-3,8486	0,002		
T (time)	0,3839	0,1636	2,3472	0,0354		

Source: own statistical elaboration in Statistica

As we can see from this table, for most Visegrad countries the econometric models have good values for the basic statistical criteria (Student criterion or t-value and Fisher criterion or F-value), it means that estimations for the parameters are statistically significant at level $p<0.05$ for each variable and for model at all. R-values are also relatively high and it means that these models are good fitted for the description of the relations between selected indicators. In the case of Czechia we observe that first parameter (intercept) is statistically significant at level $p<0.05$, but second parameter for variable V2_C is statistically significant at level $p<0.1$ and third parameter for time variable is statistically significant at level $p<0.15$. In addition, value for Fisher criterion is not high and statistically significant only at level $p<0.2$. R-value for model built for Czechia is not high, only 0.48. Nevertheless, this model can be used for the analysis of relations between selected indicators.

Let to interpret these models. For all models the estimations for the intercept are positive and can be explained as initial level for the share of the capital and current transfers in the revenue without the impact of such factors as the share of the capital and current taxes in the revenue. The highest estimation was used for Slovakia (44,22) and the lowest was for Poland (17,78). For all countries the estimations for variable V2_C (share of the capital and current taxes in the revenue) are negative, it means that the share of the capital and current transfers in the revenue reduced if the share of the capital and current taxes in the revenue increased. For Hungary, Poland and Slovakia the value of the V1_C (share of the capital and current transfers in the revenue) were increasing over time period from 2002-2017, the related estimations for the time variable are positive. In case of Czechia, the estimation for time variable is negative, it means that values of V1_C (share of the capital and current transfers in the revenue) have some tendency to reduce over time.

In table 2 the results of the econometric model were given for the analysis of the horizontal relations between social benefits and net social contributions on the central government level.

Table 2. The results of the econometric model for the analysis of the dependence of the share of the social benefits in the expenditure (V5_C) from share of share of the net social contributions in the revenue (V3_C)

Variable	**Czechia**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
Intercept	17,4104	8,7311	1,9941	0,0676	F(2,13)=43.728 p<0.00000	0.9330
V3_C	0,4689	0,2557	1,8338	0,0897		
T (time)	0,6576	0,0734	8,9558	0		
Variable	**Hungary**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
Intercept	10,6406	2,412	4,4115	0,0007	F(2,13)=4.1519 p<0.04033	0.6243
V3_C	0,0676	0,4581	0,1476	0,8849		
T (time)	-0,1852	0,1187	-1,5597	0,1428		
Variable	**Poland**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
Intercept	5,9316	5,1543	1,1508	0,2705	F(2,13)=5.1538 p<0.02249	0.6650
V3_C	0,2959	1,2166	0,2432	0,8116		
T (time)	-0,1115	0,0348	-3,2086	0,0069		
Variable	**Slovakia**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
Intercept	18,5559	3,0309	6,1221	0	F(2,13)=1.1648 p<0.34251	0.3898
V3_C	-0,7759	1,6218	-0,4784	0,6403		
T (time)	0,1178	0,1165	1,5262	0,1509		

Source: own statistical elaboration in Statistica

As we can see from this table only for Czechia the econometric models have good values for the basic statistical criteria (Student criterion or t-value and Fisher criterion or F-value), it means that estimations for the parameters are statistically significant at level $p<0.05$ for each variable and for model at all. R-values are also relatively high and it means that these models are good fitted for the description of the relations between selected indicators. In case for Hungary and Poland F-value is significant al level $p<0.05$, but estimations for some parameters are not statis-

tically significant at level p<0.05 according to t-value. In case for Slovakia only estimation for intercept is statistically significant at level p<0.05, other estimations for variables are not statistically significant at level p<0.05 and this model has relatively low value for Fisher criterion.

The estimations of the intercept are relatively high for case of Czechia and Slovakia and low for Poland.

Then, only for Czechia share of the social benefits in the expenditure (V3_C) has an essential impact on the change of share of the social benefits in the expenditure (V5_C) in this model, for other V4 countries in presented models the variable V3_C does not have statistically significant influence to V5_C. Also, in case for Czechia and Poland the linear trend for the development of share of the social benefits in the expenditure (V5_C) should be taken into account, because the estimations for the parameters for time variable are statistically significant at level p<0.05.

In table 3 the results of the econometric model were given for the analysis of the horizontal relations between subsidies, transfers, investment grants and capital and current taxes on the central government level.

Table 3. The results of the econometric model for the analysis of the dependence of the share of the subsidies, transfers and investment grants in the expenditure (V4_C) from the share of the capital and current taxes in the revenue (V2_C)

Variable	**Czechia**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
Intercept	30,5946	9,3884	3,2588	0,0062	F(2,13)=16.761 p<0.00025	0.8488
V2_C	0,0588	0,438	0,1343	0,8953		
T (time)	-0,591	0,1854	-3,1872	0,0071		
Variable	**Hungary**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
Intercept	48,61	6,9545	6,9898	0	F(2,13)=7.3986 p<0.00716	R= 0.3281
V2_C	-0,0216	0,2179	-0,0992	0,9225		
T (time)	-0,5868	0,2026	-2,8967	0,0125		
Variable	**Poland**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
Intercept	43,2944	7,1716	6,037	0	F(2,13)=0.78422 p<0.47692	R= 0.3281
V2_C	0,2002	0,3407	0,5876	0,5669		
T (time)	0,1314	0,106	1,2402	0,2368		
Variable	**Slovakia**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
Intercept	47,6912	9,7903	4,8713	0,0003	F(2,13)=2.8426 p<0.09460	0.5515
V2_C	-0,3838	0,3659	-1,0488	0,3134		
T (time)	-0,2984	0,1685	-1,7709	0,1		

Source: own statistical elaboration in Statistica

For this kind of the model only estimations for intercept are statistically significant at level p<0.05 and for cases of Czecia, Hungary and Slovakia the linear trend for the development of the share of the subsidies, transfers and investment grants in the expenditure (V4_C) should be taken into account, because the estimations for the parameters for time variable are statistically

significant at level p<0.1. The estimations for the intercept have relatively high values in cases of Hungary and Slovakia, for Czechia the estimation for the intercept is the lowest.

Then, in the presented models the variable share of the capital and current taxes in the revenue (V2_C) does not influence significantly on the change of the variable share of the subsidies, transfers and investment grants in the expenditure on the central government level for all V4 countries.

For local government level and analysis of the horizontal relations we used models described below.

In table 4 the results of the econometric model were given for the analysis of the horizontal relations between share of the capital transfers, investment grants and current transfers in the expenditure and the share of the transfers in the in the revenue on the local government level.

Table 4. The results of the econometric model for the analysis of the dependence (W4_L) from (W6_L)

Variable	**Czechia**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
Intercept	15,6242	1,7159	9,1055	0	F(2,13)=39.099 p<0.00000	0.9259
T (time)	-0,6537	0,0776	-8,4207	0		
W6_L	-0,1929	0,0882	-2,1862	0,0477		
Variable	**Hungary**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
Intercept	8,066	0,9224	8,7445	0	F(2,13)=4.7573 p<0.02816	0.6501
T (time)	0,2864	0,1018	2,8146	0,0146		
W6_L	-0,0098	0,0277	-0,3554	0,728		
Variable	**Poland**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
Intercept	7,6341	1,1731	6,5075	0	F(2,13)=0.22560 p<0.80109	0.1831
T (time)	-0,0217	0,0851	-0,2547	0,803		
W6_L	**-0,0564**	0,1088	-0,5187	0,6127		
Variable	**Slovakia**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
Intercept	8,0377	2,9399	2,734	0,0171	F(2,13)=4.8570 p<0.02659	0.6539
T (time)	-0,4491	0,1615	-2,781	0,0156		
W6_L	0,0723	0,1175	0,6157	0,5487		

Source: own statistical elaboration in Statistica

From this table it is seen that only for Czechia the econometric models have good values for the basic statistical criteria (Student criterion or t-value and Fisher criterion or F-value), it means that estimations for the parameters are statistically significant at level p<0.05 for each variables and for model at all. R-values are also relatively high and it means that these models are good fitted for the description of the relations between selected indicators. For Hungary and Slovakia, the estimations for the intercept and time variable are statistically significant at level p<0.05, but estimations for variable W6_L are not statistically significant. It means that in presented models share of the transfers in the in the revenue does not influence to share of the capital transfers,

investment grants and current transfers in the expenditure on local level for Hungary and Slovakia. For case of Poland only the estimation for the intercept is statistically significant at level $p<0.05$, but other estimations for variables T (time) and W6_L are not statistically significant. In case of Czechia the estimation of the intercept is relatively high in comparison with cases in Hungary, Poland and Slovakia. Also, only for Czechia the share of the transfers in the in the revenue has the essential impact on the change of share of the capital transfers, investment grants and current transfers in the expenditure.

In table 5 the results of the econometric model were given for the analysis of the horizontal relations between share of the transfers in expenditure and the share of the transfers in the in the revenue on the local government level.

Table 5. The results of the econometric model for the analysis of the dependence (W34_L) from (W56_L)

Variable	**Czechia**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
T (time)	-0,8854	0,0934	-9,4797	0	F(2,14)=366.76 p<0.00000	0.9905
W56_L	0,3373	0,0167	20,2357	0		
Variable	**Hungary**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
T (time)	0,1009	0,2143	0,4709	0,645	F(2,14)=131.01 p<0.00000	0.9743
W56_L	0,2233	0,0344	6,4943	0		
Variable	**Poland**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
T (time)	0,3831	0,2086	1,8361	0,0877	F(2,14)=169.48 p<0.00000	0.9799
W56_L	0,3125	0,0494	6,3265	0		
Variable	**Slovakia**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
T (time)	-0,0654	0,1037	-0,6313	0,538	F(2,14)=59.372 p<0.0000	0.9457
W56_L	0,2366	0,0307	7,7145	0		

Source: own statistical elaboration in Statistica

For the presented models we can see that the estimations for the parameters for variable W56_L (share of the taxes and transfers in revenue) are statistically significant at level $p<0.05$ for all V4 countries, it means that share of the taxes and transfers in revenue has the essential impact on the change of share of transfers in expenditure on local government level for all V4 countries. In case of Czechia and Poland the estimations for time variable are also statistically significant at level $p<0.1$, but for Czech Republic the linear trend has negative slope (values of the share of transfers in expenditure are reducing over time), and in case of Poland the linear trend has positive slope (values of the share of transfers in expenditure are increasing over time).

For local government level and central government level analysis of the vertical relations we used indicators from central and local government level and analyzed models presented in next tables.

In table 6 the results of the econometric model were given for the analysis of the vertical relations between the share of the taxes and transfers in revenue on local government level and the share of taxes and transfers in revenue on the central government level.

Table 6. The results of the econometric model for the analysis of the dependence of the share of the taxes and transfers in revenue on local government level (W56_L) from the share of taxes and transfers in revenue on the central government level (V12_C)

Variable	Czechia					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
Intercept	68,9486	12,0664	5,7141	0,0001	F(2,13)=1.4837 p<0.26279	0.4310
T (time)	-0,0284	0,1908	-0,1489	0,8839		
V12_C	-0,5335	0,3977	-1,3415	0,2027		
Variable	**Hungary**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
Intercept	61,5682	60,9849	1,0096	0,3311	F(2,13)=1.6323 p<0.2331	0.4480
T (time)	1,5653	0,9073	1,7253	0,1081		
V12_C	-0,4557	1,7553	-0,2596	0,7992		
Variable	**Poland**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
Intercept	41,0718	27,7701	1,479	0,163	F(2,13)=2.3569 p<0.13385	0.5158
T (time)	0,5173	0,2973	1,7403	0,1054		
V12_C	-0,1717	1,0372	-0,1655	0,8711		
Variable	**Slovakia**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
T (time)	-1,8273	0,3825	-4,7773	0,0003	F(2,14)=190.47 p<0.00000	0.9821
V12_C	1,2506	0,0985	12,6924	0		

Source: own statistical elaboration in Statistica

From this table it is seen that estimation for time variable is statistically significant at level $p<0.5$ for Slovakia, this estimation is positive and it means that the linear trend has negative slope and the values of the share of the taxes and transfers in revenue on local government level are reducing over time.

For Hungary and Poland these estimations are positive and statistically significant only at level $p<0.1$ it means that increasing tendency of the values of the share of the taxes and transfers in revenue on local government should be taken into account. The estimations of the parameters for the variable V12_C (the share of taxes and transfers in revenue on the central government level) is statistically significant at level $p<0.05$ for Slovakia, in the rest models these estimations are not statistically significant. It means that in the presented models only for case of Slovakia the share of taxes and transfers in revenue on the central government level has an essential impact on the change of the share of the taxes and transfers in revenue on local government level.

In table 7 the results of the econometric model were given for the analysis of the vertical relations between the share of the transfers in expenditure on the local government level from the share of the social benefits, subsidies, transfers and investment grants in the expenditure on the central government level.

From this table it is seen that the estimations of the parameters for time variable and variable V45_C (the share of the social benefits, subsidies, transfers and investment grants in the expenditure on the central government level) are statistically significant at level $p<0.05$. It means that for all V4 countries we observed linear tendency of the change of the share of the transfers in ex-

penditure on the local government level over time and the share of the social benefits, subsidies, transfers and investment grants in the expenditure on the central government level had essential impact on the change of the share of the transfers in expenditure on the local government level for Czech Republic, Hungary, Poland and Slovakia.

Table 7. The results of the econometric model for the analysis of the dependence of the share of the transfers in expenditure on the local government level (W34_L) from the share of the social benefits, subsidies, transfers and investment grants in the expenditure on the central government level (V45_C)

Variable	Czechia					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
T (time)	-0,8433	0,0791	-10,6607	0	F(2,14)=490.54 p<0.0000	0.9929
V45_C	0,2755	0,0117	23,4463	0		
Variable	**Hungary**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
T (time)	0,3293	0,1028	3,2047	0,0064	F(2,14)=373.89 p<0.00000	0.9907
V45_C	0,2246	0,0189	11,8756	0		
Variable	**Poland**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
T (time)	0,451	0,154	2,9291	0,011	F(2,14)=262.67 p<0.00000	0.9869
V45_C	0,2255	0,0272	8,2798	0		
Variable	**Slovakia**					
	Estimation for the parameter	Standard deviation for the estimated parameter	t-value	p-level	F-value for the model	R for model
T (time)	-0,3549	0,1653	-2,1467	0,0498	F(2,14)=40.027 p<0.00000	0.9225
V45_C	0,1849	0,03	6,1715	0		

Source: own statistical elaboration in Statistica

For the analysis of horizontal and vertical relations simultaneously on the local and central level we tested other models. But one of the problems in such models is that the multi collinearity between exogenous and endogenous variables exists and the estimations for the parameters are not statistically significant at level $p<0.05$ or $p<0.1$. Nevertheless, the analysis of the correlation matrices presented the coefficient of pair correlation between variables on the central government level and local government level shows that the certain essential relations between mentioned variables exist, but the input-output models may be more complicated than multiple linear models.

4. CONCLUSION

Despite the similarities in the historical background of Visegrad countries, former traditions in the development of self-governance in regions, cultural micro regions and the territories with own ethnical and cultural identification, we revealed some differences in the development of fiscal reforms and processes of financial decentralization. By means of econometric analysis and regression models we showed essentially strong vertical and horizontal relations for some countries of EU between their fiscal indicators on central and local government level. Nevertheless, we had the different estimations of the parameters for factor variables, as well as for trends, which can be explained by important differences in the policy of these V4 countries-neighbors in the policy of fiscal decentralization, social and economic development.

REFERENCES

Buček, M., Rehák Š., Tvrdoň J. 2010. *Regionálna ekonómia a politika*. Bratislava, 2010.

Crook, R. 2003. *Decentralization and Good Governance*. In Federalism in Changing World: Learning from Each Other. Montreal: McGill-Queens University Press, 240-259 p.

Crook, R., Manor, J. 2000. *Democratic Decentralization*. OED Working Paper Series. No. 11, World Bank. Washington DC.

Dubrovina, N., Péliová, J., Neubauerová, E. 2016. *Analysis of the relationship between taxes and social benefits and transfers in the EU*. - Registrovaný: Web of Science. In European financial systems 2016. International scientific conference. *European financial systems 2016: proceedings of the 13th international scientific conference: June 27-28, 2016 Brno, Czech Republic*. – Brno: Masaryk university, 2016. ISBN 978-80-210-8308-0, p. 125-132.

Maaytová, A., Ochrana, F., Pavel, J., 2015. *Verejné finance v teorii a praxi*. Praha, Grada Publishing. 208 s. ISBN 978-80-247-5561-8.

Markowska-Bzducha, E. 2006. *Samodzielnosc finansowa samorzadow terytorialnych w dwudziestu piecu krajach Unii Europejskej*. In: FunduszeEuropejske. Nr 6(13). 2006. – S.18-21.

Morvay, K a kolektiv. 2002. *Aktuálneotázkyfungovaniaverejnýchfinancií SR*. Bratislava. 2002. 130 s. ISBN 80-7144-127-9.

Ochrana, F., Pavel, J., Vitek, L. 2010. *Verejný sector a verejné finance*. Praha. Grada Publishing. 264 s. ISBN 978-80-247-3228-2.

Schultzová, A. a kolektiv. 2009. *Daňovnictvo: daňováteória a politika*. Bratislava. IuraEdition. 2009. 260 s. ISBN 978-80-8078-407-2.

Zubaľová, A. a kolektiv. 2008. *Daňovéteórie a ichvyužitie v praxi*. Bratislava. Iura Edition. 2008. 189 s. ISBN 978-80-8078-487-4.

LOW CODE PROGRAMMING WITH ORACLE APEX OFFERS NEW OPPORTUNITIES IN HIGHER EDUCATION

Alenka Baggia[1]
Robert Leskovar[2]
Blaž Rodič[3]

DOI:

Abstract: *Rapid development of software development tools presents lecturers in ICT study programs with a demanding challenge: selecting optimal tools to be used in classrooms. An interesting option is low code development environments, where minimal programming skills are needed to develop simple, yet attractive web applications with responsive design. We present several cases of introducing such a tool - Oracle Application Express (APEX) at Faculty of Organizational Sciences at the University of Maribor study programs. Diverse approaches were used to bring APEX closer to students, from incorporating social network paradigm, development of web application, to software quality assurance. Based on the positive experience of using the APEX development environment in the classroom, other faculties are considering introducing similar tools in their study programs.*

Keywords: *Higher Education, ICT study programs, Low Code Development Environment, Web Applications, User Interface, Oracle APEX*

1. INTRODUCTION

Higher education institutions offering ICT study programs have to face demanding challenges to compete for students that want to learn application development and usage of various software (SW) development tools. Apart from the influence of the rapid evolution of SW development tools on the curricula, faculties have to compete with a large number of self-paced online learning platforms. Faculties aim to train students to be flexible and prepared to think and act out of the box to be able to compete in the job market. IT companies that follow the dynamics of the technological segments often consider fresh graduates unprepared for work (Babič, Gašpar, & Satala, 2018).

This paper aims to present several case studies of the introduction of a low code development environment in study programs. Cases were implemented in diverse courses at the University of Maribor, Faculty of Organizational Sciences (UM FOV) and are planned at the Faculty of Information Studies (FIS). Both involved study programs are not strictly focused on computer science and programming but have a wider focus on the management of information systems, where a relatively less technical approach to application development proves to be very useful and efficient. The aim was to introduce the application development environment gradually, considering the needs of a particular study level.

The tool of choice in our cases was Oracle Application Express (APEX), both for its availability within the Oracle Academy initiative and its reputation as a suitable tool for the teaching and

[1] University of Maribor, Faculty of Organizational Sciences, Kidričeva cesta 55a, SI-4000 Kranj, Slovenia
[2] University of Maribor, Faculty of Organizational Sciences, Kidričeva cesta 55a, SI-4000 Kranj, Slovenia
[3] Faculty of Information Studies, Ljubljanska cesta 31a, SI-8000 Novo Mesto, Slovenia

learning of enterprise databases (Monger, Baron, & Lu, 2009), as well as web application development (Mason, 2013)share their knowledge with peers and can inspire students to study the subject after they graduate from the university. One of the goals of the Regis database practicum is to inspire students to continue to study the subject of database technologies after they graduate (e.g., life long learning.

2. ORACLE APPLICATION EXPRESS

Oracle APEX enables the design, development, and deployment of database-driven applications using only a web browser (Oracle, 2018b). It combines the qualities of a low code tool such as productivity, ease of use, and flexibility, with the qualities of an enterprise development tool such as security, integrity, scalability, availability and built for the web (Oracle, 2017). It allows end-users to interact with their data via tools like the interactive report, interactive grid, different types of charts, maps and more (Riaz, 2018). When needed, developers can also include SQL, PL/SQL, HTML, JavaScript and CSS to enhance the user interface.

APEX is the native web development tool that is installed with the Oracle Database (Geller & Spendolini, 2017). All the data presented, inserted or updated in the web application developed with Oracle APEX is therefore securely saved in the database. Most of the basic functionalities of APEX are supported by wizards, which lead the developer through the process of web application development. Consistent, user-friendly report pages, data entry forms or tabular forms are therefore developed with minimum coding effort. From the other perspective, when the usage of applications developed with Oracle APEX is considered, one of the main advantages of is a high degree of client-side platform independence (Geller & Spendolini, 2017).

3. ORACLE APEX IN THE EDUCATIONAL PROCESS

The Oracle Academy Initiative offers an online course “Oracle Application Express – Application Development Foundations”, which introduces students to the techniques and tools required to develop database-driven web applications (Oracle, 2018a). Students can gain specific Oracle Academy certificates for the successful completion of the online course. Although certification can be used as a diploma supplement when applying for a job, only some of the students involved in case studies were interested in applying for the certification procedure. According to previous experiences of the instructors, the student’s lack of interest in the certification is usually caused by the lack of knowledge on certain topics. Therefore, the authors decided to familiarize students with Oracle APEX gradually during their study.

In the academic year 2014/15 Oracle APEX was used for the first time at UM FOV, Organization and management of information systems (OMIS) study program. A physical server with Oracle APEX 4.2 was installed and made available to the master’s degree students. For the last three years, students have also been advised to use free cloud workspace at the apex.oracle.com website for their assignment and self-study.

4. CASE STUDIES IN GRADUATE STUDY

Oracle APEX was introduced in several courses at UM FOV professional and academic study programs. Case studies of individual courses are presented in this chapter.

4.1. Computer science and informatics course

The obligatory course Computer science and informatics is carried out in the first year of study at the three study programs at UM FOV (Organization and management of information systems, Organization and management of human resources and educational systems, and Enterprise engineering). To encourage the students to connect with their classmates and at the same time learn about the web application development, they are invited to log in to the Oracle APEX application and enter data about their peers and the level of acquaintance. The lecturer develops a simple web application based on the social network paradigm in-vivo, at the lectures. Following this presentation, students are invited to log in and mark their acquaintances. The collected connections are gathered in a database table. Students are invited to log in and mark their acquaintances. Further on, graphical representation of top »knowers« and top known students is added to the interface. Students upgrade their experience on their social network at lab exercises, where they learn how to design and present the formed social network with R software (Figure 1).

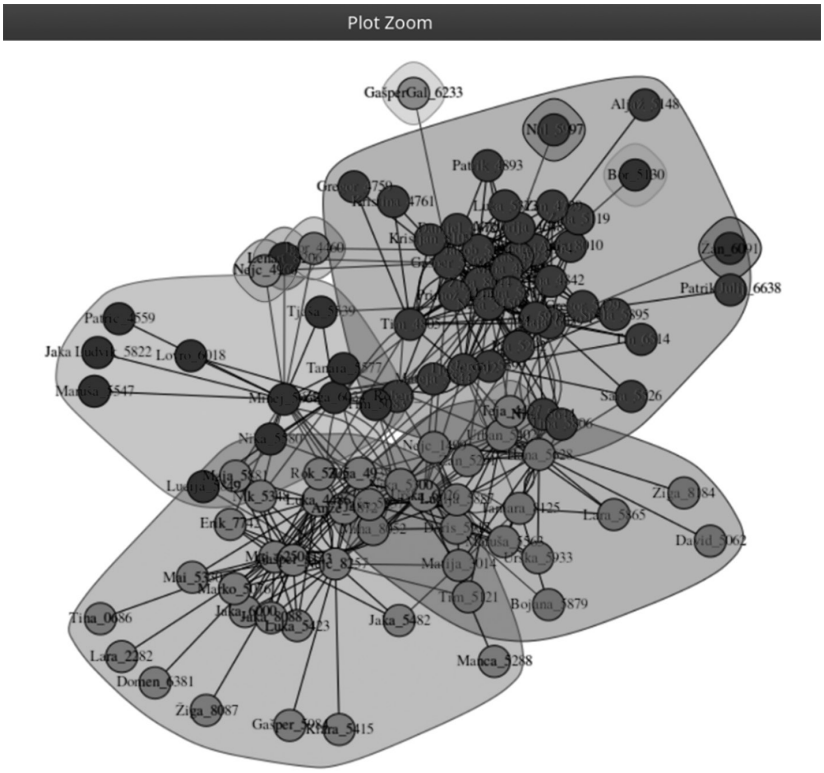


Figure 1. The social network of 1st-year students

4.2. System analysis course

In the second year of study, students attend the course System analysis that introduces them to the process of information systems development. In addition to process modelling techniques, students are introduced to database design and the basics of Structured Query Language (SQL). The goal of the course is to follow the information system (IS) design phases, producing a working prototype at the end of the course. Since Oracle database is used to practice SQL basics, students are encouraged to design a prototype in Oracle APEX low code environment. A simple example of employees and departments is used to present the basics for forms and interactive reports development (Baggia, Mali, Grlica, & Leskovar, 2018).

To enhance the knowledge and gain additional first-hand information, two expert APEX developers were invited to conduct a workshop in the study year 2017/18, The 3- hour workshop was offered to the students in addition to regular lectures and lab practices. The developers used a simple case, which students proposed and developed partly based on their knowledge, to show some advanced techniques and new APEX capabilities. Due to the change of study program, in 2018/19 students were provided with web tutorials on basic APEX application development. Each student selected his/her own case of information system and developed a prototype application with a minimum of one master/detail form.

4.3. IT project course

In the last year of graduate study, students attend a specialized course, where they work in teams to develop an IT project based on the selected methodology. All the lecturers and assistants working at the OMIS study program are engaged as mentors in this course. The challenge for a certain team can be selected and defined by the students or selected by the mentor. Challenges should be real-world problems in an organization, where a prototype solution can be developed in the given time frame (6 months).

The number of team members depends on the number of students enrolled in the course, with a minimum of three members. In the study year, 2017/18 one team of nine students has applied their knowledge at the problem presented by an enterprise with 800 employees having issues with a lack of interest of employees for their intranet solution. Since the enterprise uses an Oracle database, a proposal was made to develop a prototype of an intranet application with Oracle APEX. After three meetings with the client (representatives of the enterprise), students formulated the specification for the updated intranet application and started with the prototype development in the Oracle APEX cloud.

The presentation of the prototype was held at the end of the study year. The representatives of the enterprise and all lecturers involved in the IS project course participated in the event. Several issues and suggestions for improvements were given to the students. One of the students decided to develop the prototype into a working application and use this topic as a graduate degree thesis. A page presenting the homepage of the intranet application and selection of documents and application forms as seen by a manager is shown in Figure 2.

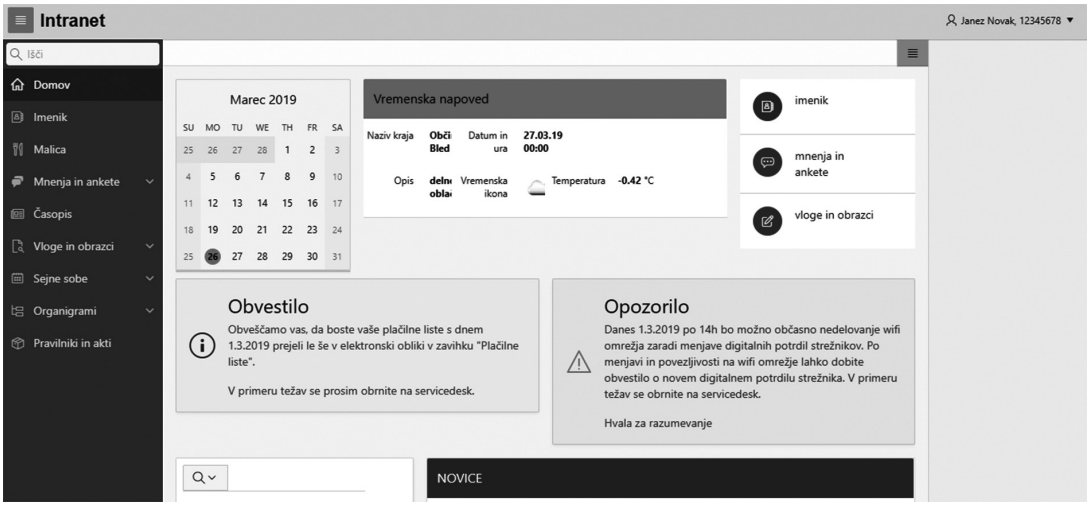


Figure 2. Intranet application (Mihelič, 2019)

5. CASE STUDIES IN MASTER DEGREE STUDY

5.1. Software quality course

In the second year of master's degree study, students are enrolled in the course Software Quality, where they get an insight into software quality assurance in the process of IS development. In the study year 2017/18, students were given the challenge to develop an application with an emphasis on software quality assurance in each development phase. Students worked in teams, which were formed after a detailed analysis of prior knowledge. Due to the diversity of background knowledge of master's degree OMIS students, usage of low code environment, Oracle APEX was proposed. In addition to the basics of software quality assurance, students were introduced to the Oracle APEX development environment. Basics of APEX can be learned very quickly, whereas profound usage requires more training and knowledge.

Students were given the challenge to develop an application, which can be used to collect feedback at the lectures from students' mobile devices. When appropriate, the lecturer enters the question and students have to reply to the question in a predefined time (usually 30 to 180 seconds). Due to the mentioned diversity of knowledge, students were invited to play different roles in the development process. Students with limited knowledge in programming and application development were therefore asked to develop a detailed specification for the proposed application following the life cycle methodology. Coders were asked to write comments to their code, to enable easier testing procedures. To ensure the proper functioning of the database objects, unit testing was performed in SQL Developer. Furthermore, a simple web application was developed using Oracle APEX. The application enables the lecturer to interact with the student by posting challenges to which a student has to respond. Based on ISO/IEC/IEEE 29119 standard (ISO/IEC/IEEE, 2014), a testing plan for the application was formulated, resulting in the testing report.

Students presented their prototype as a poster at the 2018 Apex Alpe Adria conference in Graz, where their work was introduced to the Senior Director for Software Development at Oracle, Mr. Joel R. Kallman (Figure 3).

Figure 3. UM FOV master degree students meeting Mr. Joel R. Kallman, Senior Director, Software Development at Oracle America, Inc.

In the study year 2018/19 the students received a special challenge in the form of a project assignment, aiming to unify the existing IT solutions using APEX. In recent years several APEX based user interfaces and applications have been created within various study courses, with each application using a separate database. As the databases were closely related in content, we have decided to consolidate the databases and their respective user interfaces or applications. A total of six applications and their databases were included in the project assignment.

The project assignment was specified as such: the design of current databases allows multiple applications to be used but requires the user to switch between different Apex workspaces, leading to poor user experience. As the database structure and program code in packages are related, it is possible to consolidate data and applications. The assignment goals were:

1. **Create** a new, consolidated workspace in APEX,
2. **Review** the existing code in individual workstations,
3. **Create and test** a new script for creating tables, insights, sequences, triggers, including all foreign keys,
4. **Create** a new, consolidated database with all relevant tables, sequence views, and triggers,
5. **Transfer** relevant existing and new data into the new database,
6. **Schedule** information was provided in the spreadsheet. The data had to be rearranged, prepare the lookup fields that they were in the appropriate format for entering the database.
7. **Create and test** a new PKG_PREDAVALNICA package with consolidated and tested functions and procedures,
8. **Transfer** existing applications and update them with new features,
9. **Test** the software,
10. **Prepare** project documentation.

Students worked on the fixes and updates of both the database and the applications in groups, under the mentorship of the professor or assistant. They conducted a complete code review, entered the relevant comments in the code, and checked the appropriateness of the naming tables and other elements used in the code. They used the Trivago PL/SQL Cop tool to view the PL/SQL code and obtain suggestions for improvements.

As a result, the students created one common database and updated three different applications. Students had to use a new, updated database, and import it into their APEX Workspace. Due to the complexity of ISO/IEC/IEEE 29119, the test plans were simplified. All tests and incident reports have been compiled into the documentation that will be used by the next generation of students to update the applications.

6. CONCLUSION

Oracle APEX is a low code environment that comes with Oracle database and can be used to develop enhanced web applications with some coding input, as well as simple web applications with minimal knowledge and skills in programming. The presented case of using Oracle APEX at the University of Maribor, Faculty of Organizational Sciences shows, that APEX can be used in different educational levels, from secondary school to master degree study in the field of information systems. The main advantage of APEX is that it can be used for topics not strictly related to IS development, as well as advanced topics in IS education. In addition, web application development with APEX gives students an opportunity to get real experience with working in the cloud.

Since Oracle Academy Database design and foundations, SQL and PL/SQL courses are available to UM FOV students, they are also encouraged to extend their knowledge and earn certificates of course completion for Oracle APEX. Based on the good experience using Oracle free workspace service for the development of APEX applications in the study process, this approach will also be used in the following years. Whereas for advanced projects, like IT project course, on-premises installation of Oracle APEX will ensure better performance and more space to save the data. In addition to activities integrated into the courses and Oracle Academy certifications, students are also invited to participate in workshops organized by the Oracle APEX special interest groups (e.g. Apex Alpe Adria).

Faculty's experiences with low code application development environments have been presented on several occasions, with other HE institutions showing interest. Due to the positive experiences with Oracle APEX at UM FOV, Faculty of Information Studies in Novo Mesto is also looking to introduce Oracle APEX as a low code application development environment within their first level study programs in courses Web and Mobile Information Systems and Development of Solutions for Small Companies. Their use case will be documented and presented in further publications.

REFERENCES

Babič, F., Gašpar, V., & Satala, P. (2018). New Trends in Mobile Technologies Education in Slovakia: An Empirical Study. *ICETA 2018 - 16th IEEE International Conference on Emerging E-Learning Technologies and Applications, Proceedings*, 37–42. https://doi.org/10.1109/ICETA.2018.8572277

Baggia, A., Mali, A., Grlica, A., & Leskovar, R. (2018). Oracle APEX in Higher Education. In O. Arsenijević, I. Podbregar, P. Šprajc, D. Trivan, & Y. Ziegler (Eds.), *Proceedings of the 37th International Conference on Organizational Sciences Development* (pp. 27–38). https://doi.org/10.18690/978-961-286-146-9

Geller, A., & Spendolini, B. (2017). *Oracle Application Express: Build Powerful Data-Centric Web Apps with APEX 5*. New York: McGraw-Hill Education.

ISO/IEC/IEEE. (2014). *ISO/IEC/IEEE 29119 Software Testing: the international standard for software testing*. ISO/IEC/IEEE.

Mason, R. T. (2013). A Database Practicum for Teaching Database Administration and Software Development at Regis University. *Journal of Information Technology Education: Innovations in Practice*, *12*, 159–168.

Monger, A., Baron, S., & Lu, J. (2009). More on Oracle APEX for Teaching and Learning. *Ideas in Teaching, Learning and Assessment of Databases: A Communication of the 7thInternational Workshop on Teaching, Learning and Assessment of Databases (TLAD 2009).*

Oracle. (2017). What is Application Express?

Oracle. (2018a). *Oracle Academy Courses*.

Oracle. (2018b). Oracle Application Express.

Riaz, A. (2018). *Oracle APEX 18.1 For Beginners: A Platform to Rapidly Develop Data-centric Web Applications Accessible from a Multitude of Devices*. USA: CreateSpace Independent Publishing Platform.

PERSONALITY TRAITS AND BUYING BEHAVIOR FROM THE VIEWPOINT OF SELECTED SOCIO-DEMOGRAPHIC CHARACTERISTICS – PRELIMINARY FINDINGS

Tatiana Lorincová[1]
Ivana Ondrijová[2]
Jana Kovaľová[3]

DOI:

Abstract: *The aim of the study is to compare personality traits (extraversion, agreeableness, openness to experience, conscientiousness and neuroticism) and buying behavior among respondents from the Y and Z generations in the context of gender. The research sample consisted of 105 respondents aged between 18 and 65 years (average age: 32.34, standard deviation: 11.81). The sample included 57 women, 48 men, 32 respondents from generation Y and 41 respondents from generation Z. A shortened version of the Big Five (Janovská 2011) questionnaire was used to explore the personality traits, which consists of 40 adjectives, where respondents answered on the scale from 1 – quite inaccurately to 8 – quite accurately. The Customers' buying behavior (CBB) authors' questionnaire consists of 7 items, where respondents rated by the Likert scale from 1 – doesn't matter at all to 5 – depends very much. The research results were processed in statistical program IBM SPSS 20.00 Statistics and assessed by T-test for two independent samples. Research results showed statistically significant gender differences in the level of extraversion, agreeableness and conscientiousness in favor of women. On the other hand, research results showed statistically significant difference in the level of extraversion between respondents from generation Y and respondents from generation Z in favor of respondents from generation Z. The limitation of research study is an occasional choice of research sample.*

Keywords: *Buying Behavior, Customer, Gender, Generation, Personality Traits*

1. THEORETICAL BACKGROUND

Personality traits deal with temporally and situationally invariant personal characteristics that distinguish different individuals and lead to consistencies in behavior across situations and over time (McAdams, 2001). Personality traits can be measured by the popular Big Five model. It is defined as a hierarchical model with five broad factors, which represent personality at the broadest level of abstraction. "Each bipolar factor (e.g., extraversion vs. introversion) summarizes several more specific facets (e.g., sociability), which, in turn, subsume a large number of even more specific traits (e.g., talkative, outgoing). The Big Five framework suggests that most individual differences in human personality can be classified into five broad, empirically derived domains" (Gosling, Rentfrow & Swann, 2003, p. 506).It focuses on a core set of behavioral traits: extraversion, neuroticism, agreeableness, conscientiousness and openness to experience and its proponents argue that people can be understood by knowing how much they display each of these five traits in their lives (Sheldon, Ryan, Rawsthorne & Ilardi, 1997).

As McCrae and John (1992) explain, the model integrates a wide array of personality constructs, thus can be used in many areas of research. Also, it is comprehensive and gives basis

[1] Prešovská univerzita v Prešove, Fakulta manažmentu, Konštantínova 16, 080 01 Prešov, Slovakia
[2] Prešovská univerzita v Prešove, Fakulta manažmentu, Konštantínova 16, 080 01 Prešov, Slovakia
[3] Prešovská univerzita v Prešove, Fakulta manažmentu, Konštantínova 16, 080 01 Prešov, Slovakia,

for exploration between personality traits and other indicators. Third benefit they point out is efficiency of the Big Five model, because of only five scores. Baumgartner (2002) states that "consumers' standing on the purchase-related traits could also be related to more basic dimensions of personality such as the Big Five factors in an effort to find out to what extent different purchase behaviors have their roots in more basic tendencies of the individual" (p. 289).According to the literature (Nga & Ken Yien, 2013; Giovannini & Thomas, 2015; Lin, 2011) we aimed our research to relationships between personality traits (measured with The Big Five model), generations (Horváthová & Čopíková, 2015) and gender.

Generation is defined as people within a delineated population, who experience the same significant events within a given period of time (Robinson 2018). The differences in trade behavior among individual generations are dealt with in generational marketing that uses the generation segmentation in marketing communication (Kumar, 2014; Bačík et al., 2018).

Through the segmentation of customers, it is possible to acquire information enabling to create new products and services, to understand the different requirements and preferences or to know what customers appreciate (Mainland 2012). An overview of generations in Slovak conditions is shown in Picture 1.

Picture 1. The boundaries of the years for individual generations
Source: Horváthová & Čopíková, 2015.

The Baby Boom generation refers to people born during economic prosperity after World War II in the USA (1946 - 1964). They grew up in a stable period believing that they have political and social responsibility and can influence the world they live in (Mainland 2012; Hansen & Leuty 2012). Baby Boomers are confident, independent, and self-reliant. Their negative feature is avoiding changes and insufficient adaptability (Kane 2019). They are attracted to the foreign or exotic and reject high fashion, imitations, and fakes (Littrell, Jin Ma & Halepete, 2005). Baby Boomers "want to know how a product was made, who made it, and what will happen to it when they are done with it" (Ray, 1997, p. 32). For the purposes of research study, the determination of years for generation X is the range of customers born between years 1965 – 1981. As Wroblewski (2018) claims, this generation highly values freedom and independence. They are competitive, self-assertive and hardworking, on the other hand individualistic and less loyal. They prefer balance between a working and private life. Customers in the X generation, can be gained by marketing staff through media means that are fragmented and reasonless. They better respond on product design, which has more diversified choices (Lin, 2011). The customers of generation Y (1982-1992) are able to actively search, classify, filter and analyze needed information. This generation is more resistant and skeptical to traditional marketing tools and tactics as the previous generations (Hershatter & Eprstein 2010; Broadbridge et al. 2007). Generation Y consumers are viewed as being high public self-conscious individuals and are more likely to be brand conscious when making purchase decisions (Giovannini & Thomas, 2015). For this generation, the uniqueness of the product can be enhanced to create an atmosphere that is new and unconventional to allow them to have the sense of superiority of being different (Lin, 2011). For the generation Z (1993-2010), according to IBM (2017) technologies are still a natural part

of their life and require a higher standard as the previous generations. They are accustomed to high-tech and multiple information sources, with messages from all sides. They have never lived without the Internet. Generation Z values authenticity and realness. From the marketing view they are discerning consumers who think a lot about what they are going to wear and the purchases they make themselves (Williams & Page, 2011).

The last facet of research study is comparison of customer buying behavior in the context of gender. Birknerová, Frankovský, Zbihlejová & Parová (2017) explain gender in three levels: socio-structural level, interpersonal level and individual level. There are a number of studies that confirm different buying behaviors from a gender perspective. As Benko & Pelster (2013) report, women in buying behavior tend to collect important information during the actual purchasing process. They enter the shop with a certain idea, but they are also open to the other possibilities that occur during the meeting itself. Men focus their attention on a particular role and do not change their plans and activities during the purchasing process. They trust more in their judgment and decide faster than women. Jones et al. (1998) examined the role of gender in forming a relationship between seller and buyer. They found that the perception of this relationship depended on the seller's and the buyer's gender, the relationship being perceived as stronger when the seller and the buyer are of the same gender. In the study Homburg & Stock (2005) is shown that the relationship between the seller and the buyer is positively moderated by sellers´ empathy, expertise and reliability. The research by Mitchell and Walsh (2006) shows that women are more perfectionist than men. Men are less sensitive to news and fashion and women are more likely to get confused.

2. RESEARCH METHODOLOGY

The main goal of the research is to compare personality traits and customer buying behavior in the context of gender and generation of respondents. Statistically significant differences are assuming in the level of personality traits and customer buying behavior in the context of generation.

3. RESEARCH SAMPLE

Research sample consisted of 105 respondents aged from 18 to 65 years (average age was 32.34 with standard deviation 11.807). The proportionality of gender was uneven- the sample contained 48 men and 57 women. The research sample consisted of 8 respondents from generation BB (year of birth 1946-1964), 24 respondents from generation X (year of birth 1965-1981), 32 respondents from generation Y (year of birth 1982-1992) and 41 respondents from generation Z (year of birth 1993-2010).The participants of the research were selected by using occasional selection.

4. RESEARCH METHODS

For research purpose were used two self-reported questionnaires. A shortened version of the Big Five questionnaire (Janovská, 2011) was used to explore the personality traits, which consists of 40 adjectives, where respondents answered on the scale from 1 – quite inaccurately to 8 – quite (accurately). Factors of Big five methodology (extraversion, neuroticism, agreeableness, conscientiousness and openness to experience) consist of 8 items. Shortened version of the Big Five questionnaire measures five personality traits (extraversion, neuroticism, agreeableness, conscientiousness and openness to experience). Cronbach´s alpha was 0.79.

The Customers' buying behavior (CBB) authors' questionnaire consists of 7 items, where respondents rated by the Likert scale from 1 – doesn't matter at all to 5 – depends very much. Cronbach´s alpha was 0.84.

Example of items CBB questionnaire:

- *To what extent do you care about the price of the products?*
- *To what extent do you care about the color design of the store?*

5. RESEARCH RESULTS

The comparison of differences in the level of personality traits (extraversion, agreeableness, conscientiousness, openness to experience and neuroticism) and customers´ buying behavior in the context of gender and generation of participants were assessed by using statistical method t-test for two independent samples and processed in statistical program IBM SPSS 20.00 Statistics. Table 1 shows statistically significant differences in the level personality traits and customers´ buying behavior in the context of gender.

Table 1. Comparison of statistically significant gender differences in the level of personality traits and customers´ buying behavior of participants

	Gender	n	Mean	Standard Deviation	t	Degree of Freedom	p
Extraversion	**Women**	57	**6.188**	0.832	2.442	103	**0.016**
	Men	48	5.804	0.765			
Agreeableness	**Women**	57	**6.493**	0.838	3.243	103	**0.002**
	Men	48	5.901	1.009			
Conscientiousness	**Women**	57	**6.131**	0.941	3.065	103	**0.003**
	Men	48	5.562	0.956			
Openness to experience	**Women**	57	5.256	0.811	1.120	103	0.266
	Men	48	5.057	1.012			
Neuroticism	**Women**	57	**4.388**	0.976	1.003	103	0.318
	Men	48	4.187	1.074			
Buying behavior	**Women**	57	**3.538**	0.539	2.637	103	**0.010**
	Men	48	3.244	0.605			

Source: own processing

The comparison of means of gender differences is statistically significant in four cases. Statistically significant gender differences in the level of extraversion (p=0.016) were detected. In the level of extraversion was the difference 0.384 in favor of women. Statistically gender differences were found in the level of agreeableness, conscientiousness and customers´ buying behavior. In the level of agreeableness was the difference 0.592 in favor of women. In the level of conscientiousness was the difference 0.569 in favor of women. Finally, in the level of customers´ buying behavior was the difference 0.294 in favor of women. Table 2 shows statistically significant differences in the level of personality traits and customers´ buying behavior in the context of generation.

The comparison of means of differences in the context of generation was statistically significant in one case. Statistically significant differences were found in the level of extraversion (p=0.007). In the level of extraversion was the difference 0.488 in favor of participants from generation Z. In the level of agreeableness, conscientiousness, openness to experience, neuroticism and customers´ buying behavior we did not find statistically significant differences.

Table 2. Comparison of statistically significant differences in the level of personality traits and customers´ buying behavior in the context of generation of participants

	Generation	n	Mean	Standard Deviation	t	Degree of Freedom	p
Extraversion	Generation Y	32	5.707	0.611	-2.755	69.812	**0.007**
	Generation Z	41	**6.195**	0.898			
Agreeableness	Generation Y	32	5.871	0.933	-1.700	71	0.093
	Generation Z	41	6.253	0.967			
Conscientiousness	Generation Y	32	5.558	0.925	-0.610	71	0.544
	Generation Z	41	5.695	0.966			
Openness to experience	Generation Y	32	4.949	1.051	-1.899	71	0.063
	Generation Z	41	5.375	0.874			
Neuroticism	Generation Y	32	4.265	0.976	-0.358	71	0.722
	Generation Z	41	4.357	1.151			
Buying behavior	Generation Y	32	3.281	0.525	-1.641	71	0.105
	Generation Z	41	3.512	0.646			

Source: own processing

6. DISCUSSION AND CONCLUSION

The aim of the study was to compare personality traits (extraversion, agreeableness, openness to experience, conscientiousness and neuroticism) and customers´ buying behavior among respondents from the Y and Z generations in the context of gender. The research results were processed in statistical program IBM SPSS 20.00 Statistics and assessed by T- test for two independent samples.

The use of the Big five methodology in relation to customers´ buying behavior has found application in many studies. The recent study of Ratnawat & Borgave (2019) was focused on investigation of Big-Five personality to impulsive buying behavior. The data for the present study were collected from 178 respondents and random sampling in India was chosen as the technique. In this study agreeableness and neuroticism significantly correlated with impulsive buying behavior. Vice versa extraversion, openness and conscientiousness practically did not have correlations with impulsive buying behavior.

Results of the study showed statistically significant gender differences in the level of extraversion, agreeableness and conscientiousness in favor of women. Women scored higher than men in the level of extraversion, agreeableness, conscientiousness and customers´ buying behavior. Similarly, McCrae & Cost (1990) refer to gender differences concerning to the Big Five model such that women tend to show higher scores on agreeableness and neuroticism, are evident in different cultural contexts.

In the generational context, on the base of analyses were confirmed statistically significant difference only in the level of extraversion between customers from generation Y and Z. In this identified statistically significant difference, customers from the generation Z scored higher than customer from the Generation Y. The customers from younger Generation Z are more extroverted than the Generation Y.

These findings are consistent with earlier studies (Ratnawat & Borgave 2019; Farwizah, Rahim & Abd Rahim 2018; Ercis & Unalan 2017; McCrae & Costa 1990). All these findings point out to importance of knowledge different personality traits in the context of customers´ buying behav-

ior from the point of view of gender and generation of customers. This issue creates space for future research that has a general and interdisciplinary character. The limitation of research study is an occasional choice of research sample and low number of respondents. The research results are basis for future research with more socio - demographic and personality characteristics.

ACKNOWLEDGMENT

Scientific paper was elaborated within the framework of the project KEGA 0033PU-4/2017 Implementation of interpersonal skills in the context of the Psychology of business - innovation of contents and teaching.

REFERENCES

Bačík, R., Fedorko R., Rigelský, M., Sroka, M. & Turáková, A. (2018). Perceiving the advertising in gender-generational characteristics. *In Polish Journal of Management Studies*, *1*(18), 44–57.

Baumgartner, H. (2002). Toward a Personology of the Consumer: Figure 1. *In Journal of Consumer Research, 29*(2), 286–292. doi:10.1086/341578

Benko, C. & Pelster, B. (2013). *How Women Decide. Harvard business review.* [online]. [2019-15-09]. Available at:<https://hbr.org/2013/09/how-women-decide>.

Birknerová, Z., Frankovský, M., Zbihlejová, L. & Parová, V. (2017). Gender differences in perception of advertising in the context of expectations of advertising. *In Journal of applied economic sciences, 12*(6), 1751–1758.

Broadbridge, M. A., Maxwell, G. A. & Ogden, S. M. (2007). Students' views of retail employment – key findings from Generation Ys. *In International Journal of Retail & Distribution Management, 35*(12), 1–19.

Ercis, A. & Unalan, M. (2017). Relationship among big five personality traits, compulsive buying and variety seeking. *In Journal of Management, Marketing and Logistics*, *4*(3), 217–223.

Giovannini, S., Xu, Y., & Thomas, J. (2015). Luxury fashion consumption and Generation Y consumers. *In Journal of Fashion Marketing and Management: An International Journal*, *19*(1), 22–40.

Gosling, S. D., Rentfrow, P. J. & Swann, W. B. (2003). A very brief measure of the Big-Five personality domains. *In Journal of Research in Personality.*37(6), 504–528.

Hansen, J-I. C. & Leuty, M. E. (2012). Work Values Across Generations. *In Journal of Career Assessment*, *20*(1), 34–52.

Hershatter, A. & Eprstein, M. (2010). Millennials and the World of Work: An Organization and Management Perspective. *In Journal of Business & Psychology*, *25*(2), 211–223.

Homburg, Ch. & Stock, R.M. (2005). Exploring the conditions under which salesperson work satisfaction can lead to customer satisfaction. *Psychology & Marketing*, *22*(5), 393–420.

IBM, 2017. *Despite Living a Digital Life, 98 Percent of Generation Z Still Shop In-Store.* [online]. [2019-22-09]. Available at: https://www03.ibm.com/press/us/en/pressrelease/51397.wss

Janovská, A. (2011). *Subjektívna pohoda učiteľov a jej vzťah k osobnostným a interpersonálnym činiteľom.* Disertation. Pavol Jozef Šafárik University in Košice.

Jones, E., Moore, J.N., Stanaland, A. & Rosalind, A.J. (1998). Salesperson Race and Gender and the Access and Legitimacy Paradigm: Does Difference Make a Difference? *In Journal of Personal Selling & Sales Management*, *18*(4), 71–88.

Kane, S. (2019). *Traditionalists (aka The Silent Generation).* [online]. [2019-15-09]. Available at: <http://legalcareers.about.com/od/practicetips/a/Traditionalists.htm>.

Kumar, P. (2014). Managing Career Aspiration of Generation Y - A Key to Business Excellence. *In Global Journal of Multidisciplinary Studies*, *3*(5), 114–118.

Lin, C. H. (2011). Personality, value, life style and postmodernism consumer behavior: a comparison among three generations. *In International Journal of Organizational Innovation, 3(*3), 203–230.

Littrell, M. A., Jin Ma, Y. & Halepete, J. (2005). Generation X, Baby Boomers, and Swing: marketing fair trade apparel. *In Journal of Fashion Marketing and Management: An International Journal*, 9(4), 407–419. doi:10.1108/13612020510620786

Mainland, B. (2012). *Why you should segment your target market by generation.* [online]. [2019-22-09]. Available at:<https://www.dynamicbusiness.com.au/small-businessresources/starting/segmenting-your-target-market-via generations-20102012.html>.

Mitchell, V.W. & Walsh, G. (2006). Gender differences in German consumer decision making styles. *In Journal of Consumer Behaviour. 3*(4), 331–346.

Robinson, M. T. (2018). *The Generations. Which Generation are You?* [online]. [2019-09-09]. Available at: <https://www. career planner. com/Career-Articles/Generations.cfm>.

McCrae, R. R., & John, O. P. (1992). An Introduction to the Five-Factor Model and Its Applications. *In Journal of Personality, 60*(2), 175–215. doi:10.1111/j.1467-6494.1992.tb00970.x

McAdams, D. P. (2001). *The person: An integrated introduction to personality psychology* (3rd ed.). Fort Worth, TX, US: Harcourt College Publishers.

McCrae, R. R. & Costa, P. T. (1990). Personality in Adulthood, Guildford Press, New York.

Nga, J. K. H., & Ken Yien, L. (2013). The influence of personality trait and demographics on financial decision making among Generation Y. Young Consumers, *14*(3), 230–243.

Rahim, F. F. M., & Rahim, H. A. (2018). The Effect of Personality Traits (Big-Five), Materialism and Stress on Malaysian Generation Y Compulsive Buying Behaviour. *In International Journal of Academic Research in Business and Social Sciences*, *8*(7), 349–362.

Ray, R. H. (1997). "*The emerging culture", American Demographics.19*(2), 9–34.

Ratnawat R.G. & Borgave S. A. (2019). Impact of Big-Five Personality on Impulsive Buying Behaviour. *In International Journal of Multidisciplinary, 4*(6), 500–505.

Williams, K. C., & Page, R. A. (2011). Marketing to the generations. *In Journal of Behavioral Studies in Business*, *3*(1), 37–53.

ANALYSIS OF THE ECONOMIC TERMS OF THE INTERNET MEDIA IN THE SLOVAK REPUBLIC

Marcel Lincényi[1]
Michal Fabuš[2]

DOI:

Abstract: *The main objective of presented research study is to analyse the development trends of selected Slovak Internet media in the monitored period 2008-2017. The research has confirmed that the media on the Internet is the fastest growing media market in the Slovak Republic in recent years, which is characterized not only by a noticeable increase in Internet media traffic, but also by a clear trend of ad growth in this sector. Research has shown, among other things, that media traffic on the Internet has quadrupled over the next 10 years, with advertising volumes in the online advertising media being up almost five times over.*

Keywords: *Trends, Analysis, Internet Advertising, Internet Media Traffic.*

1. INTRODUCTION

We can analyse and evaluate the development trends of the Internet media market based on Internet media traffic and the volume of Internet advertising. The Slovak Internet is still growing. It has become the part of the life of not only the younger generation but of almost the entire population.

The Internet can transfer information and in such forms as audio and video recordings and the quality where traditional media fail (V. Vavrečka, J. Mezuláník, 2015). The Internet has significantly influenced the development in the world and is now regarded as the main communication channel – an information medium, which triggered massive changes in the area of trade, marketing and communication (I. Bulanda et al. 2018).

The phenomenon of social networks has made it an important medium for modern communication. It is fast, cheap and provides almost instant feedback. Although the Internet is a symbol of freedom, the paradox is that digital agencies know almost everything about the user. This is extremely advantageous for the advertiser because he pays for a defined target group or number of visits.

Nowadays, it is also possible to target the communication campaign strictly regional, or just to a very narrow target group, and the success of the campaign will really be only about the quality of the message. The only disadvantage of measuring the Internet is that most of the data are declared by the respondent and it is not possible to verify them - mainly the socio-demographic data (age, status, income, employment). The location of the connection, the number of unique visits, and the location are accurate.[3]

[1] Department of Economics and Finance, Economics and Management Institute, School of Economics and Management of Public Administration in Bratislava, Slovakia

[2] Department of Economics and Finance, Economics and Management Institute, School of Economics and Management of Public Administration in Bratislava, Slovakia

[3] Lipták, R. Analýza mediálneho trhu v Slovenskej republike [online]. c2014 [cit. 2016-02-16]. Available at: <http://webcache.googleusercontent.com/search?q=cache:YOvG2PMG15AJ:www.nsrr.sk/

Since when data on Slovak households have been available (2006), the proportion of households connected to the Internet has tripled until 2017- from 26.6% in 2006 (Vlačuha et al., 2012) to 81.3% in 2017 (Vlačuha et al., 2017). The highest increase was recorded in 2007 (19.5%), while the high growth continued in 2008 (12,2 %). Between 2009 and 2012, the proportion of households connected to the Internet grew from 3 to 5%, (Vlačuha et al., 2012) and from 2013 to the present it is approximately 1% increase in connected households per year. (Vlačuha et al. 2017). Most frequently, over the last 3 months, the Internet was used by respondents aged 35-44 (95.3%), 16-24 (95%), 25-34 (93.7%), from the entire population aged 16-74. 54 (84.4%), with the least respondents aged 55-64 (65.1%) and respondents aged 65-74 (36.6%). (Vlačuha et al. 2017).

2. METHODOLOGY

The main objective of the presented research study was to analyse the development trends of the selected Slovak Internet media in the monitored period 2008-2017.

The side research objective of the empirical part was to analyse the development of the media audience size of selected Internet media in the Slovak republic in 2008-2017 based on Internet media traffic.

The next side research objective was to analyse the development of the volume on Internet advertising in the Slovak republic in 2008-2017.

In the case of further planning and research, we prioritized the concept of research questions. We identified one major research question (VO) that we have developed on two other specific research questions:

- **The main research question:** What were development trends of the market of selected Slovak Internet media in the Slovak Republic like during the monitored period 2008-2017?
- **Specific question 1:** What was development of website traffic in the monitored period 2008-2017 like?
  We expected more than double increase of website traffic in the Slovak Republic in 2017 compared to 2018. We based on results of the Statistical Office of the Slovak Republic, which have found out that from 2006 to 2017 the ratio of households connected to the Internet increased up to three times. (Vlačuha et al. 2017).
- **Specific question 2:** What was the development of the advertising volume in selected Internet media in the Slovak republic like during the monitored period 2008-2017?
  We expected more than triple increase of advertising volume in Internet in 2017 compared to 2018. This statement was set not only on development trends of connected households on the Internet, but also on the basis of development trends of volume advertising of nationwide newspapers, which almost tripled in the years 2000 to 2014. (Lincényi, Fabuš 2017).

2.1. Research methods

We used economic analysis and comparative analysis in a research. As the part of the economic analysis, we analysed the Internet advertising monitoring of all monitored Internet advertising media and we also analysed real Internet users. "Analysis of advertising revenues, so-called

download.php%3FFNAME%3D1418718194.upl%26ANAME%3DAnal%25C3%25BDza%2Bslovens keho%2Bmedialneho%2Btrhu.pdf+&cd=1&hl=sk&ct=clnk&gl=sk>

advertising monitoring has quantitative aspects. The volume of advertising is one of the essential indicators according to which the concentration in the media market (increasing the market share of media operators) is assessed." (Trampota, 2010, pp. 46-47)

After data collection, we subjected the data to the process of verification, selection and classification. This was followed by a comparative analysis, where we compared the individual data across the monitored period between 2008 and 2017. We processed the data into graphs for a clearer presentation of comparative analysis results.

2.2. Research material:

Although the Internet is very dynamic environment, the Internet media market in the Slovakia has been stable over the past few years. This is proven by the fact that over recent years the same web portals are still in place in the chart of top-twenty, only their order sometimes changes.

To analyse the volume of Internet advertising in the Slovakia in 2008-2017, we will use the data of the Interactive Advertising Bureau Slovakia (IAB Slovakia). IAB Slovakia – Association of the Internet Media is the biggest association on the Slovak digital market. Currently it has 40 members, including the biggest Slovak publishers, media agencies and other important players active in online advertising. IAB operates AIMmonitor, which is a comprehensive, independent audited visit ranking of the Slovak online media.[4]

We conducted an analysis of the development of Internet media traffic in Slovakia based on AIMmonitor results.

AIMmonitor is the measurement tool of the audience of the online advertising media. Data from AIMmonitor are officially accepted data (single currency) by media agencies, advertising agencies and sponsors. AIMmonitor offers data about visits of the Internet media and socio-demographic profile of the online audience. Access to the data is for the purpose of planning, purchase and evaluation of the advertising campaigns of the Internet media in Slovakia. This project was officially launched in January 2007. The sponsor of the research is IAB Slovakia and the project is executed by Gemius Slovakia. AIM monitor is executed by the Gemius AudienceTm system, which consists of these main parts: Gemius Traffic measurement tool, which enables the monitoring of the usage of a webpage, assessing the reading scripts from the source code of the webpage. Pop-up panel, which secures the collection of socio-demographic data about the web page visitors.[5]

We analysed the development of Internet media traffic according to real user data. We compared the individual years due to spatial reasons according to the data in January, but the basic rule of the research method was to compare what can be comparable. The author is conscious that there have been minor deviations, either in decline or increment, in the conversion of the Internet media market share of each month during the year, but these have not been so significant since in one year the order of these Internet media has not changed.

---

4 IAB Slovakia. 2018. About Us. [online]. 2018 [8.10.2018]. Available at: https://www.iabslovakia.sk/us/

5 IAB Slovakia. 2019. AIMmonitor. [online]. 2018 [2.1.2019]. Available at: https://www.iabslovakia.sk/aimmonitor-2/

3. ANALYSIS

3.1. Analysis of the development of the volume of Internet advertising in the Slovak Republic

In **2017,** the cost of Internet advertising in Slovakia reached almost 118 million Euro. In terms of spending on individual formats, native advertising grew the most, reaching a quadruple of 2016 spending. Among the media, video grew by 39 % compared to 2016. The growth of programmatic advertising sales by 62 % is due to the media work - possibly due to automated purchase of their media space. Banner advertising overall recorded a minimal increase (of 0,4 %) compared to 2016. Growth has been reported by the type of "classifieds and directories" by 8%. The company recorded a significant increase in mobile advertising for the entire market and in the membership base (for members 7.5 times 2016) as well. Currently, mobile advertising accounts for 37% of total spending. In 2017, a media space worth was more than 9 mil. Euros. This purchase method is particularly attractive for video ads.[6]

In **2016,** spending on online advertising exceeded 112 million €. According to the declared income of the members of the Internet advertising association IAB Slovakia and the classified AdEx commission estimate, expenditures on Internet advertising grew year-on-year by 23.2%. Since 2012, this has been the highest year-on-year growth rate. In absolute terms, banner advertising is at the forefront with 28.4% growth. The year-on-year growth of programmatic advertising, video, and mobile advertising is under the sign of its year-on-year growth. This trend is also reflected in member media declarations: programmatic recorded 47% growth, mobile display advertising 46% growth and video advertising 29% growth compared to 2015. In total, however, these three categories in 2016 account for only 30% of the banner advertising declared by IAB members. Searching maintains a solid position, but its overall share of advertising spending has fallen slightly compared to the previous year.

The highest percentage of the year-on-year increase was recorded in the Other item, where several forms of advertising are included, but they do not show high numbers alone in absolute terms. Among these formats, most spending is directed to native advertising, PR articles, and affiliate marketing. Native advertising achieved 90% growth among member media compared to 2015.[7]

Income from Internet advertising on the Slovak online market jumped by 20.5% in **2015.** In 2015, Slovak advertisers spent more than 91 million € on Slovak and multinational Internet media. Compared to 2014, this is a 20.5% increase. Revenues are made up of declared reported revenues of IAB Slovakia member media and a qualified estimate of non-member media revenues as well as multinational companies operating on the Slovak online market. IAB Slovakia members declare revenues from online on a half-year basis. We appreciate the return of the gradual increase in percentage growth in year-on-year comparisons, as revenues from online growth increased between 2013 and 2014, but by almost 3% less than in the previous year-on-year comparison.[8]

[6] PZ. 2018. Výdavky do internetovej reklamy v roku 2017 narástli. Najviac zadávatelia investovali do nativnej reklamy. [online]. 2018 [8.10.2018]. Available at: https://strategie.hnonline.sk/marketing/1721790-vydavky-do-internetovej-reklamy-v-roku-2017-narastli-najviac-zadavatelia-investovali-do-nativnej-reklamy

[7] IAB. 2017. V roku 2016 výdavky do internetovej reklamy presiahli hranicu 112 miliónov eur. [online]. 2017 [8.10.2018]. Available at: https://www.iabslovakia.sk/tlacove-centrum/v-roku-2016-vydavky-internetovej-reklamy-presiahli-hranicu-112-milionov-eur/

[8] IAB. 2016. Príjmy z internetovej reklamy na slovenskom online trhu poskočili o 20,5 %. [online]. 2016 [8.10.2018].

Internet advertising in **2014,** according to IAB Slovakia, increased by 14.7% compared to 2013. In absolute terms, the volume of advertising in 2014 reached more than 75.5 mil. €. Thus, the volume growth slowed down from an aggregate point of view (2013/2012 17.5%). In absolute terms, growth is almost 9.7 million. €.[9]

Online advertising spending in Slovakia has increased by 17.3 per cent in **2013,** according to the IAB's Internet Media Association, which was the third-highest jump in other European countries. Expenditure grew faster in Russia (+ 26.8%) and Turkey (+ 24.3%). The value of the Slovak online advertising market IAB Slovakia estimated at 65.8 million € in the 2013 report, excluding agency commissions and bonuses. This volume also included estimates of revenue for actors like Facebook and Google, which do not provide local data. The year-on-year increase was 18%. According to ZenithOptimedia media network estimates, real Internet advertising spending in Slovakia reached 45 million €. According to them, the year-on-year increase was 28.6 percent.[10]

In **2012** total Internet advertising spending in Slovakia amounted to 56,022,793 mil. €, which consists of display (21,330,188), classifieds a Directories (12,446,982), paid-for search (20,231,973), and others.[11]

In **2011** total spending on Internet advertising in Slovakia was in the amount of 45175847 mil. €, which consists of display (20,793,003), classifieds a Directories (7,456,469), paid-for search (13,113,166), sponsorship (950,837), e-mail (514,967), slotting fees (168,368), rich media (1,406,264), and lead generation (772,773).[12]

In **2010** total Internet advertising spending in Slovakia amounted to 25,086,605 mil. €, which consists of display (13,105,787), classifieds a Directories (4,961,665), paid-for search (3,973,87), sponsorship (736,806), e-mail (751,963), slotting fees (114,992), rich media (1,119,134), and lead generation (322,371).[13]

In **2009** total spending on Internet advertising in Slovakia was in the amount of 23,291,985 mil. €, which consists of display (12,112,774), classifieds a Directories (5,167,190), paid-for search (3,757,636), sponsorship (445,345), e-mail (608,095), slotting fees (150,473), rich media (990,663), and lead generation (59,809).[14]

Available at: https://www.iabslovakia.sk/tlacove-centrum/prijmy-z-internetovej-reklamy-na-slovenskom-online-trhu-poskocili-o-205/

9 IAB. 2015. Objemy reklamy na Slovensku v roku 2014. [online]. 2015 [8.10.2018]. Available at: https://www.iabslovakia.sk/tlacove-centrum/objemy-reklamy-slovensko-tlacova-sprava/

10 CWITKOVICS, Tomáš. 2014. Rast výdavkov do online reklamy bol vlani na Slovensku tretí najvyšší v Európe. [online]. 2014 [8.10.2018]. Available at: https://medialne.etrend.sk/internet/rast-vydavkov-do-online-reklamy-bol-vlani-na-slovensku-treti-najvyssi-v-europe.html

11 IAB Slovakia. 2018. Objem internetovej reklamy (SK). [online]. 2018 [8.10.2018]. Available at: https://www.iabslovakia.sk/vydavky-do-reklamy/objemy-internetovej-reklamy-sk-2017/

12 IAB Slovakia. 2018. Objem internetovej reklamy (SK). [online]. 2018 [8.10.2018]. Available at: https://www.iabslovakia.sk/vydavky-do-reklamy/objemy-internetovej-reklamy-sk-2017/

13 IAB Slovakia. 2018. Objem internetovej reklamy (SK). [online]. 2018 [8.10.2018]. Available at: https://www.iabslovakia.sk/vydavky-do-reklamy/objemy-internetovej-reklamy-sk-2017/

14 IAB Slovakia. 2018. Objem internetovej reklamy (SK). [online]. 2018 [8.10.2018]. Available at: https://www.iabslovakia.sk/vydavky-do-reklamy/objemy-internetovej-reklamy-sk-2017/

In **2008** total Internet advertising spending in Slovakia amounted to 24,627,461 mil. €, which consists of display (14,176,425), classifieds a Directories (4,753,933), paid-for search (4,026,223), sponsorship (504,845), e-mail (733,685), slotting fees (0), rich media (389,199) and lead generation (43,151).[15]

We have tried to show the concrete evolution of Internet advertising investments, expressed in accurate figures in euros, for a more precise view of developments. See figure no. 1.

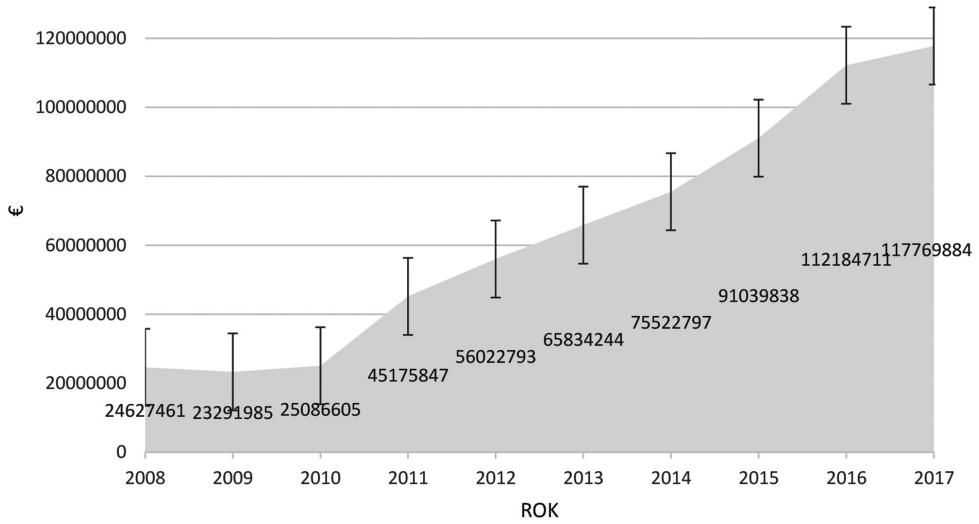


Figure 1: Analysis of the development
of the total volume of Internet advertising (€) in 2008 - 2017
Source: Processed from the results of the IAB Slovakia

3.2. Analysis of Internet media traffic development in the Slovak Republic

In January of **2017,** AIMmonitor estimated 44 001 407 real Internet users for the monitored online media. Of this, the greatest amount of real Internet users had: azet.sk (2799976), zoznam.sk (2444011), sme.sk (2262691), aktuality.sk (2129825), atlas.sk (1867208), cas.sk (1849794), heureka.sk (1813390), bazos.sk (1609764), topky.sk (1603171), pluska.sk (1552757).

In January of **2016,** AIMmonitor estimated 40 515 656 real Internet users for the monitored online media. Of this, the greatest amount of real Internet users had: azet.sk (2830281), zoznam.sk (2471274), sme.sk (2290470), aktuality.sk (2087634), cas.sk (1996733), atlas.sk (1926375), topky.sk (1677576), heureka.sk (1654680), pravda.sk (1604287), pluska.sk (1488670).

In January of **2015,** AIMmonitor estimated 34 360 924 real Internet users for the monitored online media. Of this, the greatest amount of real Internet users had: azet.sk (2665446), zoznam.sk (2354199), sme.sk (2118123), aktuality.sk (2079434), cas.sk (1833787), atlas.sk (1753452), topky.sk (1616898), pravda.sk (1389159), heureka.sk (1364720), pluska.sk (1064119).

In January of **2014,** AIMmonitor estimated 30 255 711 real Internet users for the monitored online media. Of this, the greatest amount of real Internet users had: azet.sk (2464813), zoznam.sk (2327346), sme.sk (2044255), aktuality.sk (1836445), cas.sk (1816727), atlas.sk (1771945), topky.sk (1650441), pravda.sk (1369282), heureka.sk (1340724), pluska.sk (932020).

[15] IAB Slovakia. 2018. Objem internetovej reklamy (SK). [online]. 2018 [8.10.2018]. Available at: https://www.iabslovakia.sk/vydavky-do-reklamy/objemy-internetovej-reklamy-sk-2017/

In January of **2013,** AIMmonitor estimated 28 198 046 real Internet users for the monitored online media. Of this, the greatest amount of real Internet users had: azet.sk (2239822), zoznam.sk (2163349), sme.sk (1997242), aktuality.sk (1811100), atlas.sk (1784175), topky.sk (1516419), cas.sk (1388014), pravda.sk (1253475), heureka.sk (1176065), centrum.sk (801748).

In January of **2012,** AIMmonitor estimated 22 871 084 real Internet users for the monitored online media. Of this, the greatest amount of real Internet users had: azet.sk (1827188), zoznam.sk (1802722), sme.sk (1620139), atlas.sk (1460265). aktuality.sk (1362534), topky.sk (1236412), cas.sk (1038064), pravda.sk (976726), centrum.sk (840738), heureka.sk (787201).

In January of **2011,** AIMmonitor estimated 19 927 760 real Internet users for the monitored online media. Of this, the greatest amount of real Internet users had: azet.sk (1791791), zoznam.sk (1749549), sme.sk (1506503), atlas.sk (1391302), topky.sk (1038870), aktuality.sk (897684), pravda.sk (867745), cas.sk (840360), centrum.sk (814374), markiza.sk (683703), tvnoviny.sk (557736)

In January of **2010,** AIMmonitor estimated 16 763 205 real Internet users for the monitored online media. Of this, the greatest amount of real Internet users had: azet.sk (1742961), zoznam.sk (1585418), sme.sk (1373440), atlas.sk (1309864), topky.sk (928841), aktuality.sk (831254), centrum.sk (809122), pravda.sk (693769), cas.sk (590151), markiza.sk (565333).

In January of **2009,** AIMmonitor estimated 13 566 472 real Internet users for the monitored online media. Of this, the greatest amount of real Internet users had: azet.sk (1518960), zoznam.sk (1470046), atlas.sk (1227663), sme.sk (1156486), topky.sk (871912), centrum.sk (765202), aktuality.sk (752985), pravda.sk (566515), markiza.sk (511792), cas.sk (505441).

In January of **2008,** AIMmonitor estimated 10 279 495 real Internet users for the monitored online media. Of this, the greatest amount of real Internet users had: zoznam.sk (1460097), azet.sk (1294699), atlas.sk (1149290), sme.sk (975949), topky.sk (928026), centrum.sk (719827), aktuality.sk (562071), markiza.sk (500747), pravda.sk (428693), profesia.sk (393928).

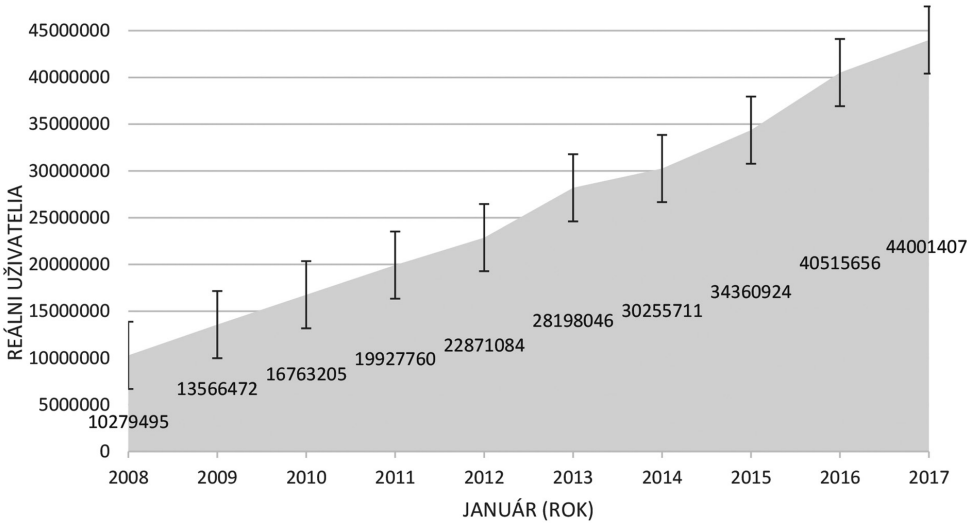


Figure 2: Analysis of the development
of estimated actual Internet users (month January) in 2008-2017

Source: Processed from the results of the AIMmonitor

4. RESULTS AND DISCUSSION

As part of the first specific research question, we anticipated more than double increase in Internet media traffic in the Slovak Republic in 2017 compared to 2008, based on the results of the Statistical Office of the Slovak Republic, according to which the household ratio connected to the Internet grew up to three times. (Vlačuha et al. 2017). This assumption was confirmed. However, the analysis showed that the increase was far higher than the expected double of traffic, as the actual amount of Internet users in January 2008 (January - 10,279,495) increased by four times by 2017 (January - 44,001,407). After examining the visits of the Internet media in Slovakia, there is a clear trend that has been increasing over the past 10 years, as the number of Internet users has not fallen year on year in a single year. The highest increase in Internet users was recorded in the period 2015-2017, when the number of Internet users grew by almost a third compared to the January 2014. In January 2016, up to 6,154,732 Internet users were added compared to January in the previous year. The year-on-year increase in Internet users was so strong that even in January, the number of real users did not drop below 2,000,000 users compared to the previous period. When calculating the share of real Internet users, it can be stated that the Internet media market has been stable in recent years, because since 2010 the order of the first 3 places has not changed: 1. azet.sk, 2. zoznam.sk, 3. atlas.sk. In 2009 the leader of Internet media became azet.sk, which moved on zoznam.sk to the second place where it stayed until 2017. In 2008-2009 at the third place was atlas.sk, which in 2010 was replaced by sme.sk, which was in this position until 2017.

As part of the second specific research question, we expected more than threefold increase in the volume of Internet advertising in 2017 compared to 2008, with our opinion based on the trends of connected households on the Internet, but also on the results of research into the development of the volume of advertising of the nationwide newspapers almost tripled between 2000 and 2014. (Lincényi, 2017). This claim was also confirmed. However, the analysis showed that the increase was far higher than the expected double, as the total volume of online advertising in 2008 (€ 24,627,461) increased almost fivefold by 2017 (117,769,884 €). The highest increase in advertising volume compared to the previous year was observed in 2016 (21,144,873 €), and then in 2011 (20,089,242 €).

It is very interesting that the increase in advertising volume compared to the previous year in the period between 2011 and 2016 was so strong that it never fell below 9 million euros. The stagnation of the upward trend can be seen in 2009, 2010 and 2017. The volume of Internet advertising on the Slovak market in the period under review decreased only once in 2009 (23,291,985 €), when the total volume of Internet advertising was lower than in the previous year (24,627,461 €) and the subsequent stagnation trend in 2010 (25,086,605 €). This decline and stagnation can be explained by the effects of the global economic crisis.

5. CONCLUSION

Based on the development analysis of the volume of advertising in selected national Internet media in the Slovak Republic in 2008 to 2017, the following conclusion can be drawn:

In the analysed period (2008-2017), there was a noticeable upward trend in Internet media traffic in Slovakia, which increased fourfold from 2008 (January - 10,279,495) in the same period to 2017 (January - 44,001,407), while the number of Internet users has not fallen year-on-year. In

the analysis of calculations of the share of real Internet users it can be further stated that this market of Internet media has been stable in recent years; since 2010 the order of the top 3 places has not changed (1. azet.sk, 2. zoznam.sk, 3. atlas.sk). While the market share of Internet media in the months during the year was smaller, there were minor deviations, either in decline or increase, but in one year, the order of these online media has not changed.

In addition, a clear upward trend in Internet advertising can be observed over the period under review, rising almost five times from 2008 (24,627,461 €) to 2017 (117,769,884 €). The impacts of the global economic crisis were reflected in the Slovak Internet market until 2009, when the total volume of Internet advertising (23,291,985 €) was lower than in 2008 (24,627,461 €) and the subsequent stagnation trend in 2010 (25,086,605 €).

REFERENCES

Bulanda. I. et al. (2018). Slovak consumers from generation Y and their shopping behavior on discount portals. In *International Scientific Days 2018: "Towards Productive, Sustainable and Resilient Global Agriculture and Food Systems." Conference Proceedings,* Nitra May 16-17, 2018. Praha: Wolters Kluwer, 2018. ISBN 978-80-7598-180-6, p. 275-287.

Czwitkovics, T. (2014). Rast výdavkov do online reklamy bol vlani na Slovensku tretí najvyšší v Európe. [online]. 2014 [8.10.2018]. Available at: https://medialne.etrend.sk/Internet/rast-vydavkov-do-online-reklamy-bol-vlani-na-slovensku-treti-najvyssi-v-europe.html

IAB Slovakia. (2018). About Us. [online]. 2018 [8.10.2018]. Available at: https://www.iabslovakia.sk/us/

IAB Slovakia. (2019). AIMmonitor. [online]. 2018 [2.1.2019]. Available at: https://www.iabslovakia.sk/aimmonitor-2/

IAB. (2017). V roku 2016 výdavky do Internetovej reklamy presiahli hranicu 112 miliónov eur. [online]. 2017 [8.10.2018]. Available at: https://www.iabslovakia.sk/tlacove-centrum/v-roku-2016-vydavky-Internetovej-reklamy-presiahli-hranicu-112-milionov-eur/

IAB. (2016). Príjmy z Internetovej reklamy na slovenskom online trhu poskočili o 20,5 %. [online]. 2016 [8.10.2018]. Available at: https://www.iabslovakia.sk/tlacove-centrum/prijmy-z-Internetovej-reklamy-na-slovenskom-online-trhu-poskocili-o-205/

IAB. (2015). Objemy reklamy na Slovensku v roku 2014. [online]. 2015 [8.10.2018]. Available at: https://www.iabslovakia.sk/tlacove-centrum/objemy-reklamy-slovensko-tlacova-sprava/

IAB Slovakia. (2018). Objem Internetovej reklamy (SK). [online]. 2018 [8.10.2018]. Available at: https://www.iabslovakia.sk/vydavky-do-reklamy/objemy-Internetovej-reklamy-sk-2017/

Lincényi, M. & Fabuš, M. (2017). Economic trends of business actors on daily newspaper market: Case of the Slovak Republic. *Entrepreneurship and Sustainability issues.* Volume 5, Number 1, ISSN 2345-0282. DOI: http://doi.org/10.9770/jesi.2017.5.1

Lipták, R. Analýza mediálneho trhu v Slovenskej republike [online]. c2014 [cit. 2016-02-16]. Available at: <http://webcache.googleusercontent.com/search?q=cache:YOvG2P-MG15AJ:www.nsrr.sk/ download.php%3FFNAME%3D1418718194.upl%26AN-AME%3DAnal%25C3%25BDza%2Bslovens keho%2Bmedialneho%2Btrhu.pd-f+&cd=1&hl=sk&ct=clnk&gl=sk> [

PZ. (2018). Výdavky do Internetovej reklamy v roku 2017 narástli. Najviac zadávatelia investovali do nativnej reklamy. [online]. 2018 [8.10.2018]. Available at: ttps://strategie.hnonline.sk/marketing/1721790-vydavky-do-Internetovej-reklamy-v-roku-2017-narastli-najviac-zadavatelia-investovali-do-nativnej-reklamy

Trampota, T., & Vojtěchojvská, M. (2010). *Metody výzkumu médií.* Portál. ISBN 978-80-7367-683-4.

Vavrečka, V. & Mezuláník, J. (2015). Digital marketing communication tools in the process of implementation of marketing strategy of the tourist area Jeseníky – East. In *Marketing Identity – Digital Life part I.,* Trnava: FMK, ISBN 978-80-8105-779-3, pp. 374-388.

Vlačuha, R. & Kotlár, J. & Želonková, V. (2012). Prieskum o využívaní informačných a komunikačných technológií v domácnostiach za 1. štvrťrok 2012. Štatistický úrad Slovenskej republiky. ISBN 978-80-8121-152-2.

Vlačuha, R. & Kotlár, J. & Želonková, V. (2017). Zisťovanie o využívaní informačných a komunikačných technológií v domácnostiach. Štatistický úrad Slovenskej republiky. ISBN 978-80-8121-571-1 (online)

EXPLORING THE USE OF DIGITAL DATA IN THE AGRI-FOOD CONTEXT

Moreno Frau[1]
Francesca Cabiddu[2]

DOI:

Abstract: *This paper explores digital data exploitation behaviors and shows how these comportments change according to the data sources employed by the firms when trying to develop their products. This article aims to provide a theoretical framework concerning how digital data are employed for product development. Since the relationship between data exploitation and product development represents an empirically under-explored research area, the authors adopt an exploratory multiple case study design to develop new theoretical and empirical insights pertaining to this topic. This paper provides guidelines that help agri-food firms recognize the features of how food processing might take advantage of digital transformation and digital data gaining competitiveness by improving production efficiency and supporting the development of their products.*

Keywords: *Digitization, Digital Transformation, Food Processing, Product Development, Behavior.*

1. INTRODUCTION

Digital transformation is dramatically changing the face of the economy (Matzler et al. 2018). Digital transformation is the *application of new technologies [...] [which] requires skills that involve the extraction and exchange of data as well as the analysis and conversion of that data into actionable information.* (Schallmo, Williams, and Boardman 2017, 4). Previous studies on technological innovation and food production (e.g. Beckeman, Bourlakis, and Olsson 2013; Grunert et al. 2008), on one hand, have significantly explained how agri-food firms made use of technologies and what new food products have been developed due to the new technologies (e.g. Leek, Szmigin, and Carrigan 2001; Marette et al. 2009; Steenis and Fischer 2016). On the other hand, they missed the opportunity to investigate the increasing availability of digital data in a poor-technology-adopter sector, and how the information gathered by the elaboration of digital data can foster product development (Schweitzer, Handrich, and Heidenreich 2019). This gap inspires our research question: how do low-tech firms exploit digital data to develop their products?

This article contributes by empirically demonstrating that digital data exploitation behaviors change according to the data sources employed by the firms when trying to develop their products. Our paper is structured as follows: firstly, we argue for the effects of digital transformation and the use of digital technologies in the agri-food industry; secondly, we display the methodology that was adopted to conduct the study; then, we thoroughly discuss the key findings; finally, we conclude with the discussions, research limitations, and some implications for future research.

[1] Università degli studi di Cagliari, Via Sant'Ignazio da Laconi, 74, 09123, Cagliari, Italy
[2] Università degli studi di Cagliari, Via Sant'Ignazio da Laconi, 74, 09123, Cagliari, Italy

2. DIGITAL TRANSFORMATION IN THE AGRI-FOOD INDUSTRY

The impact of digital transformation on the agri-food industry is greatly influencing raw materials supply chain, production, processing, distribution, and marketing (Weick 2001). The digital transformation in food production fosters the creation of new types of machinery, such as 3D food printers (Charlebois and Juhasz 2018). Still, the technologies used to produce *space food*, which is the food of astronauts during the space missions, gives the opportunity to supply healthy ready-to-eat food to busy people on *Planet Earth* (Varese and Cane 2017). Recently, the adoption of micro and nanotechnologies (Marette et al. 2009; Steenis and Fischer 2016), allowed, for example, the encapsulation of food active components (Roos et al. 2016). As a consequence, firms could introduce in the market a great number of innovative new *functional foods* (Bigliardi and Galati 2013; Tollin and Erz 2017).

The happening of the digital transformation in the agri-food industry has divided customers into opened versus skeptics towards the adoption of new technologies. Looking at the relationship between consumers' age and product selection, elderly people are usually willing to pay a premium price for products treated with technologies that provide added health benefits (Leek, Szmigin, and Carrigan 2001). Conversely, millennials who care about sustainability issues are skeptic regarding the positive contribution of technologies to produce more sustainable food products and consider dangerous those technologies adopted to prolong food shelf life (Cavaliere and Ventura 2018; Steenis and Fischer 2016). However, a study on consumer preferences for *familiar* versus *novel* food products claims that age is not a determinant factor in consumption decisions with familiar products, while it plays a more decisive role in the structure of preference regarding novel food products, particularly in young consumers (Barrenar, García, and Camarena 2015). In the presence of irrational behaviors, customers may contrast new food technologies, this is a phenomenon known as *technophobia* (Gorgitano, Verneau, and Sodano 2017). To obstruct technophobia and change consumer attitudes toward food technologies adoption, firms need to associate food innovations with positive pictures, which not only has immediate benefits but also prevents positive effects from extinction (Loebnitz and Grunert 2015). Briefly, to launch a successful new food product in the market, it is advocated to involve the customers in the food development process for improving consumers' acceptance (Busse and Siebert 2018).

So far, agri-food research has greatly explained how technologies have been employed by the food industry and what food products have been created by the intensive use of technologies (e.g. Leek, Szmigin, and Carrigan 2001; Marette et al. 2009; Steenis and Fischer 2016). These studies also deeply investigate the role of the customer in the food industry, providing interesting insights regarding the technological centers, suppliers, retailers, and manufacturers too (e.g. Beckeman, Bourlakis, and Olsson 2013; Beckeman and Olsson 2011). Notwithstanding, just a few scholars studied the adoption of new digital technologies and focused on a pivotal phenomenon such as digital transformation in the agri-food firms (Vlachos, 2004; Anastasiadis, Tsolakis and Srai, 2018). Thus, previous research missed the opportunity to study the increasing availability of digital data generated by the application of new technologies in food production, and how the information provided by the processing of digital data can support product development (Schweitzer, Handrich, and Heidenreich 2019).

3. METHODOLOGY

This paper aims to provide a theoretical framework concerning how digital data are employed for product development. Since low-tech firms' digital transformation is an empirically underexplored field of research, we adopt an exploratory multiple case-study design (Eisenhardt and Graebner 2007). We ground the theorizing in the empirical data for an in-depth understanding of the research question.

Data Collection. We collected data from both primary and secondary sources: (a) semi-structured interviews with actors involved in the digital transformation strategy, digital data analysis, and product development process (e.g. CEOs, IT, R&D and Digital transformation specialists); (b) archival data (e.g. technological improvement and product development plans), company social media pages and websites.

We adopted an interview protocol consisting of 12 questions and several bullet questions divided into three sections: 1) preliminary questions about the company, the interviewee and the context the of phenomenon; 2) questions related to the firm technologies that create digital data; 3) questions concerning how the firm exploit digital data to develop its products. The questions asked of the interviewees included, e.g., what kind of data does food processing machinery create? How does the firm save/store data concerning food processing? Which is the process followed by the company for the development of new products? And, in this process, how useful was the data related to food processing created thanks to the new technologies? The 8 interviews were recorded and transcribed within 24 hours. They lasted from 42 to 58 minutes. We complemented the interviews with the collection of data from firms' social media, websites and internal plans and reports (when made available) in order to triangulate data sources.

Data Analysis. We conducted data analyses in four cumulative stages of coding, starting with the within-case analysis of each case, moving from the specific case context to the overall phenomenon (Saldaña 2015; Eisenhardt and Graebner 2007).

We started with a preliminary within-case analysis of the 8 cases and their individual characteristics by reconstructing the summaries of distinct case studies. During the first coding process, we segmented and grouped data following a data-driven coding scheme. We identified a set of descriptive codes (Miles and Huberman 1994). Accordingly, the outcome of this stage of coding was a list of codes as observed in the single-considered cases.

At the second stage of coding, we began with the abstraction process either categorized new data under existing codes, grouping similar codes or created a new code if it was analytically distinct. Consequently, we reanalyzed the descriptive codes, looking for interpretative codes that reflect the researcher's understanding of the data (Miles and Huberman 1994).

Then, we carried out the third stage of coding which led the analysis to a further level of abstraction. Starting from the previously identified interpretative codes, we looked for patterns (Miles and Huberman 1994). In doing so, we identified two behaviors which, according to our analysis explain how digital data are employed for product development (see Table 1).

The final stage of data analysis involved assessing the relationships among them. This final stage of coding aimed at connecting the constructs and transformed them from static and standalone behaviors into dynamic and integrated theoretical frameworks.

Table 1: Summary of digital data exploitation behaviors

Phenomenon	Behavior	Illustrative quote
Digital data exploitation	Data receiver	*Then there are a bunch of analyzes of product quality and productivity. We don't need to do additional analysis. From the data collected by the machinery, the information system generates information for us. Then, the man has to interpret the information, but we have already available all the analyzes we need.* Managing director, Case study 1.
	Data explorer	*Machinery suppliers partially limit the autonomy of the company to carry out independent analyzes. We are a bit forced to use and follow their models. We are able to carry out independent analyzes thanks to the additional sensors that we insert in the machinery to produce an autonomous and parallel data collection.* Head of IT & Digital Transformation, Case study 8.

4. DIGITAL DATA EXPLOITATION BEHAVIORS IN LOW-TECH FIRMS

Firms analyze data for several reasons. Our research focuses on the exploitation of digital data for product development in terms of additional benefits to the customer (incremental innovation) or the creation of new products. Moreover, firms analyze data from different sources. For example, raw materials, production process, warehouse (data internally created) or data related to market trends, partnerships, competitors, sales (data externally created). We combined the types of product development processes with different data sources and found two behaviors connected to digital data exploitation: Data receiver and Data explorer. These two behaviors can also be observed simultaneously in the same firm (Mixed behavior).

Data Receiver. Data receivers have a passive attitude towards data analysis which is mainly done to produce standardize pieces of information to foster product development. The Data receiver is the most common behavior among the firms of this study. According to our analysis, Data receivers conduct analysis on data concerning internal aspects of the firm with the aim of improving current products by exploiting internally created data: *Each production is a test, the data are analyzed to identify strengths and weaknesses of the product. Over time, we improve our products, for example, by changing the flour mixture or inserting another type of raw material,* said the quality manager of case study 2. Data receivers also want to improve their current products (or create variations of them) and they do that by performing analysis also on firms' external dynamics (e.g. sales or mark trends): *We track everything we sell and we usually invest in products that sell the most to create variations of them. These variations are likely to be accepted by the market* explained the IT specialist of case study 3. Lastly, Data receivers are exploiting externally collected data to create new products. For instance, by analyzing competitors' products, as the CEO of case study 6 put it: *We are followers as regards the creation of new products. We observe large companies that can make important investments in research and development… then, we analyze their products and we try to adapt to what the largest companies do.*

Data Explorer. Such behavior is adopted by firms that explore digital data by examining them with a critical eye and deepening data analysis to find novel pieces of information. Our analysis detected a few numbers of Digital explorers that query their database to create new products and understand whether they are able to do so, as the CEO of case study 7 up it: *Production data are analyzed to create new products. Therefore, the opening of new markets is done by analyzing the production data to understand if the production plant is capable of producing a product that presents new characteristics that make the products more interesting to the final customer. For example, it happened when we created the hamburger made of seitan.*

Mixed Behavior. Among the Data explorers and Data receivers, there are firms that conduct both behaviors but in distinct situations. Firms in this group behave as Data receivers when they exploit digital data to make simple or routinized decisions. To do so, Mixed behavior firms use the standard information make available by the information system. On the other hand, when Mixed behavior firms face new problems and have to make not-routinized decisions, they dig into the collected digital data to find information for supporting the diction-making process. Our analysis discloses that Mixed behavior firms are the ones that better exploit their availability of digital data since they exploit internally and externally collected data to perform both incremental innovation and new product development.

5. CONCLUSION AND FUTURE RESEARCH DIRECTIONS

Building on prior research on digital transformation and digital technologies in the agri-food industry, our study contributes by providing first insights about how low-tech firms exploit digital data for product development. Our research empirically demonstrates that digital data exploitation behaviors change according to the data sources employed by the firms when trying to develop their products.

Digital data exploitation behaviors and the lack of new product miners. Earlier research clearly identifies digital data as the key outcome of the digital transformation (Dremel et al. 2017). Studies on technological innovation in the food production (e.g. Beckeman, Bourlakis, and Olsson 2013; Grunert et al. 2008), at one end, shed light on how agri-food firms utilize technologies and what new products have been developed due to the new technologies (e.g. Leek, Szmigin, and Carrigan 2001; Marette et al. 2009; Steenis and Fischer 2016). On the other end, they do not investigate the increasing availability of digital data in the agri-food sector, and how the information gathered by the analysis of digital data can affect product development (Schweitzer, Handrich, and Heidenreich 2019). Our study extends previous research by identifying digital data behaviors and theorizing how these behaviors change according to the data source and the kinds of the product development process. More specifically, while previous research demonstrates that new technologies adoption has positive implications in terms of product development, our analysis suggests that firms mostly adopt a passive behavior (Data receiver) when exploiting digital data both for incremental innovation and new product development. Data receiver feed their product development process with the information made available by the information system. However, the results also show that active behavior (Data explorer) is needed to exploit internally created data (e.g., production data) with the intent of creating new products. Despite the importance of exploiting digital data for new product development, Data explores are a minority. They display an active will in finding correlation between their available data and the possibility to create new producers (e.g., verifying whether the production plant is able to produce a new product or not). Finally, when firms are able to behave as Data receiver and Data explorer simultaneously (Mixed behavior), they are also fully exploiting the potential of internal and external data to innovate their current products and/or create new ones.

Future Research. The exploratory design of this research implies limitations that suggest avenues for further theoretical and empirical research. The choice of the agri-food industry and the restriction to food processing firms as the research's empirical setting provides a partial view of the digital transformation in the broader social field of low-tech firms. Additionally, this study was based on a sample of 8 cases within a single geographical market (Italy). Future research is needed to extend our approach to other low-tech sectors (e.g. tourism), particularly

in a multinational/multicultural context. A plurality of industries and cultures may suggest different behaviors leading to digital data exploitation for product development. Furthermore, our research considers the production firm's point-of-view. Hence, the analysis was based on data from just one actor. However, digital data exploitation also involves several players within the food industry and each one may affect digital data exploitation. Therefore, future research could consider a multi-actor perspective in order to analyze the same phenomena by involving, e.g., software house specialized in developing solutions for agri-food firms, digital data analysts, machinery suppliers.

REFERENCES

Barrenar, Ramo, Teresa García, & Dena María Camarena. (2015). 'An Analysis of the Decision Structure for Food Innovation on the Basis of Consumer Age'. *International Food and Agribusiness Management Review* 18(3): 149–170.

Beckeman, Märit, Michael Bourlakis, & Annika Olsson. (2013). 'The Role of Manufacturers in Food Innovations in Sweden'. *British food journal* 115(7): 953–974.

Beckeman, Märit, & Annika Olsson. (2011). 'The Role of Swedish Retailers in Food Innovations'. *The International Review of Retail, Distribution and Consumer Research* 21(1): 51–70.

Bigliardi, Barbara, & Francesco Galati. (2013). 'Innovation Trends in the Food Industry: The Case of Functional Foods'. *Trends in Food Science & Technology* 31(2): 118–129.

Busse, Maria, & Rosemarie Siebert. (2018). 'The Role of Consumers in Food Innovation Processes'. *European Journal of Innovation Management* 21(1): 20–43.

Cavaliere, Alessia, & Vera Ventura. (2018). 'Mismatch between Food Sustainability and Consumer Acceptance toward Innovation Technologies among Millennial Students: The Case of Shelf Life Extension'. *Journal of Cleaner Production* 175: 641–650.

Charlebois, Sylvain, & Mark Juhasz. (2018). 'Food Futures and 3D Printing: Strategic Market Foresight and the Case of Structur3D'. *International Journal on Food System Dynamics* 9(2): 138–148.

Dremel, Christian. (2017). 'How AUDI AG Established Big Data Analytics in Its Digital Transformation.' *MIS Quarterly Executive* 16(2).

Eisenhardt, Kathleen M., & Melissa E. Graebner. (2007). 'Theory Building from Cases: Opportunities and Challenges'. *Academy of management journal* 50(1): 25–32.

Gorgitano, Maria Teresa, Fabio Verneau, & Valeria Sodano. (2017). 'Sustainable Food Innovation Finding the Right Balance between Technological Determinism and Technophobia.' *Quality-Access to Success* 18.

Grunert, Klaus G. (2008). 'User-Oriented Innovation in the Food Sector: Relevant Streams of Research and an Agenda for Future Work'. *Trends in Food Science & Technology* 19(11): 590–602.

Leek, Sheena, Isabelle Szmigin, & Marylyn Carrigan. (2001). 'Older Consumers and Food Innovation'. *Journal of International Food & Agribusiness Marketing* 12(1): 71–89.

Loebnitz, Natascha, & Klaus G. Grunert. (2015). 'Evaluative Conditioning of Food Technologies'. *Psychology & Marketing* 32(7): 725–741.

Marette, Stéphan. (2009). 'Impact of Environmental, Societal and Health Information on Consumers' Choices for Nanofood'. *Journal of Agricultural & Food Industrial Organization* 7(2).

Matzler, Kurt, Stephan Friedrich von den Eichen, Markus Anschober, & Thomas Kohler. (2018). 'The Crusade of Digital Disruption'. *Journal of Business Strategy* 39(6): 13–20.

Miles, Matthew B., & A. Michael Huberman. (1994). *Qualitative Data Analysis: An Expanded Sourcebook*. Sage.

Roos, Yrjö H. (2016). 'Food Engineering at Multiple Scales: Case Studies, Challenges and the Future—a European Perspective'. *Food Engineering Reviews* 8(2): 91–115.

Saldaña, Johnny. (2015). *The Coding Manual for Qualitative Researchers*. London: Sage.

Schallmo, Daniel, Christopher A. Williams, & Luke Boardman. (2017). 'Digital Transformation of Business Models—Best Practice, Enablers, and Roadmap'. *International Journal of Innovation Management* 21(08): 1740014.

Schweitzer, Fiona Maria, Matthias Handrich, & Sven Heidenreich. (2019). 'Digital Transformation in the New Product Development Process: The Role of It-Enabled PLM Systems for Relational, Structural, and NPD Performance'. *International Journal of Innovation Management*: 1950067.

Steenis, Nigel D., & Arnout RH Fischer. (2016). 'Consumer Attitudes towards Nanotechnology in Food Products: An Attribute-Based Analysis'. *British Food Journal* 118(5): 1254–1267.

Tollin, Karin, & Antonia Erz. (2017). 'The Strategic Viewpoints of Innovation and Marketing Teams on the Development of Novel Functional Foods'. In *Developing New Functional Food and Nutraceutical Products*, Elsevier, 63–83.

Varese, Erica, & Paola Cane. (2017). 'From Space Food Research and Innovation to Immediate Advantages for Earth Eating Habits: An Aerospace–Food Producer Company Case Study'. *British Food Journal* 119(11): 2448–2461.

Weick, Cynthia Wagner. (2001). 'Agribusiness Technology in 2010: Directions and Challenges'. *Technology in Society* 23(1): 59–72.

ELECTRONIC WORD OF MOUTH ACTIVITIES IN THE HOTEL INDUSTRY

Emel Yarimoglu[1]
Tugrul Gunay[2]
Yigit Sebahattin Bozkurt[3]

DOI:

Abstract: *In this study, we focused on analyzing customers' electronic word of mouth activities in third-party booking websites which consist of detailed reviews, suggestions, and complaints about hotels. It was included to the research Booking.com, TripAdvisor, Trivago, Agoda, Hotels.com, Expedia, and Kayak as third-party booking websites. The aim of the study was to analyze the relationships among electronic word of mouth activities, trust, and loyalty. The field study was conducted with 120 university students chosen by convenience sampling. Data were collected by using online survey in North Cyprus during March, 2019. Data were analyzed via confirmatory factor analysis and structural equation modelling. In findings, it was found out that trust has a positive effect on loyalty, loyalty has a positive effect on electronic word of mouth intensity, and electronic word of mouth intensity had a positive effect on positive electronic word of mouth activities. Interestingly, it was not found out a significant relationship between loyalty and positive electronic word of mouth. Implications for booking websites and hotel industry were interpreted, and limitations and further research suggestions were advised.*

Keywords: *Booking Websites, Electronic Word of Mouth Intensity, Electronic Positive Word of Mouth, e-WOM, eWOM.*

1. INTRODUCTION

Information about products or services has become the key point that affects consumer behavior. Mostly before buying, customers prefer asking to their friends or relatives about the product or service that they intended to buy. With the developments in information technology, spread of knowledge has been raising day by day. Electronic word of mouth (e-WOM) is the solution who seeks advices and suggestions from people who they trust. Singh (2000) emphasized that e-WOM is a perfect mean to deliver to others about what customers have experienced during their shopping or visiting. Goyette et al. (2010) analyzed e-WOM activities into three parts such as e-WOM intensity, positive e-WOM, and negative e-WOM. e-WOM intensity showed the frequency level of speaking about the company, positive e-WOM consisted of the positive past experiences about the company, and on the contrary of this, negative e-WOM contained negative past experiences about the company.

In service industries, online customer reviews, which are one of the mostly used types of e-WOM activities (Yarimoglu and Ozelturkay, 2017), were paid great importance by prospect customers since services are intangible and prospect customers would like to get more information before using this service in order not to be dissatisfied. In the hotel industry, particularly in booking websites and

[1] Yasar University, Faculty of Business, Department of Business Administration, Universite Cad. N:37-39 35100 Bornova-Izmir/Turkey
[2] Eastern Mediterranean University, Faculty of Tourism, Gazimagusa, Turkey
[3] Adnan Menderes University, Faculty of Tourism, Aydın/Turkey

social media channels, online customer reviews consisting of suggestions, advices, and complaints were created by former customers to affect prospect customers' intentions of buying in a good way or bad way. Third-party booking websites such as Booking.com, TripAdvisor, Trivago, Agoda, Hotels.com, Expedia, and Kayak were the general platforms that former customers wrote about their positive or negative experiences. The e-WOM activities on these websites also show the satisfaction or dissatisfaction levels of the customers from the hotels that they have stayed and experienced.

In literature, mostly the effects of e-WOM on consumers' buying behavior were investigated (Park and Lee, 2008; Amblee and Bui, 2011; Ladhari and Michaud, 2015; Babic Rosari et al., 2016). However, in this study, it was aimed to analyze the effects of trust, which was found as one of the antecedents of loyalty (Chaudhuri and Holbrook, 2001; Munuera-Aleman 2003), and loyalty on e-WOM activities. Within this aim, the hypotheses were developed as follow:

Hypothesis One: Trust positively influences loyalty.
Hypothesis Two: Loyalty positively influences e-WOM intensity.
Hypothesis Three: Loyalty positively influences positive e-WOM.
Hypothesis Four: e-WOM intensity positively influences positive e-WOM.

The research model of the study was shown in Figure 1 below.

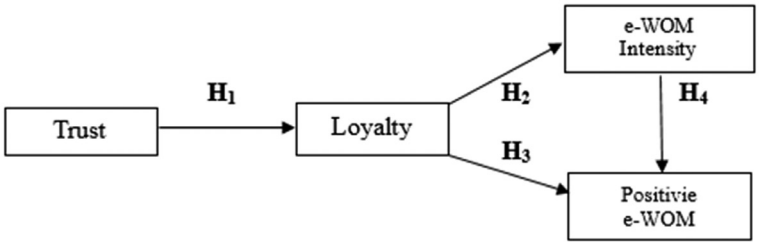


Figure 1. Research model

2. RESEARCH METHODOLOGY

Data were collected from university students by using online survey. The questionnaire was generated by modified scales taken from the literature. Trust scale was taken from Munuera-Aleman et al. (2003) and adapted to the research with four items. Loyalty scale, which was a four-item scale, was modified from Munuera-Aleman et al. (2003). e-Wom scale, which had nine items, was adapted from Goyette et al. (2010). The field study was conducted in North Cyprus, Eastern Mediterranean University in March, 2019. Total 120 international students chosen by convenience sampling participated in the research. They answered the questions in the survey based on their last hotel experience. Data were analyzed by confirmatory factor analysis and the hypotheses were tested via structural equation modelling.

3. FINDINGS

The undergraduate students from Department of Tourism were participated in the research. The demographic characteristics of participants were shown in Table 1 below.

According to the Table 1, the great majority of the participants were male, the majority of the students are between 22 and 25 years old. Most of them were from Turkish Republic of Northern Cyprus. They have taken monthly allowance between 2000 and 3999 TRY. When the research was conducted, 1 USD (USA dollar) equaled to 5.50 TRY (Turkish Lira).

Confirmatory Factor Analysis (CFA) was implemented to the scales. After necessary modifications, one item from Trust scale (T4), one item from Loyalty scale (L4), and one item from Positive e-WOM scale (PW6) were deleted. The results of CFA in Table 2 below showed that total 14 observed variables loaded on their respective dimensions, and they provided a good fit ($\chi 2$/df=1.347; GFI=0.894; AGFI=0.844; CFI=0.914; RMSEA=0.054) (Schumacker and Lomax, 2004).

Table 1. Demographic characteristics

Demographics		Frequency	Percent
Gender	Female	48	40
	Male	72	60
	Total	120	100
Age	18-21	34	28.3
	22-25	57	47.5
	26-29	29	24.2
	Total	120	100
Nationality	Northern Cyprus	63	52.5
	Iran	26	21.7
	Nigeria	20	16.7
	Ukraine	11	9.2
	Total	120	100
Allowance	2000-3999 TRY	64	53.3
	4000-5999 TRY	46	38.3
	6000-7999 TRY	10	8.3
	Total	120	100

Table 2. Results of factor analysis

Item	Factor Loading
Trust (T)	
T1. This hotel meets my expectations.	0.763
T2. I feel confidence in this hotel.	0.289
T3. This hotel never disappoints me.	0.535
Loyalty (L)	
L1. I consider myself to be loyal to this hotel.	0.326
L2. Only under extreme circumstances, I would consider visiting a different hotel.	0.502
L3. If this hotel was full, I would go somewhere else.	0.899
e-WOM Intensity (WI)	
WI1. I spoke of this hotel much more frequently than about any other hotels.	0.297
WI2. I spoke of this hotel much more frequently than about companies of any other type.	0.604
WI3. I spoke of this hotel to many people around me.	0.824
Positive e-WOM (PW)	
PW1. I recommended this hotel.	0.534
PW2. I speak of the good sides of this hotel.	0.752
PW3. I am proud to say to others that I am the customer of this hotel.	0.717
PW4. I strongly recommend people buy different services from this hotel.	0.372
PW5. I mostly say positive things to others about this hotel.	0.371

Structural equation modeling was used to test the model and hypotheses. Model fit well ($\chi 2$ /df=1,316; GFI=0,893; AGFI=0,846; CFI=0,919; RMSEA=0,052). The results were shown in Table 3 below.

Table 3. Results of path analysis

Hypothesis	S.E.	C.R.	p	Result
H_1: T →L	0.110	2.393	0.01	Supported
H_2: L → WI	0.202	1.897	0.05	Supported
H_3: L → PW	0.195	-0.494	0.62	Not Supported
H_4: WI → PW	0.498	2.453	0.01	Supported

Except H_3, other three hypotheses were found as significant. H_1 that predicted the effects of trust on loyalty was supported (β=0.628). H_2 that predicted the effects of loyalty on e-WOM intensity was supported (β=0.398). H_3 that predicted the effects of loyalty on positive e-WOM was not supported. H_4 that predicted the effects of e-WOM intensity on positive e-WOM was supported (β=0.726).

5. CONCLUSION

The study investigated the effects of trust and loyalty on e-WOM intensity and positive e-WOM. In the results, firstly, trust affected loyalty. It was approved in literature. In the study of Munuera-Aleman et al. (2003), it was found out that trust affected loyalty (β=0.45). Second, it was found out that loyalty had low impact on e-WOM intensity. Third, e-WOM intensity directly affected positive e-WOM activities. And lastly, it was found out that loyalty did not affect positive e-WOM. This result was interesting since it was known that loyal customers usually say positive things regarding companies. The link between loyalty and positive e-WOM activities should be revisited again.

Based on findings, it can be said that the biggest impact was found between e-WOM intensity and positive e-WOM activities. It showed that the more e-WOM intensity increases, the more positive e-WOM raises. The second biggest influence was found between trust and loyalty. It showed that if trust increases, loyalty increases as well. The weakest effect was found between loyalty and e-WOM intensity. And, no significant relationship was found between loyalty and positive e-WOM.

In the hotel industry, suggestions of other customers are one of the important sources for travelers. Many people search online before travelling. Since third-party booking websites are the ones which were used much during decision-making process, they should create more contents to encourage customers who will involve e-WOM activities. Trust and loyalty were the key factors that affect e-WOM intensity. So, it is important especially for booking websites to create trustful relationships with their customers. After building trust, satisfied and loyal customers will create e-WOM activities on by own. This led booking websites to produce better and trustful advices and suggestions regarding hotels in the tourism industry.

6. LIMITATIONS & FUTURE RESEARCH SUGGESTIONS

There were some limitations in the research. First, the research involved all types of third-party booking websites such as Booking.com, TripAdvisor, Trivago, Hotels.com, Agoda, Kayak, and Expedia. It was advised to researchers to choose one specific website, then conduct a study with the customers of this website.

Second, social media channels are also good sources for online customer reviews. In further studies, customers' e-WOM activities in different social media channels such as Instagram and

Facebook should be investigated. Also, the effects of influencers and influencer marketing could be included to the research.

Third, in this study, only positive e-WOM activities were included to the research. However, previous studies showed that negative e-WOM affects customers more than positive e-WOM (Park and Lee, 2009), and the credibility of negative e-WOM was higher than positive e-WOM (Lee and Koo, 2012). It was advised to scholars to search about the effects of negative e-WOM and analyze them within complaint management.

Lastly, there were some methodological limitations in the research such as sample consisted of university students and only one university was included to the research. In future studies, it was advised to conduct this study with bigger and older samples.

REFERENCES

Amblee, N., & Bui, T. (2011). Harnessing the influence of social proof in online shopping: The effect of electronic word of mouth on sales of digital microproducts. *International journal of electronic commerce, 16*(2), 91-114.

Babić Rosario, A., Sotgiu, F., De Valck, K., & Bijmolt, T. H. (2016). The effect of electronic word of mouth on sales: A meta-analytic review of platform, product, and metric factors. *Journal of Marketing Research, 53*(3), 297-318.

Chaudhuri, A., & Holbrook, M. B. (2001). The chain of effects from brand trust and brand affect to brand performance: the role of brand loyalty. *Journal of marketing, 65*(2), 81-93.

Goyette, I., Ricard, L., Bergeron, J., & Marticotte, F. (2010). e-WOM Scale: word-of-mouth measurement scale for e-services context. *Canadian Journal of Administrative Sciences/ Revue Canadienne des Sciences de l'Administration, 27*(1), 5-23.

Ladhari, R., & Michaud, M. (2015). eWOM effects on hotel booking intentions, attitudes, trust, and website perceptions. *International Journal of Hospitality Management, 46*, 36-45.

Lee, K. T., & Koo, D. M. (2012). Effects of attribute and valence of e-WOM on message adoption: Moderating roles of subjective knowledge and regulatory focus. Computers in Human Behavior, 28(5), 1974-1984.

Munuera-Aleman, J. L., Delgado-Ballester, E., & Yague-Guillen, M. J. (2003). Development and Validation of a Brand Trust Scale. *International Journal of Market Research, 45*(1), 1–18.

Park, D. H., & Lee, J. (2008). eWOM overload and its effect on consumer behavioral intention depending on consumer involvement. *Electronic Commerce Research and Applications, 7*(4), 386-398.

Park, C., & Lee, T. M. (2009). Information direction, website reputation and eWOM effect: A moderating role of product type. Journal of Business research, 62(1), 61-67.

Singh, D. (2000). Electronic word of mouth. *Paradigm, 4*(2), 1-11.

Yarimoglu, E. K., & Ozeltürkay, E. Y. (2017). Examining online customer reviews by aidmsas hierarchy of effects model: a research on university students. *Pazarlama ve Pazarlama Araştırmaları Dergisi, 10*(20), 135-153.

OPPORTUNITIES AND RESTRICTIONS OF INNOVATION IN BULGARIA

Vera Pirimova[1]

DOI:

Abstract: *In the adopted in 2015 and updated in 2017 „Innovation Strategy for Smart Specialization 2014-2020", the Bulgarian state sets ambitious goals and undertakes serious commitments to encourage and more decisively support innovation. The main objective of this paper is to investigate certain structural features and indicators of innovation and as a result on this basis to summarize some adopted opportunities and existing constraints on innovation in the private and public sectors at the end of the programming period. As a result of the analysis, both stimulating and retaining factors are synthesized in the context of the size (scale of activity) of the predominant part of the companies, the sectoral company and innovation concentration and the size and structure of R&D expenditure in the private and public sectors. During the study methods of analysis and synthesis, induction and deduction, as well as methods of descriptive analysis were used.*

Keywords: *Innovation, Innovation Firms, R&D Expenditures*

1. INTRODUCTION

In recent years innovation has become a growing priority of policies at European and national level, which focus on both the private and public sectors. Their role is emphasized in the conclusions of the European Commission's analysis, which accounts for about two-thirds of the European Union's economic growth, and about one-fifth of global R&D investment in the EU (European Innovation Scoreboard 2018). The need to improve these indicators across the EU has been transposed into the adopted strategic documents, into measures and policies taken in the field of innovation in each member state.

Accordingly, in 2015 the „Innovation Strategy for Smart Specialization of the Republic of Bulgaria 2014-2020 (IS3)" was approved and in 2017 the parameters of its key objectives were updated. They envisage a qualitative leap in the country's innovation performance in the EU; a strategic goal is to be reached so that by 2020 Bulgaria is to move from the group of „modest innovators" to the group of „moderate innovators", i.e. move one position forward on the EC's annual charts and classifications. However, according to the latest report from 2019, Bulgaria still remains in the last group of „modest innovators" together with Romania (European Innovation Scoreboard 2019, p. 7) and the end of the programming period approaching, it is of interest to summarize the achievements done so far as well as the delays in relation to some innovative indicators.

In this context the main objective of the report is to identify the opportunities and/or constraints to innovation in Bulgaria by looking at the structure, i.e. mainly the size and sectoral distribution of companies, investments, innovations and R&D expenditure in the private and public sectors. On this basis similarities or differences with the structure of GDP can be identified as indicative of untapped potential for acceleration or of obstacles to innovation in certain areas.

[1] University of National and World Economy (UNWE), Sofia, Bulgaria, bul. 8th December, Students town, Sofia 1700, Bulgaria

Methods of analysis and synthesis, induction and deduction as well as methods of descriptive analyses are mainly applied in the study. NSI statistics data and calculated by the author derivative indicators are used.

2. NEW SECTORAL MEASURES OF GDP AND INNOVATION

In recent years, there has been a steady irreversible trend of change in the sectoral structure of Bulgaria's GDP. After a consistent and rapid expansion in the period preceding 2017, the service sector has the largest relative share of more than 71% of GDP, the industry is already second and generates about a quarter (24.7%) of the GDP, the share of rural, forestry and fisheries accounting for only 4.1%. These changes are a consequence of the accompanying market reforms processes of privatization, closure or transformation of ownership and activity of state-owned companies and the development of an entirely new field of private entrepreneurship - which favors many activities in the service sector. As a result, the public sector was limited, the private sector became dominant and the sectors and industries key to the economy were gradually rearranged. The joining of the EU in the beginning of 2007 has greatly contributed to these changes, which in turn as given impetus to Bulgaria's strengthening integration with other EU countries.

The different new structure of the economy reflects on the structural characteristics and the priority orientation of investment, innovation and growth. They manifest themselves in two main directions:

Firstly, with the limited share of the industry and the faster development of the service sector, further encouragement of investment and innovation in the material production sector is required. There are opportunities to introduce more technological product and process innovations. The rate of return on this type of investment can be higher and long-term, their effects on the growth of companies and the economy are more secure and more sustainable, leading to an expansion of production potential. The modernization of the industry sector through the introduction of numerous new production methods and products has revitalized its role as a stable source of economic growth in the present as well as in the future, despite it being pushed to the second position in the GDP structure.

Secondly, the changing sectoral profile of investment and innovation is also influenced by a greater number of opportunities for new ICTs to become more widespread and faster in the service sector than in industry, for example. However, this is typical not of all, but of certain activities in the service sector. For example, according to A. Dinkin (2008) in the beginning of the 21st century, ten industries have a high share of ICTs in the United States, with eight of these being in the service sector. In particular, they are wholesale, business services, education, financial services and insurance, retail, healthcare and legal services. Their development is further stimulated by new technologies, given the fact that they require other qualitative characteristics of labor and human capital and new organizational and managerial models. This induces a stronger impetus in the implementation of organizational and marketing, i.e. non-technological innovations, which in many cases prove to be financially advantageous, more easily applicable, more often preferred and prevalent.

The sectoral focuses and the dynamics of investment and innovation are also influenced by the different sensitivity and response to internally or externally induced crises displayed by the economic sectors. The impulses of the 2008-2009 global crisis, for example, had a specific depth and duration of recovery across sectors. In Bulgaria, this crisis manifested itself with a one-off GDP

fall of 4% in 2009, covering almost all sectors. However, the service sector (and the financial and insurance activities) being in top place was more strongly and long-term affected by the crisis. One of its activities noted a series of irregular downturns and weak gains that continued well into 2016. Unlike services, the industry emerged as a relatively more stable sector. It reported a one-off decrease in production, it restored its growth back in 2010 and maintained a positive growth rate until the end of the period. They were aided by both domestic and foreign direct investment, which diverted from the previously dominant financial sphere to the manufacturing industry. In 2018, for example, this sector attracted over 73.5% of FDI inflows. However, the country's economic growth in 2018 was due to other activities - the highest growth rates were reported by real estate operations (9%), financial and insurance activities (7%) and construction (4%).

In the context of these new developments and differentiated peculiarities in the dynamics of the sectors, there is a need for further analysis.

3. MAIN STRUCTURAL CHARACTERISTICS OF COMPANIES AND INNOVATION

In the complex conditionality of investment, innovation and growth, the size and sectoral distribution of firms and their innovative activity, as well as the size and structure of R&D expenditure, play an important role.

In terms of investment and innovation activity, there are tangible differences between operating small and large companies. Smaller firms are well-suited and able to thrive in certain activities and industries, mainly in the services sector and partly in the manufacturing industry. They have more flexibility and simpler management; counteract unemployment by providing employment and income to the owner and his family members. But they are financially and economically unsustainable, have limited capital and growth opportunities, find it difficult to access bank loans and target European programs and funds. Their efforts and activities are focused mainly on current results, providing the necessary financial resources to maintain production (in most cases on the same scale), focused mainly on the internal market and demand, to overcome irregularities and to gain more revenue and profits. Many of these companies do not have strategic plans in place for their future development; they are lagging behind in technology. Most of them lack sufficient financial and human resources to carry out their own research and innovation.

Due to larger scales of activity, revenues and profits, better resource availability and economies of scale, easier access to credit and other sources of finance, most often the potential for innovation and growth is concentrated in larger companies. Greater access to both internal and external markets guarantees a better realization of traditional as well as newly created products; this justifies and accelerates the return on investment in research, development and experimentation. It is large and to some extent medium-sized companies in particular that strategically, consistently and systematically plan future investment projects, give priority to maintaining and expanding their already existing market positions and shares, as well as to their competitiveness, which is enhanced by the creation and implementation of more innovative products and technologies. Otherwise, they run the risk of being left behind by the more competitive national and foreign companies and of inducing development delay.

Advantages and disadvantages, differences between large and small companies in the field of investment and innovation have been identified in a number of studies. For example, J. Wein-

berg (Weinberg, (1994), comes to conclusions and evidence of such specificity, which he binds predominantly with the life cycle of companies. Iv. Kitov (Kitov Ivan) reveals significant differences in the development of size distribution of companies across different industries in the US, which has an effect on the growth model of firms and serves as a solid basis for the development and implementation of selective investment strategies. Famous economists such as D. Evans (Evans, (1987), Robert Lucas (R. Lucas, (1978), Franco Modigliani (Fr. Modigliani, (1958), Joseph Stiglitz (J. Stiglitz, (1981) also come to similar conclusions. At the same time, emphasis is placed on the innovative characteristics of investments made by larger and smaller companies (Symeonidis G., (1966). The provided summaries show that R&D costs and innovation rates are explained by a number of company characteristics. Thus, D. Shefer and A. Frenkel (Shefer, A. Frenkel, (2005) suggest that they relate to varying degrees to firm size, organizational structure, type of ownership, industrial branch, and location of firms (in larger cities or small towns). Feedback-focused research is also being conducted to clarify the impact of innovation on the average size of businesses. By focusing on the differences between product and process innovation, N. Bosma and G. de Wit (N. Bosma, G. de Wit, (2004) clearly demonstrate the explicit positive impact that innovation has on the average size of the firm.

In addition, there are analyzes proving the opposite thesis - of the more important role played by the flexibility and innovation of small businesses. W. Dolfsma and G. van der Velde investigate the introduction of new products and discover that those industries that are dominated by small firms are consistently and significantly more innovative than those dominated by large ones. They take into account the role of both the structure of the industry concerned and the dynamic levels of competition, referring their findings to industries with high and increasing levels of new entrants. In this case, the crucial role is given to the activity of performing the so-called. „Entrepreneurial Function", a term coined by J. Schumpeter. However, in conclusion they emphasize that the contribution of small firms to industrial innovation is different from that of large and new firms.

In more recent studies, the focus has shifted from manufacturing to the already prevailing service sector (Audretsch D., (2018). The three main aspects of innovation are analyzed - R&D costs, innovative output and productivity as they are manifested in knowledge-intensive services. By combining the models of Crepon et al. (1998) and Ackerberg et al. (2015) we can prove that intensive knowledge services benefit from innovative activities and this can lead to increased productivity of labour. An interesting fact is that the advantage of firm size is of importance to the sphere of production, but it does not manifest itself and almost disappears from services that require knowledge.

In the context of the predominant part of the conclusions about the role of their size, the structure of the companies that operate in Bulgaria creates certain obstacles to the intensification of innovation and growth.

Among the companies operating in the country those that are small have the greater advantage. Out of the total number of non-financial corporations, which are 406 310 altogether according to the latest NSI data for 2017, over 99 percent are small and medium-sized enterprises (SMEs), and over 92 percent of them are even micro-enterprises (with a number of employees from 1 to 9 people). Over the years, their numbers have varied, but their share in the total number of companies has remained relatively constant. The process is characterized by the continuous closure of some, but also the registration of other new companies, which in most cases are small. It is

clear that there are very few (only about 6%) medium-sized companies working in the country - employing 10 to 49 people, a negligible share of large companies (employing between 50-249 people or over 250 people employed), a significant portion of which are private.

With such a size structure of companies, the innovation process is difficult given the limited financial, production and technological capacity available to the vast majority of firms. Both the allocation of funds and the undertaking of R&D, their own research, development and experimental work, as well as the supply of these companies with high-tech advanced technology and equipment through their purchase from the domestic or foreign markets are obstructed. Due to lower pay and the mostly lacking additional rewards and incentives, small businesses often attract and retain on a permanent basis less qualified personnel. This creates obstacles to the level of awareness, to management as well as to making use of the opportunities that innovation brings about.

It is of importance to note in which sectors and industries the concentration of large, medium and small companies is highest, and thus where the innovation potential is mostly concentrated.

Sectoral concentration of companies in Bulgaria according to their size is one of the driving forces behind innovation. A large part of micro-enterprises carry out activities in the field of trade and repair, a smaller part are in „Professional Activities and Research" and in the manufacturing industry (see Table 1). The sectoral distribution of small enterprises is similar. With reference to the medium, large and largest companies, the manufacturing industry is in first place, with far too great an advantage over the other activities. Therefore, the best potential for innovation and investment stands out in the latter industry. It is more favorable not only in terms of its predominantly large companies, but also in view of the broader possibilities of this sector for technological and product innovation. In spite of the overall progress in the field of services, which are assisted by the rapid introduction of new information and communication technologies, their potential cannot be fully unlocked due to the limited size of the companies operating in them.

Table 1. Number of non-financial Enterprises by Economic Activity Groupings and Size in terms of employed in 2017

SECTIONS BY NACE Rev.2	Total	Size classes of number of persons employed				
		0-9	10-19	20-49	50-249	250+
Mining and quarrying	342	215	51	35	28	13
Manufacturing	31 272	23 615	2 960	2 686	1 724	287
Electricity, gas, steam and air conditioning supply	1 679	1 541	63	32	26	17
Water supply; sewerage, waste management and remediation activities	793	542	73	77	60	41
Construction	19 889	16 772	1 585	1 004	493	35
Wholesale and retail trade; repair of motor vehicles and motorcycles	141 059	133 180	4 600	2 412	783	84
Transportation and storage	23 191	21 056	1 178	649	261	47
Accommodation and food service activities	27 096	24 131	1 739	886	319	21
Information and communication	13 471	12 257	560	399	211	44
Real estate activities	22 396	21 864	343	155	..	..
Professional, scientific and technical activities	44 394	43 087	842	..	115	..
Administrative and support service activities	11 414	10 119	547	443	236	69
Repair of computers and personal and household goods	3 491	3 450	31	..	..	-

Source: NSI data as of 13.10.2019, http://www.nsi.bg/bg/content/7697/брой-на-предприятията

A significant proportion of medium and large enterprises, functioning in different industries which are relatively more resilient, contribute to the weaker and shorter-term impact of the global crisis on the industry sector. During the first years following the 2009 crisis, more FDI inflows turned to this sector, both because of the higher stability of investment in it and because foreign investors prefer larger enterprises and avoid higher risk SMEs. The sectoral performance of medium and large companies is a sign of the corresponding sectoral focus of investments and innovations in Bulgaria in recent years. However, the notable variance as compared with the GDP-leading service sector, together with the predominantly small number of Bulgarian companies explain the weaker effect of the relatively good innovation dynamics and the limited potential for long-term and lasting growth stabilization.

This conclusion is confirmed by the statistical data on the amount of investments, innovations and R&D expenditures undertaken in the country, as well as by their basic structural features.

Investment in the country in recent years is not among the leading, consistently emerging and stable sources of growth. Over the period 2008-2017, firms' fixed tangible assets (FTA) expenditures have not shown steady increase, but have volatile, mixed dynamics instead. They collapsed in the crisis year of 2009 as well as during the next year. Decrease is witnessed also in 2016 and 2017. Therefore, as of 2017, the last year reported, they are over BGN 11 million less than the year before the crisis. With regard to this indicator there is a certain lag in the service sector. Although FTA expenditures are allocated to more types of activities within the services provided, they are highest in industry (over 31%) and in trade, transportation, accommodation and food service activities (almost 26%). Therefore, it becomes evident that the real GDP growth achieved in the 2010-2018 period, though at lower rates, is based on other preconditions and not uniquely defined by investment.

Data on innovation, which is quite insufficient in volume and characterized by unfavorable structure of type and economic sector, lead to similar conclusions and observations.

Industry has the highest relative share of innovative enterprises (31.6%), while in the service sector they are about one fifth (22.1%). These shares have remained relatively constant over the last few years. A significant proportion (almost 82%) of the companies that identify themselves as innovative are large - they belong to the group of companies employing up to or over 250 people (see Table 2). For example, in the SME group they are much less in number; only about one fifth of the companies employing 10 to 49 people can be termed as "innovative". Due to the lack of specific information, it can be assumed, but with a relatively high degree of certainty, that among the prevailing number of micro-enterprises (with the number of employees from 1 to 9 people) the share of innovative companies is negligible. In general, the share of innovative enterprises is growing, roughly doubling, by movement on the upward scale of the size of firms according to the number of employees in them - with transition from small to medium-sized and from medium to large companies. Low innovation activity of the prevailing number of small companies impedes and slows down the impact of innovation on GDP growth.

Unsatisfactory effects in support of growth are generated by the relative share of firms that have made the respective type of innovation. Although all types of innovation contribute to the growth of companies and the economy as a whole, in Bulgaria only 19.8% are enterprises with technological (product and process) innovations and 17.3% of the companies have undertaken non-technological (organizational and marketing) innovations. Companies with technological

innovations in the industry sector (which are almost 25%) are overwhelmingly ahead of those in the service sector (which are only about 14%); still both of these parameters are too low. In both sectors the share of non-technological innovation enterprises is also low and of similar value, with a difference of less than one percentage point. Therefore, there is a need for additional stimulation and there are certain opportunities to increase innovation activity of companies, both in industry and in the service sector with relation to both technological and non-technological innovations. The focus should be primarily on the SME group, which is far behind the innovative larger companies.

Table 2. Innovative Enterprises, as a Share of all Enterprises, 2016*

Industries (NACE rev. 2)	**2016**		
Size class (by number of employees)	**Innovative enterprises (%)**	**Enterprises with technological innovation (%)**	**Enterprises with non-technological innovation (%)**
Total	27.2	19.8	17.3
Industry [1)]	31.6	24.9	17.9
Services [2)]	22.1	14.1	16.7
10 - 49 employees	20.5	15.2	12.7
50 - 249 employees	44.3	32.9	28
250 or more employees	81.9	50.6	62

Source: Latest NSI data as of 13.10.2019; https://www.nsi.bg/en/content/6787/innovative-enterprises-share-all-enterprises

1) Included are NACE sections B, C, D and E.

2) Included are NACE sections H, J and K, and NACE divisions 46, 71, 72 and 73.

In addition, trends in dynamics and some basic structural features of R&D spending can be derived as well. Following a steady increase in R&D spending over a period of a few years, they sharply decreased in 2016 and 2017. The shrinkage covers all observed sectors - it is manifested simultaneously in enterprises, the public sector, higher education, and partly in non-profit organizations. At the same time, their structural distribution is unfavorable - a huge part of these costs is current, with only 9% being allocated for the acquisition of FTA. In sectoral terms, in 2017, most of the R&D expenditure was incurred in the manufacturing industry, followed in second place by „Creating and Disseminating Information and Creative Products, Telecommunications", followed by „Professional Activities and Research" in third place. The enterprises' performance in relation to their size is similar to the already identified innovation trends. More than 40% of R&D expenditures are made by large companies with up to and over 250 employees, nearly 25% are due to the activity of companies with 50-249 employees, only about 7% is the share of micro enterprises with 1-9 employees and no employees. Uncharacteristic of the growth conditions is the consistent decline in R&D spending in enterprises, the public sector and higher education over the last three years (2015-2017). It has a deterrent effect on the innovation process and the rates of economic growth.

The trends in the dynamics of budget allocations for R&D and their targeting towards the main socio-economic goals can be traced separately. They largely determine the ability to achieve the strategic goals set out in the „Innovation Strategy for Smart Specialization of the Republic of Bulgaria 2014-2020", adopted in 2017.

Budget expenditure on R&D cannot be characterized by a consistent increase over all years. In 2011 and 2016 they are less than in the previous year. For the rest of the period, their annual increase is different in degree and amount, but relatively small. Therefore, for 2018 the amount of

budget expenditures for R&D exceeds only by BGN 28 153 thousand the budget allocations in 2010. There are fluctuations and inconsistencies in the percentage of expenditure by individual socio-economic objectives, which does not make it possible to identify their priority areas. What is striking is the steady decrease in the percentage of education development expenditure as well as the almost continuous reduction in its absolute size (with one exception in 2015). As a result, in 2018, only slightly more than BGN 9.3 million was spent on the education sector, compared to more than BGN 23.6 million in 2010. Although the development of this area is also based on funds from the private sector, it should be above all the responsibility and serious concern of the state. Innovation needs to be encouraged and applied in the training process to enable the formation of highly qualified professionals capable of developing, managing, using and serving innovative products, processes and technologies in the business practice. This will also create the preconditions for the realization of one of the key sub-goals of IS3, related to the development of quality human resources and capital who will create and work with the technologies of the future.

Therefore, it is necessary to conclude that with regard to the dynamics, the features of the volume and basic structural indicators for investment, innovation and R&D expenditures, it can be observed that there are insufficient conditions and untapped opportunities in relation to the potential of accelerated economic growth in Bulgaria at this stage and in the near future also.

4. CONCLUSION

In summary, a conclusion is drawn about the manifestation of some retarding factors in the future intensification of innovation in the context of the size and sectoral distribution of Bulgarian companies, innovation and R&D expenditure. In addition, some of the structural parameters indicate the presence of underutilized opportunities for innovation in certain economic sectors and in the group of medium and small companies as well. Opportunities to give a moderate impulse of innovation and growth in the coming years can be created by stimulating and boosting the orientation of SMEs and new companies towards more innovative products and technologies, increasing domestic investment, attracting more FDI.

REFERENCES

Dinkin A., The World Economy: Forecast to 2020, M., IMEMO RAS, 2008, p. 122 (In Bulgarian)

European Innovation Scoreboard 2018, https://europa.eu/rapid/press-release_IP-18-4223_en.htm

European Innovation Scoreboard 2019, p. 7, https://ec.europa.eu/docsroom/documents/36281

Innovation strategy for smart specialization of the Republic of Bulgaria 2014-2020 (IS3), https://www.mi.government.bg/en/themes/inovacionna-strategiya-za-inteligentna-specializaciya-na-republika-balgariya-2014-2020-g-i-proces-na-i-1470-287.html

Audretsch David B., Marian Hafenstein, Alexander S. Kritikos, Alexander Schiersch, Firm Size and Innovation in the Service Sector, IZA Institute of Labor Economics, Discussion Paper Series, IZA DP No. 12035, December 2018, http://ftp.iza.org/dp12035.pdf

Bosma Niels, Gerrit de Wit, The influence of innovation on firm size, SCALES-paper N200318, January 2004, https://ideas.repec.org/p/eim/papers/n200318.html

Dolfsma Wilfred, Gerben van der Velde, Industry innovativeness, firm size, and entrepreneurship: Schumpeter Mark III?, J Evol Econ (2014) 24:713–736, Springer-Verlag Berlin Heidelberg 2014, https://wilfreddolfsma.net/site/assets/files/1015/jee_dolfsma_vandervelde_schumpeter_iii_2014.pdf

Evans, David., The Relationship between Firm Growth, Size and Age; Esti-mates for 100 Manufacturing Industries, Journal of Industrial Economics, vol. 35 (June 1987), pp. 567–82, https://ideas.repec.org/a/bla/jindec/v35y1987i4p567-81.html

Kitov Ivan O., What is the best firm size to invest?, https://arxiv.org/ftp/arxiv/papers/0903/0903.0286.pdf

Lucas, Robert E., On the Size Distribution of Business Firms, Bell Journal of Economics, vol. 9 (Autumn 1978), pp. 508–23, http://homepages.ulb.ac.be/~plegros/documents/classes/IO-Ecore/lucas.pdf

Modigliani, Franco, Merton H. Miller., The Cost of Capital, Corporation Finance and the Theory of Investment, American Economic Review, vol. 48 (June 1958), pp. 261–97, https://gvpesquisa.fgv.br/sites/gvpesquisa.fgv.br/files/arquivos/terra_-_the_cost_of_capital_corporation_finance.pdf

Shefer Daniel, Amnon Frenkel, R&D, firm size and innovation: an empirical analysis, Technovation Volume 25, Issue 1, January 2005, P. 25-32, https://www.sciencedirect.com/science/article/pii/S0166497203001524

Symeonidis George, (1966), Innovation, Firm Size and Market Structure: Schumpeterian Hypotheses and Some New Themes, OECD Economics Department Working Papers No. 161, 1966, https://www.oecd-ilibrary.org/docserver/603802238336.pdf?expires=1567790365&id=id&accname=guest&checksum=11226392A56C6276DAA201E743D742FB

Stiglitz, Joseph E., Andrew Weiss, Credit Rationing in Markets with Imperfect Information, American Economic Review, vol. 71 (June 1981), pp. 393–410, https://economics.ut.ac.ir/documents/3030266/23771038/credit_rationing_in%20_markets_with_imperfect_information.pdf

Weinberg John A., Firm Size, Finance, and Investment, 1994, FRB Richmond Economic Quarterly, vol. 80, no. 1, Winter 1994, pp. 19-40. Available at SSRN: https://ssrn.com/abstract=2125388

http://data.worldbank.org/indicator/NV.SRV.TETC.ZS

http://data.worldbank.org/indicator/NV.IND.TOTL.ZS

http://data.worldbank.org/indicator/NV.AGR.TOTL.ZS

http://www.nsi.bg

THE ROLE OF TOP MANAGEMENT IN ANALYZING THE PROFITABILITY OF A COMPANY

Silvana Pašovska[1]

DOI:

Abstract: *The reaffirmation of the elements of the market economy system imposes the need to redefine the motives for management and the categories for expressing the efficiency of the business entities. Accordingly, the substance and the manner of expressing and measuring profitability undergo changes characteristic in the standards of the market economy and thus the basic starting point for quantifying profitability is profit. In this way, assumptions are made to understand the purpose of the principle of profitability that should be studied through the following components and relationships:*

- *Global relationship between the profit and the assets engaged,*
- *the partial relationship between the elements of the profit and the elements of the assets engaged,*
- *analysis and quantification of the factors that determine the size, the structure and the dynamics of the profit, i.e. the size and dynamics of the engaged assets on the other hand.*

Starting from the conclusion that the integral part of the complex of the profitability is the engaged assets, it is necessary to consider not only the volume of the investment and engagement of those assets, but also the intensity of their use and spending. The amount of the average engaged and invested assets is determined by two sizes:

- *the amounts of assets engaged and invested in the individual production process cycles, and*
- *the duration of their engagement.*

Keywords: *Profitability, Management, Business, Financial Analysis, Portfolio Investment.*

1. INTRODUCTION

The application of the principle of profitability at the level of individual companies, confirms the purpose and the motive that should be achieved with this principle. In the long term, the profitability is manifested as maximizing of the financial result with minimum capital investment (assets). The expression of profitability based on the relationship between the profit and the capital, i.e. invested assets, emphasizes the need to specify the type of capital that will be the starting point for measuring profitability. In the context of financial analysis, and in function for increasing profitability, the borrowed capital is particularly interesting, which through the amount of financing costs (interest), affects the reduction of the final effects and the realized profitability. It follows from the foregoing that one of the tasks of the financial policy is to reduce the price of the funding sources which will create assumptions for maintaining financial balance and stable financing relationships.

2. FUTURE RESEARCH DIRECTIONS

2.1. Profitability analysis

Every company, in order to achieve full success in its operations, must take into account the costs incurred in production (cost-effectiveness), the engagement of the workforce in terms of the realized production (productivity), and to perform its tasks with the least amount of engaged

[1] University St. Kliment Ohridski-Bitola, Scientific Tobacco Institute, Prilep, Republic of North Macedonia

assets. That requirement - the results of the process of operating to be achieved with as little amount of engaged assets as possible - represents the principle of profitability. So, profitability reflects the final business success of any corporation. The principle of profitability by definition requires you to achieve as much profit as possible by engaging less in reproduction. Profitability as a partial expression of the quality of the economy and expresses the efficiency of the assets engaged in generating profits. The formula for expressing profitability is:

(1)

Profitability, in terms of profit, depends on the amount of the total income earned, then on the size of the material cost of reproduction, the engaged assets and on the cycle of reproduction itself. The size of the total income affects the profitability if the company makes full use of its capacity and sells its production at selling prices that will enable it to profit and vice versa, with reduced capacity utilization it reduces the total income and thus the profit, which in turn has less profitability. The total income is also dependent on the selling price, so if lower sales price is achieved the total income is reduced, i.e. the profitability is reduced.

Since profitability is the relationship between the profits made on the one hand and the assets engaged on the other, the problem of its measuring will depend on the exact expression of their magnitudes. It is, above all, an indicator of business success. Hence companies are required to dispose of a method by which they can provide accurate data on the success achieved, that is, they will be able to have an accurate picture of the dimensions of the results achieved. The efforts for productive and economical operation have appropriate effects on the profitability of the operation. Measures taken to increase productivity and economy directly affect the profit, its size directly impacts the degree of profitability. Profitability indicators can be grouped as partial and global, i.e. synthetic. The first relate to the rate of business and net profit whose analysis and determination is based solely on periodic income statements. The second indicators cover the rate of return on the total own assets, which inevitably assumes that for their determination and analysis it is necessary to use the income statement and the balance sheet. The income statement should be structured in such a way as to enable analysis of the interdependence of the incomes, expenses, inter-phase and final results of the company's operations for the specific time period. That analysis can have two different aspects. One deals with examining the relative share of certain segments of the expenditure and the results of the realized sales income. This analysis is usually referred to as a ratio analysis of the income statement. The second aspect concerns the dynamic combination of the invoices on which the difference between the income and expenditure, business and net profit depends. This analysis has taken place with the breakpoint methodology or profitability graph, which can be presented as follows in Figure 1.

The first information in Figure 1 relates to the intersection point of the line of the total income and the total costs, in which the business profit is equal to zero. In this case, the company only reaches the lower limit of profitability, whereby the volume of realization can be calculated by the following formula:

$$\text{Lower profitability limit} = 1 - \frac{\frac{\text{Fixed costs}}{\text{Variable costs}}}{\text{Income from sale}} \quad (2)$$

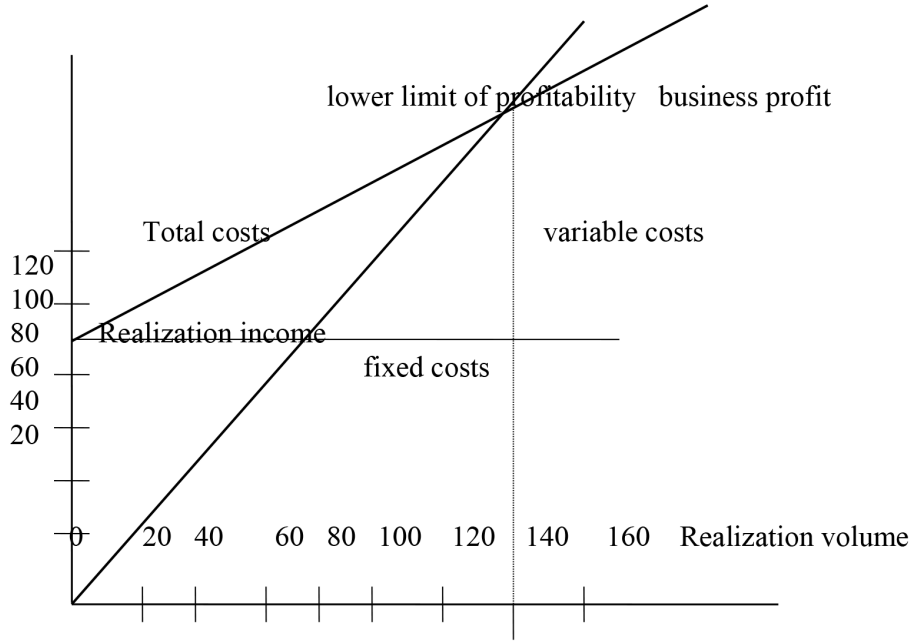


Figure 1. Profitability graph
Source: own analysis

The combination of factors, which provides only a complement to the regular costs, is a minimum requirement for existence, which means that with determining the lower limit of profitability, the analytical sense of the profitability graph does not exhaust. On the contrary, its task is to strive to achieve the optimal combination of the relevant factors in order to maximize the business profits. The purpose may be the basis for structuring the income statement, i.e. for determining the order of reimbursement of expenses with recurring income from the realization. Such a structure of the income statement, in particular, exists in the variable cost calculation system (Direct Costing), in which the variable costs are proportionally complemented by the realization of the products and the services, while the fixed costs fall entirely on the current income.

The most general financial indicator of profitability is the rate of the total business assets which, in financial and accounting terms, is a periodic increase of the total business assets that are used to perform the regular business activities of the corporate enterprise during the same period.

Accordingly, the rate of return on the total business assets can be obtained directly from the following relationship:

$$\text{Rate of return on total business assets} = \frac{\text{Business profit}}{\text{Average business assets}} \quad (3)$$

This rate should show how much the average business invested assets earn during the observation period. The relative importance of that growth can only be talked about in the context of time and spatial analysis. The time analysis refers to the comparison of the current rate of return from the previous periods, while the spatial analysis implies comparing of the current rate of return with the returns of other companies in the same production branch, i.e. with the average rate of return of the whole branch. Only in these relationships can be obtained a competent impression of whether and how effectively the analyzed company is using its assets. However, analytically, that expression of the profitability of the business investments that derives from the individual determinants of the rate of return, is more significant. These are the following deter-

minants: turnover ratio of an average business assets and the business profit rate in terms of the realization income. Their relationship with the rate of return can be explained by the so-called triangular interdependence that includes the net realization income, the average business assets and the business profit. Graphically, this interdependence is as follows:

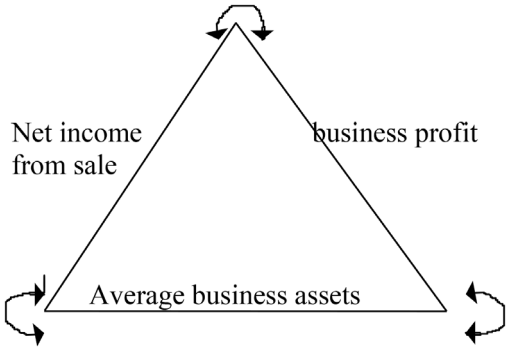


Figure: 2 - Triangular Interdependence
(net income from sale, business profit, average business assets)
Source: own analysis

$$\text{Rate of business profit} = \frac{\text{Business profit}}{\text{Net income from sale}} \tag{4}$$

$$\text{Turnover ratio of assets} = \frac{\text{Net income from sale}}{\text{Average assets}} \tag{5}$$

$$\text{Rate of return of business assets} = \frac{\text{Business profit}}{\text{Average assets}} \tag{6}$$

Converted as a simple equity, this interdependence shows that the rate of return on business assets is the product of the ratio of the average engaged assets and the rate of business income on the realization profit. Namely:

$$\frac{\text{Business profit}}{\text{average business assets}} = \frac{\text{net income from sale}}{\text{average assets}} \cdot \frac{\text{business profit}}{\text{net income from sale}} \tag{7}$$

This clearly shows that maximizing the rate of return inevitably implies a constantly acceleration of the turnover of the total business assets, as well as an increase in the rate of profit on the realized income. In this context, the analysis should show that with smaller investment in business assets, should be achieved greater volume and income from the sale, with lower cost of operating (maximizing the profit rate), since only in this way can affects the constant increase in the return on business assets as the most general financial indicator of profitability. Unlike the business profit which is the effect of the operation of the total assets, the net profit shows the effect of the investment of own assets. Raising the own capital is a particularly important purpose of the operation and it can be concluded that the relative relationship between the net profit and the own sources of financing is an important qualitative indicator in the financial analysis.

This relative ratio is called the rate of return on the own assets, which is determined as follows:

$$\text{Rate of return on own assets} = \frac{\text{net profit}}{\text{average own assets}} \tag{8}$$

The rate of return on own assets and the rate of return on the total business assets can be explained by the triangular interdependence, which is represented by the following scheme:

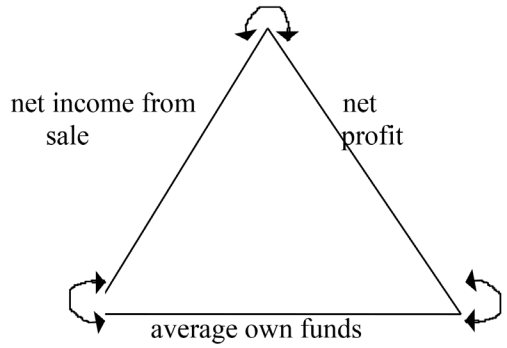


Figure 3. Triangular Interdependence
(rate of return on own funds and rate of return on total business assets)
Source: own analysis

$$\text{Rate of net profit} = \frac{\text{net profit}}{\text{net income from sale}} \tag{9}$$

$$\text{Own assets turnover ratio} = \frac{\text{net income from sale}}{\text{average own funds}} \tag{10}$$

$$\text{Rate of return on own assets} = \frac{\text{net profit}}{\text{average own funds}} \tag{11}$$

This interdependence gives rise to equality in which the rate of return on own assets appears as a product between the turnover ratio on own assets and the rate of the net profit on the realization incomes. In other words, that is the following relationship:

$$\frac{\text{Net profit}}{\text{average own funds}} = \frac{\text{net income from sale}}{\text{average own funds}} \frac{\text{net profit}}{\text{H net income from sale}} \tag{12}$$

Based on the foregoing, it can be concluded that all factors affecting the rate of return on total assets directly and simultaneously reflect the rate of return on own funds. Namely, this rate is part of the total assets, and the growth of the own funds in the process of production and realization cannot be done at a rate greater than the rate of return on the total assets.

However, practice shows that this can be in some cases, where the reasons should not be sought in the action of the factors that regulate the regular activity of the corporate enterprise. The reasons should be sought in certain stand-alone effects of the financing from borrowed sources and the profitability of the own capital, i.e. in the intensity of the financial leverage effect. Perceiving and emphasizing the qualitative differences between the basic economic principles or what are still called objective economic principles and the principles of organizational methods for achieving the objective does not only arise from the intention to systematize the scientific approach, but the purpose of a studio treatment involves not only the formulation of the economic principles, but also a development of methods that will analyze and control the extent of realization of goals of each principle separately and in a specific situation. In this way it is possible to establish relationships and relationships between the achieved results and the investments in the reproduction process. Namely, the principles of liquidity and security should enable the achievement of the objectives of the basic economic principles. This means that in market-oriented economies, the quality of the economy is not only determined by the general economic laws, but also by the type and intensity of the influence of numerous direct and indirect factors. The problems related to the quality of the economy expressed through the principle of profitability can be allocated to the changes of the two aggregate economic contents:

- profit, and
- engaged assets.

Determined by the impact of the social, technical and organizational factors, the quality of the achieved profitability varies depending on whether the factors cause changes in the amount of profit made or on the value of the assets invested. Therefore, an additional problem in studying the complexity of profitability is not only the identification of the factors, but also the differentiation of the dynamics of the realized profitability resulting from the action of those factors. Differentiating the impact of the factors that cause changes in the complexity of the profitability, in its analysis, creates additional methodological problems. Namely, the changes that have an impact on the quality of the economy and the reasons that cause these changes must be permanently discovered and quantified in order to enable the qualitative implementation of the objectives of the profitability principle.

In this context, through a practical example we will measure the profitability of operating of one company using hypothetical indicators. For this purpose, we will calculate the rate and the business result (profit), the rate of the net profit, the rate of return on total assets and the rate of return on the own funds. We assume that the business profit in one company is 98,928 denars, and the net profit is 6,313 denars.

The financing of the company comes from foreign sources, which causes high financial expenses, which amount to 175.709 denars. It speaks of a heavy financial burden on the company, i.e. a high factor of financial leverage. This has a negative impact on the overall performance of the business, which can be seen from the following indicators:

$$\text{Rate of Business Profit } = \frac{\text{Business Profit}}{\text{Total Income}} * 100 = \frac{98{,}928}{1{,}628{,}067} * 100 = 6{,}075 \quad (13)$$

This means that the company for every income of 100 denars of sales of products and services in the current year, realized an average business profit of 6,076 denars.

$$\text{Rate of Net Profit t } = \frac{\text{Net Profit}}{\text{Total Income}} * 100 = \frac{6{,}313}{1{,}628{,}067} * 100 = 0{,}38 \quad (14)$$

This means that for every income of 100 denars from the sale of products and services, the company realized 0.38 denars net profit.

$$\text{Rate of return on total engaged assets } = \frac{\text{Business Profit}}{\text{Average engaged assets}} * 100 = \frac{98.928}{1.957.115} * 100 = 5{,}05 \quad (15)$$

The rate of 5.05 denars indicates that for every 100 denars average invested funds, the company has increased those funds by 5.05 denars.

$$\text{Rate of return of own business assets} = \frac{\text{Net Profit}}{\text{Average Own Assets}} * 100 = \frac{6.313}{1.314.735} * 100 = 0{,}48 \quad (16)$$

It shows that for every 100 denars of own invested assets, the company has increased those assets by 0,48 denars. From this it can be concluded that the growth of the part of the business assets that is financed from own sources is very low. The very low profitability of the own business assets is due to the very high cost of the foreign sources of financing of the company and due to the negative exchange rate differences.

3. CONCLUSION

Based on all of the foregoing in relation to the financial analysis, we can deduce the following findings:

- In order to provide a valuable assessment of a corporation's financial position, activities and performance, a financial analysis based on standards or criteria for the relevant assessment of the corporation's financial and business activities is required.
- The main point of the financial analysis is to examine and discover the corporation's internal reserves. This will be achieved by a permanent analysis of short deadlines, thorough, detailed, comprehensive analysis of the total financial flows, which will provide selective, concise and functional information.
- Successful financial analysis must start from the set and results of the financial policy, because they are a complex and inseparable whole, whose complexity comes from the whole process of reproduction in all its stages
- Careful assessment of the liquidity, solvency, activity, indebtedness and profitability of the companies, with a proper assessment of the current market trends and the state of stock supply and demand, should significantly contribute to the achievement of the basic goals of the portfolio investment - capital gains income and dividends as return on the invested capital.

REFERENCES

Afuah, A (2003) *Innovation Management Strategies, Implementation and Profits*, Oxford University

Bownder, B. I dr. (2010), *Innovation strategies for creating competitive advantage, Research Technology Management*

Daniels, J., Radebaugh, L., & Sullivan, D. (2002). *Globalization and Business*. New Jersey: Prentice Hall

Wallerstein, I. (2000). *Globalization or the age of transition?* International Sociology,

Hil Č., (2010) Meģunaroden biznis, natprevaruvanje na konkurentniot pazar, prevod na Vladata na R.M.,

Lee, J.& Gang, Y. (2010). Main characteristics of technological entrepreneurship and the impact of governmental policies in Korea, *International Journal of Entrepreneurship and Innovation Management*

Madrid-Guijaro, A., Garcia, D., & Van Auken, H. (2009) Barriers to Innovation among Spanish Manufacturing SMEs, *Journal of Small Business Management*

Littunen, Hannu; Niittykangas (2010): The rapid growth of young firms during various stages of entrepreneurship. *Journal of Small Business and Enterprise Development.*

Autio, Erkko; Kronlund, Mathias; Kovalainen, Anne (2007): High-Growth SME support initiatives in nine countries: analysis, categorisation, and recommendations. Report prepared for the Finnish Ministry of Trade and Industry. MTI Publications

OECD, Organisation for Economic Cooperation and Development Measuring Entrepreneurship. The OECD-Eurostat Entrepreneurship Indicators Programme. By Mariarosa Lunati, Jeroen Meyer zu Schlochtern and Gueram Sargsyan. OECD Statistics Brief, November 2010

Reinstaller A. (coord.), Hölzl, W., Janger J., Stadler, I., Unterlass F., Daimer S., Stehnken (2010): Barriers to internationalisation and growth of EU's innovative companies. PRO INNO Europe: INNO-Grips II report. Brussels: European Commission, DG Enterprise and Industry. http://www.proinnoeurope. eu/sites/default/files/newsroom/2010/12/InnoGripsII_Report_Barriers.to_.internationalisation.and_.growth

Deardorff's Glossary of International Economics, "policy", accessed 2 May 2010.

Strategija za ekonomski rast preku razvoj na mali i sredni pretprijatija"– Sojuz na stopanski komori na Makedonija, January 2012.

APPLICATION OF FUNDAMENTAL ANALYSIS IN INVESTMENT DECISION MAKING: EXAMPLE OF A DOMESTIC BUSINESS ENTITY

Pavle Dakić[1]
Luka Filipović[2]
Marko Starčević[3]

DOI:

Abstract: *The subject of this research is to analyze the methods of fundamental investment analysis on the example of stocks of a domestic company listed on the Belgrade Stock Exchange. The aim of the research is to obtain concrete information on the possibilities of improving the effective management of the portfolio of shares of this company with a special focus on the optimal selection of techniques and methods of fundamental analysis that deals with the study of economic, political and social indicators of the national economy in order to predict trends in the financial market into the future. The methodology used in this paper includes exploratory technique methods as well as analysis and synthesis methods. The results of the research will be useful to the academic community for further research in this area as well as to future investors.*

Keywords: *Fundamental Analysis, Investments, Stocks, Belgrade Stock Exchange*

1. INTRODUCTION

Stock exchanges and trading on them can be viewed from different perspectives depending on what is the focus of dealing with specific issues. Undoubtedly, stock exchanges represent one of the most significant, if not the most significant market institution, at least it is in the countries with developed capital markets, which is not the case with the capital market of the Republic of Serbia, but we certainly hope that this circumstances will change in the nearer or, in the worst case, in the further future. According to Andjelic and associates (2017) the overall socio-economic climate depends to a large extent on the situation and opportunities on them, the volume of trading, the number of participants, the safety of business. The link between the achieved level of socio-economic development and stock market conditions and opportunities has been confirmed in a large number of studies, but constantly changing market environment conditions place increasing demands on policy makers to analyze, view and test contemporary aspects of stock trading in the light of an effective response to changing environmental conditions (p. 2). An investment strategy that involves making investment decisions when investing in a particular portfolio of stocks must be based on fundamental or technical analysis, or both of them, depending on the spatial diversification of the portfolio and the investor's attitude and attitude to risk, and thus the yield.

In the moment of breakdown of price movements of financial instruments, it is very important to identify the factors that influence the price movement of those instruments. Fundamental analysis of investments in financial instruments deals with the study of economic, political and social indicators of the national economy with the aim of predicting price movements in the financial market

[1] Singidunum University, Danijelova 32, 11000 Belgrade, Serbia
[2] EuroAudit llc, Bvld. despota Stefana 12, 11000 Belgrade, Serbia
[3] Union-Nikola Tesla University, Knez Mihailova 33, 11000 Beograd, Serbia

in the future. In the broadest sense, fundamental analysis is concerned with analyzing all the data that may have an impact on the price movement of financial instruments. The fundamental data that this type of analysis deals with is economic factors, then, trends specific to a particular industry, capital market conditions, and last but not least, specific company-specific data. In the framework of fundamental analysis, quantitative factors are studied, which include specific indicators of company performance and market functioning, as well as qualitative and / or intangible indicators, such as quality of technology or efficiency of management. According to Steinberg (2000), by understanding the fundamentals of fundamental analysis, as well as a more thorough observation of the fundamental economy, understanding of the financial market can be greatly improved, thereby improving the efficient management of securities and investing in financial instruments (p. 56).

In this paper, a fundamental analysis of the investment in the stocks of domestic company (furthermore the Company) was applied. The Company was privatized in early 2008. In the same year, the foreign investor, a strategic partner of the Company bought a controlling stake in the state for a total value of € 400 million and acquired ownership of 51% of the company.

The continuation of this paper follows the application of fundamental analysis to invest in equity securities of this company.

In accordance with the foregoing, this paper starts from the following hypotheses:

H1: *The market value of the stock of the analyzed company is not overstated relative to the generated revenues.*

H2: *Using a fundamental analysis, one can estimate the undervaluation of a financial instrument in the capital market.*

2. FUNDAMENTAL ANALYSIS

The market price of stocks is one of the key indicators of the success of a business entity, and for investors it is a basic indicator of which the justification of investment in a particular financial instrument can be measured. A share is actually an equity security that has a certain nominal value, is part of the share capital of a company and is issued by a joint stock company. In order for an investor to make the most favorable decision on investing in a particular financial instrument, it is crucial to carry out both technical and fundamental analysis - which is the subject of research in this paper. In the broadest sense, the goal of fundamental analysis is to identify the real value of the shares of a particular company and compare it with the market price. According to Jagongo and Mutswenje (2014), fundamental analysis of a company is one of the important factors that affect individual investment decision (p. 99). Hou and associates considered in their work (2011) that fundamental factors as the main factors that affect the movement of the stock return (p. 2573). It can be used to predict the future earnings or return. Anywise, there are quite a few papers which support the predicting power of fundamental analysis. In the prior studies, Ou and Penman (1989) suggested that abnormal return can be predicted by using fundamental analysis. (p. 296) Abarbanell and Bushee (1998) used the accounting ratio that consists of conceptual and theoretical background (p. 27). They focus on individual signal to evaluate the strength of predictive power of each signal instead of combine the predictors into a summary measure. Therefore, the contextual that influence their credibility can be investigated.

According to Suresh Kumar and Elango (2011) fundamental analysis supposed, that the current and the future stock price depended on the characteristic value of the stock and the expected return. As and when new information about the company was disengaged, the analysis got

updated as the expected return changed. Accordingly, the changes in the stock prices were predicted even before the change de facto happened. The economy and industry analysis in the background also helped to forecast the growth opportunities for stocks (p. 45). Furthermore, Sureshkumar and Elango (2011) concluded that this type of analysis assumes that a stock's current (and future) price depends on its intrinsic value and anticipated return on investment. As new information is released relative to the company's status, the expected return on the company's stocks are going to change, which disembogues their value. The advantages of fundamental analysis are its ability to predict changes before they show up on the charts (p. 45).

In order to estimate the fair value of stocks, many authors used valuation models by Fundamental Analysts in stock markets, these analysts use information of current, future and in some cases past earnings of the company to evaluate the fair value (Bernard, 1994; Fischer, Jordan, 1995; Penman, 1991; Bauman, 1996; Rielly, Brown, 2002; Jones, 2007 and Bodie, et al, 2009), and then compared with the market value to determine whether it was possible to invest in or to be excluded.

According to Dzelatovic and Milosevic, fundamental analysis uses earnings and dividend prospects from the company, expectations of future interest rates, and estimates of the company's risk to determine the true stock price. Fundamental analysts usually start with a study of past earnings and an examination of the company's balance sheet. Later, the analysis is supplemented with detailed economic analyzes, usually including an assessment of the quality of the company's management, the status of the firm in its business, and the prospects of the industry as a whole (p. 50). After all, fundamental analysis is an attempt to determine the instant discounted value of all payments a shareholder will receive from each share. If, by fundamental analysis, the determined value exceeds the stock price, the fundamental analyst would recommend the purchase of a block of shares. The goal of fundamental analysis is to identify the performance of a company that is not yet recognized in the market. However, the efficient market hypothesis predicts that most fundamental analyzes are doomed, and this is why fundamental analysis is difficult to evaluate.

3. INVESTMENT DECISION-MAKING ON THE CASE OF DOMESRIC COMPANY BY APPLYING FUNDAMENTAL ANALYSIS

When making investment decisions, investors consuetude a variety of analysis techniques. They analyze the financial statements in the way of reviewing the organizations financial position and collect relevant information. Investors are very important stakeholders through which large companies come to the required capital. They use information from the financial statements for the purpose assessing the quality of company results and as basis for predicting future value society. Also, in addition to financial statements, they use other sources of information as well, information such as investment service, publications which were published by large brokerages, expert magazines, etc. According to Richard *et al* (2009) Investors can do a fundamental analysis combine with technical, quantitative analysis and analysis of financial behavior, where a rational analysis is thus obtained (p. 723).

At the beginning of 2008, the analyzed company was privatized for € 800 million. Strategic foreign partner bought a controlling stake in the state for a total value of € 400 million and acquired ownership of 51% of the company. Free stocks were distributed to citizens, each with 5 stocks. Company stocks appear on the Belgrade Stock Exchange in August 2010 with a price of 505 dinars per unit. In accordance with the provisions of the Public Takeover Bid Law, in the

spring of 2011, foreign partner purchased an additional 5% of the shares and acquired 56% of the total ownership of the Company. Foreign partner bought Bid for 505 dinars or 4.8 euros for the offer to take over the Company's share.

In years 2010-2011 the Company achieved excellent business result. The price stocks increased from 505 (30.08.2010) to over 800 dinars in 2011. In the spring of 2013, there was a sharp jump in the stock price. Instead of the announced dividend payment of 15%, the Company paid 25% of dividend income in April 2013 when stock price recorded a historical high of RSD 1,020. The fall of 2014 marked the beginning of the oil crisis when the price of crude oil dropped sharply by 70%, from over $ 100 per barrel to just $ 30 in early 2016, indicating a disruption in the global oil market (in 2009- In the 10th year they started exporting alternative oil from shale). During years 2012-13. excise taxes and other taxes (sales tax, reserve tax) increased, and as excise taxes are fixed and burden over 40% of Company's fuel sales price, the recorded decrease in crude oil prices on the world market did not drastically affect the decrease in gasoline prices.

In the period 2014-15. Company recorded a decrease in revenues and a fall in profitability, as well as an increase in debt. Other companies in this industry have a high level of indebtedness due to the high costs of finding new sites, innovating equipment, research and development and large investments. In addition, negative foreign exchange gains and losses resulting from the strengthening of the USD against the RSD contributed to the poor business results. In January 2016, the price of crude oil was at a multi-year low of $ 30 per barrel, when Company's shares fell below 500 dinars. In 2016, sanctions imposed by Russia on the European Union also affected foreign partner, which is a state-owned company. In 2016, the Company made only € 100 million in profit, while in 2013-14. Profit amounted to EUR 400 million. In 2016, the Company had a 45% market share in the retail market and a share of over 60% in the wholesale market. Company's dividend yield in 2016 was about 3%.

At the end of 2016, OPEC decided that from 01.01.2017. will reduce the amount of crude oil produced to influence the rise in the price of crude oil. Russia and Saudi Arabia also joined the decision, bringing the price of crude oil up to $ 55 in early 2017. During 2017, the price of Company's stocks ranged from 700 to 750 dinars. At the beginning of 2018, Company had a market capitalization of EUR 1 billion. The price of crude oil in early 2018 rose to $ 70 per barrel as a result of the decline in crude oil produced by the OPEC agreement. The growth of Company's revenues in 2017 was generated by the increased price of oil, but also by the strengthening of RSD against USD and EUR (revenues based on exchange rate differences). The price of Company's stock at the beginning of 2018 was around 720 dinars.

Table 1 shows the Basic Characteristics of a Company's Business, and Tables 2 and 3 represent summarized financial Statements of the Company.

Table 4 presents the Basic Financial and Price Indicators.

In 2016, the value of assets increased by 1.20% compared to 2015, fixed assets by 10.92% and current assets decreased by 21.14%. In 2016, the value of liabilities increased by 1.20% compared to 2015, capital increased by 3.77%, long-term liabilities increased by 6.98%, while short-term liabilities decreased by 12.87%. During 2017, the value of assets continued to grow, and compared to 2016 it increased by 1.74%, fixed assets increased by 4.54%, current assets decreased by 7.32%. Liabilities increased by 1.74% in 2017, equity increased by 8.23%, long-term liabilities

decreased by 5.98%, while short-term liabilities decreased by 4.47%. During 2018, the value of assets increased by 4.43%, fixed assets decreased by 1.35% while current assets increased by 25.51%. Liabilities increased by 4.43% in 2017 compared to 2017, equity increased by 15.72%, long-term liabilities decreased by 2.62%, while short-term liabilities decreased by 16.40%.

Table 1. Basic business characteristics of the company

2015.	2016.	2017.
Major disruptions in the global oil market	Major disruptions in the global oil market	Price recovery in the world oil market
Decline in revenue and profitability	Decline in revenue and profitability	Revenue and profitability growth
Debt growth	Debt growth	Pos. effects of exch. differences
Significant decline in net profit	Continued trend of decl. net profit	Net profit growth
High negative exch. rate diffs. (exchange rate losses due to falling oil prices)	Business rationalization through efficiency gains	Business rationalization through efficiency gains

Table 2. Summarized Company Balance Sheet (in RSD billion)[4]

	2015.	2016.	2017.	2018.f*
Assets	**361.667**	**366.016**	**372.383**	**388.900**
Fixed assets	**252.014**	**279.539**	**292.234**	**288.300**
Property, plant and equipment	232.390	247.213	259.908	231.500
Goodwill and other intangible assets	7.494	7.155	7.155	3.100
Sales receivables and other long-term receivables	73	14.657	24.849	3
Long term investments	241	321	321	296
Working assets	**109.653**	**86.477**	**80.150**	**100.600**
Supplies	39.131	24.178	25.200	27.500
Receivables	51.691	34.979	28.800	31.500
Short-term financial placements	6	201	2.072	16.400
Cash and cash equivalent	8.326	19.271	16.200	23.700
Liabilities	**361.667**	**366.016**	**372.383**	**388.900**
Capital	**183.774**	**190.698**	**206.384**	**238.830**
Share capital	81.530	81.530	87.149	81.530
Undistributed profit	102.696	109.698	119.235	157.300
Long-term liabilities	**102.601**	**109.765**	**103.200**	**100.500**
Long-term provisions	9.013	9.451	11.000	9.100
Long-term financial liabilities	93.588	100.314	92.200	91.400
Short-term liabilities	**75.446**	**65.739**	**62.800**	**52.500**
Short-term financial liabilities	14.832	17.136	14.000	10.400
Business duties	43.752	29.364	28.800	25.300
Other current liabilities	5.322	6.538	20.000	4.100

Source: Official database of the agency for business registers of the Republic of Serbia (APR)

In 2016, sales revenue decreased by 18.51% compared to 2015, while operating expenses decreased by 14.51%. EBITDA decreased by 26.66% in 2016, EBIT decreased by 38.05%, EBT decreased by 43.74%, net profit decreased by 47.52%. In 2017, we continue to see a downward trend in sales revenue by 14.56%, while operating expenses decreased by only 8.70%. In the same year, EBITDA decreased by 25.24% compared to 2016, EBIT decreased by 43.77%, EBT decreased by 21.49%, while net profit decreased by 12.95% compared to 2016. In 2018, Company generated sales revenue that was 30.55% higher than in 2017, while operating expenses increased 23.81% in the observed year. In 2018, EBITDA grew by 48.14%, EBIT growth by 93.58%, EBT growth by 137.30% and net profit growth by 120.19%.

[4] 2018f* - estimated data based on nine-month company reports.

Table 3. Summarized Income statement of the analyzed company (in RSD billion)[5]

	2015.	2016.	2017.	2018. f*
Revenues from sales	**258.527**	**210.679**	**180.000**	**235.000**
Business expenses	**207.314**	**177.975**	**162.500**	**201.200**
Cost of oil, gas and petroleum products	147.664	122.164	110.000	119.500
Production and processing costs	18.116	18.905	17.200	37.2502
Sales costs, general and administrative expenses	20.263	16.539	15.400	17.100
Depreciation expense	12.757	14.282	14.200	17.700
EBITDA	**63.400**	**46.500**	**34.765**	**51.500**
EBIT	**50.126**	**31.051**	**17.460**	**33.800**
Financial income	397	430	500	1.200
Financial expenses	3.420	4.364	900	3.100
Foreign exchange differences	13.234	8.061	1.100	7.200
EBT	**33.870**	**19.056**	**14.960**	**35.500**
Income tax	6.031	4.448	2.244	7.500
Net gain	**27.838**	**14.608**	**12.716**	**28.000**

Source: Official database of the agency for business registers of the republic of Serbia (APR)

Table 4. Basic financial and price indicators[6]

	2015.	2016.	2017.	2018.f*
Financial indicators				
Liquidity				
General Liquidity Ratio	1,45	1,32	1,28	1,92
Reduced liquidity ratios	0,93	0,95	0,88	1,39
Solvency				
Fin. liabilities / equity	1,33	1,44	1,34	1,36
Fin. liabilities / total equity	0,59	0,62	0,57	0,46
Fin. liabilities / total assets	0,30	0,32	0,31	0,29
Profitability				
EBITDA margin	24,52%	22,07%	19,31%	21,91%
Net profit margin	10,77%	6,93%	7,06%	11,91%
ROA	7,70%	3,99%	3,41%	7,20%
ROE	15,15%	7,66%	6,16%	11,72%
Price indicators				
Earnings per share in RSD (EPS)	170,72	89,59	77,98	171,72
Stock price	534	534	740	714
P/E ratio	3,13	5,96	9,49	4,16
P/S ratio	0,34	0,41	0,67	0,49
P/B ratio	0,47	0,46	0,56	0,49

Source: Author's calculations

The EBITDA operating result before depreciation shows the efficiency of the company when interest, depreciation and amortization are neglected. Therefore, a higher EBITDA margin indicates a higher degree of business efficiency. In the observed period, EBITDA margin is quite favorable. The net profit margin shows how much profit a company generates in terms of revenue and represents a ratio of revenue to cost. It is desirable to be as large as possible, but the amount also depends on the industry: low net profit margins are experienced by heavy industry companies, construction companies as a capital-intensive branch with large costs of the underlying asset, which hardly earn a net profit margin of more than 10% in 2015. and nearly 12% in first nine months of 2018.

[5] 2018f* - estimated data based on nine-month company reports.

[6] 2018f* - Indicators calculated using estimated data based on nine-month company reports.

3. CONCLUSION

During 2017, the analyzed company achieved a 11.91% net profit margin. In other words, the company made a profit of RSD 11.91 per 100 dinars of revenue. The return on assets, ROA in 2017 was a solid 7.20% and shows how much profit Company has made in relation to assets. In the same year, the company had a return on equity, a ROE of 11.72%, which is considered a good result. Stock gain of 171.72 din. represents the maximum dividend payout amount and actually shows how much 1 stock earned during 2018.

By analyzing the basic financial and price indicators, as well as considering the basic business indicators, RSD exchange rate and crude oil price in 2018, we conclude that the stock is undervalued, and rational investors would use the elements of fundamental analysis to buy Company shares with expectations about rising stock price in the future. The low level of P / E ratio with high, rising EPS indicates that Company's stock is undervalued. The P / B ratio is lower than 1 and indicates that Company's stock is undervalued and that its market value represents only 49% of its book value. This all indicates that the first hypothesis, which states that the market value of the shares of the analyzed company is not overestimated relative to the earned income, on the contrary, the stock of this company is undervalued. The P/S ratio shows how much investors are willing to pay per dinar of sales. A low ratio may indicate the stock is undervalued, while a ratio that is significantly above the average may suggest overvaluation. The P / S ratio shows that the market value of the stock is not overstated relative to the company's revenue. Since it is desirable that this ratio be below 1, the company is profitable because it generates excellent profit from high income. With this sales revenue, the company can generate net profit margin, ROE and ROA growth.

Since we have applied fundamental analysis techniques, as well as analyzed basic financial and price indicators, considering the basic business indicators, movements of the RSD exchange rate and crude oil price in 2018, we were able to determine that the price of this company's shares is undervalued, it follows that the second hypothesis Using a fundamental analysis, one can estimate the undervaluation of a financial instrument in the capital market can be validated and accepted as valid.

REFERENCES

Abarbanell, S., Bushee, J., (1998). Abnormal returns to Fundamental analysis strategy. The analysis. Research Starters Business, 1-5. Accounting Review, 73(1), 19-45.

Anđelić, et. al. (2016). New development trends of commodity exchanges through the prism of modern standards. Poslovna ekonomija, 10(2), 1–27.

Bauman, M., (1996). A review of Fundamental Analysis Research in Accounting. Journal of Accounting Literature. 15, 1 - 33.

Bernard, L., (1994). Accounting-based valuation methods, determinants of market-to-book ratios, and implications for financial statements analysis. Working paper. (University of Michigan. Business School. Faculty Research). No. 9401.

Bettman, J., Sault, S., Schultz, E., (2009). Fundamental and Technical analysis: Substitutes or complements. Accounting and finance. 49 1, 21 – 36.

Bodie, Z., Kan, A., Marcus, J., (2009). Investments. 8th Ed. McGraw-Hill Irwin.

Dzelatovic, M., Milosevic, M., (2017). Fundamentalna i tehnička analiza u funkciji efikasnog upravljanja portfoliom HoV, Business Economics year 11 No 1, 47-68.

Fisher, E., Jordan, J., (1995). Security Analysis and Portfolio Management. 6th Ed. Prentice-Hall, New York, N.Y.

Gould, M. (2016). Fundamental vs. technical financial analysis. Research Starters Business, 1-5.

Hou, W., Kho, K., Karolyi, G.A. (2011). What factors drive global stock returns? Review of Financial Studies, 24(8), 2527-2574.

Jagongo, A., Mutswenje, S. (2014). A survey of the factors influencing investment decision: The case of individual Investors at NSE, International Journal of Humanities and Social Science, (4), 92-102.

Jones, P., (2007). Investment. 10th Ed. John Wiley & Sons, Inc.

Ou, J., Penman, H., (1989). Financial statement analysis and the prediction of stock returns, Journal of Accounting and Economics 11, North-Holland 295-329.

Penman, H., 1991. An evaluation of accounting rate-of-return. Journal of Accounting, Auditing & Finance. 6, 2, 233 – 255.

Reilly, F., Brown, K., 2002. Investment Analysis and Portfolio management. 7th Ed. South-Western.

Richard, P. et al, Measuring Organizational Performance: Towards Methodological Best Practice, Journal of Management, vol. 35, No. 3, 2009.

Steinberg, M. (2000), Guide to Investing, Third Edition, New York Institute of Finance, Prentice Hall Press.

Sureshkumar, K., Elango, M. (2011). An efficient approach to forecast Indian stock market price and their performance analysis. Int. Journal of Computer Application, 34 (5), 44-49.

THE IMPACT OF KNOWLEDGE INDICATORS ON THE COUNTRY'S COMPETITIVENESS

Elena Širá[1]

DOI:

Abstract: *Each economy contains a key resource that determines its economic growth. Knowledge is the main source in the knowledge economy. Its creation and use have a dominant share in wealth creation. However, it is not only a matter of deepening existing knowledge, but also of using it effectively and applying it to all economic activities. The aim of the paper is to determine, if the performance of the country in the area of knowledge economy influences its competitiveness. The knowledge economy will be evaluated through selected indicators, such as number of scientific publications and number of patents. To evaluate the competitiveness, were used the data from competitiveness ranking published by the World Economic Forum. The article investigated these indicators in the example of selected countries from the Europe. It assessed the dependence between the number of scientific publications per capita and the number of patent applications per capita.*

Keywords: *Knowledge Economy, Scientific Publications, Patents, Development.*

1. INTRODUCTION

1.1. Knowledge economy

The knowledge economy, which is a part of the knowledge society, is the term umbrella of the economy of knowledge and the knowledge-based economy. The problem of the knowledge-based economy has become acute at the turn of the millennium, especially in the context of the lagging European countries against the US in competitiveness. The concept of knowledge society and economy does not have a fixed conceptual apparatus, the idea of knowledge society is based on the concept of information society. (Murgas, 2011)

The prerequisites for the emergence of knowledge-based economies according to Dudová (2011) are:

- a long-term trend of gradual growth in the weight of intangible capital on production factors,
- the emergence and growth of the diffusion of information and communication technologies - this factor underlying the emergence of the knowledge economy is based primarily on the fact that- communication technologies are a factor in accelerating the pace of innovation.

Knowledge is sometimes considered a fifth factor of production in the current economy and its generation plays a critical role in the firm's competitive advantage and its economic performance. (Rajnoha, Štefko, Merková, Dobrovič, 2016) The information society is increasingly transforming into a knowledge society, which is characterised by a mass access and use of knowledge. (Tomčíková, Bednárová, Naščáková, 2015)

[1] Faculty of Management, University of Prešov in Prešov, Konštantínova 16, 080 01 Prešov, Slovakia

A successful transition to a knowledge-based economy is often based on the following four basic elements:

- long-term investment in education,
- innovative skills - their development,
- modernization of information infrastructure,
- creating a favourable economic environment. (Sundać, Krmpotić, 2011).

Other authors, e.g. Pukala and Koval (2017) added the next element, the government regulation. The World Bank has defined the following pillars of the knowledge economy:

1. **economic incentives and the institutional system** - this pillar provides an adequate economic policy and institutions that allow effective mobilization and resource allocation and stimulate creativity for the efficient creation, dissemination and exploitation of existing knowledge,
2. **educated and skilled human resources** - which can continuously be developed and they can adapt their skills to create and exploit knowledge effectively,
3. **an effective business innovation system** - this includes research centers, universities and consultants from other organizations that can keep pace with the knowledge „revolution", draw on growing knowledge stocks, master them and adapt them to local needs,
4. **a modern and appropriate information and communication structure** - which can make communication more efficient, as well as the dissemination and processing of information and knowledge (Chen, Dahlman, 2005).

1.2. Competitiveness

Competitiveness is a market feature to give the right to manage and assess the society resources primarily to those who use them most efficiently. In different economic or management encyclopedias and vocabularies, competition is described as a contention of producers and traders for better farming and goods' realisation conditions as well as for the entrench in the market, noting that competition stimulates culture development of economics and management and leads ineffectively working producers to bankruptcy. (Rutkauskas, 2008)

Competitiveness of national economies depends on competitiveness of enterprises, companies, competitiveness of regions and socio-economic conditions. (Mura et al., 2017) It represents the growth (Pirimova, 2017) of the country in the sphere of other countries' development. Innovations are a key factor for the competitiveness on national and business level. (Stoyanova, Sterev, 2018)

2. METHODOLOGY

The aim of the article is to determine, if the performance of the country in the area of knowledge economy influences its competitiveness. The knowledge economy will be evaluated through selected indicators. They are:

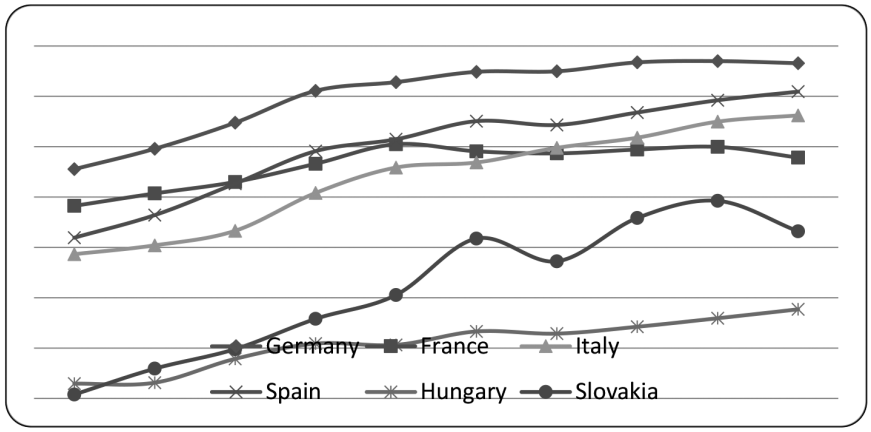
- the number of scientific publications,
- the number of patent applications.

To determine these set indicators, there were used other data from Eurostat, World Bank, World Economic Forum and other organisations. To evaluate the competitiveness, we have used the data from competitiveness ranking named the Global Competitiveness Index published every year. The period for evaluation the situation in mentioned countries was from 2009 to 2018.

These countries were chosen for evaluation: Germany, France, Italy, Spain, Hungary and Slovakia. These countries were chosen according to the value of GDP per capita. Germany and France belong to the strong economies with the highest amount of GDP per capita from the selected countries. Italy and Spain gained the middle value of GDP per capita and Hungary and Slovakia were the weakest countries with the lowest values of this indicator. These selected countries also belong to almost all four groups of countries according to the Summary Innovation Index SII marked by Bobáková (2007).

3. DISCUSSION

An important output of scientific research is the quantity of scientific publications in peer-reviewed academic journals. Although there are more than 100,000 journals in the world, but only the part of them are indexed by world famous research databases. (Nguyen, Pham, 2011) Firstly, we have analysed the number of scientific publications per million inhabitants in selected countries. This indicator is very important for every knowledge economy, because it is focused on the value of research in a country.

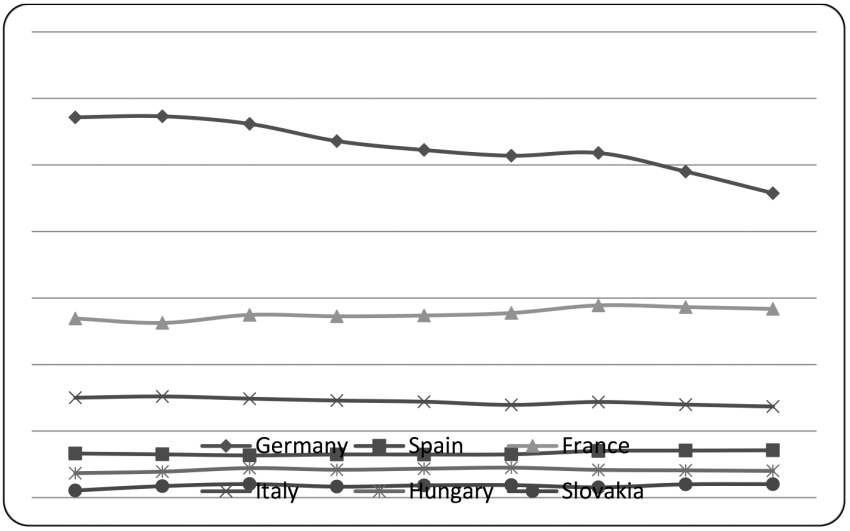


Graph 1. Number of scientific publications per million capita
Source: own calculations according to Scimago data

As one can see from the Graph 1, the highest number of this indicator was in Germany through the whole analysed period. There is the big gap between the best countries and the last one. But the positive information is, that in every analysed country, there was an increase in indicator level. The greatest increase was in the case of Slovakia in the analyzed period.

While patents reflect inventive and innovative activities that are proprietary in nature and developed mainly for commercial purposes, scientific literature informs mainly about the activities of the academic community. However, scientific literature has become more and more relevant for high-technology industries in the last few decades, and it is an important source of industrial competitiveness. (Archibugi, Coco, 2005)

The next analysed indicator of knowledge economy, the number of patents per million inhabitants is shown in the next graph. The development of this indicator in the years 2009 - 2017 was almost similar. Only in the Germany, there has been the decline in the stated values. In this indicator, there can be seen the cluster of 3-4 countries, with the similar values. Mainly, there are Slovakia, Hungary, Spain and maybe Italy.

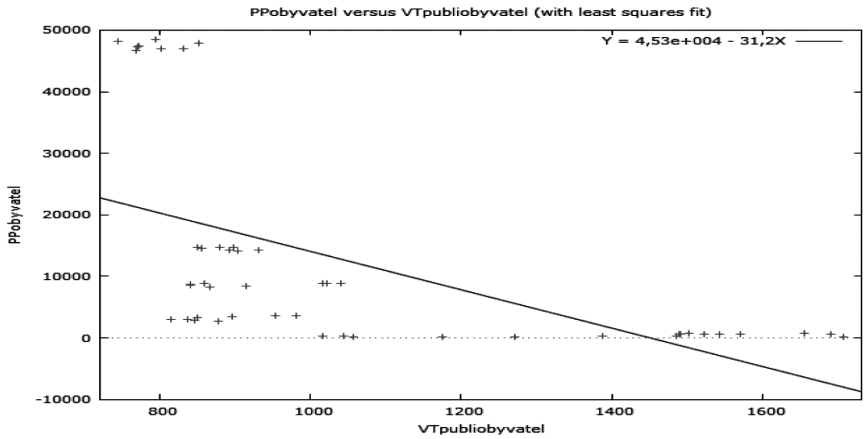


Graph 2. Number of patent applications per million capita
Source: own calculations according to Eurostat data

We will solve the hypothesis by means of a correlation coefficient, which determines the strength of the relationship among individual indicators, or variables, using the XY Scatterplot, which determines the linear dependence of the variables and ultimately their statistically significant dependence or independence through regression analysis. This analysis will be carried out through the Gretl statistical program.

Hypothesis: We assume a dependence between the number of scientific and technical publications per capita and the number of patent applications per capita.

Correlation coefficient: the value of the correlation coefficient based on the calculation of the Gretl program is: r = -0.55450204 which represents a great force of relationship between variables.



Graph 3. Hypothesis 1 – XY Scatterplot graph
Source: own processing via Gretl

On the basis of the above graph, there is an indirect link between the number of scientific and technical publications per capita and the number of patents per capita.

3.1. Regression analysis

As the above hypothesis implies, we want to find out whether the number of patents per capita depends on the number of scientific and technical publications per capita. In this case, y is a dependent variable and thus is per capita scientific and technical publications, and x is an independent variable, i.e. the number of patent applications per capita. There can be determined general model, the specific model and the estimated regression model:

General model: $y_i = \alpha + \beta 1 \times l_i + u_i$

Specific model: $scientific\ \ publications = \alpha + \beta 1 \times number\ of\ \ patent\ applications + u_i$

We set the hypotheses:

H0: β = 0 holds if p <0.05

H1: β ≠ 0 applies if p ≥ 0.05

where H0 speaks about the statistical significance of the coefficient β and thus confirms the dependence between the variables, and H1 says that the coefficient β is not statistically significant, therefore it says that there is no dependency between the variables.

```
Model 1: OLS, using observations 1-48
Dependent variable: VTpubliobyvatel

               coefficient    std. error    t-ratio    p-value
  ------------------------------------------------------------
  const        1174,14        44,9565       26,12     3,12e-029 ***
  PPobyvatel     -0,00985407    0,00218048   -4,519    4,32e-05  ***

Mean dependent var   1051,542   S.D. dependent var   295,2582
Sum squared resid     2837518   S.E. of regression   248,3650
R-squared            0,307473   Adjusted R-squared   0,292418
F(1, 46)             20,42336   P-value(F)           0,000043
Log-likelihood      -331,8028   Akaike criterion     667,6056
Schwarz criterion    671,3480   Hannan-Quinn         669,0198
```

Graph 4. Hypothesis 1 – Regression model

Source: own processing via Gretl

Estimated model:

$$scientific\ \ publications = 1{,}174.14 - 0.0098 \times number\ of\ \ patent\ applications + u_i$$

A negative value of the coefficient β confirms the indirect dependence between variables.

P-value: The p-value based on the Gretl program represents 0, which implies 0 <0.05 thus H0 is rejected, H1 is accepted and thus β is statistically significant and there is a statistically significant dependence between variables.

4. CONCLUSION

In the case of the set indicators and countries' performance in it, we can say that there are differences between high developed countries and others. But the gap between them is small, and other countries for example Slovakia, has raised its performance in the number of scientific publications per million inhabitants very fast. According to statistical evaluation, we can state that there is a statistically significant dependence between both variables.

In the case of competitiveness in the GCI 2018, the Germany reached the 3rd place from 140 world economies. From our analyzed countries, it was the best position. Also, in the analyzed indicators, Germany obtained the highest values and during the analyzed period, it gained the best position. Hungary reached the lowest values in analyzed indicators as well as in GCI. Hungary ranked the worst position in GCI from the analyzed countries.

Table 1. Ranking of the countries according to GCI

Country	GCI 2018
Germany	3rd place (82.8 score)
France	17th place (78 score)
Spain	26th place (74.2 score)
Italy	31st place (70.8 score)
Slovakia	41st place (66.8 score)
Hungary	48th place (64.3 score)

Source: own processing according to WE Forum

According to these results, we can say that the performance of the economy in the area of knowledge economy indicators predetermines economies to similar development of competitiveness.

There are many indicators, which can be placed into the group of knowledge economy indicators. So, their further analyses can bring new results and thus it can be a theme for further investigation.

REFERENCES

Archibugi, D., & Coco, A. (2005). Is Europe becoming the most dynamic knowledge economy in the World? *JCMS: Journal of Common Market Studies*, *43*(3), 433-459.

Bobáková, V., (2007). Inovačná výkonnosť ekonomiky. *Zborník z medzinárodnej vedeckej konferencie SEMAFOR 2007–Ekonomika firiem*, 44-51.

Chen, D. & Dahlman,C. (2005). *The Knowledge Economy, the KAM Methodology and World Bank Operations*

Dudová, I. (2011). Ekonómia vzdelávania. Bratislava: Vydavateľstvo EKONÓM. ISBN: 978-80-225-3117-7.

Koval, V. & Pukala, R. (2017). Implementation of regulatory policy in economic activity: development of the institute regulatory impact assessment. *Економіка. Екологія. Соціум*, (1, вип. 1), 24-32.

Mura, L., Ključnikov, A., Tvaronavičienė, M., & Androniceanu, A. (2017). Development trends in human resource management in small and medium enterprises in the Visegrad Group. *Acta Polytechnica Hungarica*, *14*(7), 105-122.

Murgaš, F. (2011). Znalostná ekonomika, tacitné znalosti, spillovers znalostí a ľudský kapitál. *RELIK*, 1-9.

Nguyen, T. V., & Pham, L. T. (2011). Scientific output and its relationship to knowledge economy: an analysis of ASEAN countries. *Scientometrics*, *89*(1), 107-117.

Pirimova, V. (2017). External determinants of growth in the Bulgarian economy In Recent Advances in Information Technology, Tourism, Economics, Management and Agriculture. Paper presented at International Scientific Conference ITEMA 2017, Budapest, October 26, 2017 (pp. 350-357). Belgrade: Association of Economists and Managers of the Balkans.

Rajnoha, R., Štefko, R., Merková, M., & Dobrovič, J. (2016). Business intelligence as a key information and knowledge tool for strategic business performance management. *E+ M Ekonomie a Management*.

Rutkauskas, A. V. (2008). On the sustainability of regional competitiveness development considering risk. Technological and Economic Development of Economy, 14(1), 89-99.

Stoyanova, T. & Sterev, N. (2018). Technology transfer as innovation driver for growth *In* V. Bevanda (Ed.), *Recent Advances in Information Technology, Tourism, Economics, Management and Agriculture.* Paper presented at 2nd International Scientific Conference ITEMA 2018, Graz University of Technology, Graz, November 8, 2018 (pp.13-19). Belgrade: Association of Economists and Managers of the Balkans. https://doi.org/10.31410/itema.2018.125

Sundać, D. & I. F. Krmpotić. (2011). Knowledge Economy Factors and the Development of Knowledge-based Economy. In Croatian Economic Survey

Tomčíková, M., Bednárová, L., & Naščáková, J. (2015, November). The knowledge society and offer of qualified workers. In *2015 13th International Conference on Emerging eLearning Technologies and Applications (ICETA)* (pp. 1-6). IEEE.

A STUDY ON ETHICAL COMMUNICATION IN BUSINESS

Nicoleta Dospinescu[1]

DOI:

Abstract: *In an increasingly competitive business environment, differentiation occurs through honest communication with stakeholders, which implies respecting ethical standards in business. Multinational corporations often apply socially responsible practices that comply with business codes of conduct. These companies play a considerable role when it comes to developing this business practices on a large-scale. Small businesses, on the other hand, play an important role in supporting local communities. The principles and methods of applying business ethics help to develop moral judgments and give the possibility to make correct managerial decisions. The entire organizational culture should support social responsibility and at the same time it should reward and strengthen ethical actions.*

The current study is conducted in the Romanian pharmaceutical field and concerns the perception of 100 clients regarding the ethical communication of companies when applying various forms of promotion. Customers' perception of the promotional messages intensity and content launched to obtain recognition and loyalty can lead to the cataloging in two clusters: manipulative or persuasive. For the study we used the free words association test, the confidence test, the attitude tests.

Keywords: *Business Ethics, Manipulation, Persuasion, Ethical Communication*

1. INTRODUCTION

The role of communication within an organization is to maintain its image to the standards proposed both to employees and to the external environment. An organization that has a high degree of adaptability to environmental trends will send its messages to stakeholders through various ways. According to Agheorghiesei – Corodeanu et. al., (2014) ethical issues must be approached in an integrated manner, emphasising the management of ethics, which entails a cause-effect relation.

The pharmaceutical industry consists of pharmaceutical manufacturers and networks that participate in the research, development, production and distribution of medicines to people. This industry contributes to maintaining and improving human health, as well as economic growth, becoming a strategic sector for the Romanian economy. To be successful in the market, pharmacy networks must invest in promoting their products and at the same time adopt strategies to keep their customers loyal to remain loyal to them. To what extent is their promotional communication ethical on a highly competitive Romanian market?

2. LITERATURE REVIEW

Agheorghiesei and Poroch (2013) show that it is essential to make managers aware of the importance and necessity of implementing an ethical management system. The field of health care needs more attention in terms of systemic vision and approach, ethical culture and leadership and programs. According to Bikard, (2011), Encouraging employees to engage in ethical behavior and effectively measuring ethical conduct are two of the most challenging aspects of building a strong compliance program.

[1] Department of Marketing & Management, Faculty of Economics and Business, Administration, University Alexandru Ioan Cuza, Iasi, Romania

Sandu, A., & Caras (Frunză), A. (2014, pp: 846-854) differentiate the ethical values of an organization into constitutive ethical values around which the organization was formed and operates, and the operational values - around which are set the organization's good practices. Operational ethical values of the organization, understood as the source of its success, are: strengthening the relations with customers, suppliers and communities, perfect behaviour, honesty, respect for others, treating (others) with dignity. Habermans (1987) underlined the communicative techniques that comes to manages the factual sphere of economic, and to the strategic one, which is oriented towards the success in the social plan, that is seen as power and influence (Maxim, 2010, pp. 35-45). Credibility represents a constitutive value of the organization and is obtained through its communication with the external environment. To achieve this, it must be accompanied by the operational values of the organizational culture. We refer mainly to the honesty used in transmitting information. Also, loyalty is another value transposed in the action of promoting the organization and protecting certain significant stakeholders. In order for the organization to benefit from respect, it must first show its respect for the environment in which it operates. The way a client is exposed to the details of a requested medical product / service is essential. Its full description, its exposition in a convincing way accompanied by empathy will lead to a successful transaction. Employees in the pharmaceutical sector, through their communication with clients, in a highly competitive environment in Romania, strive to communicate the values of the company they work for, to differentiate it and to position it in their minds. The techniques to which they seek follow both empathy with them, as well as gaining their trust, respect and loyalty. Various communication techniques used can be persuasive or manipulative, transforming pharmaceutical organizations, in the perception of consumers, into ethical or less ethical. We will consider that these employees often use the principles of persuasion mentioned by Robert Cialdini (2019, pp.15-50; pp.118-275) that can become manipulative in the case of using deliberate errors of argumentation. The honesty of communication between the organization and its stakeholders can generate a long-term relationship, if persuasion is the basis. Any attempt to manipulate, depending on its intensity, leads to shortened cooperation between the two market players. Business ethics has become an important concept for organizations that respect each other and want a positive image, notoriety, trust, long-term partnerships. The manipulation exerted on the clients by the big pharmacies represents an escalation of the emotions starting with social pressures and determining the fear, insecurity, joy and promises that in the clients' view represent chances of adaptation to the environment. Through adaptability, due to the increasing number of sick people, customers are looking for solutions that make them feel safe and reduce the intensity of their needs. Pharmacies are the direct source that by their existence must meet these needs. Due to the customers' dependence on the products made available by the pharmacies, they take advantage of this opportunity and pursue their own interests.

Customer vulnerability is another key factor used to increase pharmacy sales. This feeling is driven by the clients' inability to solve their own problems by looking for alternatives other than pharmacies.

The research objectives are:

1. Testing the degree of customer confidence regarding two leading and challenging pharmacies on the Romanian market, C and D.
2. Testing the degree of application, by the two pharmacies, of the principles of persuasion in communicating with clients, namely: reciprocity, commitment, authority, sympathy, rarity, social proof.

The research instrument is the questionnaire, through which quantitative and qualitative data were collected. It has been applied to 100 natural persons in Romania. The target group was selected based on the filter questions that determined those people who purchase products from the mentioned pharmacies. The questionnaire included 16 questions and used types of scales such as: nominal, ordinal, interval.

3. RESEARCH RESULTS

The importance of previous shopping experiences from the two pharmacies considered, the knowledge and reputation of pharmacies and information from the online environment, mass media and family, friends or strangers were taken into account to determine the extent to which these factors lead to a certain level of trust. to consumers. In order to obtain results on the scores of the scale from 1 (total disagreement) to 5 (total agreement), we have achieved an average of their values. In this sense, previous experiences in C take the value 2.8 which means that there is a neutral state compared to previous experiences, compared to D, where there is a positioning of 3.3 between indifference and partial agreement. For this reason, the customers follow the state of satisfaction offered at the end of the purchase process. From the point of view of pharmacy knowledge, there is a shift from partial disagreement to indifference, namely C = 2.42; D = 2.78.

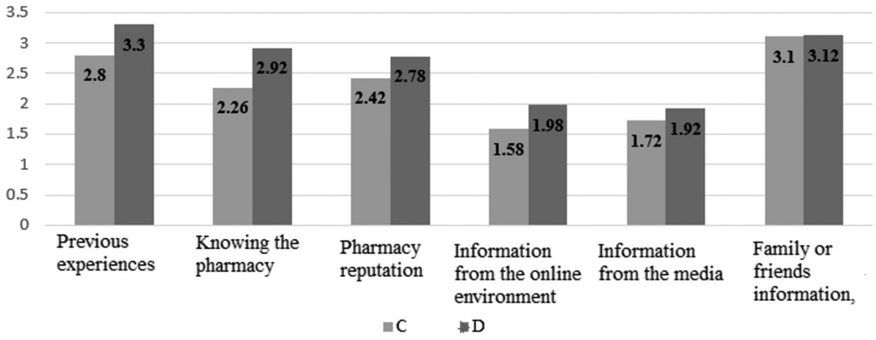


Figure 1. The average of the factors that determine the confidence in the 2 pharmacies

Testing the degree of customer confidence in the two pharmacies brought an average of about 3 units on a scale of 1 to 5.

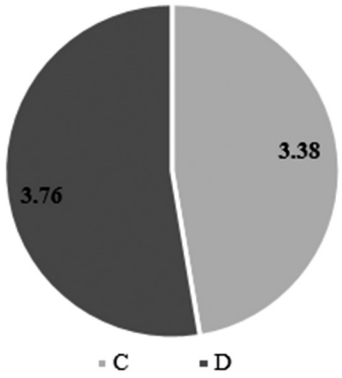


Figure 2. Average customer confidence in the two pharmacies

Based on these data, the fluctuation of customers can be interpreted, namely the neutral or indifferent position adopted by them shows that the manipulation is perceived at an average intensity that does not affect the decision to buy neither in a positive nor negative sense. Confidence in

pharmacies is an element that can be easily manipulated by the smiles of celebrities in the commercials, by happy children on posters, by old people excited about the use of pharmaceuticals. The clients of pharmacy C have a state of indifference towards partial agreement with the influence of these mentioned aspects, with the value of 3.38. In comparison, the clients of pharmacy D are more influential, and they have a higher confidence in the pharmacy with a value of 3.76.

The correlation between the elements specific to the principles of persuasion, used by pharmacies, and the degree to which they manage to determine the purchase decision can be seen in the following graph.

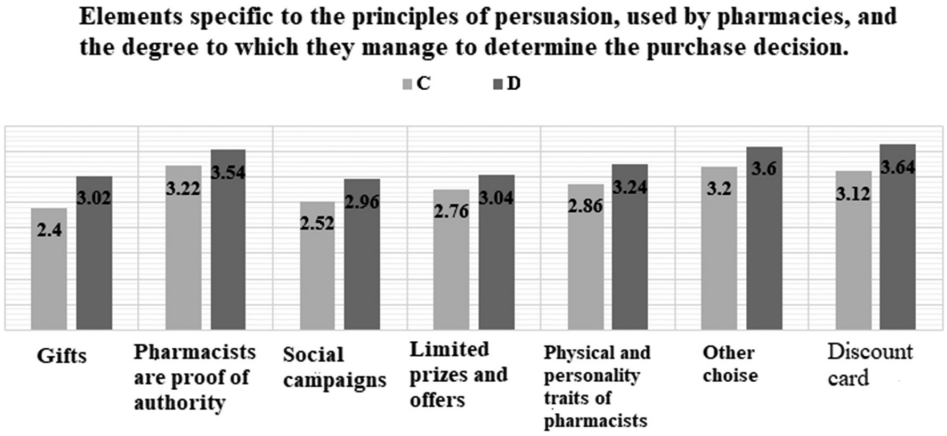


Figure 3. Persuasive factors and influencing the purchase decision

This list of elements is based on the principles of persuasion / manipulation. The discount card is a factor that implies the rarity, which acts differently depending on the type of the discount card and gives the feeling of a significant reduction in the price to the customers, and what follows after the welcome greeting at both pharmacies is the question, „a discount card" you have"? The appearance of reductions involves manipulating customer behavior to the point where they automatically offer the discount card. Alternatives in most cases are offered to customers in situations such as: out of stock or the need to sell a product no matter what the customer wants. The alternatives determine the customers to be consistent in their decision and for this reason the principle of commitment and consistency triggers the affirmative answer of purchase. The alternatives are presented immediately after the clients answer yes to the techniques „yes..but"; „if..then".

The principle of sympathy is found at the staff level. On average, C customers appreciate the pharmacy staff in the interval of total disagreement and indifference with the value of 2.86. This means that the physical characteristics and personality of the pharmacists are not relevant to the clients at the time of purchase. In the case of D clients, the average value of 3.24 is between the limits of indifference and agreement and at the time of purchase they are more determined to buy when pharmacists have pleasant physical traits and trustworthy personality.

The principle of rarity can be found in the form of limited offers, promotions, prizes. The results obtained express both in the case of pharmacy C and in the case of pharmacy D the clients' indifference when it comes to these types of discounts, having an average value of 2.76 and 3.04, respectively. For this reason, the rarity is not the main reason for the customers and depending on the situation they will want or not to get limited prizes and offers. However, gifts for clients D take the value of 3.02 neither agree nor disagree. In this situation, it is possible to determine a customer to buy a particular product in order to receive a certain gift.

Social campaigns are a form of social proof and the values are for both pharmacies between total disagreement and indifference with an average of 2.52 and 2.96 respectively. Through these values, customers refuse to participate in social campaigns. For this reason, the pharmacy's attempt to involve clients in such actions will not generate profits.

Pharmacists by their presence represent to the clients the proof of authority. Because the level of trust in pharmacies is high, respect for pharmacists increases in the same way. The principle of authority is applied by offering the status of authority to pharmacists. Thus, they impose themselves in front of the clients, the recommendations offered by them are the best ones.

The degree of fidelity is tested according to the proxemics, but also according to the form of communication approached by the pharmacies.

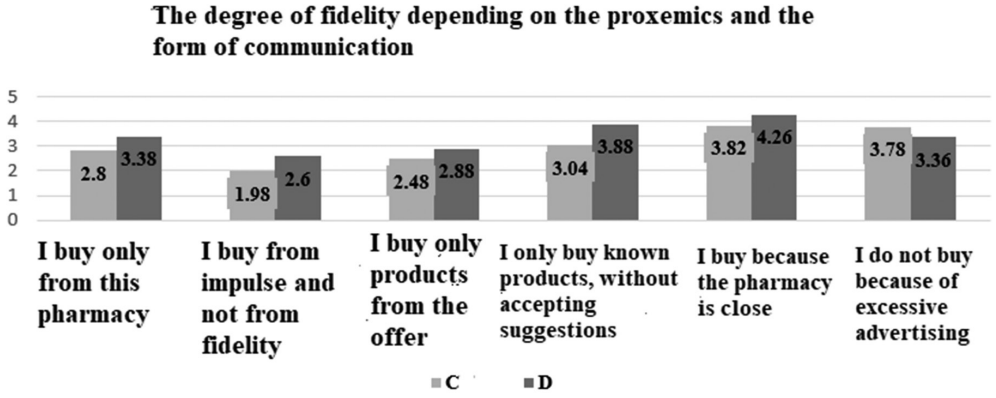


Figure 4. Degree of fidelity depending on proxemics and form of communication

According to the graphical representation, the fidelity and the stability to buy only from a certain pharmacy are between partial disagreement and indifference for C clients with 2.8; partial agreement from the point of view of D customers with 3.38. The difference between the two values can be determined by the physical characteristics and the personality or the attitude of the staff. The impulse purchase represents for consumers the transition from total disagreement to partial disagreement or indifference, which means that according to the power of belief of pharmacists, customers do not completely refuse to purchase a substitute or a particular product. The situations in which the power of conviction increases are: the situations in which the clients do not have the time or do not know exactly what they want. However, most of the customers know what they want so the values are 3.04, respectively 3.88 are in the indifference and partial agreement interval. The location of the pharmacy is an aspect that counts for the clients in choosing the pharmacy with an average value of 3.82 and 4.26 respectively. These values support the strong point encountered at both C and D and the optimal geographical positioning, with one location in each area where the fluctuation of people is high. Another aspect is the excessive publicity of the two pharmacies. Clients show a high degree of annoyance when mentioning excessive advertising, the values are above the degree of indifference in the case of both pharmacies.

4. CONCLUSION

Managers are the ones who take on the role of scapegoats in the employer-employee relationship, because they are the ones who convey the values of the organization to their staff and determine them to adopt different behaviors in different situations.

Both pharmacies use the subtlety of manipulation in the process of influencing the purchase, obtaining the commitment and consistency from the customers. The main ways of influencing are offering tips and gifts or discounts. An unknown product sold to a customer as a result of their commitment, authority and sympathy is a manipulation action because the pharmacist sells what he wants and not necessarily what the customer asks for. The degree of customer confidence is in the neutral range and partial agreement. This result denotes the impact of pharmacy handling methods on customer behavior.

By applying the principles of manipulation, both pharmacies use specific elements such as: the description of personal experiences regarding certain medicines determines reciprocity and consists in the purchase by the customer of that product because it has confidence. Loyalty is a manipulative element because it offers false discounts to the customers, but from the customers perspective any price reduction becomes an individual gain. Depending on the frequency of purchase, the visits made and the amounts spent, pharmacists can differentiate between customers by the size of discounts. The exercise of authority by pharmacists causes the clients to adopt an obedient behavior towards them because the differences in education provide validity to the information presented by the latter. This information may be wrong, but the false authority attributed to the staff of the two pharmacies gives them a much more important status than the doctors. By associating with doctors, pharmacists consider that they can exert pressure on the decision to buy clients.

Through social proof, pharmacies can use special offers when purchasing certain products, and the effect is to determine the customers present to order those products. Customers adopt a behavior similar to the rest of the customers, provided that the added value of such a reaction is beyond their expectations. Media campaigns are part of the social evidence sphere. Excessive advertising used by C bothers customers

From the personnel point of view, the principle of sympathy is the one that acts on the purchasing decisions of the customers. Therefore, they can use the push technique of products that can replace a product requested by customers in certain situations, as a smile attracts attention and changes the purpose of the customers. The affective elements that the pharmacists managed to convey to its customers are empathy and positivity, with a degree of indifference towards total agreement in case D, which results in the importance that the clients attach to these elements. Through these environments, pharmacy D staff impose their authority and exert pressure on their clients. Also, the respondents are in a state of uncertainty regarding the meaning of the manipulation being associated with persuasion. This aspect arises from the responses of the respondents regarding the negative and positive aspects introduced in the questionnaire. Thus, on the one hand the customers feel attacked by the excessive publicity, but the professionalism of the staff influences to them the decision of purchase. At the same time, customers perceive manipulation to a small degree, resulting in the subtlety of pharmacies in applying the manipulation techniques. Previous experiences, as well as recommendations received from family or friends contribute to the adoption and maintenance of purchasing behavior. Pharmacy C uses the method of persuading social proof more often, compared to the D pharmacy, which uses the sympathy combined with the authority in relation to their clients.

REFERENCES

Agheorghiesei (Corodeanu), D.T. (2014). ș.a., Why is an ethical and integrated audit accreditation process required for Romanian hospitals. *South African Journal of Economic and Management Sciences*. Vol 17, No 3. http://apps.webofknowledge.com/full_record.do?product=UA&search_mode=GeneralSearch&qid=1&SID=N1JBTGYmtVfwz95A4p-Z&page=1&doc=1

Agheorghiesei (Corodeanu) D.T. (2015). Ethics and Responsibility in Public Management. *Social Work Review*. Issue 2.

http://www.swreview.ro/index.pl/ethics_and_responsability_in_public_management

Bikard, A. (2011). Building Ethics into the Compliance Program. Retrieved from https://www.complianceweek.com/news/news-article/building-ethics-into-the-compliance-program#.WqodLT8XeDI

Cialdini, R., (2019). *Psihologia manipularii*, Romania. Euro Press Publisher.

Habermas, J. (1987). *Theory of Communicative Action*. Volume 2. Boston. United States: Beacon Press.

Maxim, S. T. (2010). *Peripatetice*. Iași, Romania. Pim Publisher.

Sandu, A., & Caras (Frunză), A. (2014). Some Consideration on the Construction of Ethics Policies. Shared Ethics and Communicative Action. *Procedia – Social and Behavioral Sciences 149*.