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## AGRICULTURE AND FOOD SECTORS IN SLOVAKIA AND BALTIC COUNTRIES – A COMPARISON

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**Abstract.** Input-output analysis represents a form of macroeconomic analysis, based on studying direct and indirect linkages within each economy, as well as overall intersectoral interdependencies. It is also a relatively simple, but rather useful, tool for analysing the structure of various economies or undergoing structural changes. The information given by input-output tables allows the evaluation of impacts of positive or negative shocks and their propagation throughout the national economy. The study of import and export relations helps to understand countries' international interactions. The aim of this paper is to present and compare the main characteristics of two selected sectors in the Baltic countries and Slovakia. The focus is on the agriculture and food sectors. The analysis contains a comparison of various input-output coefficients, as well as multipliers, for the period of 2000-2014. The verification of the overall stability of these two industries, similarities in their development and the strength of their backward and forward linkages were also important issues of this analysis. The findings enabled to verify the presence of key industries. It is expected that in accordance with general trends, these two sectors would be marked with a slowly decreasing trend over the observed period.

**Keywords:** *Agriculture, Coefficients, Food sector, Input-Output Analysis, Key Sectors, Linkages, Multipliers.*

**JEL Classification:** C67, F62, L66

### INTRODUCTION

Input-output tables (IOT), as one of the basic macroeconomic tools, were developed by the economist W. Leontief. Even though this type of analysis is not new, it still represents a very useful and rather simple way how to assess the ongoing structural changes in a particular economy. The input-output tables show how one industry's total production is divided among various production processes in other industries and final consumption. (Leontief, 1953) This way one can easily see and analyse the sectoral interdependencies or linkages. What is more, IO analyses help in understanding how a change in demand for products in a particular industry would impact the whole national economy. Through the export and import links it is also possible to study the importance of cross-border links of domestic sectors.

The paper is focused on the agriculture and food sectors, the two sectors that have been following a general decreasing trend over the last decades. The aim of the analysis is to compare and evaluate the positions and the development of these sectors in Slovakia (SK) and the Baltic countries (Estonia – EST, Lithuania – LIT, Latvia – LAT) over the period of 2000-2014. The main objectives are the identification of the sectors' demand and supply linkages, the verification of their strength and the importance of their positions in national economies (especially from the point of view of key sectors). In accordance with general trends and the previous research, it is expected that these two sectors would have experienced a fairly stable but decreasing trend over the observed period. However, it does not necessarily mean that they will not present some traits of key industries.

## 1. LITERATURE REVIEW

The economic importance of the agricultural and food sectors has declined over the last decades. This general trend can be observed in many European countries. It can be even more pronounced in countries that shifted from a centrally planned economy to a market system such as Central European or the Baltic countries. In these countries the transition process significantly impacted also agricultural policy, e.g. in terms of transformation of institutional structure of the economy, property rights transfers and by changes of production of agricultural firms. The competition with cheap imported products or the need of new equipment and vehicles appeared as other important issues. In the late 1990s it became impossible for the Baltic countries to export into Russia due to its internal crises, though it had been the principal sales outlet for their agricultural products during the Soviet era (Lauri, 2012). At the same time, the national agricultural policies were also influenced by the accession to the European Union (EU). The EU accession enabled countries to draw yearly financial resources supporting agriculture in order to help the sector and to increase its efficiency in general (Némethová & Cíváň, 2017). It also brought the possibility of selling food products to other European countries as there were no longer any customs or import restrictions.

According to the most recent agricultural census of Eurostat in 2013, the share of utilised agricultural area of the countries' whole territory represented about 39 % in Slovakia, 42 % in Lithuania, 28 % in Latvia and 22 % in Estonia (Eurostat, 2018a, 2018b, 2018c, 2018d). The following years did not bring any significant changes in this area. Thanks to the IO analysis it can be easily verified to what extent the positions and impacts of agriculture as well as food sector on the whole economy correspond with their shares on the total territory.

When analysing the sectors of agriculture and food production, one should also take into account other important factors, such as declining or less favourable terms of agricultural trade or extreme weather (Pokrivčák, 2003). Nowadays it can be expected that the impacts of deteriorating climate conditions related to global warming will appear more and more often and will also require further restructuring of both sectors. One of the latest trends is gradual increase of interest in organic farming, especially after countries' accession to the EU. Among the Baltic countries, Latvia had the widest area under organic farming, followed by Lithuania and Estonia. Over the period 2000-2016, the utilised agricultural area under organic farming increased by 27.3 % in Estonia, by 32.4 % in Latvia, by 41.6 % in Lithuania and by 13.8 % in Slovakia (European Commission, 2018; Melnikienė, 2018; Central Statistical Bureau of Latvia, 2017; Koov, 2017).

The changes in agriculture sectors in former transition countries were studied and compared by various authors, e.g. Věžník, Král and Svobodová (2013), Vaishar and Zapletalová (2009) or also various reports on agriculture (Melnikienė, 2018; Central Statistical Bureau of Latvia, 2017; Koov, 2017) pointing out many structural changes such as a rapid decline in particular breeds of animals, transformation of the way of breeding but also many significant structural changes of the general food sectors.

When analysing any sector, their positions and importance in the national economy can be described by various basic indicators, such as the sector's level and performance, calculated, e.g. as the sector's share in overall output, in overall employment, exports, imports or in value added. In case of the agriculture sector, Némethová and Cíváň (2017) also cite an indicator of a crop to livestock production ratio.

Input-output analysis offers another, more exact, approach for analysis of the particular sector, its place in the national economy or its linkages with other sectors. IO analyses are based on the model by Wassily Leontief. The simple models use data from national IOT. However, they can be modified using world IOT in order to see existing import and export linkages between countries (Dujava, Lábaj & Workie, 2011). IOT supply data covering the activities of all sectors of the economy, from the point of view of producers (suppliers) of inputs, as well as

from the point of view of buyers (consumers) of inputs, within the whole production process of the economy. IOT record both intra- and intersectoral flows in monetary terms and for a particular time period (usually one year). (Miller & Blair, 2009). The knowledge of these flows and linkages can be very useful when evaluating overall macroeconomic impacts of the changing demand in various sectors (D'Hernoncourt, Cordier & Hadley, 2011). Therefore the analyses based on IOT are sometimes referred to as impact analyses (Pissarenko, 2003).

IOT models allow calculating the following types of multipliers: output, input, import, employment, income or value added multipliers (Lábaj, 2017). They can be calculated either as simple (partial) or as total multipliers depending on whether the household consumption is part of the model (so-called open or closed model) (Pissarenko, 2003). If, for example, the sector "i" increases its production, the result is an increase in demand for the production of all supplying sectors (supplying input for production of the sector "i"). This demand relationship is often called a demand or backward linkage (BL). On the other hand, higher output of the sector "i" means that at the same time an additional volume of products is available on the market and can be used in the production of other linked industries. This relationship represents a forward-looking perspective and is referred to as a supply or forward linkage (FL) (Reis & Rua, 2009; Miller & Blair, 2009; Timmer 2012). Analyses of the strength of supply and demand linkages make it possible to identify the most important sectors in the economy. Stronger linkages indicate stronger overall impacts of demand changes on the whole national economy. In other words, the growth of one sector's production is beneficial for the whole economy. Higher values of forward linkages confirm stronger impacts on the supply side, i.e. a greater importance in terms of its necessity for further production. By combining these results, it is possible to determine the position of individual sectors and to identify which are key sectors (on the demand side, on the supply side or on both sides at the same time). What is more, these results also allow to study the distribution of impacts on other industries. Variation coefficients (VK), calculated from the values of BLs and FLs, show how the particular industry impacts other industries; whether these effects are evenly distributed (lower values of VK) or they are concentrated on smaller number of other industries (higher values of VK) (Reis & Rua, 2009; Timmer, 2012). Variation coefficients can be considered as a common measure of dispersion of effects on the whole economy.

Even though these methods are not new, they still remain popular due to the fact that the results of these analyses, i.e. the values of multipliers, remain relatively stable even for longer periods of time. It can be explained by the actual production structures of the economies and the frequency with which new technological changes appear. Most important ones do not appear often or frequently. Thus the structure of the economy is not significantly modified either. The only exceptions are the sectors that are sensitive to the world prices fluctuations or those depending on the climate conditions (McLennan, 1995).

## 2. METHODOLOGY

The IO models envisage that each economy can be divided in "n" sectors and all relationships existing between these sectors can be described by a set of equations. The structure of the economy can be described as follows (Miller & Blair, 2009):

$$\begin{aligned}
 X_1 &= Z_{11} + Z_{12} + \dots + Z_{1j} + \dots + Z_{1n} + Y_1 \\
 X_2 &= Z_{21} + Z_{22} + \dots + Z_{2j} + \dots + Z_{2n} + Y_2 \\
 X_i &= Z_{i1} + Z_{i2} + \dots + Z_{ij} + \dots + Z_{in} + Y_i \\
 &\dots \\
 X_n &= Z_{n1} + Z_{n2} + \dots + Z_{nj} + \dots + Z_{nm} + Y_n
 \end{aligned} \tag{1}$$

where “ $X_i$ ” represents total sector output for the sector “ $i$ ”, “ $Y_i$ ” the final demand for this sector’s production and “ $Z_{ij}$ ” the intersectoral flows in this economy. The production of each sector can further serve as the intermediate consumption (inputs for other productions) or can be used directly in various sectors, i.e. consumption of households, investment of firms, government expenditures or exports. All of these consumptions represent the final use of produced goods (Habrman, 2013; Duvajová, 2014). When the flows of inputs from one sector to the other (i.e. from “ $i$ ” to “ $j$ ”) are divided by total outputs “ $X_i$ ” one can obtain so-called technical coefficients (“ $tk_{ij}$ ” or “ $aij$ ”) that reflect the cost structure of each industry. (Lábaj, 2014). The whole set of equations can be thus rewritten as  $X = AX + Y$  and transformed further to  $X = (I-A)^{-1}Y$ . The matrix  $L = (I-A)^{-1}$ , also called Leontief inverse matrix, helps to understand the total direct and indirect effects of the increase in the final demand for production in each sector. The matrix represents the base for the IO analysis.

Increases in production of the sector “ $i$ ” will generate additional demand for productions of inputs in all supplying sectors. As mentioned before, they can be considered as demand or backward linkages. On the other hand, the higher production of the sector “ $i$ ” also means that there is a higher volume of its products that can be used as input in other sectors what can possibly stimulate increases in their productions. This point of view is called a supply or forward linkage (Reis & Rua, 2009; Miller & Blair, 2009; Timmer, 2012). The backward and forward linkages are derived from the values of output multipliers (backward) and input multipliers (forward). These linkages can vary from one sector to other and their normalised values are used as a means to measure the strength of demand and supply linkages. They also help to determine which sectors are more demand- or supply-oriented or which ones can be considered as key sectors. According to Reis and Rua (2006), the term “key sector” designs a sector that has more than average impact on the economic activity in other sectors.

Nowadays, productions in various countries are interlinked and production processes are fragmented. That is why it is important to take into consideration the volume of imports that are generated by domestic production (volume of the imported inputs due to the increased domestic demand) as well as the volume of exports transported abroad (McLennan, 1995; Wixted, Yamano & Webb, 2006; Trinh, Le Hoa & Giang, 2009).

### 3. RESULTS

With regards to the limited extent, this paper presents only selected results of the previous research. More detailed results can be provided upon request. The focus of the presented analysis is narrowed to the evolution of two sectors, namely Agriculture and Food production – sectors A01 and C10-12 according to the International Industrial Classification, revision 4 (ISIC Rev.4). The research was based on data from the WIOD Database covering the period 2000-2014 (WIOD, 2018; UN, 2017). The latest WIOD update was published in 2016, the socio-economic part in 2018 and they include the period until 2014. However, from the structural point of view, it is possible to use this data to draw conclusions even for the current period as the changes in the structure of the economy are not that dynamic.

The choice of sectors can be linked to the general trend of decline of domestic production in these sectors even though they can still be considered as basic sectors in each economy. Therefore, the starting points of the study were verification of their current positions in selected countries and examination of similarities in their evolution with the aim to see whether these positions changed notably over the observed period.

As mentioned before, the position and importance of any sector in the economy can be described by various basic indicators, such as the sector’s share in total output in the economy or the sector’s share in overall employment. In this case, the countries’ most important sectors from the point of view of output or employment are very similar. In general, the number of sectors with average production share exceeding 5 % of total economy’s output (or respectively

average employment share > 5 % of total employment) are: SK - 4 sectors, EST - 4, LIT - 7, LAT - 7 (SK - 6, EST - 5, LIT - 5, LAT - 6). More specifically, the most important producing sectors are manufacture of motor vehicles (SK), construction (EST, LAT) or manufacture of coke and refined petroleum products (LIT). The biggest employers are mostly services sectors, such as education, wholesale and retail trade, construction, public administration and health and social services.

Table 1 shows the evolution of these indicators for four observed countries in case of agriculture and food sectors. One can see that out of these four countries, the shares of the agriculture and food sectors of the total production are the highest in Lithuania. For other countries they do not exceed 5 % share either for total output or for total employment. What is more, the numbers confirm gradual decreases for both sectors over the observed period. This decline was the most pronounced in case of Slovakia where the production share in agriculture was reduced by 34 % and the employment share by 54 %. As for the food sector, the share in total output fell by almost 51 % and the share in total employment by almost 40 %. This clearly confirms that the positions of these sectors are becoming less and less “important”. But in some cases such a trend can also point to certain changes in production processes, such as continuing higher automatisisation or replacement of workforce by machines. The “least significant” production decreases appeared in the Latvian agriculture sector (decline by 15 %) and the Lithuanian food sector (decline by 12.5 %). In case of employment, the least important reductions of shares were recorded in Lithuania: decline by 27 % in agriculture and by 22 % in food production.

Table 1. Shares of sector output of total economy’s output, shares of sector employment of total economy’s employment (authors’ calculations based on WIOD, 2018)

Country	Sector output of total output (%)					Sector employment of total employment (%)				
	2000	2008	2010	2014	Δ %	2000	2008	2010	2014	Δ %
SK A01	3.75	2.51	1.96	2.47	-34.1	4.78	2.61	2.34	2.18	-54.4
EST A01	3.00	2.03	2.29	2.25	-25.1	3.31	1.82	2.20	2.01	-39.1
LIT A01	6.05	4.18	4.23	4.05	-33.1	4.39	2.75	3.03	3.19	-27.2
LAT A01	3.30	2.32	2.65	2.79	-15.4	4.54	2.35	2.31	2.59	-43.0
SK C1012	4.49	2.62	2.26	2.22	-50.7	3.51	2.54	2.42	2.14	-39.0
EST C1012	5.58	4.12	4.18	4.20	-24.8	4.13	3.25	2.36	2.89	-30.0
LIT C1012	7.68	5.57	6.18	6.72	-12.5	4.81	3.82	3.72	3.74	-22.1
LAT C1012	6.93	4.24	4.73	4.02	-42.0	4.54	3.46	3.74	3.16	-30.5

The next step was analysis using the IOT with data representing the intersectoral relationship within each economy. Firstly, the analysis started with a closer look at the coefficients that represent intermediate production, i.e. technical coefficients ( $tk$ , for output), allocation coefficients ( $ak$ , for input) and import coefficients ( $ik$ , for import). Secondly, the authors analysed simple output, input and import multipliers ( $som$ ,  $sim$ ,  $simp$ ). And lastly, the importance of these industries was verified, namely by studying the strength of demand and supply linkages ( $BL$ ,  $FL$ ).

Table 2 shows the minimum and maximum values of three observed multipliers as well as general trends in the evolution of partial coefficients ( $tk$ ,  $ak$ ,  $ik$ ) for all four selected countries. As it can be seen, technical and allocation coefficients followed decreasing trends for agriculture in case of all countries except Latvia. For food production the same trend appeared in Slovakia, Lithuania and Latvia. The numbers for import confirm the growing importance of foreign productions that are slowly replacing domestic intermediate products. As for the stability of these two sectors, a simple evaluation can be made by comparing average and median values of multipliers. Closer values of average and median could be interpreted as a



higher stability of multipliers. Values that are more far apart would thus mean higher fluctuations or presence of a certain trend in the evolution of multipliers.

Table 2. Output, input and import multipliers (authors' calculations based on WIOD, 2018)

Country	SOM min	SOM max	SOM av	SOM med	tk	SIM min	SIM max	SIM av	SIM med	ak	SIMP min	SIMP max	SIMP av	SIMP med	ik
<b>SK A01</b>	1.404	1.903	1.617	1.611	↓	1.469	2.107	1.679	1.622	↓	0.183	0.308	0.238	0.231	↑
<b>EST A01</b>	1.529	1.709	1.605	1.597	↓	1.622	1.739	1.693	1.694	↓	0.272	0.353	0.308	0.302	↑
<b>LIT A01</b>	1.440	1.655	1.508	1.491	↓	1.352	1.655	1.398	1.421	↓	0.175	0.417	0.316	0.351	↑
<b>LAT A01</b>	1.510	1.701	1.605	1.604	↑	1.688	1.958	1.832	1.851	↓	0.262	0.527	0.376	0.355	↑
<b>SK C1012</b>	1.799	2.197	1.931	1.867	↓	1.111	1.691	1.236	1.196	↓	0.251	0.390	0.318	0.306	↑
<b>EST C1012</b>	1.795	1.950	1.883	1.879	↑	1.269	1.346	1.304	1.309	↑	0.344	0.439	0.384	0.383	↑
<b>LIT C1012</b>	1.578	2.059	1.729	1.685	↓	1.051	1.113	1.008	1.066	↓	0.302	0.396	0.356	0.364	↑
<b>LAT C1012</b>	1.426	1.871	1.686	1.738	↓	1.141	1.323	1.247	1.268	↓	0.241	0.461	0.343	0.331	↑

In Table 2, it can be seen that higher differences are present in food production (both *som* and *sim*). A closer look at the results indicates that the highest average demand impact appears in case of Slovak food production (SOM av, 1.931). It means that each demand increase of 1 euro in food sector could generate 1.93 euros of additional productions in all supplying sectors. The highest supply impact (SIM av, 1.832 for Latvian agricultural sector) means that 1 euro of additional agricultural production could generate 1.83 euros of additional production when looking forward. As for import multipliers (SIMP av), average values range from 0.238 (SK A01) to 0.384 (EST C1012) meaning that in case of 1 euro increase in demand, additional imports of approximately 0.33 euros would be needed.

The next step consisted of the analysis of the normalised values of output and input multipliers or demand and supply linkages as they are also referred to. Table 3 (left part) shows the average values for normalised backward (nBL) and forward linkages (nFL) in agriculture and food productions. Values of nBLs and nFLs higher than 1 indicate the orientation of the sector either backward (strong demand linkage) or forward (strong supply linkage). It is possible to say that a particular sector is important for the economy and its changes generate an over-average impact on other sectors. If both linkages exceed 1, this sector can be considered as key sector of the economy. From the results presented in Table 3, agricultural production can be on average considered as key only in Estonia. As for the food sector, or other three countries in general, the demand linkages (nBL values > 1) are on average much stronger than supply linkages (NFL values < 1). However, more detailed analysis confirms that the agriculture could have been considered as key also in Slovakia, Lithuania and Latvia at the beginning of the observed period (SK: period 2000-2005, LIT: period 2000-2002, LAT: period 2001-2003).

Table 3. nBL and nFL, VK (authors' calculations based on WIOD, 2018)

Country	nBL av	nBL VK%	nFL av	nFL VK%	Total econ	VK %	min	max	av
<b>SK A01</b>	0.979	4.413	0.990	6.118	<b>SK</b>	<b>nBL</b>	1.329 (C23)	23.065 (R-S)	4.857
<b>EST A01</b>	1.034	3.450	1.037	4.420		<b>nFL</b>	1.753 (N)	28.654 (G46)	10.142
<b>LIT A01</b>	1.048	3.481	0.950	9.108	<b>EST</b>	<b>nBL</b>	0.755 (H49)	7.377 (K66)	2.818
<b>LAT A01</b>	0.981	3.099	0.870	23.421		<b>nFL</b>	1.338 (H49)	38.209 (C30)	6.538
<b>SK C1012</b>	1.169	2.461	0.729	8.505	<b>LIT</b>	<b>nBL</b>	1.401 (E3739)	17.235 (C21)	4.311
<b>EST C1012</b>	1.213	1.621	0.799	5.506		<b>nFL</b>	2.334 (M71)	29.466 (C21)	11.072
<b>LIT C1012</b>	1.199	4.921	0.713	12.409	<b>LAT</b>	<b>nBL</b>	1.694 (N)	18.477 (C19)	4.657
<b>LAT C1012</b>	1.120	4.716	0.641	21.229		<b>nFL</b>	1.493 (M7475)	34.269 (C19)	5.626

Based on demand and supply relationships it is also possible to define the extent of the sector's impact, namely whether the effects of the particular sector are concentrated on a few other industries, or its impacts are scattered across a large number of other sectors. The range of influence can be determined based on the variation coefficient (VK). Higher values indicate a stronger concentration on interconnected industries; lower values refer to evenly dispersed impacts across the economy.

When comparing all sectors in the selected countries, there are some differences that could be pointed out (the right side of Table 3). The sectors with the most concentrated impacts on the demand side (the highest values of VK for nBL) are: R-S – Other services sector (SK); K66 – Auxiliary activities to financial and insurance services (EST), C21 – Manufacture of basic pharmaceutical products (LIT) and C19 – Manufacture of coke and refined petroleum products (LAT). On the supply side (VK for nFL) the results are the same for Latvia and Lithuania (C21 and C19); in Slovakia there is a Wholesale trade sector (G46) and in Estonia – Manufacture of transport equipment (C30). The lowest values of VK, and thus a more even distribution of impacts on the whole economy, are shown in case of the following sectors: C23 – Manufacture of other non-metallic mineral products and N – Administration services (SK), H49 – Land transport and transport via pipeline (EST), E3739 – Sewage, waste collection, disposal activities and M71 – Architectural and engineering activities (LIT), N- Administrative activities and M7475 – Other professional, scientific and technical activities (LOT). From this point of view, i.e. the sectors with most and least concentrated overall impacts, the four studied economies cannot be considered as very similar.

The same can be stated for the two observed sectors; there are no distinctive common features. It can be seen that the sector values of VK compared to the countries' average variation coefficients are lower in Slovakia (A01, C1012, for both nBL, nFL) and in Estonia (C1012 for nBL, A01, C1012 for nFL). In Latvia and Lithuania the VK values are in general lower for A01 sector and higher for C1012 sector. To conclude, the impacts on the demand side are more evenly distributed than on the supply side (VK for nBL > VK for nFL). In other words, the effects are more concentrated from the supply point of view.

## CONCLUSION

The aim of this paper was to present and compare some of the most important characteristics of two chosen sectors, namely the agriculture and food sectors, in the Baltic countries and Slovakia. The main objectives were the identification of the sectors' demand and supply linkages, the verification of their strength, their importance and impacts of their positions on the national economies (especially from the point of view of key sectors).

Firstly, the shares of these sectors in the overall output as well as in the overall employment were compared. From this point of view, neither agriculture nor food sector exceeded 5 % share of total production or total employment for Slovakia, Estonia and Latvia. It was also possible to observe the slowly decreasing trend with declines in both production and employment shares.

The next step consisted of comparisons of basic input-output coefficients and multipliers for the period of 2000-2014. Here again, the descending trend was fairly visible for technical and allocation coefficients as well as output and input multipliers. The observed increases in import coefficients and import multipliers confirmed the growing importance of foreign products on domestic markets. We can conclude that the observed countries present some common traits in the evolution of IO coefficients and multipliers.

The analysis then proceeded to the verification of the overall stability of two industries, the verification of the presence of similarities in their development and the strength of their backward and forward linkages. As for the stability of the sectors' evolution, comparisons of average and median values were used. In all four countries, higher differences were present only in case of food production (both *som*, *sim*) clearly indicating a presence of the trend, in

this case it is slightly downward. The analysis also enabled the identification of key sectors. It was expected that in accordance with the weakening importance and shares of the sectors, they would not present characteristics of key sectors which was then confirmed by the calculations. However, there was one exception, i.e. the sector of agriculture in Estonia that could be considered as a key (strong backward and forward linkages).

The last part of the analysis consisted of the studying to what extent the effects of these sectors are dispersed or concentrated in the national economies. It was found out that for the observed sectors, there were no distinctive common features. To conclude, the impacts on the demand side could be considered as more evenly distributed than on the supply side.

Based on these findings it would be interesting to compare the positions and the main characteristics of these sectors with those of other former transition countries, namely Balkan states. In some of these countries it is expected that both sectors would still hold an important place in the national economies (from the point of view of employment and production) and that they would probably show traits of key sectors with significant impacts on other sectors.

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# COMPARISON OF OECD COUNTRIES WITH CLUSTERING ALGORITHMS ACCORDING TO THE ECONOMIC FREEDOM INDEX

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**Abstract.** The economic freedom scores of all United Nations member countries are published annually by the Heritage Foundation under the “Economic Freedom Index”. The concept of freedom is an important ideal for humanity. In terms of countries, economic freedom can be regarded as a sign of sustainable growth and prosperity. Countries included in the index are scored and ranked by twelve independent variables that determine the economic freedom score. In this study, Clustering models have been used to find relationships between variables that determine the economic freedom score of Organization for Economic Co-operation and Development (OECD) member countries according to the 2018 Economic Freedom Index. OECD member countries have been identified with similar and non-similar countries according to selected indicators. As a result of the study, the best cluster selection was made by comparing the different clustering algorithms, and the similarities and differences between the OECD countries in the literature are presented.

**Keywords:** *Economic Freedom Index, Hierarchical Cluster, K-Means, OECD Countries, Two Step Cluster.*

**JEL Classification:** C38, D60, O10, O57

## INTRODUCTION

A developed economy is essential for ensuring the prosperity of the individuals living in that country. Individuals involved in the economy can act as both consumers and laborers as well as entrepreneurs. In this context the individuals in question need to have a number of economic freedoms to sustain their existence in the economic cycle.

The concept of freedom is an important ideal for humanity. We can define economic freedom as the ability of behaving freely in performing an economic activity. The fact that individuals can continue their economic activities without being under any pressure or that they do not face any obstacles during these activities can show that they are economically free. The underlying factors concerning economic freedom are the respect for individual choice, freedom of competition, protection of personal and property rights.

The concept of freedom is an important ideal for humanity. The economic freedom scores of all United Nations member countries are published annually as “Economic Freedom Index” of Heritage Foundation. For countries, economic freedom can be regarded as a sign of sustainable growth and prosperity. When calculating the index, countries are scored and ranked by twelve independent variables that determine the economic freedom score.

There are many variables that determine the economic development of countries. The Economic Freedom Index, composed of twelve variables from financial health to financial freedom, is a data set that evaluates economic performance in the long run. Considering that sustainable growth and prosperity are important economic concepts for humanity, there is a need for analysis that would measure and show development. Measuring economic freedoms is not as easy as calculating national income or GDP. For this reason, a method has been

developed in order to rank the countries according to their economic freedom scores and thus their level of freedom was found. Here, the subheadings subject to economic freedom are scored between 0 and 100 with an ordinal measurement. In the index, the position of the country rather than the country's score is of concern.

In this study, it is aimed to reveal the cluster structures of OECD member countries according to economic freedom scores. We also intend to determine the best clustering algorithm in different clustering algorithms of countries.

## 1. REVIEW OF LITERATURE

In the literature, there are studies in which economic freedoms and economic growth are associated with the economic performance of countries, where all the countries of the world, OECD and similar organizations are involved. There are also many studies on health and education for OECD countries. These studies are given below.

Taşar (2007) in his study examined the situation of Turkey according to Economic Freedom Index among 130 countries and Turkey occupied the 83rd place. This result shows that Turkey is far behind the European Union countries and the world ranking (Taşar, 2007).

Şahin (2017) has analysed the situation of Turkey within the European Union in terms of economic freedom. EU member countries were grouped by hierarchical clustering analysis according to the economic freedom scores of 2005 and of 2015. Despite the differences observed in Turkey's score in both years, it was seen that Turkey is predominantly situated in the same cluster with the Balkan countries (Şahin, 2017a).

Campbell, Fayman and Heriot (2011) examined the relationship between economic growth and economic freedoms on the basis of the data obtained from the Economic Freedom of North America index. Although economic freedoms are not in full relation with economic growth rate, they have a strong relationship between economic growth and number of firms (Campbell, Fayman & Heriot, 2011).

Şahin (2017b) divided the Eastern European countries into four clusters by clustering analysis according to 2015 economic freedom data. He explained that the socioeconomic levels of the countries in the clusters were similar (Şahin, 2017b).

Russell and Wright (2014) determined two clusters as a result of clustering analysis for 156-member countries of the United Nations. The main difference of the clusters is that the countries are classified on the basis of the difference of religious population. They concluded that religion is a determinant of economic freedoms (Russell & Wright, 2014).

Buscema, Sacco and Ferilli (2016) divided the countries into clusters by using Kohonen's Self-Organizing Maps (SOMs) method. This application was not only based on the Economic Freedom Index but also the Human Development Index, the Global Competitiveness Index, and the Corruption Perception Index. As a result, they found out that countries are divided in four clusters according to their economic power. The countries with weak economic power are placed in the same cluster, similarly strong economies were in the same cluster (Buscema, Sacco & Ferilli, 2016).

Kangallı, Uyar and Buyrukoğlu (2014) in their study analysed 34 OECD countries according to the Economic Freedom Index 2011-year data by K-mean and wards method. As a result of the study, 3 clusters were created according to the development level of countries. Although the level of development was decisive, they determined that the countries which were exposed to economic crisis were placed in the same cluster during the year when the data were obtained (Kangalli, Uyar & Buyrukoğlu, 2014).

Considering the clustering studies of OECD countries in terms of various variables, Şimşek (2014) has clustered women's socio-economic power in terms of criteria such as participation in labour force, participation in management positions and concluded that Turkey has drawn attention to the use of management issues.

In the study of Akca, Sönmez and Yılmaz (2017), they classified the health expenditures of OECD countries within the GNP by CART decision tree model. As a result, they classified 35 OECD countries in 6 categories in terms of their health expenditures in the GNP (Akca, Sönmez & Yılmaz, 2017).

In the study of OECD countries classified by health expenditures, Ersöz (2008) classified countries with multidimensional scaling analysis. The first dimension in Turkey, Korea, Mexico, Poland and the Slovak Republic attracted attention as they are involved in a similar group in terms of health spending (Ersöz, 2008).

In their study, Akin and Eren (2012) compared OECD countries in terms of educational indicators by comparing clustering and multidimensional scaling analysis. They concluded that as a result of their study the two methods gave similar clustering findings (Akin & Eren, 2012).

In another study, Ersöz (2009) also clustered OECD countries according to health expenditures. By applying Medoid clustering method, OECD countries were classified under 3 clusters in line with their level of development and Turkey was placed in the same cluster with Mexico (Ersöz, 2009).

## 2. ECONOMIC FREEDOM INDEX

The Economic Freedom Index is an index established by the Heritage Foundation and The Wall Street Journal according to the theories in Adam Smith's book "Wealth of Nations".

The Economic Freedom Index has been published yearly by the Heritage Foundation since 1985. The Heritage Foundation was founded in 1973, it is fully embracing the doctrine of market freedom and efficiency as the golden path toward individual and collective well-being. The Economic Freedom Index consequently measures the degree to which each specific country paves the way to free initiative on a variety of different fields. Specifically, the Economic Freedom Index focuses on twelve different types of 'freedom' as characteristic of a free market economy: property rights, judicial effectiveness, government integrity, tax burden, government spending, fiscal health, business freedom, labour freedom, monetary freedom, trade freedom, investment freedom, financial freedom (Buscema *et al.*, 2016).

The countries evaluated are scored on the basis of the scores of 0 to 100 according to the criteria collected in 12 different headings. With the score set for each country, the level of economic freedom of the countries was measured and thus countries were subjected to a ranking. These criteria may also be an indicator of the level of economic development of countries.

Freedom indices of the world have established themselves as fixtures in the social sciences literature, especially in the economic growth literature. Across the literature, the consistent finding is that economic freedom, as measured by the various indices, is significantly and positively related to economic well-being (Campbell *et al.*, 2011).

## 3. MATERIAL AND METHODS

The Economic Freedom Index contains data on the economic freedoms of 186 countries (The Heritage Foundation). In this study 12 variables defining the economic freedom score for 2017 were prepared to include 34 OECD countries. IBM SPSS Model and Statistics programs were used in the analysis of data.

Within OECD member countries, clustering methods of multivariate statistical techniques were used to compare the countries with economic freedoms according to the specified indicators. Some of the clustering algorithms, Ward Linkage Method, which is one of the hierarchical clustering methods, K-means and Two Steps techniques, which are non-hierarchical clustering methods, have been compared. Discriminant analysis was used to determine the results.

The clustering analysis is the process of separating the data from the data set into groups according to certain criteria by using some measures calculated according to the similarities and differences between the variables. In clustering models, the purpose is to find clusters that are very similar to each other, but whose properties are very different from each other.

Clustering methods are divided into hierarchical and non-hierarchical methods. In the hierarchical clustering method, dendrogram graphs are used to better understand the clusters, especially visually. The most commonly used distance measures in the hierarchical clustering method are Single Linkage Method, Complete Linkage Method, Average Linkage Method, Weight Centre, Medoid and Ward Linkage Method. In the non-hierarchical clustering method, it is recommended to have pre-information about the number of sets. This can be achieved by first applying the information hierarchical clustering method. In addition, the researcher can assign the number of clusters by experience. The non-hierarchical clustering methods are the K-Means technique and the Two Step technique.

The K-Means algorithm is a quick method for classifying data. The number of sets is determined and divided into groups. K is the number of clusters.

The Two Step Clustering method is designed to analyse large data groups. The number of clusters is determined to be optimal. It consists of two stages. In the first stage, the data is divided into pre-clusters and in the second stage it is divided hierarchically. BIC (Bayesian Information Criterion) and AIC (Akaike Information Criterion) methods are used to automatically determine the optimal number of clusters (Ersöz, 2017).

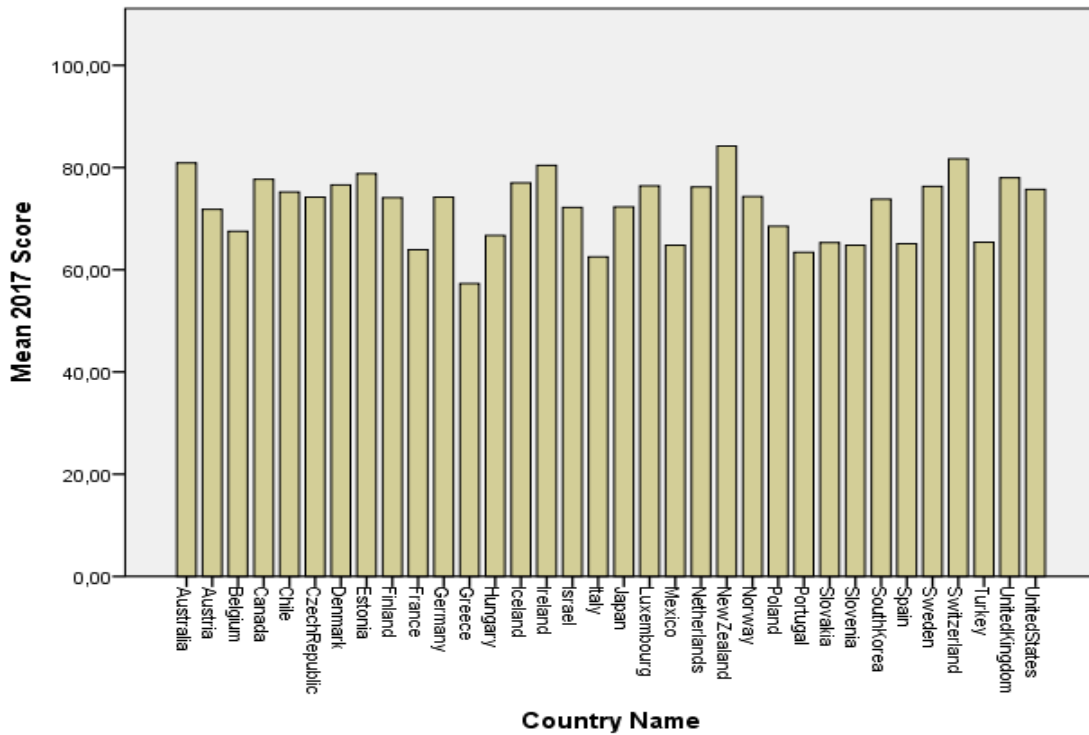
Discriminant Analysis is a collection of processes for separating the units into the groups they belong to with the least error in terms of the properties discussed. In the moment of separation, the separation function is determined, incorrect grouping possibilities are determined, the significance of the separation function is found, and the units are assigned to the groups.

In this study, it was aimed to reveal similar countries with the clustering methods in terms of economic freedoms of OECD countries.

#### **4. RESULTS**

The average scores of 34 OECD members according to the Economic Freedom Index are shown in Figure 1 as a bar graph. Figure 1 shows that Greece has the lowest economic freedom score and it is followed by Italy. It was found that the countries with the highest economic freedom scores are New Zealand, Australia, Switzerland, Ireland and United Kingdom.





**Fig. 1.** Mean scores by country's Economic Freedom Index

The descriptive statistics of the variables used in the economic freedom index calculation of 34 OECD member countries are given in Table 1 below.

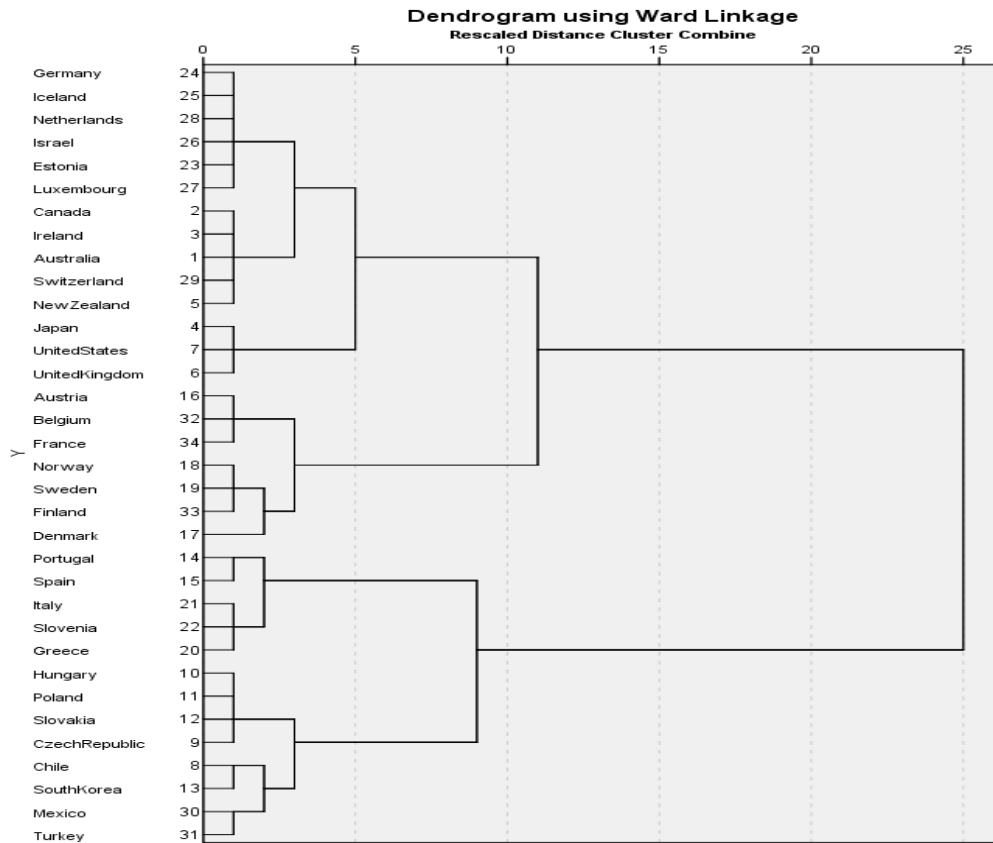
Table 1. Descriptive Statistics

Variables	Min	Max	Median	Mean	Std.Dev.
<b>Property Right</b>	52.30	95.10	80,70	78.02	11.22
<b>Judicial Effectiveness</b>	38.80	93.80	73,65	71.70	13.96
<b>Government Integrity</b>	26.90	95.70	72,70	66.55	18.89
<b>Tax Burden</b>	41.40	82.90	65,15	65.02	11.46
<b>Government Spending</b>	2.30	81.30	44,35	42.51	20.60
<b>Fiscal Health</b>	36.10	99.80	81,95	79.85	17.33
<b>Business Freedom</b>	61.80	92.50	80,35	78.81	9.32
<b>Labour Freedom</b>	44.10	91.40	60,85	63.09	12.31
<b>Monetary Freedom</b>	72.30	91.60	85,20	84.03	4.16
<b>Trade Freedom</b>	78.60	90.00	86,90	86.27	2.40
<b>Investment Freedom</b>	55.00	95.00	80,00	80.59	8.24
<b>Financial Freedom</b>	40.00	90.00	70,00	70.88	11.11

As it is seen in Table 1, "Trade Freedom" indicator is the highest indicator ( $86.27 \pm 2.40$ ) among the indicators and "Government Spending" (2.30-81.30) is the highest variability within the indicators.

In this study, first the number of clusters was tried to be determined by hierarchical clustering analysis. Wards linkage method and Squared Euclidean distance were used to determine the number of clusters by dendrogram.

The result of the hierarchical clustering analysis is shown graphically with the dendrogram in Figure 2.



**Fig. 2.** Dendrogram

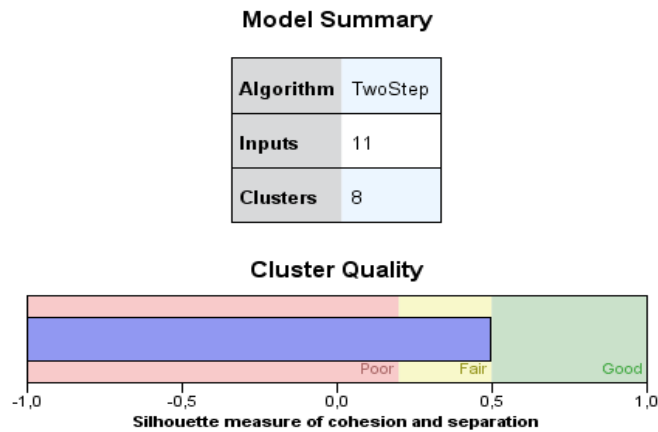
As a result of the hierarchical clustering analysis, with the aid of the dendrogram, the appropriate set can be determined between 8 and 4 clusters.

The K-means and the two step clustering methods of non-hierarchical clustering methods are compared. In all three methods, the best cluster was verified by distance and discriminant analysis. As shown in Table 2, discriminant analysis classification results, the cumulative analysis criterion is 100%.

**Table 2.** Discriminant Analysis Classification Results

Wards Method		Predicted Group Membership								Total	
		1	2	3	4	5	6	7	8		
Cluster membership	Count	1	5	0	0	0	0	0	0	0	5
		2	0	2	0	0	0	0	0	0	2
		3	0	0	6	0	0	0	0	0	6
		4	0	0	0	5	0	0	0	0	5
		5	0	0	0	0	6	0	0	0	6
		6	0	0	0	0	0	3	0	0	3
		7	0	0	0	0	0	0	4	0	4
		8	0	0	0	0	0	0	0	3	3
	%	1	100,0	,0	,0	,0	,0	,0	,0	,0	100,0
		2	,0	100,0	,0	,0	,0	,0	,0	,0	100,0
		3	,0	,0	100,0	,0	,0	,0	,0	,0	100,0
		4	,0	,0	,0	100,0	,0	,0	,0	,0	100,0
		5	,0	,0	,0	,0	100,0	,0	,0	,0	100,0
		6	,0	,0	,0	,0	,0	100,0	,0	,0	100,0
		7	,0	,0	,0	,0	,0	,0	100,0	,0	100,0
		8	,0	,0	,0	,0	,0	,0	,0	100,0	100,0

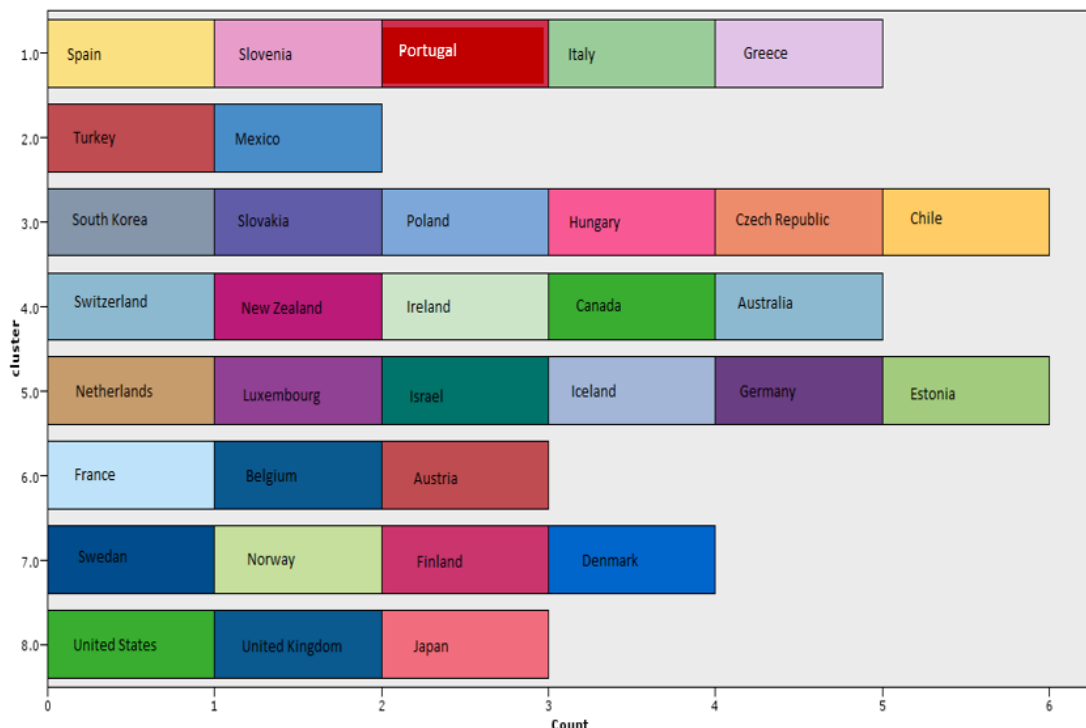
Repeated analysis by selecting eight clusters did not achieve the same cluster distinction, but successful results were obtained in four clusters. By the Two Step algorithm, the “Monetary Freedom” variable was found to be unimportant with the cluster structures similar to the hierarchical clusters, and the cluster quality was reached with eight two-step cluster algorithms. The success of the two-step method is shown in Figure 2.



**Fig. 3.** The result of two-step cluster analysis

As a result of the comparisons, the number of clusters found by the hierarchical clustering method was confirmed by two steps and similar results were obtained. The K-means method was found to have different clustering structures in each experiment. It can be recommended to work with a large data set and a small number of sets for the K-means algorithm.

Demiralay and Çamurcu (2005) in the study conducted in the literature noted that the K-tool algorithm cannot find the correct sets in each case, but it has been shown to find the correct number of clusters effectively (Demiralay & Çamurcu, 2005).



**Fig. 4.** OECD country 2017 economic freedom index clusters

Figure 4 shows the cluster structures obtained by clustering methods and verified by Discriminant analysis. OECD member countries are divided into 8 clusters for categorizing.

When we evaluate the clustering results, the first important issue is that OECD member countries are primarily clustered according to their level of development. Developed countries such United States, United Kingdom and Japan are included in the one cluster, but developing countries such Turkey and Mexico are seen together within another cluster.

Countries such as France, Belgium and Austria, the member countries of the European Union, attract attention in terms of economic freedoms, because they determine trends in one cluster.

Geographically close countries are in the same cluster. The fact that the neighbourhood makes it easier for the trade to be facilitated makes these countries have similar levels of economic freedom. Scandinavian countries are examples of this. The same language can be spoken in neighbouring countries. As seen in countries such as Belgium and France, as most of these countries are member states of the European Union, there is freedom and the same currency is used.

In the literature, it is seen that the developing countries such as Turkey and Mexico are in the same cluster in the clustering studies conducted about health expenditures. Another striking issue is that Turkey and Mexico are in the same cluster in studies investigating the socio-economic status of women in the literature.

According to the indicators of economic power, the countries such as Italy and Greece, which could not show economic growth in the year of the survey, are in the same cluster.

It can be said that the role played by countries in education and education systems is effective in defining cluster structures in terms of economic freedoms.

## CONCLUSION AND DISCUSSION

According to the Economic Freedom Index, similar results were obtained with Hierarchical methods and Two-steps algorithms as a result of clustering of OECD countries. OECD member countries are grouped in 8 different clusters according to economic freedom scores.

Hierarchical methods have been found to work better among the methods used in the clusters of OECD countries. Non-hierarchical methods are expected to give more consistent results in big data. The two-step algorithm and the hierarchical clustering method gave similar results.

When this cluster structure was determined, studies described in the literature were also taken as references. It can also be said that the economic freedoms of the countries are compatible with their economic strength and development levels.

In the European Union countries, the freedom to cross borders provides similar economic conditions. A similar situation is also valid in countries with language convergence. Countries with similar development levels and economic freedoms are included in the same clusters.

In addition, there are similarities in clusters according to the economic freedoms obtained by clustering studies about education and health systems. Therefore, education and health systems improvement in the country will change the economic freedom of the country in a positive way.

In particular, financial and economic education provides individuals with the following benefits: individuals make more conscious business investment, are active in international trade, have more free economic mobility. In addition, the emphasis on foreign language education increases economic freedom. The above-mentioned items reveal the result of economic development for both individuals and countries. More studies can be done focusing on individual variables of economic freedom index of countries.

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# RESEARCH ON PRODUCT VALUE ADDED BASED ON VALUES AND INTERESTS OF STAKEHOLDERS: CASE OF *MILZU!*

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**Abstract.** At a time when the tendency to consume organic products increases, the segment of breakfast cereals, particularly for children, mainly consists of over-sweet breakfast cereals which contain taste and aroma flavourings and colour additives. Subject of this research is to create value added for an organic product. Objective of the study – to ascertain the most effective manner to address children. Methodology/methods: In order to achieve the objective of the study, literature study and analysis are applied to find out theoretical aspects of the research subject. Both in-depth interviews are conducted to identify the interests and demand of stakeholders, as well as quantitative surveys and focus groups organized with stakeholders. Stakeholders: children, their parents. Scientific aim of the research is to determine the criteria that increase loyalty and value based stakeholder retention in long term, while providing sensory education, education and promoting creative thinking. Innovative constructor system is put forward as a solution for retention of stakeholders in long term. The created prototypes provide possibility to start innovative constructor system development (Research “Research and development of children’s toy ecosystem in *MILZU!* cereal flakes packaging to increase the value added of food products”, project No. 1.2.1.1/16/A/004). The value added of the product attracts attention of additionally involved parties. Creating value added of a product, it is necessary to respond to values and on interests based stakeholders’ needs and interests in order to encourage repeat purchase.

**Keywords:** *Loyalty Building, Marketing, Positioning, Re-Purchase Strategy, Values*

**JEL Classification:** M30, O22

## INTRODUCTION

In the industry, turnover of sales in Europe in 2018 was 7.8 billion USD. The segment of breakfast cereals tends to increase. Euromonitor forecasts an increase in breakfast cereals segment in 2023 by 4,7% compared to 2017. Research trends in Europe indicate the tendency to consume increasingly natural and healthy products. Such tendency is a challenge for breakfast cereals segment since it requires to change how breakfast cereals are perceived by revising the composition of products.

In 2014 brand *MILZU!* was made, creating innovative products in breakfast cereals market including in their composition rye and significantly reducing sugar amount, thereby forming a healthy alternative compared to current supply. In order to increase *MILZU!* market share, a research was done with an objective to determine how to build positioning of *MILZU!* products and brands for children, creating value added of the products, while converting children to healthy alimentation without changing customers’ habits.

Object of the study: *MILZU!* products and brand. Subject of the study: identification of consumer values and creation of value added of *MILZU!* products and brand.

Period of research: 2016–2018. Within the research the most effective way how to achieve the objective in a broad competitive environment was searched and the emotional attraction

through values of directly involved stakeholders is defined as a key factor in long-term consumer loyalty.

## 1. THEORETICAL BACKGROUND

Well known research methods are used in this research – systematic review of the literature, empirical research etc. The theoretical basis of the research is focused on three main components of marketing theory – positioning, identifying needs, creating value.

*Positioning.* Reviewing positioning concept theories (Kotler *et al.*, 2009; Keller, 2001; Trout, 1969; Wind, 1988), we must conclude that one of the most important questions in marketing strategy is particularly company's positioning in market. The amount of information a person faces in everyday life is too overwhelming, thus impossible to comprehend. Person's consciousness selects and accepts only the information that meets his or her current experience and knowledge. J.Trout determines the essence of positioning: positioning is what we do with human's mind. Positioning is essential to a company in order to self-differentiate in consumers' minds. Positioning's purpose is not to create something new but to manipulate with what is already in people's minds using existing responses, besides that, to change existing things in people's minds is particularly difficult. That is a system organized by companies which allows to find the way to person's consciousness (Trout, 1969). J.Wind names 6 alternative brand positioning forms: positioning based on product's different quality; advantage or problem solution; specific way of use; specific category of customers; positioning in relation to a competitor's brand and positioning based on the limits of a specific product group. *MILZU!* has strengthened its position in the existing market, yet it is necessary to focus on positioning for specific stakeholders. Scientific aim is to determine the criteria that increase loyalty and value based stakeholder retention in long term and how to address children more precisely through children's values and interests.

*Needs of stakeholders.* Marketing Professor Dr.McNeal from Texas A&M University (USA) has widely studied children and parents' needs as well as children behaviour in shops. According to J.U. McNeal's theory (1999) in order to achieve successful communication towards children, it is necessary to satisfy both the essential needs of children, and the needs of parents, concurrently satisfying children's time perspectives and identifying activity with the brand (see Table 1).

Table 1. Interests of stakeholders (based on the theory by J.U. McNeal, 1999)

Needs	Description
Satisfy children's needs	<ul style="list-style-type: none"> <li>• Need for play,</li> <li>• Need for sensory perception,</li> <li>• Need for belonging and cooperation with others</li> <li>• Need for achievement, overcoming obstacles.</li> </ul>
Satisfy parents' needs	<ul style="list-style-type: none"> <li>• Happy children,</li> <li>• Healthy children,</li> <li>• Children can cope with the tasks of life.</li> </ul>
Satisfy children's time perspectives	<ul style="list-style-type: none"> <li>• Clear long-term target,</li> <li>• Immediate benefit.</li> </ul>
Identify activity with the brand	<ul style="list-style-type: none"> <li>• Clear connection with brand,</li> <li>• Brand attributes involved.</li> </ul>

First and foremost the marketing activities for children must be based on the need to play (for instance, McDonald's focuses on the first 3 needs: fun, food, family, thus defining essential role of toys and game approach although the core business is fast food), yet the marketing activity will not be successful if it will not satisfy parents' needs. Accordingly to J.U. McNeal's theory (1999) parents care about needs mentioned above (happy and healthy child who can cope



with tasks of life), for instance, parents most likely will choose more expensive products if they provide extra valuable nutrients so their child would be healthy, likewise it is important to ensure education for their children. Children perceive time differently as adults, they need immediate response, therefore this must be taken into account in marketing activities.

*Values of parties involved.* Making systematic review of the literature, authors conclude that, developing marketing strategy, it is essential to know the stakeholders, their values and significances which stakeholders would like to receive along with the product (Kotler *et al*, 1999; McCracken, 2005; McNeal, 1999; Trout, 1969; Wind, 1988; Keller, 2001; Lury, 2004; Arvidsson, 2006). Values and their priorities determine the choice of consumer. Regardless of the consumer's choice motives – self or social identity driven choice, identification with culture or nation – they are based on consumer's values which define belonging and “my” or “unknown” feeling. Analyzing the importance of values in brand development, authors ascertain that values which customer and brand have in common create emotional attraction of customers and positive emotional attraction to brand leads to loyalty which means long-term relationship. (Wheeler, 2009; Aaker, 1997).

Any *values* express one of three fundamental needs of a human: biological needs, social interaction needs, survival and welfare needs, while all these three fundamental needs can be satisfied, implementing principles and forms of behaviour combined in value types (Schwartz, 2006). Customers use significance of consumer goods also to express cultural categories and principles, to create and maintain lifestyle and to build a self-concept in society (McCracken, 2005). The emotional attraction through values of parties involved determine strong brand and loyalty (Wheeler, 2009; Aaker, 1997), therefore *MILZU!* focusses on interests of stakeholders, creating value added of products.

*The influence of children stakeholders on purchase and choice in the shop.* Research results on children's influence on product purchase in various segments (McNeal, 1999) show, that children influence 50% of purchases in breakfast cereals segment (see Figure 1). For comparison – in the case of milk products (including yoghurts) children influence only 12% of purchases, whereas only 8% of fruit and vegetable purchases are influenced by children.

Research done by J.U. McNeal (1999) shows that in breakfast cereals segment it is important to take into account children's needs, values and interests in order to increase sales. The communication must be easily understandable for both children and mothers. Figure 2 shows J.U. McNeal research about children's choices in shops and the results show that changes in purchases within children stakeholders change accordingly to their role in shopping process. Researching children's choices within product categories, J.U. McNeal (1999) made a conclusion that the first product asked by children in the shops is breakfast cereals (47%), snacks (30%) and toys (21%), yet, when children are given the choice the situation is slightly different – 35% choose breakfast cereals, 28% prefer toys.

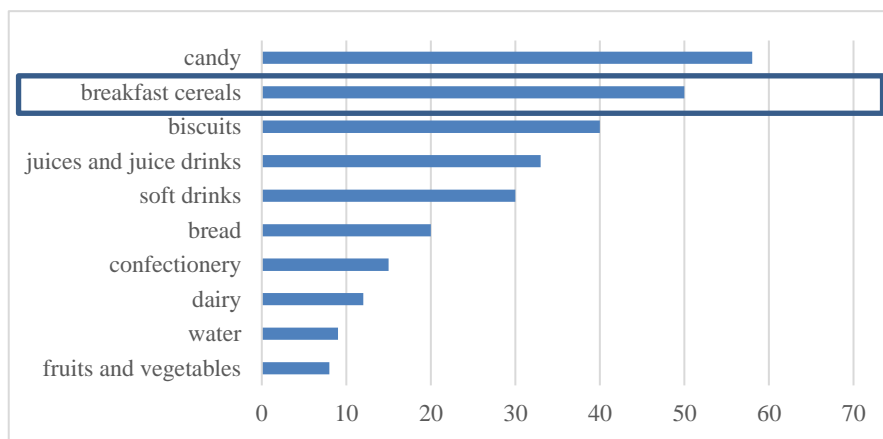


Figure 1. The influence of children on purchase making % (based on McNeal, 1999 ).

24% snacks, 6% books, 5% clothes un 2% presents. J.U. McNeal (1999) research indicates that children’s wish to purchase breakfast cereals 75% results in choice, while, when making purchase themselves, only 6% children buy breakfast cereals, preferring toys (54%) (Figure 2).

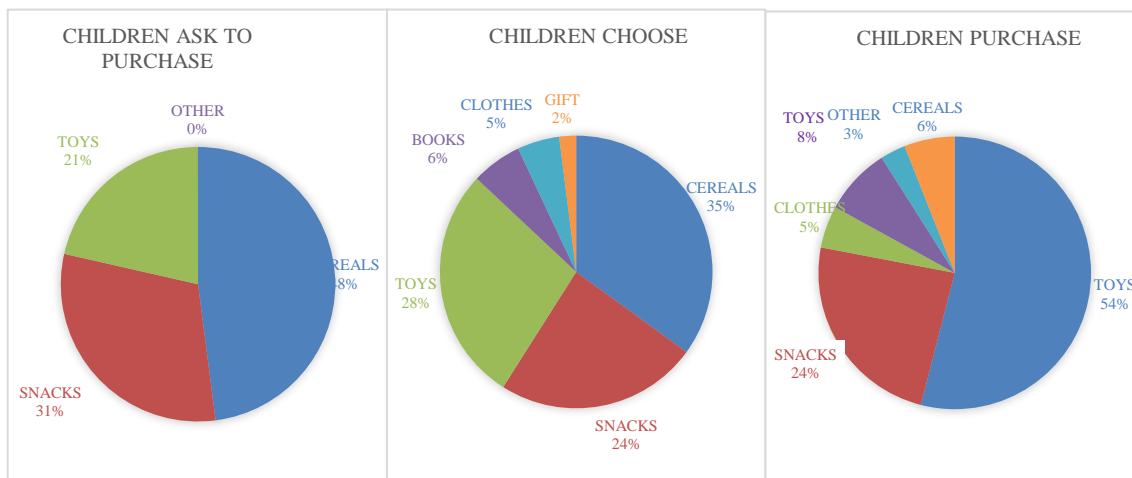


Figure 2. Changes of product choices accordingly to children’s role in purchase making (based on McNeal, 1999).

Authors conclude that children’s role in purchase making determines the children’s choice in the shop, dividing children choices within various categories and a toy added to breakfast cereal package with a clear indication would increase this proportion.

*Efficiency.* When creating marketing strategy in a company, the main target, obviously, is to increase income. Yet marketing results often can be measurable within long-term, besides financial figures are not the only indicators of marketing efficiency, for it can be measured variously. The main differences of efficiency: efficiency as economy (*efficiency*) determines how to do things correctly. Effectiveness determines whether the correct things are done, therefore the essence of effectiveness is innovations on how to find new and better ways for customer needs (Drucker, 1999).

Offer will be effective if it will provide the value added and satisfaction for stakeholders. Customer makes choice between several offers and chooses the one that provides the biggest value. The value is a ratio between what is received in exchange of what is given. Consumer receives benefits and costs accordingly to formula (Kotler, 2002):

$$\text{Value} = \frac{\text{Benefits}}{\text{Costs}} = \frac{\text{Functional benefits} + \text{emotional benefits}}{\text{Monetary costs} + \text{time costs} + \text{energy costs} + \text{psychic costs}} \quad (1)$$

where **V** – value;

**B** – benefits;

**C** – costs;

**Fb** – functional benefits;

**Eb** – emotional benefits;

**Mc** – money costs;

**Tc** – time investment;

**Ec** – energy investment;

**Pc** – psychological investment.

Based on this equation, entrepreneur can increase the value of offer by increasing benefits and decreasing costs, increasing benefits more than increasing costs or decreasing benefits less than decreasing costs. Customer, choosing between offers A and B, rates value ratio between them. According to equation above, customer will choose offer A, if its value will be bigger than 1, and will choose offer B if the value will be less than 1. If the equation is equal to 1, in such case offers are equal accordingly to theory of Ph.Kotler (2002).

Innovations more often are introduced looking for customer's benefits, yet one should consider that value without innovations is equal to changes in price, while innovations without value is equal to upgrade without demand, lack of consumer. Therefore it is important to estimate innovations return before their development, so that solution would be effective. A research must be done to find out which specific value plays importance in customer's choice.

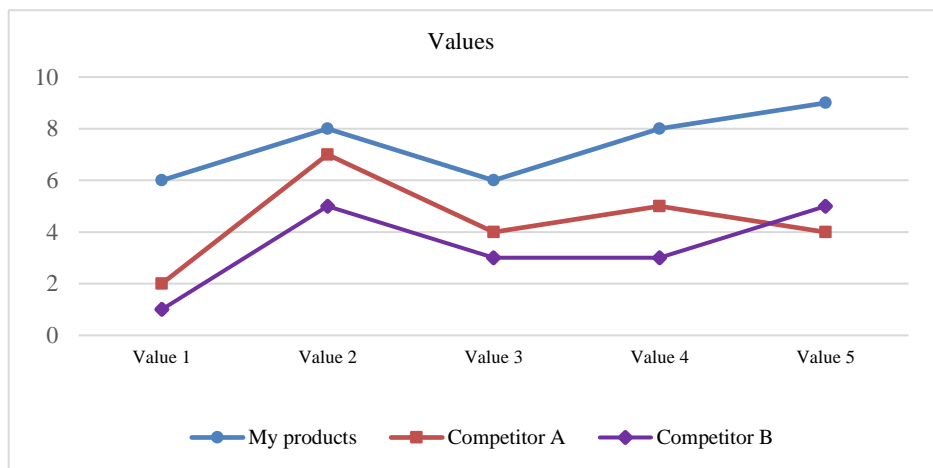


Figure 3. Curve of values (based on Kim and Mauborgne, 2005)

Curve of values (Figure 3) can be used to compare specific values in comparison to competitor and define those values which must be improved as well as competitive advantages defined (Kim & Mauborgne, 2005). Curve of values reflects.

## 2. METHODOLOGY OF THE RESEARCH

To achieve the aim of the paper theoretical research and empiric research was done. Several research methods were used:

1. theoretical literature analysis;
2. test for determination of stakeholder values;
3. in-depth interviews are conducted to identify the interests and demand of stakeholders (children, their parents);
4. quantitative survey;
5. focus groups.

## 3. MILZU! CASE RESEARCH PROCESS AND RESULTS

Within the framework of the study, a complex of activities was conducted in order to achieve results of the research. After the analysis of theory an empiric research was done. Comparing results during the empiric research previously defined theoretical concepts were approved and results were compared in different stages of research in order to verify whether the final results correlate with results of tests, interviews and surveys (Figure 4).

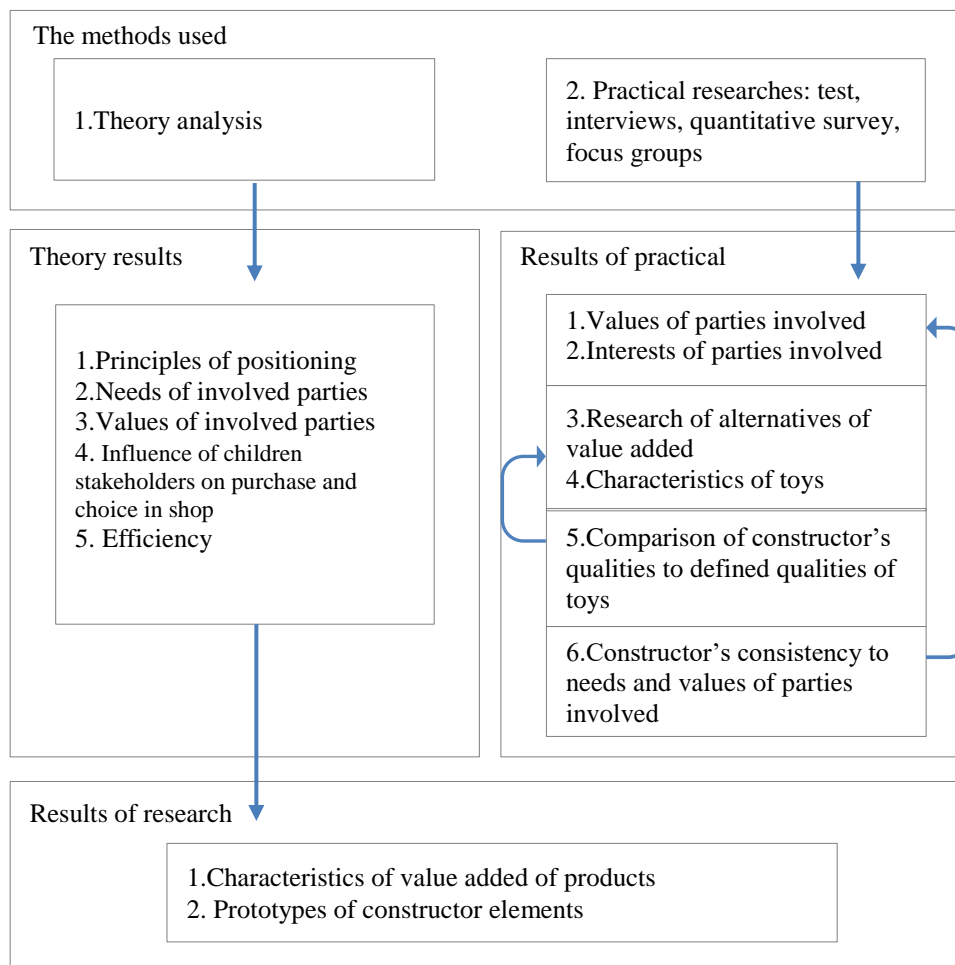


Figure 4. Process of research (authors' developed framework).

To develop prototypes, focus groups for stakeholders were organized in November, 2017, so that the accordance of results with needs, values and interests would be confirmed. Values and interests can be seen in Table 2.

Table 2. Values and interests of women and children (authors' developed framework)

Guidelines	Women	Children
Values	Family and children Health Welfare Love, peace, harmony	Family Love Friendship
	<i>Qualities:</i> Honesty and responsibility Helpfulness Security Harmony with nature	
Interests	<i>Women support children's interests:</i> Sport Creativity, arts Cognitive activities	Friends and playing Virtual environment Sports Learning, cognition Creative activities Surprise and adventure

Based on a study about women's values (determination of typology of values: adapted test version, S.H.Schwartz), priorities and interests of stakeholders (10 respondents – women in age group 25-34, with children) a study, using quantitative survey (78 respondents – women in age group 20-45), was conducted. Interviews within children were held, the total amount of respondents were 34 in age group 7-13. As a result of practical research, guidelines were proposed which are basis for *MILZU!* products' value added.

Taking into account results of interviews and focus groups within children stakeholders (interviews mentioned above and 2 focus groups: 11 boys in age group 9-12 and 10 girls in age group 9-12), it was ascertained that particularly constructor most accurately meets the needs, values and characteristics of toys which are expected by stakeholders as value added of product. The evaluation of the constructor elements' prototypes generated within the study provided feedback on the interests, needs and values of the stakeholders (19 interviews with children in age group 7-13 and 10 interviews with women in age group 25-38).

Constructor system's description includes playground environmental objects, functional elements, details for toy making, characters, thematic series, option to complement the toy set, improvise. Constructor system includes variations of different levels for diverse stakeholders (gender, age, topics of interest, accessory options). It is intended to form the constructor system from separate elements, putting them in parts as product's value added.

## CONCLUSIONS

*The theoretical contributions.* The theoretical contributions in this research are: 1. Well considered brand and product positioning in market must meet the needs and values of parties involved. 2. Brand's and stakeholders common values create customer's emotional attraction, whereas emotional attraction more successfully forms stakeholders loyalty in long term. 3. Children significantly influence the choice of breakfast cereals and their choice in the shop depends on their role in purchase making. By inserting toy in breakfast cereal pack as a gift, the choice of topicality is preserved for children who make purchase on their own. 4. Child's most essential needs are to play, need for sensory perception, need to cooperate with others, need to overcome obstacles and problem solving. Meantime adults need regarding children is happy and healthy child who can cope with the tasks of life. It is necessary to satisfy both needs of children and parents by creating value added of *MILZU!* products. 5. Offer will be efficient if it will provide added value and satisfaction for parties involved.

Authors' developed methodology (Figure 4) can be used in other enterprises.

*The practical contributions.* Analysing practical part of the research, the following conclusions can be drawn: 1. Values within women stakeholders are: family and children, health, welfare, peace, harmony, harmony with nature. Values within children stakeholders are: family, love, friendship. 2. Children interests are: friends, virtual environment, sport, playing, learning, cognition, creative activities, adventure. Mothers support: sport, creativity and arts, cognitive activities. 3. The most appropriate value added for *MILZU!* products is innovative constructor system. 4. For further development of constructor system it is necessary to conduct in-depth study about innovation implementation, which includes variations of different levels for diverse stakeholders (gender, age, topics of interest, accessory options).

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## ESTIMATION OF CORRUGATED BOARD BOX PRICE CHANGES IN THE FOOD INDUSTRY

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**Abstract.** It is important to predict the value of variables like prices of financial assets and values of indexes. Various model are developed continuously for this aim. In this study, the rates of price changes that could occur in corrugated cardboard boxes were estimated by linear regression analysis. The aim of the study is to estimate the rate of change in the corrugated board box industry which has recently been experiencing price changes and to contribute to the company's evaluations on the subject.

**Keywords:** *Corrugated Board Box, Linear Regression, Forecasting.*

**JEL Classification:** C13, C51

### INTRODUCTION

Corrugated Cardboard is defined as the type of packaging that best matches environmental conditions, because paper used in corrugated cardboard production is a recyclable raw material.

Corrugated Cardboard was first used in the United States in the 1870s. In the 1870s, Albert Jones produced corrugated paper, G. Smyth – single-sided corrugated cardboard, Oliver Long – corrugated cardboard. SEKA is Turkey Pulp and Paper Mills mills was founded in 1954 by Turkey's first corrugated cardboard factory. The first corrugated cardboard factory in the private sector in Turkey went into operation in 1968. In current situation, 91 companies in Turkey be able to make corrugated board production in their 114 different factories.

Along with the development of technology, changes in buying preferences of individuals from white goods to electronics, textiles to food, and emerging e-commerce have an important role in the development of the packaging industry. In particular, the demand for corrugated cardboard boxes used to deliver products to customers in online shopping without damage has doubled in the past 16 years. Corrugated Board Manufacturers Association (OMÜD) that Turkey has been published by the Corrugated.

70% of the paper used in the production of corrugated cardboard is obtained from recycle in Turkey. The 30% portion is derived from imported paper. Imported paper is usually obtained from certified farms, from trees cut according to certain rules, and without harming the ecological balance. New trees are being cultivated, they are supposed to replace the cut trees and reach the level of 9-15 years (OMÜD, 2018). As can be understood here, no trees are cut for the production of corrugated cardboard in Turkey.

Industry 2016 Annual Report, falling per capita consumption of corrugated cardboard between the years 2000 to 2016 has increased by 14.3 kg. This data shows that the sector has grown by 128% in the last 16 years. According to the same report, usage of corrugated cardboard has reached a level of 69%, which is at the level of 55%, in line with the increasing demand for students. The increase in demand for corrugated board box, directly reflects the price of corrugated board boxes. The changes in the price of corrugated board boxes are directly affecting the budgets of the companies with high corrugated board box purchasing as it is in the food sector.

Corrugated cardboard box prices change according to quality and price of the paper that used in the production of the box.

Especially in the first month of 2017, the recyclable paper supply has become a serious problem in Turkey. The most important reason for this is that the paper mills in China have been closed because of the problem of increased air pollution in the country. Domestic paper producers in Turkey have started to work with higher profit margins and export their paper to China, taking into account the increase in dollar and euro exchange rates. This is reflected as a price increase on recycled paper. In addition, paper on which corrugated board box producers supply from abroad is bought at high prices due to the increase in dollar exchange rate.

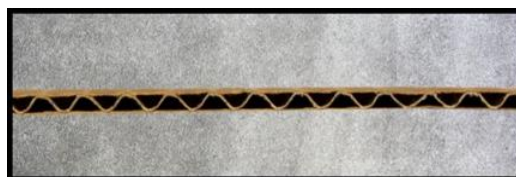
In this study, the estimation of the price change of a corrugated board box used by a company was investigated statistically. Thus, it is aimed that the company can determine the strategy of the corrugated board box purchasing in the most accurate way and contribute to the process management.

## 1. GENERAL INFORMATION

Used in corrugated cardboard production and determined as a variation in work; Papers such as Straw Fluting, Test Liner, White Test Liner, Craft Liner and NSSC are used on the inner and outer surfaces of corrugated board. In the middle part of the corrugated board called "decal", straw type paper is generally preferred, and NSSC type paper is used to prevent moisture from being used for corrugated cardboard to be used in cold weather conditions. According to the required carrying capacity, corrugated cardboard strength is provided by determining the appropriate paper weights and the wave type of the paper to be used in the middle. Since these variables are the main factors that lead to corrugated cardboard, they directly affect the price of corrugated cardboard and constitute 65% of the price. Another 35% constitutes the Producer Price Index (PPI). The factors directly affecting corrugated cardboard prices can be classified under three headings:

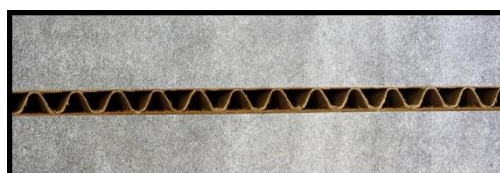
### 1.1 Types of Flute:

B flute: It is a type of flute between 2.1 mm and 2.9 mm. The number of flutes per unit is 150- 184. B flute is the most resistant type of flute against pressure and surface scratches. The reason for this is that the groove heights and wave intervals are small (Turkey Ministry of National Education, 2011). The figure for this paper type is given below in the Fig 1.



**Fig.1.** B flute paper type

C flute: The flute height is between 3.5 mm and 3.7 mm and the flute number is 120- 145 (Turkey Ministry of National Education, 2011). The figure for this paper type is given below in the Fig 2.



**Fig. 2.** C flute paper type



B+C flute (dopel): The flute type is  $6 \text{ mm} \pm 0,5$  in height, which is formed by the joining of the two submarines. The thickness, protection and carrying capacity of the corrugated cardboard are higher than other flute types. Areas where this flute type is used; textile sector, food sector, distribution channels and general export boxes (ILKE ambalaj, 2018). The figure for this paper type is given below in the Fig 3.



**Fig. 3.** B+C flute paper type

E flute: It has a thin E flute structure used for consumer goods and gift packaging that do not require strength. Unit is the type of flute with 275-310 flute depth and 1,15-15 mm flute height. The figure for this paper type is given below in the Fig 4.



**Fig. 4.** E flute paper type

## **1.2 Types of Paper**

Fluting: Straw is processed as a semi-chemical and then acquire primary fiber. Fluting paper compose of mixing the primary fiber and 60% of secondary fibers. Fluting papers generally produce as 140-160gr/m<sup>2</sup>. The surface is easily affected by humidity, although the crushing value is high. Straw fluting, paper varieties, the most common use is in Turkey (Onen, 2002).

Test Liner: There are two- or three-ply paper that can be produced as black or white. Nowadays, when recycling is important, the use of test-liner paper has become widespread. Burst values of 2-3.5 kPa are in the range of 125-350 gr / m<sup>2</sup>. Chemical resistance can be increased by using chemical additives (Onen, 2002).

White Test Liner: 125gr/m<sup>2</sup> and 140gr/m<sup>2</sup> is the kind of paper produced (ILKE ambalaj, 2018).

Craft Liner: Craft liner is paper with high strength. Craft's provision in German is "strong". Craft paper is generally produced in countries rich in forests. Original craft liners are imported from abroad in Tukey. Craft liners are usually produced in brown colour. If desired, production can be done in white. However, white paper production increases production costs. The bursting value of this paper is 3.5-5 kPa and the weight is between 125-450 gr/m<sup>2</sup> (Onen, 2002).

For the craft paper price, the price lists issued by RISI are taken as reference (Fastmarkets RISI, 2018).

NSSC: NSSC paper generally use in the production of corrugated board box' waves. NSSC and similar papers are resistant to moisture and heat. These papers can be produced as 85-200 gr / m<sup>2</sup>. Generally, the weights used are 112-127 gr / m<sup>2</sup>. Paper types and weights make up 65% of corrugated cardboard prices.

## **1.3 Producer Price Index**

According to the Turkish Statistical Institute (TURKSTAT, 2018) Domestic Producer Price Index (PPI) that is published every month, package prices are determined on the part of other expenses. Other expenses make up 35% of the price of corrugated cardboard.

## 2. LITERATURE REVIEW

As a result of the literature survey, there was no study on the estimation of the price change in the corrugated carton. In light of this, studies on the determination of stock price pricing, which is a similar issue and aimed at the same purpose, have been examined.

Lewellen (2004), who tries to estimate stock returns with financial percentages, estimates the price / profit ratio and market value / book value, etc. rates and future stock returns by using the regression method. As a result of the assessments made for companies in the New York Stock Exchange between 1946-1972 and 1973-2000, it was stated that the financial ratios and market earnings could be estimated (Lewellen, 2004).

Vasiliou, Eriotis and Papatthasiou (2006) investigated how stock price movements could be estimated in the Athens Stock Exchange in their work. Using the moving average and MACD in the study, data from 1990-2004 were used. According to the study using the t-test and descriptive statistical methods, it has been understood that this analysis can be used in estimating the price movements in buying and selling decisions.

Chin and Hong (2008) attempted to predict future stock returns by using multiple regression analysis, using per-share returns and price / profit ratios for 78 companies on the Malaysian Stock Exchange. In the study conducted, it has been revealed that future earnings per share can be estimated with the gain rate per unit of stock.

Dutta, Bandopadhyay and Sengupta (2012) worked on estimating the stock market performances of the stocks traded on the basis of the financial rate calculations between the 2005-2008 periods of the 30 most active firms in the Indian Stock Exchange. Logistic regression method was used in the study. It has come to the conclusion that the method of logistic regression can be applied to the estimation of stock movements in the stock market.

Olaniyi, Adewole and Jimoh (2011) tried to estimate the future stock quotes of the three banks to the Nigerian Stock Exchange. In this context, the dataset created with daily and weekly closing prices for the years 2007-2008 is defined by the data mining and regression analysis method. Regression analysis results were found to be meaningful in estimating the future price of equities.

## 3. MATERIALS AND METHODS

In this study, between 2016 and 2018 in line with studies using monthly data for the selected variables change direction in corrugated prices in Turkey was estimated.

Multiple regression analysis for Corrugated Cardboard Boxes (CCB) in Turkey was used. Monthly price was used dependent variable, paper types; fluting, test-liner, Craft, NSSC, WTL and PPI were used as independent variables. Monthly average values of the variables in the data taken from TURKSTAT (2018) and Pulp and Paper Price Index (RISI) sources are taken as basis. The study used 24 months data between January 2016 and December 2017 (inclusive). During the study, the values of the independent variables one month ago and the price of the dependent variable were estimated for that month.

For the purpose of estimating the future value of the dependent variable in the study, the values of the independent variables one month before are used. For the solution, regression analysis was applied using SPSS 22.0 Statistical Software Program.

The model was constructed by multiple linear regression method. Multiple regression analysis is commonly used in estimating two or more independent variable and dependent variables associated with dependent variables. It allows the interpretation of the variance annotation, which is dependent on the independent variables, and the interpretation of the relation between the independent variables and the dependent variable (Kamit & Baykan, 2004).

The multiple regression model is as follows:

$$Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \dots + \beta_k X_{ik} + \varepsilon_{ij}$$

Y<sub>i</sub>: Dependent variable,

X<sub>ij</sub>: Independent variable,

β<sub>j</sub>: Regression coefficient,

ε<sub>ij</sub>: Random error value,

k: the number of independent variables (Gunst & Mason, 1980).

#### 4. FINDINGS

In this section, the results obtained by specifying the regression model are included. It was interpreted by specifying with result tables. Table 1 shows the results of the analysis of the regression model.

Table 1. Summary of Analysis

Model	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	Standard Forecast Error
1	0.986	0.972	0.966	0.188

The multiple correlation coefficient between the dependent variable "corrugated board price" and the independent variables is shown by R (see Table 1). When the results are examined, it is seen that this value is 0.986. According to this result, it can be said that the degree of relation between dependent and independent variables is too high.

There is a strong positive correlation between all variables as a result of the correlation analysis between variables ( $0.9 < r \leq 1$ ).

R<sup>2</sup> (the coefficient of determination) describes how much of the change from the dependent variable can be expressed by the independent variable and indicates the success of the predicted model. However, in interpreting the coefficient of determination, the adjusted R<sup>2</sup> (adjusted R square) value should be interpreted (Ersoz & Ersoz, 2018). The R<sup>2</sup> value corrected according to the analysis result was found to be 0,966. According to this result, 97% of the parcels price changes can explain the cost of Kraft, WTL (white testliner) and NSSC. This value also shows that there is a high correlation between dependent and independent variables, and when the corrected R<sup>2</sup> value is taken into consideration, it is seen that the explanation power is 96%.

The standard error measures the distance at which the actual Y values are distributed around the regression surface, as well as providing an understanding of the difference between the predicted values and the actual values. It is seen that the distribution of errors between real and estimated values is normally distributed.

To test whether there is a linear relationship between the dependent variable and the independent variables, the H<sub>0</sub> and H<sub>1</sub> hypotheses are set as follows:

H<sub>0</sub>: There is no linear relationship between the dependent variable (the price of the parcel) and the independent variables (PPE, kraft, WTL (white testliner), NSSC paper prices).

H<sub>1</sub>: There is a linear relationship between dependent variable (parcel price) and independent variables (PPE, kraft, WTL (white testliner), NSSC paper prices).

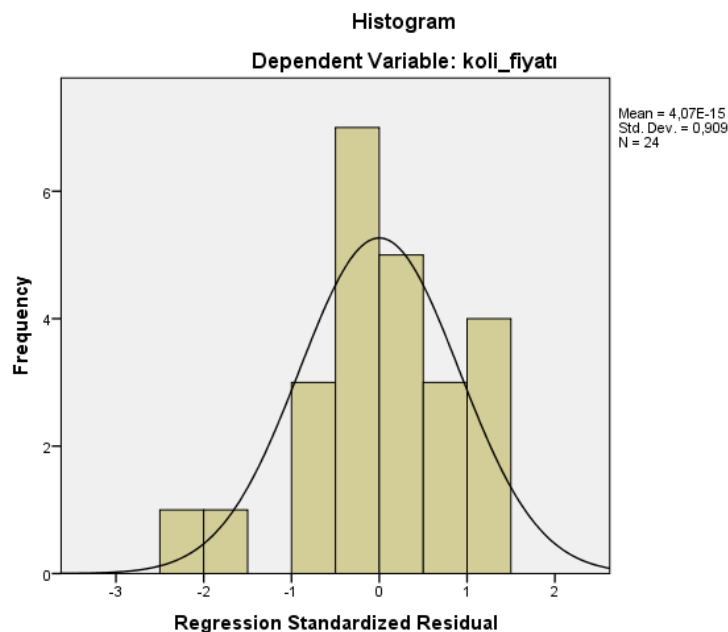


Fig. 5. Regression Residual Histogram

Table 2. Results of Anova

Model	N	SS	Sd	KO	F	Sig.
Regression	24	0.094	4	0.023	166.219	0.00*
Error		0.003	19	0.000		
Total		0.097	23			

\*p<0.05

In ANOVA table, the F-statistic = 166.219 (p-value <0.05), indicating the results of the regression model are satisfactory. The  $H_0$  hypothesis is rejected. According to this result, there is a linear relationship between model independent variables and the price of parcels.

The model found as a result of multiple linear regression analysis is given below.

$$CBP = 0.238 * (Kraft) + 0.035 * (NSSC) + 0.556 * (WTL) + 0.188 * (PPI)$$

Based on the prediction equation obtained from the multiple linear regression Model, Kraft, NSSC, WTL and PPI are found to be important factors influencing corrugated cardboard price.

Considering the partial correlation coefficients in the study, it was understood that the correlation coefficient between WTL (white testliner) and corrugated cardboard price is higher than other independent variables. It has been determined that the most important parameter in the change of corrugated cardboard price is "WTL". According to the result of the study, parcel prices; "Kraft", "NSSC", "WTL" will increase or decrease in direct proportion with the changes in prices on paper types and in PPI. As a result of the regression analysis, the most important variable determining the parcel prices is the WTL paper prices.

## 5. RESULTS

It is crucial that institutional or non-institutional companies can make predictions so that they can make the right decisions and take action quickly in line with the decisions made.

As a result of multiple regression analysis with seven variables affecting corrugated paper price change, it was understood that testliner and fluting papers had no significant effect when the price change ratio was determined. According to results of analysis, WTL paper had the

highest effect with 55%. As a result of this, it can be said that companies can make a saving operation by decreasing the usage of WTL which has the highest rate of change in price change. Costs can be reduced with this project. In addition, the effect of price increase can be reduced by lowering the paper weight used. The price increase can be overcome by using a different paper cassette, which can be an alternative to the price change effect. The new paper that used needs to have the same strength as the previous one.

There was not much work on the corrugated board sector in the literature search. Utilizing statistical analysis methods, studies on corrugated board prices can be diversified.

The increase in predictive academic work related to the paper sector is considered to contribute to the sector.

## ACKNOWLEDGMENT

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# IMPACT OF FOREIGN DIRECT INVESTMENT ON LATVIA'S ECONOMIC GROWTH

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**Abstract.** Economists have developed different FDI theories to explain why investors decide to invest in other countries and what impact these investments have on national economies. FDI provide countries not only with capital but also with innovations and technological advances, higher labour productivity and qualification levels, new jobs and have other positive effects. This, in turn, stimulates the growth of employment rates, consumption and GDP. Research focuses on the investigation of the impact of the FDI on the Latvia's economic growth. On the basis of linear regression results, such factors like employment rate and total funding for research have the greatest impact on economic growth, but incoming FDI is also a statistically significant factor for economic growth. The multifactorial regression model for GDP growth rate forecast was developed. It used three factors that were statistically significant for economic growth – accrual rate, total factor productivity and incoming FDI. It is possible to use this model to demonstrate that favourable investment environment will foster economic growth in Latvia.

**Keywords:** FDI (Foreign Direct Investment), Economic Growth, Multifactorial Regression Model.

**JEL Classification:** E22, E27

## INTRODUCTION

In the case of Latvia, foreign direct investment (FDI) is a significant factor influencing economic growth. The flow of foreign direct investment since 2000 has been changing, but the volume of accumulated foreign direct investment shows that even during the global financial crisis in 2009, foreign investors did not hesitate to withdraw the investments made. More than half of Latvia's 50 largest companies are owned by foreign investors. The aim of the research is to verify if FDI is the most significant factor of economic growth in Latvia.

Latvia has reached significant GDP growth after the global financial crisis, however it is necessary to create appropriate economic environment for stable economic growth. FDI can help to provide such environment. Ability to attract FDI in future may prove to be one of the most important factors for Latvia to continue to show high rates of economic growth. This is also mentioned in the dissertation of senior supervisor of the European Central Bank D. Titarenko "Investments as a growth factor of Latvian economy". He pointed out that effective attraction of investment in the national economy is a decisive factor, which creates favourable conditions for overcoming economic crisis, for structural changes in the economy, for promotion of regional development and technical progress, which in turn provide the basis for stable economic growth (Titarenko, 2008).

FDI is the subject of the research. The authors of the article have summarized definitions of FDI to understand the concept of FDI. Here are some examples of those definitions. In the definition given by International Monetary Fund (IMF) "FDI arises when an investor resident in one economy makes an investment that gives control or a significant degree of influence on the management of an enterprise that is resident in another economy" (Taw, 2015). The Organisation for Economic Co-operation and Development (OECD) gives a similar FDI

definition: “FDI is the category of international investment that reflects the objective of a resident entity in one economy to obtain a lasting interest in an enterprise resident in another economy” (OECD, 2018). United Nations also reflects on the definition given by IMF and points out that “FDI refers to an investment made to acquire lasting interest in enterprises operating outside of the economy of the investor. Further, in cases of FDI, the investor’s purpose is to gain an effective voice in the management of the enterprise” (UNCTAD, 2018). According to the definition given in the Oxford Dictionary of Economics, FDI is explained as the acquisition of assets by resident abroad. This can be done by investing money abroad; by land purchase; by building houses, mines or machinery; by purchasing already existing foreign companies (Black, Nashimzade & Myles, 2009). The basic idea is the same in all four given definitions, but there are slight differences in formulation.

FDI is beneficial to both investors and countries in which they invest. However, it is recognized that countries receiving FDI can also suffer losses (Dorton & Blink, 2012).

## 1. METHODS AND PROCEDURES

The literature overview was done to find out what is already discovered in the field of evaluation of FDI impact on the economic growth of the country. In this case the main research methods were critical and systematic literature review combined with umbrella review of literature. Authors used such scientific research methods as analysis, synthesis, deduction; and the research period for literature review was 1980-2017 (except one work of representative of classical school of economics Malthus, whose essay was published in 1798). The main outcomes of the literature review will be described in the first part of this article. The literature review helped to find out the research problem and to formulate the hypothesis of the research.

Mathematical methods of statistics were used to evaluate FDI impact on economic growth in Latvia. They included calculation of indicators, regression, data analysis, comparison and grouping. The research period for analysis of statistical data and development of regression model was 2000-2016.

### *1.1 Outcomes of the literature overview - main aspects of FDI impact on economic growth*

The attraction of FDI can contribute to economic growth through various aspects. They are as follows:

- External financial resources and investments

Professor K.A. Froot from Harvard University’s Graduate School of Business Administration has stated that FDI is more stable than other types of financial flows. It is easier to serve FDI than commercial loans, because the profit is related to the business activities and the business cycles of the country. Part of the FDI flows, however, has short-term motives that have similar trends as speculative portfolio investments (Froot, 2008);

- Employment and labour force qualification

R.E. Baldwin, Professor of the University of Wisconsin-Madison, wrote that new FDI creates new jobs, while R&D investments transfer the responsibility for existing employees from one business owner to another, who in some cases dismisses employees and forms a new corporate team. There are three reasons for dismissal: improving efficiency, getting rid of excessive capacity, rationalization and avoiding of duplication. However, the opposite effect or increased employment may also occur. This occurs in cases when restructuring and integration have been successful. The level of employment also depends on the motivation of the investor and the specifics of the sector (Baldwin, 1995). FDI also has qualitative effects on employment (salary level, job safety and conditions). Foreign branches of the company usually pay higher salaries than local businesses. The greatest difference is found in sectors requiring a higher level

of skills, a higher level of technology and marketing, as well as in export-oriented companies that need to ensure consistent quality and delivery on time;

- Export competitiveness and trade

Jose de Gregorio, a Chilean economist and ex-governor of the Central Bank of Chile, pointed out that FDI can be an effective way to provide a country with missing resources, such as capital, financing for labour force training, technology, etc. It allows countries to use their advantages such as cheap labour force or a large amount of natural resources more effectively. FDI cannot provide long-term export growth, because wages increase over time, therefore it is necessary to develop skill-based and technology-based exports. FDI can stimulate the improvement of the labour force skills, but it cannot influence the education system in the country. Therefore, the government policy must be sustainable and it should be able to continue FDI-stimulated export growth. In countries with a high level of education and capable workforce FDI can create new comparative advantages (Graham, 2005);

- Technological development

K. Saagi, Professor of Economics in Vanderbilt University, stated that countries prefer FDI because the knowledge and skills how technology is applicable comes with these investments. The attraction of FDI can be the best solution when improving access to export markets and different types of cooperation with foreign companies. This is important for countries lacking the ability to upgrade the technologies they have acquired through licensing. Taking into account the above factors, FDI can serve as a cheaper long-term method for obtaining technology (Saagi, 2000);

- Market structure and competition

S. D. Cohen, Professor of International Relations at the American University's School of International Service in Washington, wrote that FDI can multiply the number of companies on the market, thereby increasing the level of concentration, but it can also lead to the squeeze out less competitive companies from the market. FDI makes the industry more efficient and competitive, but it depends on the openness of the market, the intensity of local competition, the behaviour of the largest companies on the market and technological development. In developed countries FDI is associated with reduced concentrations, while in developing countries – with increased concentrations. It is because of the lack of strong enterprises in developing countries (Cohen, 2007).

FDI has been viewed as an important factor of economic growth in the economic literature only in the last five decades, so FDI theories are relatively new. The most important are the following:

- Theories in conditions of perfect competition, for example MacDougall model of the movement of capital between two countries A and B, and other models (Cohen, 2007; Otsubo, 2016; Vyuptakesh, 2011; Dunning, 1970);
- The theory of industrial organization approach (Rugman, 1996; Bento, 2009; Froot, 1993; Mehdi, 2012; Nayak & Choudhury, 2014);
- The monopolistic theory of FDI (Torben, 2010; Kusluvan, 1998);
- The internalization theory of FDI (Denisia, 2010; Shenkar, 2007; Castro, 2000);
- The oligopolistic theory of FDI (Moran, 1998; Musonera, 2008; Letto-Gillies, 1996);
- The eclectic paradigm theory of FDI (Gray, 2003; Hwy-Chang, 2015; Stoian & Filippaios, 2008);
- The currency rate theory of FDI (Dunning & Lundan, 2008);
- The international trade theory of FDI (Zhang, 2008; Schumacher, 2012; Baldwin, 2008; De Jonge & Tomasic, 2017; Dyker, 2016; Moosa, 2002).

From the analysis of the theories mentioned above the authors of the article made conclusion, that scientists have paid attention to FDI as a factor of economic growth from different perspectives. FDI theories explain why FDI is going to specific countries and what are



the main benefits for investors and the receiving countries. The hypothesis of the research was formulated – FDI is the most important factor influencing Latvia's economic growth.

However, FDI is not the only factor influencing economic growth. To prove the hypothesis, it is necessary to determine the other factors which have impact on the economic growth. Therefore, several economic growth theories and certain key factors influencing the economic growth were analysed. The most important economic growth theories, which were analysed, are:

- Classical school of economics

Scottish economist and philosopher A. Smith believed, that the main determinants of economic growth are population growth, labour force growth, technological progress, institutional system of the country's economy and investments. According to him these factors influence each other, so it is not possible to highlight one most important factor of economic growth, but investment plays an important role (Eltis, 2016). British economist D. Ricardo, unlike a number of representatives of the classical economic school, did not consider that all the investments were profitable. Ricardo in his theory explained that the richer is the country, the less are investment opportunities. This idea is in contrast to the idea of the representative of the Austrian School of Economics Joseph Schumpeter, who said, that the more developed is the country, the more opportunities they have for entrepreneurship and investment (Ekelund & Hebert, 2014). The most important idea of English economist R. Malthus was that increase in population will lead to destruction, because the volume of food production is increasing arithmetically, while the number of people - in geometric progression (Malthus, 1798). At the end of the 20th century and in the 21st century the population growth rate is decreasing, therefore modern scientists have changed this Malthus's idea about upcoming catastrophe to the direction where economic growth must be linked to efficient consumption and sustainable environmental investments (Arrow *et al.*, 2010);

- Keynesian economics

The key idea of Keynesian economics is that the state, through monetary and fiscal policies, is able to stabilize the fluctuations of business cycles and thereby also contribute to economic growth (Jahan, Mahmud & Papageorgiou, 2014). One more important aspect of Keynes's theory of growth is that spending has multiple impact on income. It is a multiplier effect (Ekelund & Hebert, 2014). One of the best-known models of Keynesian economics is the Harrod-Domar model of economic growth, in which investments play an important role (Van den Berg, 2013);

- Neoclassical school of economics

In 1956 the USA economist R. Solow and Australian economist T. Swan independently created one of the best-known models - the Solow-Swan model of economic growth. Concept of productivity growth was added to the Harrod-Domar model. The core idea of the Solow-Swan's theory is that continuous economic growth can be achieved only through technological progress, not through investment, accrual rate or other factors (Acemoglu, 2008);

- Endogenous growth theory

The founder of Endogenous growth theory is American economist P. Romer. This theory is based on the idea that economic growth is influenced by internal rather than external factors, as it was in the case of Solow-Swan and Harrod-Domar models. Endogenous growth theory shows that investing in human capital, innovation and knowledge creation is the most important factor of economic growth (Romer, 1994). In 1965 Japanese scientist H. Uzawa contributed to the development of endogenous theory by studying the relationship between economic growth and human capital (Hettich, 2000). Portuguese economist M. Sidrauski published a study on the impact of money on long-term growth in 1967 (Sidrauski, 2018).

From the analysis of the well-known theories it is possible to conclude that investments are mentioned as one of the most important factors in economic growth in all models, but other factors are also important. Representatives of the classical school of economics believed that one of the factors of economic growth was the workforce. There are two important drivers of

economic growth - capital productivity and accrual rate in Harrod-Domar model. Technological development is mentioned as the most important driver of growth in the Solow-Swan model. Representatives from the endogenous growth theory believed that growth was stimulated by endogenous or internal factors. In the framework of this theory, for example, funding for research could be seen as a factor affecting economic growth. So it would be necessary to find out whether the hypothesis formulated in the study will be confirmed and investment will be the most important factor contributing to economic growth.

### 1.2 Outcomes of the data analysis – evaluation of FDI importance in economic growth of Latvia

A simple regression analysis is performed to compare different factors that influence economic growth. It is evaluated whether the selected factors influence economic growth (GDP growth). The indicators characterising these factors are selected based on the economic growth theories described above. Each of these theories offers several factors influencing growth, including investments. One factor from each theory (except GDP, because factors are compared with GDP) and FDI are chosen for this comparison.

Indicators characterising selected factors and results of regression analysis are summarized in Table 1.

Table 1. Indicators and results of regression analysis (dependent variable is GDP chain-linked, reference year 2010)

Indicator	Economic growth theory	Prob (t)	t-statistic	R <sup>2</sup>
NODARB_LIM Employment rate	Classical school of economics	0,0000	8,339	0,8226
UZKR_NORMA Accrual rate	Keynesian economics	0,3683	0,928	0,0543
FAKT_PROD Total Factor Productivity	Neoclassical school of economics	0,0495	2,137	0,2334
FIN_PETN R&D Funding	Endogenous growth theory	0,0000	7,445	0,7870
IEN_ATI Foreign Direct Investment	All theories	0,0200	2,602	0,3110

Note: 17 observations were included in the data analysis. Prob (t) value has to be <0,05. T critical = 2,120. R<sup>2</sup> value has to be closer to 1.

From the simple regression analysis it can be concluded that among the five factors affecting the economic growth in Latvia in the period from 2000 to 2016, employment rate, total factor productivity, total funding for R&D and incoming FDI are statistically significant. Authors of the article accepted employment rate as the most important factor influencing Latvia's growth, because it explains most of the GDP fluctuations.

## 2. RESULTS OF THE RESEARCH

Based on five factors affecting economic growth discussed above, a multi-factor regression model for forecasting GDP growth rate was developed. The model also explains whether FDI is one of the most important factors influencing economic growth. GDP growth rate (IKP\_PIEAUG) is dependent variable in this model. Figure 1 shows the results of multi-factor regression model.

Dependent Variable: IKP\_PIEAUG  
Method: Least Squares  
Date: 05/08/18 Time: 13:19  
Sample: 2000 2016  
Included observations: 17

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.003878	12.76113	-0.078667	0.9387
NODARB_LIM	0.326249	0.201031	1.622878	0.1329
UZKR_NORMA	-0.735202	0.300545	-2.446232	0.0325
FAKT_PROD	0.822233	0.178591	4.603997	0.0008
FIN_PETN	-0.030993	0.019960	-1.552764	0.1488
IEN_ATI	0.004363	0.001694	2.576193	0.0258

R-squared	0.911955	Mean dependent var	3.896471
Adjusted R-squared	0.871935	S.D. dependent var	6.492873
S.E. of regression	2.323555	Akaike info criterion	4.794638
Sum squared resid	59.38797	Schwarz criterion	5.088713
Log likelihood	-34.75442	Hannan-Quinn criter.	4.823869
F-statistic	22.78722	Durbin-Watson stat	2.382983
Prob(F-statistic)	0.000018		

Fig. 1. Results of multi-factor regression model.

According to p-value indicators, two out of five factors proved to be statistically insignificant. These are the employment rate (p-value 0,1329) and the total funding for research (p-value 0,1488), which exceeds the significance level of 0,05. Consequently, these two factors were excluded from the model and a new regression equation was created with the remaining three factors: accrual rate, total factor productivity and incoming FDI (see Fig.2).

Dependent Variable: IKP\_PIEAUG  
Method: Least Squares  
Date: 05/05/18 Time: 21:42  
Sample: 2000 2016  
Included observations: 17

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	15.90287	7.431675	2.139877	0.0519
UZKR_NORMA	-0.807741	0.314305	-2.569927	0.0233
FAKT_PROD	0.846430	0.164964	5.131003	0.0002
IEN_ATI	0.004164	0.001303	3.194601	0.0070

R-squared	0.883138	Mean dependent var	3.896471
Adjusted R-squared	0.856169	S.D. dependent var	6.492873
S.E. of regression	2.462424	Akaike info criterion	4.842494
Sum squared resid	78.82590	Schwarz criterion	5.038544
Log likelihood	-37.16120	Hannan-Quinn criter.	4.861981
F-statistic	32.74728	Durbin-Watson stat	1.993195
Prob(F-statistic)	0.000003		

Fig. 2. Results of the improved multi-factor regression model.

In Figure 3 it is possible to see that all three factors influencing economic growth are statistically significant: accrual rate (p-value 0,023), total factor productivity (p-value 0,0002) and incoming FDI (0,007), because p-values are less than 0,05. The model is also statistically significant with a p-value of 0,000 and F-value 32,747. The result of Durbin-Watson test is 1,993. It is close to 2, so it can be concluded that there is no auto-correlation problem. The Histogram-Normality test indicates that the residual values are normally distributed, because p-value is 0,961. There is no homoscedasticity problem, because p-value is 0,785. The R2 is 0,8831, it means that this model explains 88,31% of GDP growth rate fluctuations. In the result the following regression equation was developed:

$$IKP\_PIEAUG = 15,903 - 0,808 UZKR\_NORMA + 0,846 FAKT\_PROD + 0,004 IEN\_ATI, \quad (1)$$

where

*IKP\_PIEAUG* GDP annual growth (%);

*UZKR\_NORMA* Accrual Rate (%);

*FAKT\_PROD* Total Factor Productivity (%);

*IEN\_ATI* Incoming FDI (billions EUR).

Analysing the Formula 1 it can be concluded that in the case when the accrual rate increases by 1% and other factors remain unchanged, GDP growth rate decreases by 0,81%. If the total factor productivity increases by 1% and other factors remain unchanged, GDP growth rate increases by 0,85%. However, if the incoming FDI increases by one million euros and other factors remain unchanged, the GDP growth rate increases by 0,004%.

Future forecasting of the GDP growth rate requires the future values of the three factors influencing economic growth. The future values were obtained by the linear interpolation method for the next three periods (2018-2020). Based on the obtained results, a multi-factor regression model was developed. It provides a forecast of GDP growth rates for 2018-2020.

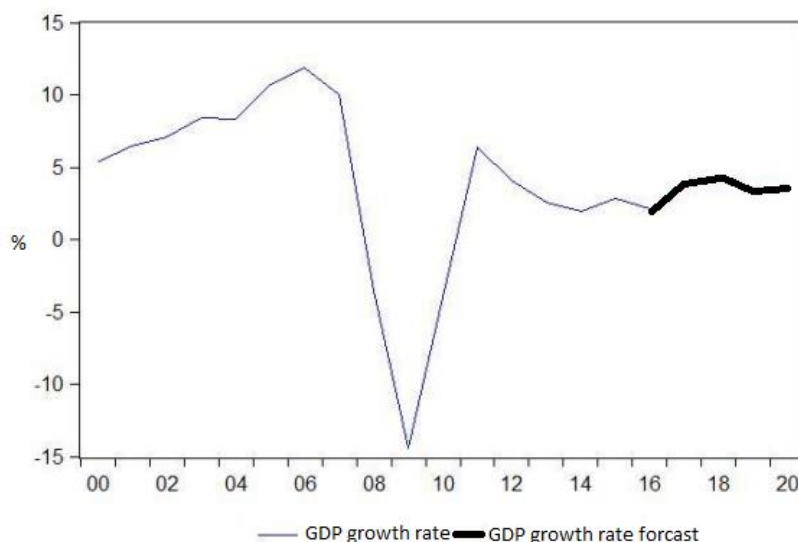


Fig. 3. GDP growth rate forecast for 2018-2020

In Figure 3 it is possible to see the dynamics of GDP growth since 2000. Latvia's GDP growth rate rapidly increased till 2007, even exceeding the 10%. As a result of the financial crisis, the GDP growth rate in Latvia experienced a sharp decline, but already in 2011, economic growth has come back. Since 2012, the indicator has been in the range of 2-4%. The development of the regression model is based on data from 2000 to 2016. According to the model, the calculated GDP growth rate in 2017 is 3,9%, which is 0,6% lower than the actual one, because according to official statistics, Latvia's GDP in 2017 increased by 4,5% compared to 2016 (CSB, 2018)

The GDP growth forecast in 2018 will be 4,2%, while in 2019 and 2020 it will be 3,4% and 3,5%, respectively. Comparing this forecast with forecasts from other researches, it can be concluded that the forecast of the GDP growth rate using the developed regression model is reliable. For example, a study by the Scandinavian "SEB" banking group initially estimated GDP growth rate of 3,7% in 2018, after re-launching the study, at 4,1%. This differs only by 0.1% from that forecasted by the model. The same researchers forecasted 3,7% GDP growth in 2019. It is 0,3% more optimistic than the one proposed in the model (SEB, 2018). According to the European Commission's forecasts Latvia is projected to have a GDP growth rate of 3,3% in 2018, which is 0,8% more pessimistic, while in 2019 it is forecasted to reach 3,3%, which is 0,1% more than forecasted in the model (European Commission, 2018).

Consequently, it can be concluded that the forecasts obtained under the regression model are reliable. In order to create a more successful model for predicting GDP, it is necessary to add other statistically significant factors influencing economic growth and cover a wider period of research.

## CONCLUSIONS

Investments play an important role in the analysed theories of economic growth, however, theories developed in different time have pointed out various factors contributing to economic growth.

On the basis of linear regression results we can conclude, that employment rate and total funding for research have the greatest impact on the economic growth, but also incoming FDI is a statistically significant factor for economic growth.

The hypothesis is not proved, because the results obtained in the simple linear regression show the employment rate as the most important of the five factors affecting the economic growth. In the case of Latvia, both of the regression analyses carried out show that FDI is a statistically significant factor of economic growth.

However, despite the fact that FDI is considered as a factor contributing to economic growth, there are theories that said that foreign direct investment also has a negative impact on the development of the country. The question about the negative aspects of incoming FDI and how to balance the benefits and losses of incoming FDI in the country should be discussed in the future researches.

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## DETERMINANTS OF EMPLOYMENT IN BULGARIA

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**Abstract.** The goal of the current research is to study the relation between employment and some of its main determinants in Bulgaria. On the basis of theoretical concept explaining the state of labour market as well as a review of related literature, the authors have defined some determinants of employment: gross fixed capital formation and average annual wage of employed. With these factors variables regression models are specified in which dependent variable is the number of employed persons. The regression models are based on time series for Bulgaria for the period 2000-2016. The source of time series is the National Statistical Institute (NSI).

**Keywords:** *Employment, Regression Models, Gross Capital Formation, Labour, Average Annual Wage.*

**JEL Classification:** D4, D6, E1, E6, H3, H4

### INTRODUCTION

The average level of employment in Bulgaria during 2016 for age group 20-64 is 67.7% and it is below the goal level of 75% indicated in the Europe 2020 strategy. This is difficult to reach due to some negative findings on the Bulgarian labour market: the existence of structural unemployment with components of age and regional unemployment; low activity on the labour market – approximately 870 thousand people neither study nor work, among them there are about 300 thousand young people; the youth unemployment rate is increasing: due to this Bulgaria ranks second after Spain in the European Union in this negative indicator; the skilled labour force concentrated in ten district cities; the inadequacy of a large part of higher and secondary education regarding labour market needs; the demographic crisis and depopulation of some regions of the country; the widening of the differences between the employment level in different regions of the country (Kolev, 2018; Ministry of Labor and Social Policy, 2017; NSI, 2018). The above problems are incompatible with the priorities of the Europe 2020 Strategy (Ministry of Labour and Social Policy, 2017) and set the current paper's purpose: to study the relation between employment and some of its main determinants in Bulgaria.

### 1. THEORETICAL CONCEPTS RELATED WITH LABOUR MARKET

There are different concepts explaining the state of labour market. The current paper presents in brief the Neoclassical and the Keynesian concepts. On the basis of these theories employment determinants are pointed out.

According to the neoclassical concept, the labour market imbalance is explained with the level of real wage. When it is higher than the remuneration established on the labor market, the employment is decreasing. On the contrary, when it is lower the employment is increasing. The proponents of neoclassical theory think that unemployment can be surmounted by means of flexible wages, which are changed in correspondence with the situation on the labour market. As the cause for unemployment is the wage that exceeds the equilibrium wage, which is



established by supply and demand of labour, the first one should be reduced. According to the neoclassical concept, the barriers hindering the functioning of the market mechanism are: syndicates which are demanding higher payment of labour; compensations for unemployment; the minimum wage defined by the decree of the Council of Ministers etc. (Spasov, 2008; Tsoklinova, 2016; 2017).

According to J. Keynes (2016) insufficient effective demand is the main cause for unemployment. When demand is scanty, the capital owners are reluctant to invest and to create new jobs. So in a situation of depressed and pessimistic expectations of entrepreneurs, the changes in interest rates do not affect investment decisions and opportunities for economic development should be sought from the state in the form of intervention which, through monetary and fiscal policy, should stimulate effective demand. Thus the modern employment policy is connected with the Keynesian concept of efficient demand management. By means of macroeconomic stimulation an increase in effective demand is generated, which on its turn increases investment, output and employment (Spasov, 2008). According to Keynesian theory the equilibrium on the labour market is achieved in the presence of unemployment. That is so because the equilibrium is not related to labour supply and demand curves, but to the availability of such quantity of labour that is in correspondence with the aggregate effective demand (Spasov, 2008).

The theory of J. Keynes was successfully practiced in the years of the Great Depression under the governance of F.D. Roosevelt as well as during the 1950s and 1960s by the government of leading Western economies. During the 1970s the influence of the Keynesian economic theory diminished. It was revived with the World Economic Crisis in 2007, when the Keynesian concept was accepted as basis of the economic politics of the US president B. Obama and the British prime minister G. Brown. It should be mentioned that in developing economies the implementation of Keynesian ideas in most of the cases do not generate positive results (Dasgupta, 1954). In this connection J. Schumpeter (1947) expressed himself metaphorically: "The Keynesian concept is a sapling that cannot be planted in a foreign soil; there it becomes poisonous and dies. But if it is planted in English soil the sapling gives fruit and shade".

Here it should be noted that closely related with the concept of J. Keynes on the state's intervention undertaken to overcome economic crises is R. Kahn's theory of employment multiplier, which was later developed. According to R. Kahn, with increased domestic investment made by the state the primary employment is raising. As a result, the incomes and purchasing power of economic subjects are increasing. They generate secondary, tertiary and quaternary employment. In this way through state investment the primary employment is created, which is multiplied and leads to an increase in total employment (Mirkovich, 2001).

## 2. DATA

On the basis of the theoretical concepts presented above two main determinants of employment ( $NE_t$ ) are identified: annual average wage of employed persons ( $WE_t$ ) and gross fixed capital formation ( $GC_t$ ). The regression models based on time series for these three variables for Bulgaria for the period 2000-2016 (see Table 1). The source of time series is the National Statistical Institute (NSI).

The essence of the variables in the linear regression models is presented below:

*The Number of Employed Persons* ( $NE_t$ ). In this paper the number of employed persons is dependent variable.

*The lower annual wage level* ( $WE_t$ ) reduces the total production costs and increases the competitiveness of companies on the market. Due to this and according to the neoclassical economic theory the cheaper labour should stimulate the increase of employment.

Table 1. Determinants of Employment in Bulgaria during the Period 2000-2016 (NSI, 2018)

Years	Number of Employed Persons (NE <sub>t</sub> )	WE <sub>t</sub> , BGN*	GC <sub>t</sub> , billion BGN
2000	3239195	2694	7.4594
2001	3214740	2880	8.9387
2002	3222119	3091	9.6660
2003	3317390	3280	10.9083
2004	3403395	3509	12.4122
2005	3495268	3885	15.7304
2006	3612042	4324	17.7676
2007	3726742	5167	20.0873
2008	3814647	6538	24.4997
2009	3749295	7309	20.1699
2010	3603885	7777	16.6063
2011	3524552	8230	15.8707
2012	3436393	8773	16.1576
2013	3421577	9301	16.2030
2014	3434165	9860	16.7573
2015	3446214	10535	17.2032
2016	3463347	11379	16.0610

\* BGN (Bulgarian lev). Source: NSI

*Gross fixed capital formation (GC<sub>t</sub>)*. According to the Keynesian concept of employment and unemployment, the investment is one of the main factors contributing to employment growth (Keynes, 2016; Mirkovich, 2001). In this paper gross fixed capital formation is used as an indicator for the amount of investments made in the national economy. According to the methodology of the NSI, the indicator includes the costs for acquiring the following types of long-term non-financial assets: buildings, equipments, vehicles, productive and working animals, software products etc. In other words, these are investments in assets that are used in production for more than one year (NSI, 2018).

### 3. EMPIRICAL RESULTS AND DISCUSSION

In the current paper, the relation between employment and its two main determinants, which are defined on the basis of the Neoclassical and the Keynesian concepts, is studied through specification of two regression models with dependent variable – the number of employed persons (NE<sub>t</sub>). In the first model the factor variables are gross fixed capital formation (GC<sub>t</sub>) and annual wage of employed persons (WE<sub>t</sub>). It is logical to suppose that the investments from the previous period have influence on the number of employed persons during the current period. Due to this, in the second model the factor variables are gross fixed capital formation for the previous year (GC<sub>t-1</sub>) and annual wage of employed persons (WE<sub>t</sub>). The statistical package, by means of which the calculations are made, is EViews 9.5 Students Version. The parameters of two models are presented in formula (1) and formula (2).

$$\begin{aligned}
 \hat{NE}_t &= 2899111 + 43708.19GC_t - 15.048WE_t \\
 se &= (48829) \quad (3570.082) \quad (5.274) \quad r^2 = 0.922 \\
 t &= (59.3727) \quad (12,2429) \quad (2.85325) \quad df = 14
 \end{aligned}
 \tag{1}$$

$$\begin{aligned}
 \widehat{NE}_t &= 2860118 + 47035.50GC_{t-1} - 16.703WE_t \\
 se &= (56412.46) \quad (4105.558) \quad (6.019) \quad r^2 = 0.925 \\
 t &= (50.70011) \quad (11,4565) \quad (2.7748) \quad df = 13
 \end{aligned} \tag{2}$$

The check for autocorrelation in the current article is done by means of coefficient of autocorrelation (Stoenchev, 2013; Velichkova, 1981):

$$r_{u_t, u_{t-1}} = \frac{\sum_{t=2}^N u_t u_{t-1}}{\sum_{t=1}^N u_t^2} \tag{3}$$

$u_t$  – the residual elements around the regression line.

The calculated through formula (3) coefficients of autocorrelation from first order for the first and second regression models are respectively 0.233 and 0.202. They are checked for statistical significance by means of R. Anderson's tables at  $\alpha = 0.05$ . The verification demands comparison of empirical values with theoretical ones from R. Anderson's tables. Since the theoretical factor is 0.299 and is higher than the empirical coefficients, it can be concluded that there is no autocorrelation of the remaining elements of the regression line in both models. From formula (1) and formula (2) the regression coefficients empirical t-criterions might be seen. Theoretical value from Student's t-distribution for the first model at  $\alpha = 0.05$  and 14 degrees of freedom (df) is 1.761, and for the second model at  $\alpha = 0.05$  and 13 degrees of freedom is 1.771. As the empirical t-criterions are bigger than the theoretical ones an alternative hypothesis is accepted which states that the regression coefficients are statistically significant. The overall significance of the models is verified through F-test. Regarding the first model at level of significance  $\alpha = 0.05$  and degrees of freedom 2 and 14 the theoretical value ( $F_t$ ) is 3.68 that is smaller than empirical value ( $F_{emp}$ ) which amounts to 83.891. When  $F_t < F_{emp}$  the alternative hypothesis is accepted, i.e. the first regression model is statistically significant. Concerning the second model at level of significance  $\alpha = 0.05$  and degrees of freedom 2 and 13 the theoretical value ( $F_t$ ) is 3.81 that is smaller than the empirical one ( $F_{emp}$ ) which amounts to 74.783, i.e. the second regression model is statistically significant.

On the basis of the first regression model we may sum up that an increase in  $GC_t$  with 1 billion BGN and elimination of the impact of  $WE_t$  cause an increase in  $NE_t$  on average with 43 708 employed persons. At the same time an increase in  $WE_t$  with 1 BGN and elimination of the impact of  $GC_t$  cause a decrease in  $NE_t$  on average with 15 employed persons. Regarding the second model it should be highlighted that an increase in investment for the previous year ( $GC_{t-1}$ ) with 1 billion BGN and elimination of the impact of  $WE_t$  cause an increase in  $NE_t$  on average with 47 035 employed persons, which is with 3327 employed persons more than in the first regression model. Concerning the impact of  $WE_t$  in the second regression model should be underlined that an increase in  $WE_t$  with 1 BGN and elimination of the impact of  $GC_{t-1}$  cause a decrease in  $NE_t$  on average with 16 employed persons, which is nearly the same influence on employment as in the first regression model.

The results presented above are not surprising. The established impact of the annual average wage of an employed person ( $WE_t$ ) and gross fixed capital formation ( $GC_t$ ) on employment verified respectively the neoclassical concept for negative relation between labour costs and employment and the Keynesian concept for positive relation between investment and employment. The neoclassical thesis is proven also in the researches of Döpke (2001) and Suedekum and Blien (2004). In Bulgaria similar research was done by the Institute of Market Economy (2015). The working team established that an increase in the minimum wage with 100 BGN leads to a decrease in the employment rate among the persons with lower education

with 1.4 percent points. At the same time the positive relation between investment and employment has been studied by Bayraktar (2003), Ekpo (2016), Karim and Yin (2015), Escudero *et al.* (2015) and Psaltopolus, Skuras and Thomson (2011). The studies of last two research teams are interesting and concern the employment in Europe. Escudero *et al.* (2015) work out two scenarios on the basis of which they estimate the influence of investments on employment in the European Union. In the first scenario the investments are distributed proportionally between the member countries according to their gross domestic product (GDP) and in the second scenario according to their level of employment. Through econometric models the authors prove that better results concerning employment are achieved in the second scenario. Psaltopolus, Skuras and Thomson (2011) investigated the influence of investment on employment in less developed regions of South Europe. They established that the effect of investment on employment in different economic sectors of regional economies is different.

## CONCLUSIONS

The results from the research give grounds for the statement that the neoclassical and Keynesian ideas about the employment in Bulgaria are valid. Due to this, the government, syndicates and all institutions on labour market should be very careful about their decision in respect to employers' costs for labour defined by means of laws and decrees as minimum wages, social security incomes, health contributions, compensations for unemployment etc.. At the same time, the state intervention through monetary and fiscal policy would generate an increase in effective demand which on its turn would increase investment, output and employment.

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## SURVEY OF GREEN INFRASTRUCTURE MANAGEMENT EXPERIENCE IN DIFFERENT COUNTRIES

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**Abstract.** Increasingly, the Green Infrastructure concept is given as an example of a sustainable approach to urban and suburban management that offers a smart, integrated way of managing natural capital. Investing in green infrastructure gives economic sense, providing environmental, economic and social benefits to society. This in turn facilitates adaptation to the changing climate and prevents the accompanying anomalies, floods and other environmental crashes. Linking the already fragmented natural and semi-natural territories, restoring damaged habitats is one of the main priorities, as this leads to an increase and improvement of the goods and services provided. The most serious challenge is linking the different land use activities such as construction, agriculture, transport and biodiversity. This requires the implementation of flexible and dynamic solutions that are sustainable, profitable and responsive to the needs of society. The experience gained and the results achieved by implemented projects and initiatives provide information on practices in green infrastructure management in different countries. This article focuses on experience in managing green infrastructure in other countries according to the landscape approach. The wide variety of projects offers different forms of planning and management from their creation to project level, through implementation to follow-up monitoring. Main goal of the study – research of European experience and the experience of the US in setting up green infrastructure (GI). This study should justify the need to invest in more GI sites in Bulgaria. The task of the report is to present good examples in which sites with high ecological and economic value are created by landscape planning impacts. Method of research – analysis and comparison by exploring the sources of information relating to the building and management of green infrastructure, and in particular, study of good examples of successful green infrastructure investment.

**Keywords:** *Experience, Green Infrastructure, Management*

**JEL Classification:** O18, O21

### INTRODUCTION

With the development of the concept of sustainable development another idea – “green infrastructure” started developing. Its main objective is to achieve a harmonious balance between protecting biodiversity and creating an environment for sustainable development of society. The term GI was first used in the 1990s in the United States to focus attention on preserving and restoring natural resources, maintaining a vital network of natural systems, recognizing their importance in planning the future of mankind (Mihova, Tsoleva, 2009). Since its inception, at the world level, many projects and initiatives have been realized. Each of them provides valuable information about the problems, the approaches aimed at their solution and the achieved goals and results.

This article focuses on experience in managing green infrastructure in other countries according to the landscape approach. The wide variety of projects offers different forms of planning and management from their creation to project level, through implementation to follow-up monitoring. This valuable experience gained from the emergence of this concept up

to nowadays provides important insight into the planning and creation of new green infrastructure sites.

Main goal of the study – research of European experience and the experience of the US in setting up green infrastructure. This study should justify the need to invest in more GI sites in Bulgaria.

The task of the research is to present good examples in which sites with high ecological and economic value are created by landscape planning impacts.

Method of research – analysis and comparison by exploring the sources of information relating to the building and management of green infrastructure, and in particular study of good examples of successful green infrastructure investment.

Methods for collecting the necessary information include:

- study of realized green infrastructure projects in USA and Europe;
- analysis of documents;
- use of the best practices for specific investment proposals in building green infrastructure objects in Bulgaria.

## 1. EXPOSITION

Addressing the challenges posed by climate change, environmental degradation and natural resource depletion is a world-class challenge. As a consequence, each country takes measures by developing its own strategies and policies that are consistent with the goals of the “Sustainable Development” concept. Within the framework of the developed documents, green infrastructure is set as a tool for particular goal achievement. The realization of such projects is already happening and is benefitting society. Their variety and scope is really huge. In order to examine the experience of other countries with regard to the management of environmentally friendly infrastructure, it is necessary to pay attention to the components that make up the infrastructure. This has a bearing on the strategies and policies developed around the world, which are quite varied, and the projects often developed cover several of them and indirectly contribute to others. For the sake of greater precision, the study is geared to spatial planning.

In a published edition of the European Commission (EU, 2010) the potential components of green infrastructure are:

- protected areas such as Natura 2000 sites, i.e. healthy ecosystems and high nature value areas that are outside protected areas such as floodplains, wetlands, coastal areas, natural forests, etc.;
- elements of the natural landscape such as small watercourses, groves, hedges, which can serve as ecological corridors or wildlife stories;
- restored parts of habitats that are associated with certain species;
- artificial elements such as eco-ducts or eco-bridges, the function of which is to facilitate the safe movement of species in areas where the areas are fragmented;
- multifunctional zones where several functions are combined in one territory. For example, land use, which combines maintaining or restoring healthy ecosystems with other activities such as recreation;
- areas where measures have been implemented to improve overall ecological quality and landscape permeability;
- urban elements such as green parks, green walls and green roofs that preserve and enhance biodiversity, support the functioning of ecosystems and link urban and outlying areas;
- adapting to climate change and reducing its impact, conservation or restoration of existing marshes, forests in floodplains and bogs that naturally protect against flooding, retain and slowly take water into the river bed or absorb the harmful emissions, etc., thus allows species to adapt to change in the environment.

The management of green infrastructure in different countries is based on the accepted principles and tasks of the sustainable development concept. The goals set are ambitious and each country determines how they can be embedded in their strategies and policies. As a continuation of the developed documents, plans are being prepared for GI development. They exist in many forms, creating a flexible data-driven development model, a digital national framework, geographic information system (GIS) techniques, and a consultative approach to planning, reviewing and delivering. According to the Green Infrastructure Planning Guide, the types of projects in support of its development and management are (Davies, Macfarlane, Mcgloin & Roe, 2015):

- Spatial Green Infrastructure Plans in City Regions
- Strategic GI guidelines that steer decision making in the development control process
- Supplementary planning documents
- Policies embedded within Local Development Frameworks and Local Area Agreements
- Statutory and non-statutory plans produced by organisations including Natural England, Forestry Commission and Environment Agency.
- Proposals included within local Area Based Initiatives
- Proposals included within regional strategic documents.

Green Infrastructure is an approach that successfully manages landscape resources. The opportunities it offers are related to a balanced interaction of the environmental, social and economic needs of society. The key principles of planning were studied and analyzed by Lennon and Scott (2014), Kambites and Owen (2006), and Hansen and Pauleit (2014) are presented in Table 1.

Table 1. Key principles of GI planning (Hehn, 2016)

<b>Lennon and Scott (2014)</b>	<b>Kambites and Owen (2006)</b>	<b>Hansen and Pauleit (2014)</b>
Connectivity (spatial, scalar and institutional)	Holistic	Integration
Multifunctionality	Strategic	Multifunctionality
Context sensitivity (interdisciplinarity and collaboration)	Inclusive	Connectivity
Prioritize GI	Qualitative	Multi-scale approach
	Linked to process of settlement development	Multi-object approach
		Strategic approach
		Social inclusion

Authors use different terms that overlap. The principle of connectivity is used in the sense of providing interaction between different green spaces that provide multiple functions and benefits as a result (Benedict & McMahon, 2006). One of the main goals of planning is to connect the fragmented habitats, increasing their resistance to harmful influence by humans. Hansen and Pauleit (2014) interpret in detail the planning of environmentally friendly infrastructure in terms of scale and perspective. While Lennon and Scott (2014) divide it according to spatial characteristics, in the sense of physical connection of the individual elements; scale – requires coordination and consistency in the actions taken; and institutional connectivity – promoting cooperation between different administrative organizations. Linking in the context of scale is also reflected by Hansen and Pauleit (2014) as a multi-scale approach, which aims to promote different initiatives on various scale projects. According to Kambites and Owen (2006), planning must be characterized by a strategic approach that goes beyond administrative and other boundaries. Hansen and Pauleit (2014) also emphasize it with a refinement of flexibility over time. Lennon and Scott (2014) also aim at interdisciplinarity and



cooperation during the various phases of planning, deployment, maintenance and management. The principle of versatility, providing a wide range of features and benefits within a limited space, is also reflected by the authors, each giving it a certain shade.

At the level of the European Union, the management of green infrastructure follows the goals and objectives of the Sustainable Development concept. As a result, the developed documents, such as strategies, policies, legislation, regulations, and directives, reflect accepted principles. It should be noted that ecological infrastructure is embedded in almost all sectoral policies. Some of the documents supporting the development of GI at EU level are (Nauman *et al.*, 2011; European Commission, 2014; 2018):

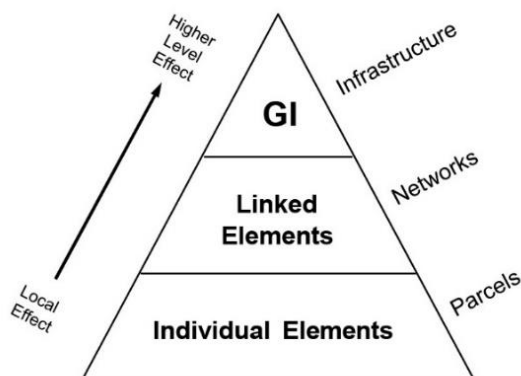
- EU Biodiversity Strategy to 2020, in which the ecological infrastructure contributes to all 6 targets, in particular, full implementation of the Birds and Habitats Directive (target 1) and maintaining and enhancing biodiversity in the wider countryside and the marine environment (targets 3 and 4).
- EU-wide strategy promoting investments in green infrastructure to restore the health of ecosystems ensures that natural areas remain connected together, and allows species to thrive across their entire natural habitat. The strategy promotes the development of green infrastructure across Europe as well as the development of a Trans-European Network for Green Infrastructure in Europe, so-called TEN-G, equivalent to the existing networks for transport, energy and ICT.
- Cohesion Policy and its European Regional Development Fund;
- Europe 2020 Strategy
- Water Framework Directive, Floods Directive and EU Action on Water Scarcity and Drought;
- EU Forestry Action Plan, Marine Framework Directive, LIFE+ Regulation;
- Environment and Health Strategy;
- Sustainable development strategy, European Spatial Development Perspective, Resource Efficiency Flagship under the Europe 2020 and its Roadmap;
- Spatial planning policies, which, at the EU level, are comprised, inter alia, of the Strategic Environment Assessment (SEA), Environmental Impact Assessment (EIA) and Environmental Liability Directive (ELD)

Every one of these documents leave a clear sign of national strategies, policies and legislation at national level. Different funding mechanisms have been created for a variety of initiatives, with the aim of stimulating greater action by Member States.

Scale is important for the management of green infrastructure, as it is related to the applied approach, starting from the individual plot of an owner to planning at a regional, sub-regional, state or transnational level. Different spatial scales are characterized by specific elements and interactions, which are essential for relationships and effects at a higher level. (Davies *et al.*, 2015). Ideally, green infrastructure is built when the planning process precedes all other actions. As a result, the allocation of land use is organized according to the priorities – protection and / or restoration areas, ensuring natural processes and wildlife migration, recreation areas, optimal water absorption, energy saving, creating an environment that improves the psycho-physical health of the community. According to an urban environment, environmentally friendly infrastructure uses approaches that emphasize urban tree vegetation, assessing the conditions in which they are developing, riparian habitats, urban parks, and linking them through different green areas. Furthermore, access to open spaces and landscapes provides the population with the most valuable clean water and air, lower summer temperatures and, to a certain extent, a natural disaster-prone environment. These facts are also confirmed by the economic expression of these investments. An example is the so-called rainforests, which are often used in the United States as a solution to the problem of large amounts of water after rains. In addition, society has another benefit – cleaner air. The monetary expression of these goods exceeds \$ 400 billion in the cost of building artificial facilities on “grey” infrastructure. That is why, over the years,

public interest in landscape planning has increased. Linking environmental services to the needs of the community is the key to sustainable population development (Firehock, 2010).

Fig. 1. Multifunctionality of GI and its elements at different spatial levels (Hansen & Pauleit, 2014, p.519)



The balance between green infrastructure approaches and “grey” infrastructure can achieve good results. An example is the expansion of sewerage channels and streets or rainwater storage tunnels to better capture drainage and ensure drainage away from the city centre. Correspondingly, there will be fewer incidents of overflows due to storms and facilities in which water is stored. It is also to be purified and used for watering. But the benefits are not just preventing floods from storms and torrential rains, protecting against sea level rise, lowering urban temperatures and reducing the effects of thermal islands (Center for Neighborhood Technology, 2010). In the Netherlands, the areas that can be flooded in anticipated climate change are indicated. An additional measure of safety is the design of houses that can float during floods. Removing populations from floodplains and coastal areas that are threatened by rising water levels is an additional strategy (Adger, Arnell & Tompkins, 2005). Such types of measures are perceived as some of the best examples of urban sustainability and as a means of adapting to emerging climate change and getting many other benefits (Center for Neighborhood Technology, 2010). Another positive example is planning of green public health infrastructure, providing the public with a place to relax and exercise to reduce levels of stress and illness.

Involvement of the stakeholders has a crucial role in the success of the GI (The Multifunctionality of Green Infrastructure, 2012). The more stakeholders get involved, the greater will be success. Thus, for example, the development of green infrastructure can be achieved by developing the Plan for Multifunctional Forest Management of the territory of the municipality of Teteven, Bulgaria (Paligorov, Ivanov, Dragozova-Ivanova & Kovacheva, 2014). The study looked at the link between the important environmental factors and possible conflicts. They may arise between different stakeholders in the process of creating a multifunctional territory. The priority for timber products, biomass and fuel wood can be harmoniously developed by so-called supporting services (biodiversity maintenance, water quality, tourism, hunting and recreation), or non-wood forest products (game meat, berries, mushrooms and nuts).

The United States gives good examples of green infrastructure management. They are created by different states, economic and non-profit organizations. In Virginia, a Green Infrastructure Center is being set up to develop strategies for the recovery, management and protection of local environmental, economic and cultural resources, assisting local authorities and communities in decision-making in environmental planning. By 2016, the non-governmental organization had developed two strategic plans that aim to facilitate the planning

of green infrastructure at local level, involving stakeholders and taking into account their interests (Green Infrastructure Center, 2017).

In the State of Georgia, the Ministry of Natural Resources develops a regulation that clearly regulates ecological criteria for planning, water supply, groundwater protection, wetland protection and green corridor protection. In addition, it develops a regional plan for the coastline of the state, which has a pro-active approach to achieving environmentally sustainable growth. Models of development in terms of spatial organization of lands provide territories with different types and intensities of use (CRS, 2018).

The ecological network Natura 2000, which aims at protecting the environment and biodiversity, is the focal point of the European Union's policy. Natura 2000 provides the basis for Europe's green infrastructure which, besides conservation, also enables the restoration of already disturbed landscapes, providing direct benefits to society. The selection of sites takes place in accordance with Directive 92/43/EC on the conservation of natural habitats and of wild fauna and flora (better known as the Habitats Directive) and Directive 2009/147/EC on the conservation of wild birds (known as The Birds Directive). For example, in Latvia the network was based upon the existing nature protected areas, adding 122 new sites. It means that every country of the European Union develops its own system of Natura 2000 sites as part of the whole Natura 2000 system (Grizans, Auzins & Vanags, 2012). In Bulgaria, forests are home to over 80% of the protected plants; over 60% of the animals threatened with extinction; over 60% of the priorities for protection habitats; eight of the twelve unique landscape complexes determined in the National Strategy for Protection of the Biological Diversity as unique and representative for the Bulgarian biological diversity; the habitat of 43 world endangered species. (Paligorov *et al.*, 2014) However, it is necessary to encourage green infrastructure investments to link the different areas of the ecological network to improve its functionality and also to provide people with access to the goods and services (Dobri praktiki v mrejata Natura 2000: Za po-dobro badeshte, 2014).

An investment in the example of Estonia with the ecological management of the Vainameri Protected Site is a good opportunity to combine environmental, social and economic benefits. The area covers a complex of marine and coastal habitats unique with their species and biodiversity. The major challenge during the project is a balance between human activity and nature conservation. The beginning was set in 1992 with the introduction of the Sustainable Development Act, which established the development approaches for these areas. Some of them are related to enhancement and maintenance of natural values, development of sustainable agriculture, production of ecological products, development of tourism, local craftsmanship and other positive activities beneficial to people and nature (Lotman *et al.*, 2005).

Comana wetlands in Romania are also good examples of environmentally friendly infrastructure management. The territory is part of the Natura 2000 ecological network and many endemic species and birds, some of which are protected, are present there. After a very serious negative impact in the 1990s, measures were taken in 2009 to 2011 to restore wetlands and biodiversity. Various monitoring systems such as fire risk management and control, visitor and information centre, panels and other activities are set. Successful implementation of the project also provides cultural ecosystem services that give a good opportunity for tourism development, visits with a cognitive or educational purpose (WWF Annual Review, 2017).

The Alpine-Carpathian Green Infrastructure Corridor is an example of cross-border management with potential for developing tourism, cycling, hunting and other activities. Increasing traffic creates a need to improve road infrastructure which leads to the disruption of an important migratory flow that determines the biodiversity of the region. The solution is building a 10-kilometre green corridor from the Alps to the Carpathians, including the construction and subsequent conservation of green bridges. In addition, the Strategic Action Plan, known as the Memorandum of Understanding, envisaging the construction of a green bridge in Austria and the provision of funds for the construction of a green bridge in Slovakia,

has been prepared and signed. The benefits to society are related to the conservation of biodiversity inside and outside protected areas, the improvement of habitats and migration paths (WWF Annual Review, 2017).

The management of the green infrastructure in Bulgaria is directly related to the strategies and policies, the objectives and tasks set at the level of the European Union. The institutional framework has shared responsibilities and obligations with respect to its governance and development.

A good example is the “Lower Danube Green Corridor” project, part of the World Wildlife Fund (WWF) Danube-Carpathian Program. Six countries are involved in the project – Bulgaria, Romania, Moldova, Ukraine, Slovakia and Croatia. The purpose of this project is to preserve the Lower Danube River because of its unique character within the continent. This is a territory with many preserved natural habitats and a wide variety of birds. Concerns arise from Europe’s view of the Danube as a future transport corridor that can have serious consequences for biodiversity. The solution is to apply innovative techniques and approaches that will help to develop the multifunctionality of the territory without interfering with each other. For this purpose, green infrastructure is among the instruments used (Lower Danube Green corridor, 2014).

## CONCLUSION

Green infrastructure makes an outstanding contribution to striking a balance between human progress and nature conservation. It offers a modern approach to management of landscape resources. Development of GI is advancing with the identification of benefits and received goods and services That is the reason why every country implements it in each of its strategies and policies.

Successfully implemented green infrastructure is achieved when the planning process precedes all other actions. Developing plans for GI management provides flexible opportunities for managing it, achieving a balanced interaction of the environmental, social and economic needs of society. Despite different opinions over the main principles in the strategic planning process, environmentally friendly infrastructure brings together a number of ideas and practices and encourages a wider set of examples of good management practices. In this aspect, the United States provides a good example of its various initiatives in planning green infrastructure.

The multidisciplinary approach is the key for creation and management of GI sites. Any investment idea to build such sites must be justified and assessed from economic, social and environmental points of view before the start of its realization. This approach is successfully implemented at the level of the European Union. A number of implemented initiatives are studied and monitored accordingly in the optimization management process. There are a few examples: Estonia, Latvia, Austria, Slovakia and others.

In Bulgaria, the management of green infrastructure should focus on investments that link different territories. The Lower Danube Green Corridor shows that co-initiative provides good results, but it is necessary to have a self-initiative on the example of Europe and the United States. This will help preserve and operate ecosystems, at the same time improving the economic condition of the region through increased land value, reducing unemployment, creating a tourism product or service.

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# REGULATION AND TECHNOLOGY DRIVEN ASPECTS OF REINDUSTRIALIZATION OF ICT IN THE AREA OF INFORMATION SECURITY

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**Abstract.** Contemporary changes in the field of legislative regulations initiated on a national and EU level, as well as the progress in the field of providing security for digital assets, are slowly becoming a powerful stimulator for the development of an organizations' and economic entities' e-business system. Large organizations, which have IT departments and relatively good financial resources, as well as startup companies regardless of their size, also due to the fact that they will eventually incorporate a system for e-business, could have a considerably easier time to adapt to these changes. Adapting to the changes, from the point of small and medium-sized organizations and economic entities, especially those which have been developing their e-business system for an extended period of time, has to go through a serious process of reindustrialization of ICT. This article presents results from the conducted applied research related to ICT reindustrialization, connected with the currently existing e-business system. It has been done within the University of Forestry, with the aim to adjust new regulations, such as GDPR and national fiscal requirements in the context of ensuring a high level of informational and communicational security. The problems studied in this paper are related to site-to-site and remote access connections of locations and personnel, management of financial and accounting information, management of user access in the context of the information security policy. The studied approaches and solutions can be easily implemented to solve problems of ICT reindustrialization and development of an e-business system in different size organizations and economic entities.

**Keywords:** *E-business, Reindustrialization, GDPR (General Data Protection Regulation), Information Security*

**JEL Classification:** M15, O14, O21, O32

## INTRODUCTION

The effects of increased competition due to globalization processes, as well as the development and improvement of market mechanisms on a regional and national level, are increasingly becoming key factors for successful functioning of contemporary organizations and economic entities. The incorporation of contemporary solutions in the field of e-business is among the main prerequisites for increasing competitiveness of organizations and economic entities during fulfillment of different business processes. Simultaneously, there exists a great number of organizations and economic entities which, in the process of informatization, have implemented and are currently successfully using different informational systems as part of their e-business system. These organizations have already acquired a considerable amount of statistical and critical business data, key to preserving their competitiveness. More and more often with these types of entities there is a possibility for side effects of informatization to surface, related to: change in technological base, accents and scope of the provided informational service, legislative and normative changes, affecting the business medium and requiring reflection within the e-business system. The listed side effects could drastically lower

the effects of the implemented e-business system and even, in certain cases, lead to loss of marketable advantages or considerable financial losses for organizations and economic entities.

Applying the concept for the e-business system helps to change the management views in the direction of correctly understanding e-business potential (Milchev, 2012), as well as making necessary decisions, related to the implementation and development of the technical and technological base for e-business, with the aim of ensuring economic efficiency. In its essence, the e-business system of organizations and economic entities represents a system developed on a module principle and grants certain minimalism for normal functioning in the chosen priorities for development of economic entities, whose organization and work fulfills different specific tasks.

The current paper aims to widen the scope of transitional research (Miltchev, 2017a; Miltchev, 2017b), connected with different aspects of reindustrialization of information and communication technology (ICT). The main aim is for suitable methods to be examined and suggested for adapting them for the currently existing e-business system of a large organization, such as the University of Forestry. It is done in the context of new requirements related to information security, including access to and protection of information of organizations, communication processes protection, connected with exchanging critical business information relating to confidentiality, integrity and accessibility; reworking of currently existing policies for information security. The studied processes, relating to ICT reindustrialization, are catalyzed from changes in the technological base and active legislation, and are connected with building a policy and applying a strategy in the field of ICT reindustrialization from the point of organizations and economic entities. These processes are connected with the necessity for removal or avoidance of established vulnerabilities and technological weaknesses related to the use of communication devices and processes for information transfer, and also to adapting with the aim to adjust new regulations, such as The EU General Data Protection Regulation (GDPR) and national fiscal requirements in the context of ensuring a high level of informational and communicational security. The problems studied in this paper are related to site-to-site and remote access-connections of locations and personnel, management of financial and accounting information, management of user access in the context of the information security policy. The formed summary allows the conducted research to be easily adapted and applied in the solution of similar problems connected with e-business system development in the context of ICT reindustrialization in different size organizations and economic entities.

## **1. ASPECTS OF INDUSTRIALIZATION AND REINDUSTRIALIZATION IN THE CONTEXT OF IT**

The application of reindustrialization ideas in the field of information technologies requires implementation of a working definition with the aim of a more clear understanding of its aspects in the proposed context. The terms “Industrialization” and “Reindustrialization” until this moment have been usually perceived and applied in their broader economic meaning. In that case, as set by encyclopedias (“Investopedia”; “Encyclopaedia Britannica”, 2007), industrialization is a process of transforming economy, and in a broader sense, the socio-economic order towards a state in which the industry is dominant and includes characteristics like economic growth, more effective labor division, and the use of technological innovations in the solution of problems, contrary to dependency on conditions outside human control. In this case, industrialization examples typically list the early industrial revolution of the 18th and 19th century in Western Europe and North America, Europe’s recovery after World War II, and the population increase in North America, the rise of the economies of “The Asian Tigers“ in the 20th century. In the context of application of information and communication technologies from the point of organizations and economic entities, the industrialization process could also be well defined. In this case, industrialization could be viewed as a form of informatization or



the adoption and implementation of information and communication technologies from organizations and economic entities as part of their e-business system development, including the use of computer and communication equipment and computer applications for the purposes of successful migration of classic business processes toward their electronic analogues while accounting for the added value of such activities.

The definition of reindustrialization in its broadest sense (“Merriam-Webster”; “Dictionary.com”) describes it as a process or policy for stimulating economic growth through the provision of government help or means for revitalizing and modernizing old or aging sectors and encouraging the growth of new ones. Under government help or measures in the context of the global market economy, acts of a local, national or regional administration could be listed, while upgrading could be viewed in its more private aspect, such as the upgrade of machines and components. As some authors note (Tregenna, 2011), when analyzing this process, the changes in shares of sectors in GDP and / or employment could be reported. In that aspect, reindustrialization is often viewed as opposing the deindustrialization processes. As Zhou (2013) states, there arises a need for restoring industrial production within economies, which up until this moment have been more oriented towards services. Unfortunately, the closest terms “upgrade” or “update”, which are used in the field of information and communication technologies, with the improvement of quality or increasing the benefit of a programming product’s structure in mind (“Cambridge Dictionary”), there is a difficulty in grasping all aspects of change in applied computer applications in the context of economic concepts like value added and labour resources, or the influencing effects on the e-business policy of organizations and economic entities in the process of granting its sustainability in the conditions of globalized markets with a high level of competition. Because of these reasons, in the current research under the term “reindustrialization of IT”, a set of measures and activities will be visualized. This set employed by organizations and economic entities in connection with the wholesome revitalization and modernization of the used computer applications, communication and network equipment. All above mentioned is seen in the context of considerable changes in the technological base, normative regulations and the active legislation, all the while accounting for added value and the human factor, for providing a sustainable e-business system.

## **2. THE IMPACT OF CHANGES IN LEGISLATION**

The effects of increased competition due to both processes of globalization and the development and improvement of market mechanisms at regional and national level are increasingly becoming a key factor for the successful operation of modern organizations and economic entities. Implementation of modern solutions in the field of e-business is among the main prerequisites for enhancing their competitiveness while carrying out various business processes. They must ensure the management of these processes, as ensuring access to resources is key, both in terms of achieving better business outcomes and in maintaining a reputation and image among customers, partners and contractors.

At present, the reindustrialization of ICT is a key strategic process because of the need to ensure and guarantee confidentiality, integrity and accessibility in the exchange of critical business information in connection with the implementation of the requirements of Regulation (EU) 2016/679 introduced in 2018 on the protection of individuals with regard to the processing of personal data and on the free movement of such data. With its regional and national scope, it imposes very serious requirements on organizations and economic entities with respect to the handling of personal data, which necessitates comprehensive changes in the philosophy of software, the methods and procedures for accessing and managing such critical information, both electronically and in paper form. In addition, changes are also required in the organizational structure related to the implementation of systems and policies for information security management. Unfortunately, in the processes of informatization of organizations and

economic entities over the past two decades in the field of development of their e-business system, especially in the case of individual entrepreneurs, small and medium-sized companies, and even in some large organizations, no drastic actions have been taken regarding information security. The experience gained over the last few years, mainly as a result of analysing breakthroughs in the field of information security, accumulated practical experience and know-how in protecting the communication infrastructure, allows us to identify some key points. This includes data encryption and access to them; certification of processes according to family standard requirements IEC / ISO 27000 for information security; introduction of hardware equipment to protect the environment for data exchange from unauthorized access; tunneling and encrypting critical traffic passing through public networks such as the Internet. This regulation is extremely restrictive and provides for fines of up to EUR 20 million or 4% of profits, providing for the possibility of scrutiny not only by the national regulator but also by other national regulators of the EU in their citizens' complaints about the protection of their personal data.

Joined actions of the Ministry of Education and Science and the Ministry of Finance of the Republic of Bulgaria in the period 2017-2018 in relation to the implementation and execution of the goals of the Action Plan (Republic of Bulgaria Ministry of Education and Science, 2014a) related to the implementation of the Strategy for the Development of Higher Education in the Republic of Bulgaria 2014-2020 (Republic of Bulgaria Ministry of Education and Science, 2014b) are another prerequisite related to the change of the legal framework that imposes urgent actions for the re-industrialization of the ICT of the system for e-business of educational institutions in Bulgaria. The Strategy for development of higher education in the Republic of Bulgaria for the 2014-2020 period, was developed following a detailed study of the Bulgarian and European documents on higher education progress for the 2014-2020 period and also in accordance with the documents of the Bologna Process and World Bank developments of independent analytical and information centres regarding the status and prospects of higher education in Bulgaria. There is also a detailed Action Plan for 2014-2020, enclosed in the proposed strategy, which proposes specific measures for the implementation of the planned reforms. The Strategy is coordinated with the project of Operational Program "Science and Education for Smart Growth – 2020", and with Partnership Agreement between the Republic of Bulgaria and the EC for the new programming period 2014-2020. There are two specific objectives which are very important from the reindustrialization of ICT point of view:

- "Promoted research activities in higher education institutions and the development of innovation oriented towards the market economy";
- "Increased funds for higher education, science and effectiveness of their use by an advanced model of funding".

In connection with the fulfillment of these objectives, the said ministries require higher education institutions to maintain detailed personal financial information about any student undergoing or that has undergone training at the university. This includes: the student's payment of fees to the university (if he learns for a fee); the state resources provided to the university in order to train this student according to his / her professional field, the rating system of the higher education institutions in the Republic of Bulgaria and the data about students' marks; the student's payment of accommodation fees, the use of the university's holiday and study facilities and other social activities.

All these aspects prove to be a major prerequisite for the urgent re-industrialization of the e-business system of the University of Forestry in the field of ICT, and are of key importance for both the educational institutions operating on the Bulgarian market as well as for organizations and economic entities operating in other sectors of the economy that face similar problems, albeit in a different context.

### 3. METHODS AND PROCEDURES

The University of Forestry is an organization which belongs to the group of large organizations with over 600 employees. The assets of the organization are highly decentralized, since they are distributed around different parts of the territory of the Republic of Bulgaria and include: the main and auxiliary training buildings, located in three separate parts of the territory of the city of Sofia, two student dormitories, two training and experimental forest ranges with training facilities and resort area, located in the region of the villages Barziya and Yundola, the educational and sports camp in the region of the town of Nessebar, the training and experimental field centre in the region of Vrazhdebna district in the city of Sofia.

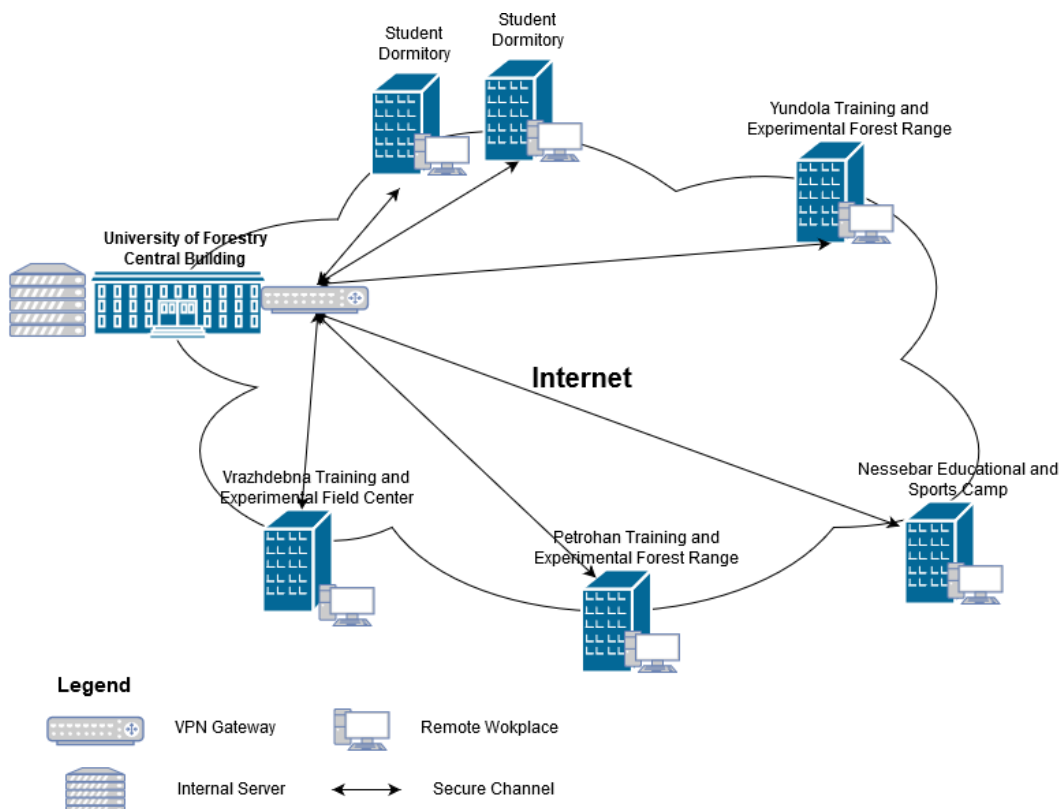
In regards to the assets in the field of ICT, the University of Forestry could be assigned to medium size organizations, with computer and communication equipment within the range of 200 to 1000 units. Regarding the built and maintained networking and communication infrastructure, within the central buildings used for administrative services and student training as well as the resort area buildings a two-layer and three-layer hierarchical model for corporate network organization is used, with the presence of separate modules like a data centre and wireless access network services. The public resources of the university available online, including the university's web portal, the e-learning platform and research portal are all positioned within a demilitarized zone (DMZ). The servers for internal use, which are used to support major informational systems of the university, are located in the data center and are accessible from machines within the range of the internal corporative network and connected to the management of financial and accountant information, student status, human resources etc.

Because the University of Forestry has been actively developing its e-business system in a relatively long period of time, part of the problems, which were listed in the exposition, requiring the application of the methods for reindustrialization of ICT were identified really early on. In relation to that, in the period of 2009-2013, with the help of funding from the European Social Fund, considerable steps were taken towards the reorganization of the network and communication infrastructure with the aim to adapt pre-existing assets of the e-business system, ensuring opportunities for its future successful adaptation towards the inevitable upcoming changes in the fields of technology and the normative base and towards sustaining competitive advantages against other educational institutions in Bulgaria. Opportunities for redundancy, grouping and dividing of devices, virtualization etc. were also provided. In addition, in the period after 2016, the university has been investing in opportunities for providing broadband access to the Internet which would help other taken measures in the field of reindustrialization of ICT with the bringing of access of lecturers and employees to the SaaS (Software-as-a-Service) – in this particular case Microsoft Office 365.

In connection with the adaptation of the pre-existing e-business system towards the imposed normative and organizational measures from the European and national legislation and the application of the correct approach for reindustrialization of ICT, analysis has been conducted over the possible methods for achieving the following major tasks: ensuring secure and reliable communication channels between distant locations and the central building of the university for the transfer of sensitive business information; adapting the financial and accounting information system towards the support of individual personal accounts of students with accounting of the incoming cash flow by directions and sources, according to specific requirements from the Ministry of Finance and the Ministry of Education and Science for the use of specialized software; the integration of informational flows related to the semester fee payments and the use of dormitories with the information system for student status management and ensuring correct export toward the Ministry of Education and Science's register on a semiannual basis (for use of student dormitories and student status, supported by two separate informational systems according to said ministry's requirements).

## 4. RESULTS

Unfortunately, the available communication and network equipment in remote locations at this stage does not allow for a wholesome integration of their network infrastructure towards the infrastructure of the central building of the university. At this stage of development of the e-business system, there still has not been a serious need for a complete inclusion of all workplaces for remote employees in the designed infrastructure.

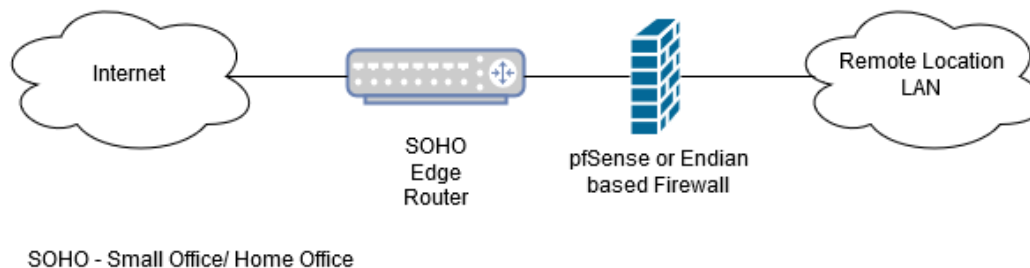


**Fig. 1.** Remote-access VPNs developed as a part of the ICT reindustrialization process.

For this reason, the proposed approach for reindustrialization of ICT towards the provision of a secure and reliable access to the data center in the central building via an encrypted channel includes only workplaces related to business processes influenced by the implementation of measures caused by the change of the normative base. According to this purpose, remote-access Virtual Private Networks (VPNs) have been configured and put into service between individual clients (in this case the workplaces dealing with financial and accounting services) and the financial and accounting system. Additionally, processes regarding digital processing of student documentation have been automated, including generation of written orders and personal files with the aim of speeding up those processes. The proposed and developed communication model based on use of secure and reliable connections between central building and distant locations is shown in Fig.1.

The process of securing network communication between remote locations and resources, which need to be accessible from the data center in the central building of the university, is not enough for filling the requirements of the GDPR. For that reason different approaches were evaluated for securing protection of the university's remote branch offices or workplaces as well as opportunities for remote administration, monitoring and providing technical support. Due to shortage of financial resources and the need to conform to active public procurement legislation, the available computer systems at the university were modified with the aim to be integrated within the networking infrastructure of remote offices in the form of security

appliance. This approach allowed for important experience and know-how to be gained, while simultaneously the ideas of the defense-in-depth philosophy were realized (Moraes, 2011). The studied approach, showed in Fig.2, allowed not only for a secure channel from the main building to the remote ones, but also allowed the integration of additional security measures like the use of stateful firewall, Intrusion Prevention System (IPS), URL filtering, traffic monitoring, etc. For that purpose, the characteristics of two main firewall systems based on community editions of pfSense® (<https://www.pfsense.org/>) and Endian Firewall (<https://www.endian.com/>) were studied.



**Fig. 2.** Remote offices integrated defense-in-depth approach, based on community edition stateful firewall system.

After providing secure channels for connecting remote offices, problems related to adapting available information systems towards the changes in the normative base were also solved. Successfully were created personal accounts for every individual student (over 4000 in number), as well as forms for information input and the preparation of individual queries and complete reports. The changes carried out at this stage give an opportunity for accounting of all financial proceeds towards the university, coming from all directions (from the state in the form of student support money in different professional areas, from education fees, dormitory use fees and etc.) which allows for a targeted allocation of funds to support the education process and research work in accordance to The Strategy for development of higher education in the Republic of Bulgaria for the 2014 - 2020 period. In that case, from a great benefit was the experience gained from IT reindustrialization in the field of DBMS usage (Miltchev, 2017a).

## CONCLUSION

The effects of increased competition due to both globalization processes and the development and improvement of market mechanisms on a regional and national level are more and more commonly turning into a key factor for successful functioning of contemporary organizations and economic entities. The application of contemporary solutions in the field of e-business is among the main prerequisites for increasing competitiveness of organizations and economic entities in the realization of different business processes, but also influences the preserving and maintaining the sustainability of this system. The decisions have to grant the management of different processes while providing access to resources within the range of authorized users with accounting for both the living cycle of the used computer applications and computer and communication equipment and the specific changes in the media and technologies.

Organizations and economic entities which apply informatization for an extended period of time as a means of developing their e-business system need to discuss suitable measures for reindustrialization of their used informational and communicational technologies, especially in the fields of providing confidentiality, integrity and availability to critical business information within the organization, especially in the presence of remote offices. That is necessary, both from the standpoint of technological considerations connected with keeping a high level of

information security and in connection with changes in active legislation on a regional and national level, such as implementing the EU General Data Protection Regulation for the protection of personal data and the requirements of public authorities. The successful procedure for the reindustrialization of ICT related to a high level of information security includes:

- Building a model of threats. Analysing individual aspects of information security in the context of the e-business system of organizations and economic entities needs to be connected with the developed in advance model for researching potential threats to individual elements of that system, which would then determine the main vectors for attack.
- Optimization of the network infrastructure and network organization. Some basic measures in this aspect include: use of client-server architecture, use of methods for identification and granting access based on an active directory of shared resources, use of VPN for the granting access from site-to-site and remote-access, transition towards a network with hierarchical architecture and defense-in-depth philosophy, configuring lists for access control and firewalls on edge router devices and end devices.
- Training of personnel. Training of personnel is necessary according to the requirements of information security standards, pre-existing best practices in the field of information security, scope of the GDPR.
- Improvement of the information security system in the context of standards and the EU regulation.
- Improvement of the organization's structure.

In the process of conducting the current research some organizational problems were established, caused by partially contradicting requirements within the frames of the activity of a single ministry. In this case, the necessity for maintaining two information registers – for student status and room occupancy in dormitories through two separate information systems. In this case there is significant doubling of information which weighs down employees and decreases opportunities for optimizing activities and personnel, and as a result, the automation of specific business processes.

More complex organization structures, with a bigger number of remote workplaces or distributed way of storing information resources, will be suitable for implementation of solutions using DMVPN (Dynamic Multipoint VPN) or even GETVPN (Group Encrypted Transport VPN) when the necessary network and communication equipment is available. The limited financial resources at the time of implementation significantly decreased opportunities for application of these approaches, but tests conducted in a limited number of locations with the implementation of DMVPN showed great potential which could be successfully applied in the e-business system of the University of Forestry.

## ACKNOWLEDGMENT

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## UNEMPLOYMENT AS THE MAIN CHALLENGE IN GEORGIA

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**Abstract.** Unemployment is a complex socio-economic phenomenon all over the world. To overcome the high unemployment is the main challenge of Georgia's macroeconomic policy as it is the main reason of poverty and causes many social-economic problems. For reducing the unemployment rate, one of the crucial factors is to identify, evaluate and analyse challenges in labour market and to develop human capital. Labour market is less developed in Georgia and it is a must to create institutes and mechanisms which finally will be reflected in qualified labour force and decrease unemployment. There are many challenges that Georgia faces nowadays in this direction, therefore, it is one of the most frequently studied subjects by Georgian researchers. But it will always be an actual issue because of its multifaceted, complex and changeable nature. The aim of this paper is to summarize results of different studies from Georgian and foreigner researchers, evaluate data from state authorities' surveys regarding labor market challenges. The purpose is to give some clear recommendations how to decrease unemployment in Georgia and make more comprehensive picture of current situation based on the existing literature. First, the analysis of the surveys conducted by state authorities is provided. Second, the views of Georgian researches are presented and summarized. Finally, by combining the first two parts, some recommendations and conclusions are given.

**Keywords:** *Unemployment; Labor marke; Unemployment.*

**JEL Classification:** M540; M510

### INTRODUCTION

Overcoming unemployment and developing the labor market is one of the biggest challenges of Georgia's macroeconomic policy. Georgia had hard times after the Soviet Union collapsed and as Tsiklashvili (2017) states in her article the economy of Georgia was in fact paralyzed after this period because of being without partners and markets. In such conditions the country's labor forces remained without function and perspectives instead of actively participating in rebuilding of the country at their working age; they appeared in the category of vulnerable populations. Moreover, most support was directed to mitigating social problems (part of it was inappropriately used) and not to creating new jobs, or rehabilitation of the already functioning enterprises. Thus, the unemployment was very high, labor market was not developing. Finally, we have received long and scaled stagnation in all the aspects of economy and it has negatively reflected on the formation of labor market (Qistauri, 2018).

Georgia has many challenges in the process of decreasing unemployment and developing labor market. In this process studies and analysis are very important. In the Georgian labor market analysis report (Ministry of Economy, 2017) by the Ministry of Economy it is said that the development of private sector is the most important and the future plans should be related to this topic. Union of Young Scientists – Intelekti (2016) in its labor market analysis says that such type of analysis is the prerequisite for the employment and business effectiveness. In terms of unemployment, factors of economic instability are appearing. This factors are, for example, reduced total demand, savings and investment demand, reduced total supply, production fall,



etc. Thus, in terms of unemployment, it is not possible to use the economic potential of the country fully, as well as not possible to increase the national wealth to the maximum level (Paresashvili, 2018). All the above mentioned requires complex solutions from the government by making appropriate policy, improving legislative environment. The private sector should analyse these problems as well and make effort from its side.

The aim of the paper is to analyze unemployment, identify labor market challenges and formulate recommendations how to face with them. Gathering, collecting and analyzing the research reports by different researchers and authorities is the main task to achieve the aim. Our research questions are highlighting the main challenges for Georgia regarding the unemployment and developing labor market, their importance and role; in addition, what the state can do to eliminate these problems and what the private sector should do from their side.

## 1. METHODOLOGY

Statistical analysis and surveys done by the state authorities are used in the article during the discussion and for making the conclusions. The methods include observation, gathering, grouping, and calculation of the generalized indicators. Namely, the data is taken from the Georgian statistics service, from the website of the Ministry of Economy and Sustainable Development and the Ministry of Education. In addition, scientific articles of Georgian researches are used for the analysis and evaluation of the arisen problems.

## 2. DISCUSSION

Unemployment is an acute socio-economic problem in Georgia. As per the NDI survey results, unemployment, inflation and poverty are important national issues as 66% of population feels unemployed. As per national statistics service unemployment rate is decreasing during the last 9 years from 18.3 in 2009 to 13.9 in 2017 (see Table 1). From the total employed population 59% is employed in agricultural sector.

Table 1. Employment and unemployment (Geostat, 2018)

	2009	2010	2011	2012	2013	2014	2015	2016	2017
<b>Workforce (thousand)</b>	1971.8	1970.9	1988.2	2004.5	1978.6	1984.6	2018.0	1996.2	1983.1
<b>Employed (thousand)</b>	1611.0	1627.8	1643.5	1659.4	1643.4	1694.4	1733.8	1717.3	1706.6
<b>Unemployed (thousand)</b>	360.8	343.1	344.8	345.1	335.2	290.2	284.2	278.9	276.4
<b>Unemployment rate (%)</b>	18.3	17.4	17.3	17.2	16.9	14.6	14.1	14.0	13.9

Georgian government tries to make active steps and reforms, but it is not enough. In last few years many labor market surveys are conducted by different authorities. They identified many problems which Georgia faces in this field. Problems have not only the economic, but social effect. Unemployment leads to an increased number of crimes, suicides and divorces. The studies evidence that 1% increase in unemployment leads to a 7-8% increase in the number of crimes. Generally, unemployment amplifies the social stress and political instability in the country (Paresashvili, 2018). As per the Georgian researchers (Tasrtsidze, 2017), main challenges are non-formal employment and illegal work migration.

The problem is more acute as the increasing investments and reforms of business climate did not have significant effect on unemployment. But the Georgian experts explain that the mentioned official numbers is not real and the unemployment rate is quite high in the Georgia.

Private business is developing fast and the demand for the qualified employees is increasing. It is quite a big barrier for employers (Qistauri, 2018); professionalism is problem on all the levels of organization. These are proved by different studies made in Georgia by state authorities.

Georgia faces three main labor market issues: (a) underutilization of labor resources, (b) earnings inequality, and (c) skills mismatch (Bank, 2013). The Ministry of Labor, Health and Social Affairs conducted a survey in 2015. This survey was done in 11 regions of Georgia. Total 6000 organizations were participated from both private and public sector. As per the analyses, following problems were identified: first, demand in the Georgian labor market is quite low (1% increment). As per the Geostat, in this period 919 700 persons were employed and the demand was for 908 373 persons. As per that report the biggest field is sales, where the number of employed persons increased the most. And the biggest reduction is in the construction, but it remains as one of the biggest field according to the employed persons. We should mention that 960 organizations from the respondents have deficit of human resource (Table 1). The reason is that there are no applicants at all or they do not agree with the offered salary.

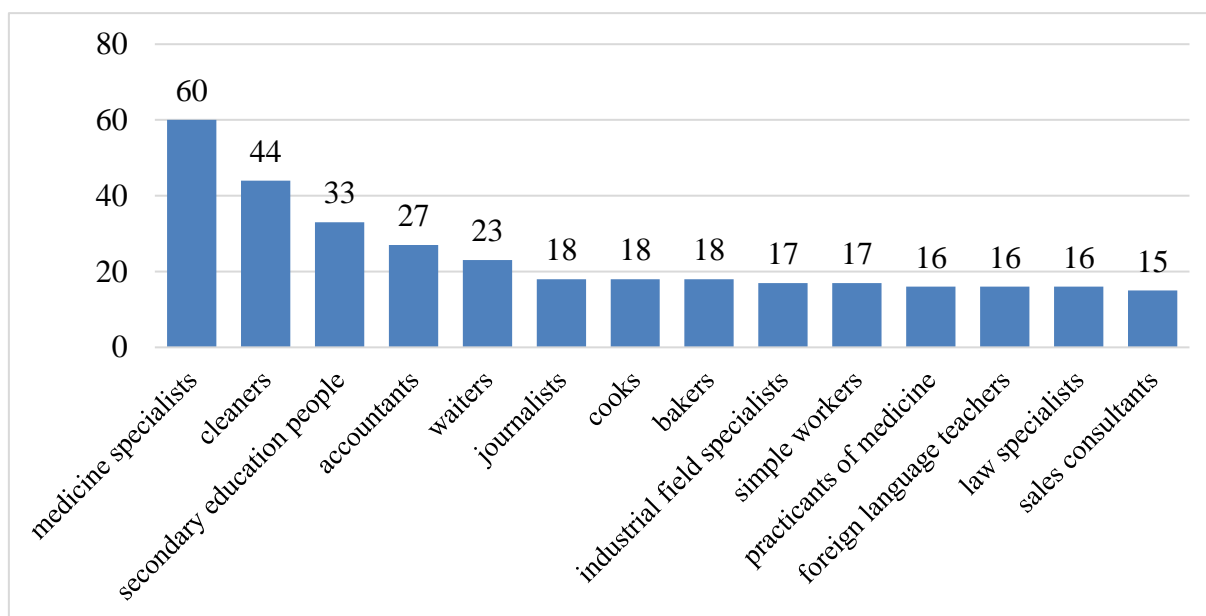


Fig. 1. Positions, where organizations have labor deficit. (Ministry of Labor, 2015)

The main reason of this is the low qualification of labor force. In the region of Adjara, the Business Consulting Group conducted the survey in 2014 to evaluate the labor market and define the demanded professions in the region. As per the results of it the main tendencies were shown: (1) employment is increasing, which is a positive fact; (2) in the conditions of high unemployment, it is quite hard for employers to find labor force; they claim there are many professions which are not studied in the region and not even in the country;(3) technical specialists are rare and hard to find; (4) educational system of Georgia requires significant improvement; etc. It shows that the general tendencies are the same in Adjara and whole Georgia (Business Consulting Group, 2014).

The Ministry of Education in Georgia published Tracer Study report in 2016 (Ministry of Education, 2017) about the graduates of professional programs. As per the report, demand for such programs increases annually. Employment rate of graduates of such programs was 56.2% in 2016, which was 0.2% higher than last year. High employment level was observed in the following fields and positions: engineering, interdisciplinary fields and specializations (barmen, hotel workers, guide, tour operator and others) and agrarian sciences.

Another survey belongs to Insource (2018), which is the leading consulting and recruiting company in Georgia. It makes the labor market analysis annually. According to their article, in 2018, demand in the sales and service field professions were increasing twice from 2012-2014 and in 2017 sales manager was the most demanded profession (total 2610 vacancies) followed by hotel and restaurants staff (1610 vacancies) and positions from bank sector. In 2018, they identified one more tendency: labor market of the regions is developing step by step (Figure 2).

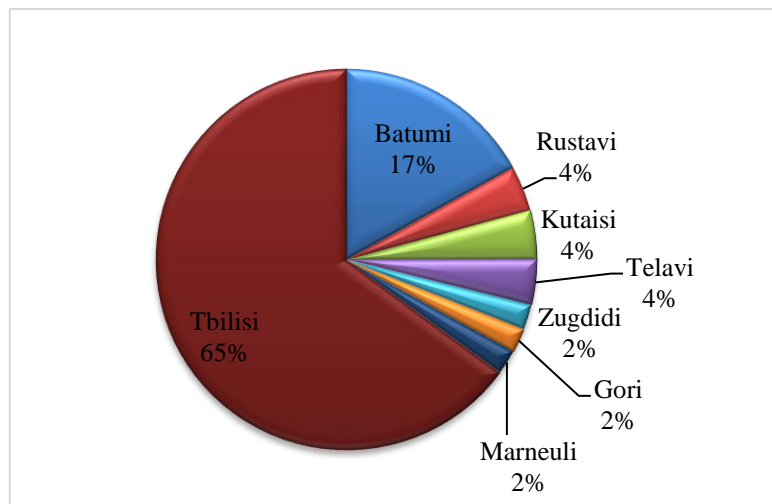


Fig. 2. Vacancies in regions of Georgia in the 1st quarter of 2018. (Insource, 2018)

The main tendencies are almost the same according to the in source's data (Insource, 2018). There is difference between demand and supply in labor market. In 2017 and in current year the employers need less existing qualifications of labor force. Their advice is also to create better programs and develop present ones. The other problem is that our training market is also homogenous and includes management, HR management, effective communications, effective sales and etc. They think this is the reason why internships become so popular nowadays.

The gender aspect is also very important. In the case of unfavorable demographic situation, high unemployment and poor economic activity, as well as insufficient employment and compensation of labor force can be observed, especially among women. There is a strong flow of the workforce, mostly young people, including high-qualified labor, to foreign countries. In addition, as strange it may seems, the flows of the professionals from abroad it is found in our country in excess numbers are quite intense (Paresashvili, 2018). Paresashvili identified other tendencies in her article: "Attitude of youth towards the labour activity has changed during the last 10 years. Majority of youth wants to be employed from the early stage".

The main goal of labour activity, i.e. "good life" is often incompatible with the selected means to achieve this goal. Young specialists are trained without any justification and preliminary calculations. Also, there is another growing tendency. The most part of young people are planning to go abroad for getting education and improving their skills in foreign languages. They indicated reason for their immigration that implies absence of perspectives and impossibility to get self-actualization in the country of their residence. One fourth out of their number are motivated by the desire to improve material conditions and to have employment in a foreign state.

The second side of this problem is private business. For most of the vacancies they are searching candidates with high qualification. In most companies of Georgia, graduates are not supported by giving a chance or offering internships. Of course there are many internship programs as well but in medium-size and small companies and in state entities they are not paid. In this case, the family should cover minimum expenses related to the internship of the graduate. Because of this many graduates cannot use such opportunities. Also HR

representatives in the manufacturing and energy fields have problems as such types of specialists are very few and it is quite hard to find such candidates and persuade the company to satisfy their requirements.

There are professional education programs in Georgia, which offer free technical courses, but the educational level is very low. Graduates from such schools cannot perform job duties even on the lowest level. They still need internship in the existing vacancy to gain minimum skills and qualification.

One more problem is labour migration. To solve this, the government should develop legislation regarding migration and state policy of employment (Tsartsidze, 2018).

In Georgia higher education system needs upgrade in order graduates can satisfy the requirements of private businesses. Modern tendencies and styles should be implemented.

Fortunately, the number of companies who make learning centres is increasing. Such good example is Rustavi Steel. They have a learning centre and prepare all types off specialists they need in the plant. For example: crane operators, welders, electricians and so on. The emphasizing fact is also that this period for the beginners is paid. So, it is crucial from business side to make the correct accents.

## CONCLUSION

Proceeding from all the above-mentioned it is clear that Georgia faces many challenges about the labour market. A positive fact that we can see is that many governmental authorities are taking care about this issue. Researches and surveys used in the article prove it. Also, on the bases of the Geostat data (Geostat, 2018) we can see that the unemployment rate decreased in 2017. Further researches are essential for identifying the problem and finding solutions. To sum up the information from the text, it is visible that unemployment is still quite a big challenge for Georgia. There is a big disbalance between demand and supply on the labour market. The legislation and migration policy need improvement. The unqualified workforce is the problem to be solved. While speaking of unqualified personnel, it is clear that the solution is to develop a high-quality and appropriate educational system both in the higher educational system and in the professional educational system. By the optimal management and appropriate strategy, the unemployment rate can be decreased and the economy of the country and social situation can be improved.

The Ministry of Economy in 2017 report says that analysis is crucial. We have to pay the attention on both the employment and unemployment. Namely, the following components: asymmetries of the labour market, low level of mobility, existence of low productive and non-adequate qualification from the supply view and from the demand view: not enough diversification of the private sector, unequal development among sectors and geographical concentration issues of business and industrial fields. Only after such kind of analysis it is possible to make and implement correct and effective strategy to decrease unemployment.

The Business Consulting Group (2016) in their report offers the following steps for making the situation better on our labor market: plan the professional education, re-train the workforce and increase its qualification on the basis of labour market survey reports.

Paresashvili and Oqruashvili (2017) think that the modernization of the educational system is necessary along with synthesizing the traditional and computer educational methods that will help individuals to gain the necessary knowledge on their own.

Considerable attention should be paid to regional programs of employment. They will allow strengthening and developing the professional skills of youth. The real situation and conditions of every region should be considered with the analysis of problems of youth employment. Only in this way it is possible to prepare more competitive youth for the labour market, creation of corresponding conditions for adaptation, development of activities that support youth and mitigate the results of structural transformation of economy. Besides, different categories of

youth and their labour potential should be used more extensively. Youth should get social and psychological support. They must be socially protected and their entrepreneurship initiatives must be supported. The measures to regulate the labour market may incorporate investing to support the economically expedient jobs and the similar (Paresashvili, 2018).

To sum up, all these recommendations should be considered by the state and this process should be permanent. To make correct conclusions, the analysis period should not be stopped. For example, above mentioned reports from the Ministry of Education regarding traces was not published in 2017 and the most recent survey from the Ministry of Labour, Health and Social Protection was 2015 (Ministry of Labor, 2015). All these reports show us the main challenges of the market and give us an opportunity to make solutions and improve these solutions all the time. All that should be very helpful for business representatives to make correct accents. The state and the business should collaborate with each other, especially while developing professional programs. On the one hand, the state should consider surveys and, on the other hand, they should take recommendations from the business about the demanded human capital and required skills.

The recommendations for decreasing the unemployment are: creating appropriate labour legislation; making investments and developing programs for training and preparing qualified workforce; implementing reforms in the educational system; creating/developing an informative system of the labour market; regulation of labour migration; improving communication and perception; improving the employment services offered by the state; creation of a monitoring system and permanent observation.

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# MANAGEMENT OF CREDIT DEFAULT INDICATORS IN PRIVATE REAL ESTATE FINANCING

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**Abstract.** Financing of real estates was a trigger of the biggest financial crisis after the “Great Depression” crisis of the 1930s. One of the main causes for this 2007-started crisis was bad risk management of credit defaults in financing real estates. This paper examines the impact of interest rates and macroeconomic indicators on credit default rates. The research proposes a model that proves that the relationship between different predictor variables such as mortgage interest rates and macroeconomic indicators on the response variable of credit defaults are strong. The method is descriptive and inferential experimental research by collecting secondary data in different markets and by analysing these data for correlations and for bivariate and multivariate linear regressions. The research gives the evidence that the macroeconomic indicators have a higher impact on credit defaults than mortgage interest rates. The scientific research on this theme led to nearly the same result in different markets. The unemployment rate is the most responsible predictor variable for the credit defaults. It is very necessary for the involved stakeholders (borrowers and lenders) to keep the view on macroeconomic indicators but especially on the unemployment rate. The lenders can avoid credit defaults when unemployment rates are growing by not increasing interest rates at these times. The borrowers should use times with personally better circumstances for increasing their repayment rates. The financial markets need more regulation and control, and it needs a change of the market culture in the points of business ethics and morality.

**Keywords:** *Credit Defaults, Financial Crisis and Subprime Mortgage Crisis, Financing Private Residential Real Estates, Interest Rates, Mortgages, Risk Management*

**JEL Classification:** D12, E43, G21, H12, H63

## INTRODUCTION

**The Actuality of the Topic.** Risk management came into the field of high interest because of the biggest worldwide financial crisis in the 1930s due to a lack of guidance and supervision in lending money for home mortgages (Brunnermeier, 2009). It seemed that the policy of giving mortgages under very mild conditions and at very low initial interest rates led to this disastrous situation of extreme increase of credit defaults especially in the USA real estate market (Mazumder & Ahmad, 2010).

The topic is up to date even ten years after the crisis that started in 2007 because new findings and improvements of risk management for real estate financing are necessary at all times to protect the stakeholders from a financial crisis like this last one.

**The Research Object** is Risk Management. It is used as a keyword for the fundamental basics in operation of each economy and even of the financial industry.

**The Research Subjects** are mortgage loans for financing private residential real estates.

**The Aim of the Research** is to investigate and to compare the impact of different causes of credit defaults in private residential mortgages and especially the influence of the interest rates and of macroeconomic indicators on credit defaults.

**The Used Methods** are descriptive and inferential experimental research by collecting secondary data in different markets and by analysing these data for correlations and linear regressions. The research approach proposes a model that proves that the relationship between different predictor variables such as mortgage interest rates and macroeconomic indicators on the response variable of credit defaults are strong.

Within this thesis the author examines two **Research Questions**:

**RQ<sub>1</sub>** Which influences do the interest rates have on the credit default rates?

**RQ<sub>2</sub>** Which influences do macroeconomic indicators have on the credit default rates?

The author will investigate **two** central **Hypotheses** to compare the influences of interest rates and of main macroeconomic factors on the credit default rates.

**H<sub>01</sub>** The credit default rates of mortgages are not significantly dependent from the interest rates of these mortgages.

**H<sub>02</sub>** The credit default rates of mortgages are significantly dependent from main macroeconomic indicators.

**The Limitations** are given by research about financing private real estates with mortgages in the markets of the USA and Germany especially for the time between 1998 and 2014. Commercial financing of real estates or other than the named markets or times are not the subject of the research.

## 1. FOUNDATIONS OF FINANCIAL RISK MANAGEMENT

In the view of the topic “financing residential real estates” it is helpful to use the New Oxford American Dictionary which defines “risk” as “a situation involving exposure to danger” or in economic terms “the possibility of financial loss” (Stevenson, 2016).

The aim of financial risk-management for the system of mortgage lending should be to organize a situation for borrowers and lenders in which they are comfortable with their risks in financing. The main task of risk-management is the diagnosis of the recent and future risks and the decision which risks are acceptable or which risks have to be managed by the organization (Hull, 2011).

Risk-Management is a row of processes shown in Table 1 which contains Risk-Identification, Risk-Measurement, Risk-Analysis, Risk-Handling, and Risk-Controlling. These processes run dynamically. At the beginning of the risk-management process, a financial corporation has to identify the potential risks for the company. The next step is to measure and analyse the outcomes of the risk. At the end of these two stages, the enterprise knows its risks and the financial value of the vulnerability. The next process is to decide how to handle the risks. Therefore, a strategy has to be developed to clarify which instruments should treat the risks. Depending on the risk aversion of the corporation there are different methods to minimize or to avoid the risks, but there will not be a complete risk avoidance without the minimization or elimination of returns too (Maier, 2007). Afterwards the kind of risk handling is defined, the realization of the strategy has to be organized, done, and controlled.

Table 1. Process of Financial Risk-Management

Risk -Identification	Risk – Measurement Risk - Analysis	Risk -Handling	Risk - Controlling
Types of Risks	Business Ratios	Instruments	Organization
<ul style="list-style-type: none"> <li>• Market Risks</li> <li>• Credit Risks</li> <li>• Liquidity Risks</li> <li>• Operational Risks</li> </ul>	<ul style="list-style-type: none"> <li>• Expected Loss</li> <li>• Worst Case Loss</li> <li>• Value at Risk</li> <li>• Volatility</li> </ul>	<ul style="list-style-type: none"> <li>• Prevention</li> <li>• Limitation</li> <li>• Compensation</li> <li>• Diversification</li> </ul>	<ul style="list-style-type: none"> <li>• Planning</li> <li>• Control</li> <li>• Information</li> </ul>

Source: developed by the author, adapted from Wolke (2008)



This paper is focusing especially on Credit Default Risks and uses quantitative Risk-Measurement and Risk-Analysis as research methods. Quantitative methods of risk-measurement are based on the determination of risk ratios. These are discovered by measurement of countable data of real estate financing and by using these data at stochastic equations to describe the risks.

Figure 1 shows the kinds of risks and the origin of the credit risks. Credit Risks are the Credit Default Risk, the Interest Rate Risk, or the Pre-Payment Risk. Within this thesis the author will estimate the Credit Default Risk.

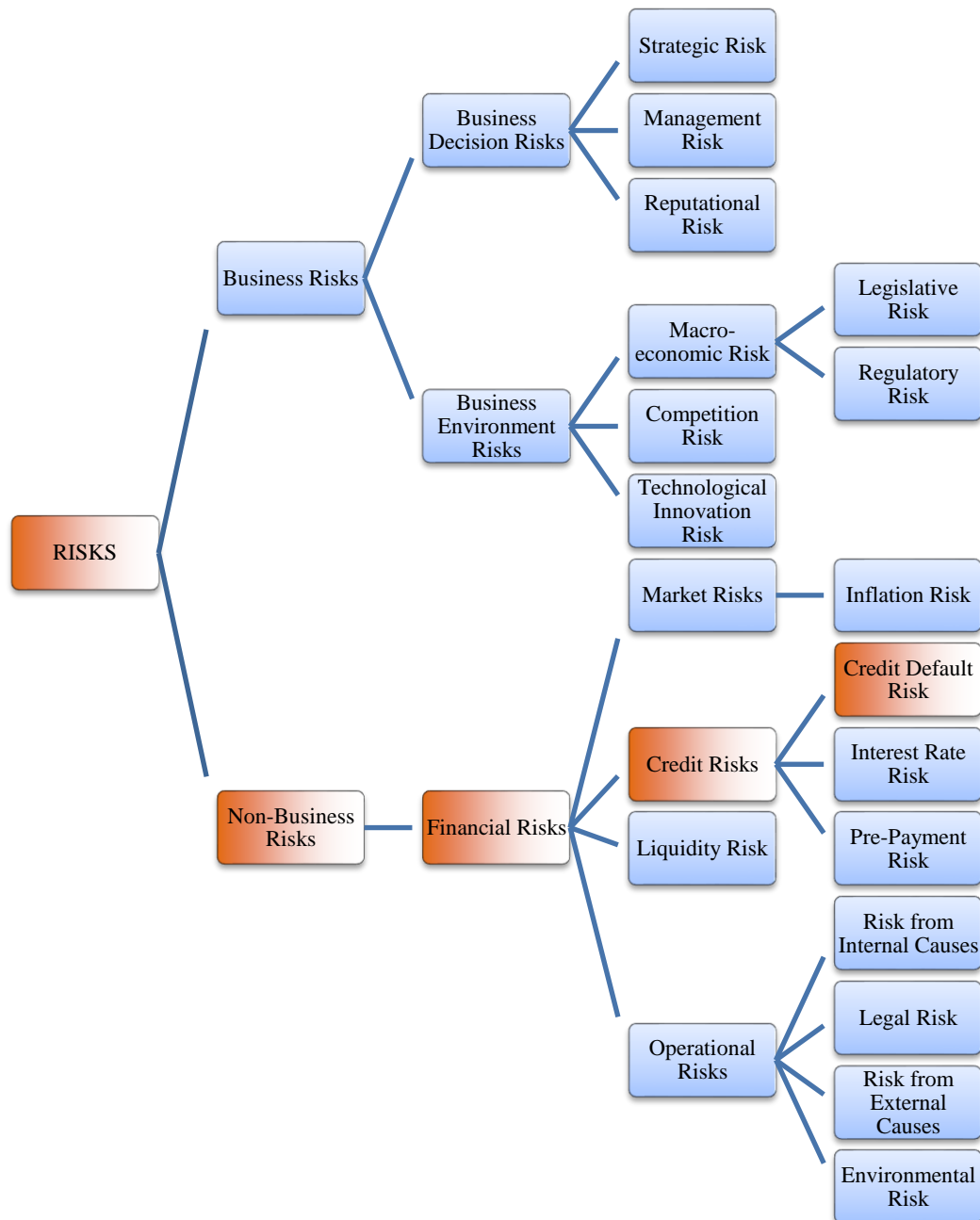


Fig. 1. Kinds of Risks (developed by the author, adapted from Jorion (2007)).

### ***1.1 Types of Mortgages***

One of the most important financial decisions any household has to make is whether to own a home and, if so, how to finance it. Depending on the interest rate during the contractual time, there are two broad categories of housing finance: Fixed (Interest) Rate Mortgages (FRM) and Adjustable (Interest) Rate Mortgages (ARM).

**Fixed Rate Mortgages** have the same interest rate for the whole time of the mortgage contract. Usual contract times are 10, 15, 20 or 30 years. The longer is the period the borrower has for repaying the loan (maturity time), the higher is the interest rate set by the lender because of a growing interest rate risk for the lender.

**Adjustable Rate Mortgages** have, in contrast to the fixed rate mortgages, a periodical change or adjustment of the interest rates during the time of repaying the loan. This adjustment could be with shorter or longer intervals depending on the contract conditions. In the USA, the adjustment depends on the change of the interest rate (Federal Refund Rate) set by the central bank (US Federal Reserve Bank). The shorter is the contractual time for checking and adjusting the interest rates, the smaller are the interest rates for the borrower because of a smaller interest rate risk for the lender. In general, at the same time, the interest rates for ARM are lower than those for FRM because of a lower inherent interest rate risk for the lender.

A study from Mills and Gardner in 1986 showed that the majority of the customers prefer the less risky fixed-rate mortgages to the ARM (Mills & Gardner, 1986). In 2008, Bucks and Pence also described the adjustable rate mortgages especially the part of the subprime adjustable rate mortgages as more complicated than fixed rate mortgages (Bucks & Pence, 2008).

### ***1.2 Credit Defaults and Foreclosures***

The Credit Default Risk is highly connected to the default risk of the borrowers in cases when they are unwilling or unable to repay a loan. The author states: This kind of risk was the most important of all risks that triggered the financial crisis.

The causes for credit defaults of the borrowers can be changes of interest rates (of adjustable rate mortgages), of individual indicators or macroeconomic indicators. Adverse movements in macroeconomic factors can potentially affect the borrowers' ability to pay and it threatens a foreclosure. Foreclosure means that the property rights go from the borrower to the lender, so the lender has the right to sell the property to use the money for the losses from payments. It is necessary for lenders to understand the relationship between macroeconomic indicators and credit default risk and foreclosures in order to manage this risk (Nang, Neo, & Ong, 2003).

From 2007 until 2013, more than 5.5 million families in the USA lost their homes because of foreclosures by a repossession process. More than 11 million borrowers or around 23% of households with mortgages got in trouble with their mortgages (Das, 2012). From 2007 to 2014 more than 15.5 million USA households had to open a foreclosure filing in a foreclosure process because of not fulfilling their financial duties to the banks (Statista, 2015).

## **2. ANALYSIS OF THE MARKETS**

The analysis of the markets is an empirical investigation of **Risk Identification**. The author states that one cause of this big crisis was the huge part of Adjustable Rate Mortgages (ARM) in the US market. The number of ARM's had a steep increase in the US market between 2001 and 2004 from 12% up to 34%. The 2008 default rate of subprime ARM's was 33.4% vs. 3.0% of prime FRM's. The number of subprime borrowers in the USA increased from 2001 to 2005 from 7.8 up to 21.3% (Barth, 2009).

Table 2. USA Mortgage Originations and Credit Default Rates 1990 to 2010

Item	1990	2000	2004	2005	2006	2007	2008	2009	2010
<b>MORTGAGE ORIGINATIONS</b>									
<b>Total (bil. dol.)</b> .....	<b>459</b>	<b>1,139</b>	<b>2,773</b>	<b>2,908</b>	<b>2,726</b>	<b>2,306</b>	<b>1,509</b>	<b>1,995</b>	<b>1,572</b>
Purchase (bil. dol.) .....	389	905	1,309	1,512	1,399	1,140	731	664	473
Refinance (bil. dol.) .....	70	234	1,463	1,397	1,326	1,166	777	1,331	1,099
<b>DELINQUENCY RATES <sup>1</sup></b>									
<b>Total</b> .....	<b>4.7</b>	<b>4.4</b>	<b>4.5</b>	<b>4.5</b>	<b>4.6</b>	<b>5.4</b>	<b>6.9</b>	<b>9.4</b>	<b>9.3</b>
Prime conventional loans .....	(NA)	2.3	2.3	2.3	2.4	2.9	4.3	6.5	6.5
Subprime conventional loans .....	(NA)	11.9	10.8	10.8	12.3	15.6	19.9	25.5	25.9
Federal Housing Administration loans .....	6.7	9.1	12.2	12.5	12.7	12.7	13.0	14.0	12.8
Veterans Administration loans .....	6.3	6.8	7.3	7.0	6.7	6.4	7.2	7.9	7.5

Source: US Census Bureau, Statistical Abstract of the United States 2012

At the same time, the German mortgage delinquencies rates are very stable on a low level. Since 2004, the mortgage delinquency rates were shrinking continuously from around 2.5% and reached 0.9% in 2014. They are much smaller than in the American market at “normal” times.

Table 3. German Credit Default Rates 2004-2014

Germany	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total (%)	2,06	2,26	2,38	2,50	2,50	2,40	2,50	2,50	2,50	2,50	2,50
Mortgages	2,47	2,35	2,19	2,09	1,95	1,91	1,71	1,44	1,16	1,03	0,90

Source: by the author with data from SCHUFA 2007-2017

### 3. RESEARCH DESIGN AND METHODOLOGY

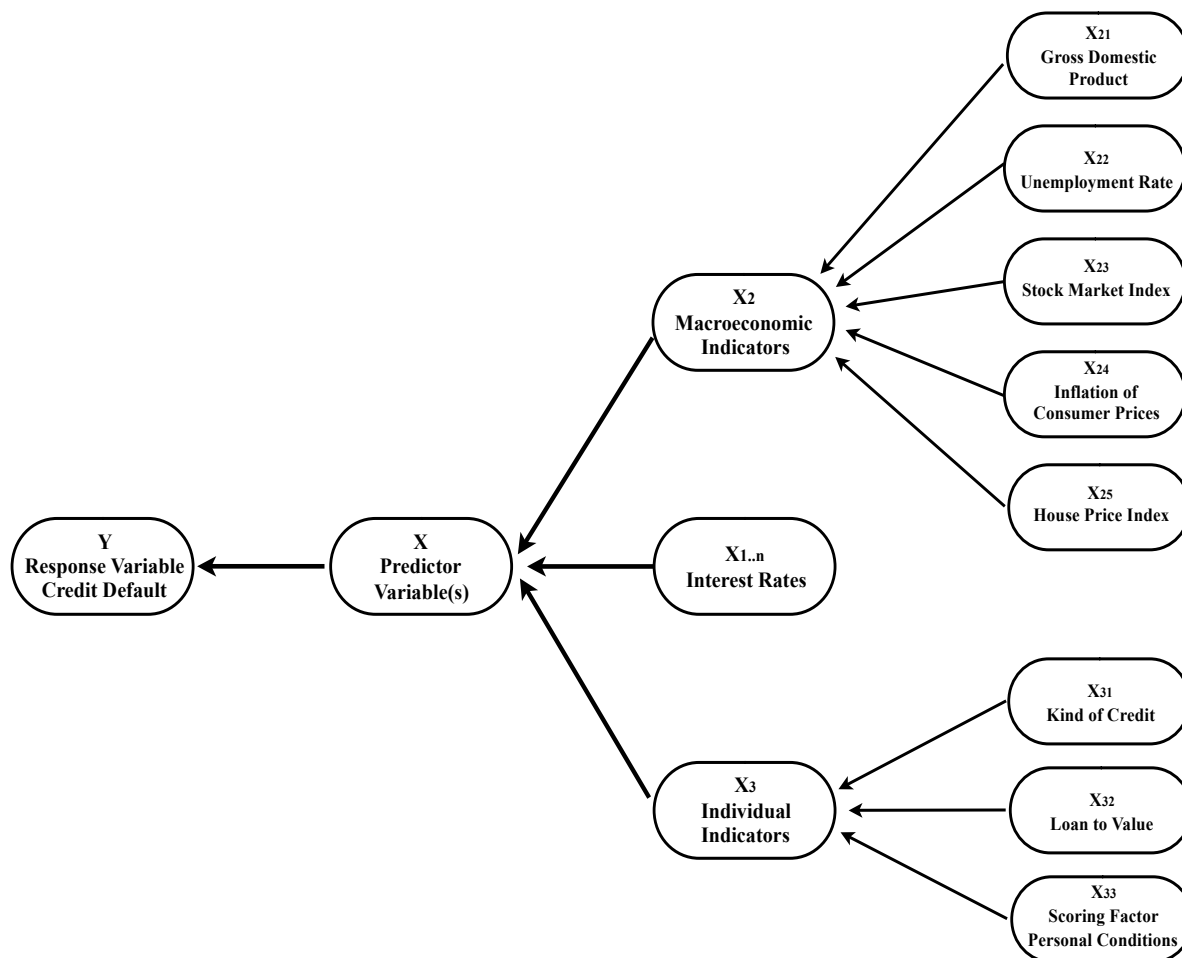
The **Research Design** builds the frame for the collection and analysis of data. A special aim of the research design is to express causal connections between numbers of variables. The author uses a so-called cross-sectional design. It means that the same variables will be analysed in different groups or inside this thesis in different markets. Another name for this cross-cultural or international research is comparative research design (Bryman & Bell, 2007).

The author uses the quantitative strategy. That means the researcher first sets the theory and then he proves it with data collecting and data analysing. This is also called the deductive approach (Collis & Hussey, 2009).

The **author takes secondary data** for his analyses. There can be cross sectional measurements at one point of time or there can be measurements over a time horizon, which are called time series measurements followed by a time series analysis (Schulze & Porath, 2012, p. 217). The author uses time series between 1998 and 2014 as data material for the regression analyses inside this thesis. Memmel et al. stated that the advantage of using observable average data as systematic drivers is that one can use standard econometric tools such as linear regressions (Mommel, Gündüz, & Raupach, 2015).

Figure 2 shows the author’s relationship model for credit defaults.

The author will make the analyses just for the interest rates and for the macroeconomic indicators, because there were great difficulties to research individual indicators in the official statistics. The research inside this thesis investigates three main parts of risk management – identification, measurement and analysis of financial risks for the indicators of the credit defaults, and uses the linear regression analysis as a model that proves how strong is the relationship between different predictor variables such as the mortgage interest rates and macroeconomic indicators on the response variable the credit default rate.



**Fig. 2.** Relationship-Model for Credit Defaults (created by the author).

Levišauskaite and Varanauskine as the most important factors for credit defaults see household income, housing prices, inflation and interest rates (Levišauskaite & Varanauskine, 2013). Rottke and Gentgen (2008) wrote that the Gross Domestic Product and the unemployment rate are the strongest macroeconomic factors with the most implications not only on the German real estate market (Rottke & Gentgen, 2008). Diaz-Serrano (2005) found that the volatility of household income also triggered by the employment status and unforeseen events is the most relevant variable that influences mortgage delinquencies. Danis and Pennington-Cross also stated that the probability of default is strongly related to the local labour market conditions, represented by the unemployment rate (Danis & Pennington-Cross, 2008).

Within the H01 hypotheses the following mortgage interest rates will be tested:

- Mortgages with Average Interest Rates
- 1 year – Adjustable Rate Mortgages
- 30 years – Fixed Rate Mortgages

Within the H02 hypotheses the next macroeconomic indicators will be tested:

- Gross Domestic Product
- Unemployment Rate
- Stock Market Index
- Inflation of Consumer Prices
- Home Price Index

Both hypotheses will be tested by bivariate linear regressions, because only one dependent and one independent variable will be compared.

All bivariate hypotheses will be tested in the USA and in the German market in the same way and for the same predictors.

The author uses the following steps recommended by Backhaus and other scientists to make the linear regression analysis (Backhaus, Erichson, Plinke, & Weiber, 2016):

- Formulation of a relationship model
- Estimation of a regression function
- Examination of the regression function
- Examination of the regression coefficients
- Examination of the model statements

The author proves the goodness of fit of the regression function by squaring of the correlation coefficient (R). This is the examination of the quality of the bivariate regression function. The result is called squared correlation ( $R^2$ ) or coefficient of determination. The validity of the hypothesis will be checked by the Analysis of Variation (ANOVA). To decide if the hypothesis is verified or not the author will make a comparison between the calculated probability (p) and a significance level, the alpha-level ( $\alpha$ ), which is set as a limit for statistically significance normally at 0.05. As smaller the p-value as higher is the determination of the significance of the tested hypothesis.

#### 4. RESEARCH FINDINGS

Test of H01 Hypotheses (Interest Rates) in the US market:

- **Average of Interest Rates for Mortgages (AIR)**
  - $H_{01-US-AIR}$  was rejected. (The hypothesis is not proved.)
  - Credit defaults are significantly dependent from the mortgages with Average Interest Rates
- **Fixed (Interest-) Rate Mortgages (FRM)**
  - $H_{01-US-FRM}$  was rejected. (The hypothesis is not proved.)
  - Credit defaults are significantly dependent from the Fixed Rate Mortgages
- **Adjustable (Interest-) Rate Mortgages (ARM)**
  - $H_{01-US-ARM}$  was accepted. (The hypothesis is proved.)
  - Credit defaults are not significantly dependent from the Adjustable Rate Mortgages

Test of H01 Hypothesis (Interest Rates) in the German market:

- **Average of Interest Rates for Mortgages (AIR)**
  - $H_{01-DE-AIR}$  was rejected. (The hypothesis is not proved.)
  - Credit defaults are significantly dependent from the mortgages with Average Interest Rates

Test of H02 Hypotheses (Macroeconomic Indicators) in the US market:

- **Gross Domestic Product (GDP)**
  - $H_{02-US-GDP}$  was accepted. (The hypothesis is proved.)
  - Credit defaults are significantly dependent from the Gross Domestic Product.
- **Unemployment Rate (UER)**
  - $H_{02-US-UER}$  was accepted. (The hypothesis is proved.)
  - Credit defaults are significantly dependent from the Unemployment Rates.
- **Stock Market Index: DJIA**
  - $H_{02-US-DJIA}$  was rejected. (The hypothesis is not proved.)
  - Credit defaults are not significantly dependent from the stock market index: DJIA.
- **Inflation of Consumer Prices (ICP)**
  - $H_{02-US-ICP}$  was rejected. (The hypothesis is not proved.)

- Credit defaults are not significantly dependent from the Inflation of Consumer Prices.
- **Case Shiller Home Price Index (HPI)**
  - H<sub>02-US-HPI</sub> was rejected. (The hypothesis is not proved.)
  - Credit defaults are not significantly dependent from the Case Shiller House Price Index.

Test of H<sub>02</sub> Hypotheses (Macroeconomic Indicators) in the German market:

- **Gross Domestic Product (GDP)**
  - H<sub>02-DE-GDP</sub> was accepted. (The hypothesis is proved.)
  - Credit defaults are significantly dependent from the Gross Domestic Product.
- **Unemployment Rate (UER)**
  - H<sub>02-DE-UER</sub> was accepted. (The hypothesis is proved.)
  - Credit defaults are significantly dependent from the Unemployment Rates.
- **Stock Market Index: DAX**
  - H<sub>02-DE-DAX</sub> was accepted. (The hypothesis is proved.)
  - Credit defaults are significantly dependent from the stock market index: DAX.
- **Inflation of Consumer Prices (ICP)**
  - H<sub>02-DE-ICP</sub> was rejected. (The hypothesis is not proved.)
  - Credit defaults are not significantly dependent from the Inflation of Consumer Prices.
- **Home Price Index (HPI)**
  - H<sub>02-DE-HPI</sub> was accepted. (The hypothesis is proved.)
  - Credit defaults are significantly dependent from the House Price Index.

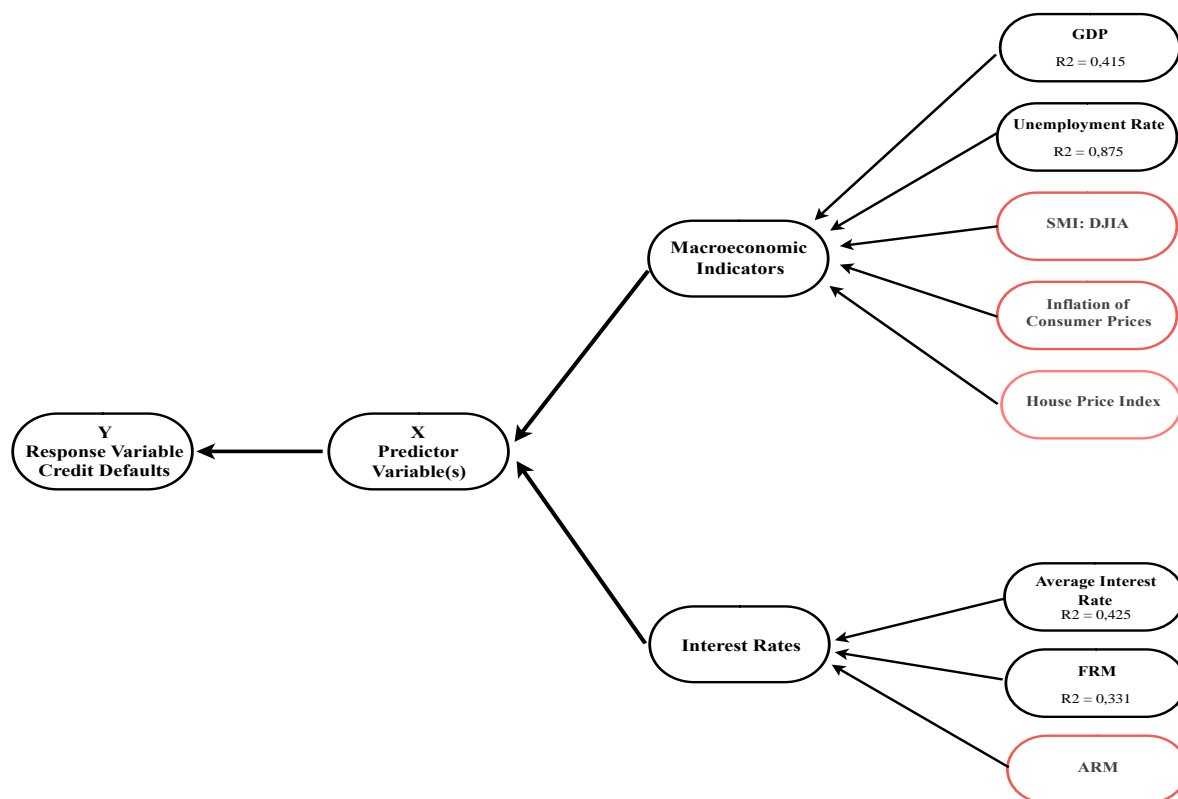


Fig. 3. Model of Results for the US Market (created by the author)

The last two figures demonstrate the research results as relationship models for the US and for the German market.

They show the relation between the credit default rates and the interest rates on one side and the macroeconomic indicators on the other side.

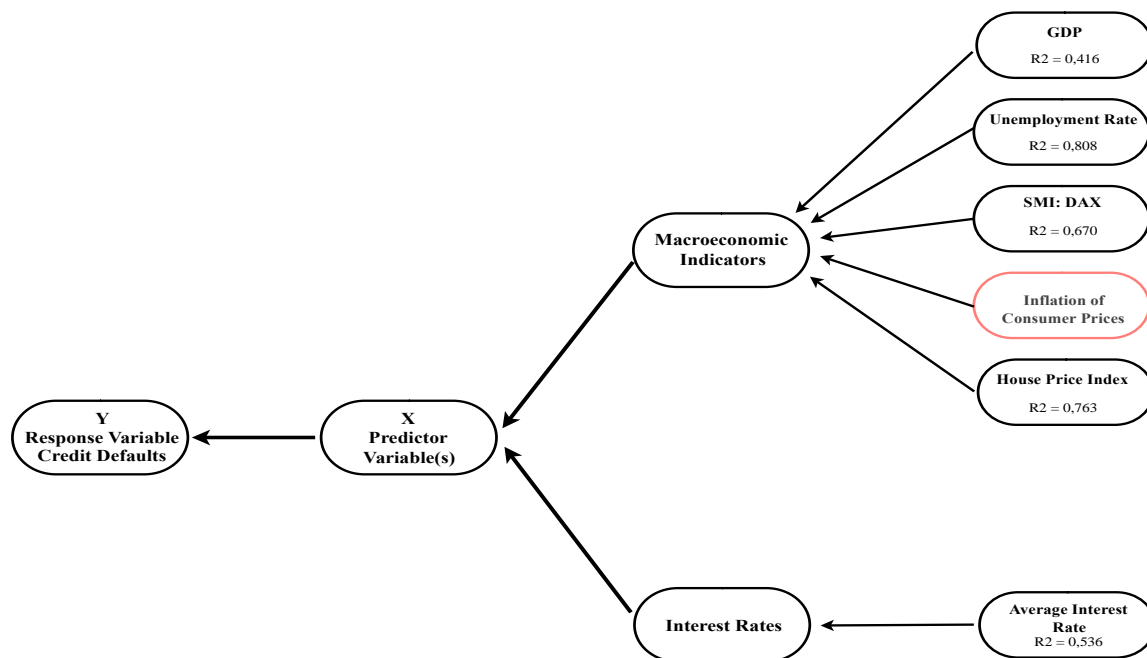


Fig. 4. Model of Results for the German Market (created by the author)

In the table below, one can see directly the differences between both markets. The coefficient of determination  $R^2$  demonstrates the strength of the regression function. The larger the  $R^2$ , the better is the goodness of fit. The hypothesis is proved when the p-value is smaller than the set value for the significance level; in this thesis it is 0.05. One interesting fact is that apart from the unemployment rate (UER), all variables are in another way correlated with the credit default rate in the USA and Germany. The German correlations have the “right” directions according to the author’s view. That means: good macroeconomic values are connected with low credit default rates and vice versa. The American correlations look like a “wrongly” working market. The meaning of “right” and “wrong” in the case of how the markets are working is the common sense as well as the scientific view that good macroeconomic conditions lead to low credit defaults and vice versa – bad macroeconomic conditions lead to high credit default rates.

Table 4. Comparison of credit defaults in the USA and in Germany

Hypothesis	US Market			German Market		
	R <sup>2</sup>	p-Value	Correlation	R <sup>2</sup>	p-Value	Correlation
AIR	0,425	0,005	-0,652	0,536	0,001	0,732
FRM	0,331	0,016	-0,575	---	---	---
ARM	0,226	0,054	-0,475	---	---	---
GDP	0,415	0,005	0,644	0,416	0,005	-0,645
UER	0,875	<0,0001	0,935	0,808	<0,0001	0,899
DJIA, DAX	0,025	0,543	0,159	0,670	<0,0001	-0,819
ICP	0,212	0,063	-0,460	0,001	0,900	0,033
HPI	0,020	0,589	0,141	0,763	<0,0001	-0,874

Source: created by the author

## CONCLUSIONS AND RECOMMENDATIONS

### Conclusions

As **Novelty**, the author demonstrates the evidence that the interest rates are not the main factor to trigger the credit default rates. The unemployment rate is the most responsible predictor variable for the credit defaults. The scientific research on this theme led to nearly the same result on the different markets – the USA and Germany.

The used research method of linear regression analysis is the most widely applied model to explain statistical relationships, and the author got valuable results by using bivariate and multivariate linear regressions.

The subprime mortgage crisis of 2007-2010 was a result of what happens if there is an immense **Failure of Risk Management**. None of the four phases of risk management did work effectively before and during the crisis, especially not in the USA market.

**Risk Identification.** At first, the risks with subprime loans were not identified correctly and careless checking of borrowers' credit worthiness was a massive fault.

**Risk Measurement and Analysis** have to be improved as well. One problem with the quantitative measurement of the value of risk ratio failed because of missing historical data of defaults from subprime mortgages. Another point is to think about the accuracy of the main used risk management tool Value at Risk.

**Risk Handling** before this crisis was very careless and partially fraudulent because it is not only a question of fairness to sell unchecked mortgages in the second mortgage market but it is also a question of fraud and it should be corrected immediately. Doing this, the investment banks have an enhanced chance to analyse their risks.

**Risk Controlling** went wrong on the sides of all stakeholders beginning on the lenders' side following by the internal and external controlling of financial institutions and furthermore on the government side.

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## CHANGES IN THE STRUCTURE OF SELECTED ECONOMIES

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**Abstract.** The divergent developments in productivity and employment over the past two decades as well as the crisis and subsequent recovery of the global economy have led to significant changes in different parts of the economic structure in the Baltic countries and other European Union (EU) countries. The aim of the article is to examine changes in the basic segments of the economic structure of the Baltic countries. The development of segments is assessed through the indicator of gross value added (in current prices) and employment in the period 1995 to 2017. The situation of the Baltic countries is confronted with the situation in the EU15. We note that the structure of the Baltic countries differs from that of the EU15. The difference is that the service segment has significantly increased its share in value added in the EU15 countries, while a relatively large share of manufacturing industry and also agriculture continues to remain in the Baltic economy. However, the share of services is slowly rising. This divergent development contributes to the structural gap between the Baltic and EU15 countries ranging from 2 to almost 8%. However, it is true that the upward trend is only reflected in Lithuania.

**Keywords:** *Employment, EU-15, Gross Value Added, Structural Deviation, Structural Gap.*

**JEL Classification:** F61, F63

### INTRODUCTION

The Baltic countries, as well as other European countries, changed very significantly under the influence of both external and internal political and socio-economic factors. In particular, the relatively challenging process of transforming the economy into a market economy and its subsequent establishment on European markets has prompted many changes.

The aim of the article is to highlight how much the structure of economies in the Baltic countries has changed in comparison with the structure in the EU15. In formulating the goal of the article, we assumed that the Baltic countries, as part of their transformation, tried to adapt as much as possible to modern trends in Europe. In the last two decades, in the economies of the European states (we are talking about the original EU states) we can see the increase of the share of the service segment in gross value added. This is also related to the involvement of countries in global value chains and the overall development of global production. That is why we have tried to examine whether the Baltic countries have also reorientated from the traditional sectors – agriculture and manufacturing – to service industries.

In connection with the efforts of the Baltic countries to enter the EU and later the Economic and Monetary Union (EMU), we assumed that the internal changes brought the economy into a structure that changed and adapted to the structure of developed economies that the country was trying to get closer to. We assumed that the structural gap between the Baltic countries and the EU15 average (or individual EU15 countries) is not more than 5%.

## 1. METHODS AND PROCEDURES

We used the industry classification NACE (Rev. 2) to investigate changes in structure, with the economy divided into 10 sectors. The changes were monitored in the period 1995-2017. However, 22 years is too long a series of data. That is why we chose only 5 years for the analysis to evaluate the changes that have occurred. Years 1995 and 2017 represent the beginning and end of the reference period. Other years chosen to analyse are 2000, as a time of formation of new conditions in the attempt to join the EU; 2008, as the breakthrough year between the economic growth and the economic crisis; and the last year selected is 2012 as the year of the end of the economic crisis. Primary variables were gross value added (in current prices) and employment (in thousands of people). All used values were available in the Eurostat and OECD databases. Missing data was complemented by country statistical data.

When examining the structural gap, we relied on the Dujava (2010) methodology and the structural gap was calculated twice for each of the Baltic countries. Firstly, a structural gap between the EU15 average and the Baltic country, and secondly, the structural gap between each EU15 country and the Baltic country. The reason was to remove distortions that might have occurred during the first calculation due to the use of an average value. The basic procedure for calculating the structural gap was as follows:

$$s = 100 * \sqrt{\sum_{i=1}^{11} h_i * \left( \frac{VA_{i,EST/LVA/LTU}}{VA_{EST/LVA/LTU}} - \frac{VA_{i,EU15}}{VA_{EU15}} \right)^2} \quad (1)$$

$$h_i = \frac{1}{2} \left( \frac{VA_{i,EST/LVA/LTU}}{VA_{EST/LVA/LTU}} + \frac{VA_{i,EU15}}{VA_{EU15}} \right) \quad (2)$$

where:

s – Structural deviation indicator;

$h_i$  – I - th sector;

$VA_{i, country}$  – the Gross value added (GVA) in the country's "i-th" sector;

$VA_{country}$  – the total GVA in country;

$VA_{i, EU15}$  – the size of the GVA in the EU15 "i-th" sector;

$VA_{EU15}$  – the total GVA in the EU 15

The volume of the structural wobble index is increasing with the growing differences between the share of individual sectors in the economy of Estonia/Latvia/Lithuania and the EU-15 economy (Dujava, 2010). For the calculation of the structural deviation in employment, the GVA is changed for employment.

Throughout the article, we will use the following abbreviations for each segment:

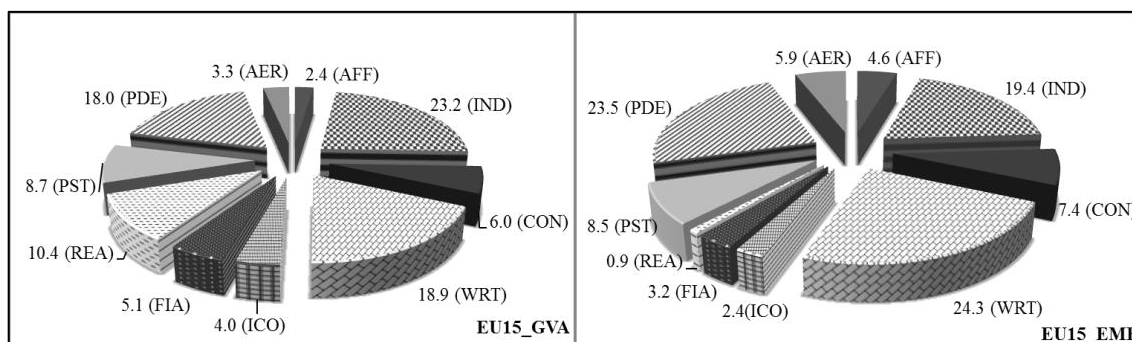
Table 1. Segment names and their abbreviations

Segment	Abbr.	Segment	Abbr.
Agriculture, forestry and fishing	AFF	Financial and insurance activities	FIA
Industry (except construction)	IND	Real estate activities	REA
Construction	CON	Professional, scientific and technical activities; administrative and support service activities	PST
Wholesale and retail trade, transport, accomodation and food service activities	WRT	Public administration, defence, education, human health and social work activities	PDE
Information and communication	ICO	Arts, entertainment and recreation; other service activities; activities of household and extra-territorial organizations and bodies	AER

## 2. RESULTS

### 1.1 Structure of EU-15 economy

The structure of the EU15 economy has gradually changed and evolved. By comparing the data for all EU15 countries, we found that in 1995 the economies of these countries were mainly based on three key sectors: Industry (IND), Wholesale and retail trade (WRT) and Public administration, defense, education, human health and social work activities (PDE). The IND segment had the largest average share in the EU15 value added – up to 22.5% of value added. The largest share of IND was in the Finnish economy (28.8%) and the smallest share in the Luxembourg economy (14.9%). The main component of IND was Manufacturing (MAN), which accounted for up to 81% of the gross value added of IND. The second core sector was WRT, which accounted for an average of 20% of the EU15 gross value added. WRT was the main sector in Greece's economy (26.9%) and the smallest share of this sector was in Germany (15.8%). The third major sector was PDE with 18.5% share in gross value added. The PDE segment had the largest share in gross value added in Denmark (22.35%) and the lowest in Luxembourg (13.8%). Thus, the IND, WRT and PDE segments jointly generated up to 70% of the EU15 gross value added on average. (Fig. 1) The exception for the EU15 was Luxembourg, where FIA had the largest share (24%) in gross value added. WRT was second and IND was third.



**Fig. 1.** The structure of the EU15 economy according to GVA and EMP in 1995 (%)

*Source: own calculation based on (Eurostat2, 2018)*

The significant position of the IND, WRT and PDE segments has also confirmed the share of these segments in employment. In this case, however, the order of the segments was different from the gross value added. Most people were employed in the WRT segment (24.3%), the second was PDE (23.5%) and then IND (19.4%).

Over the next five years all 3 segments reduced their shares in gross value added. The most significant decline was in the value added share in the IND segment (decrease by 1.4%), but it was still the largest share. The status and shares of other segments did not change significantly. The structure of Luxembourg economy continued to be specific as the FIA's share increased (from 24% to 25.9%) compared to 1995.

In 2008 the world economy reached the peak of an economic cycle. However, the character of the development in individual segments had changed. The IND sector had experienced a share decline of almost 3% on average, while the WRT's share had not changed and the PDE's share had grown by 1%. WRT had become the largest share in value added. The most significant decline was the fall of the MAN's share in Finland (from 27.6% in 2000 to 23.7% in 2008).

The years 2008-2012 are considered as crisis years in the global economy. The share of the IND sector continued to decline, while the PDE sector had increased its share in added value in that period. In several EU15 countries, we could observe a stronger increase in the REA's share

(in Greece shifts from 13.1% to 19.1%, in Italy shifts from 12.4% to 13.8%). Significant changes also occurred in the Netherlands, where the share of FIA significantly increased from 5.9% to 9.1%.

The post-crisis period meant stabilizing the 2012 structure for Belgium, France and Austria. However, Ireland had undergone significant structural changes over this period. The share of IND had increased to 36% over the 5-year period, largely due to an increase in the MAN share. On the contrary, both the WRT and PDE sectors (both in the structure of Ireland) experienced a significant decline in the share of these sectors – WRT declined from 16.3% in 2012 to 12.3% in 2017 and PDE dropped from 17.4% in 2012 to 11.2% in 2017. The REA sector was more pronounced in Finland and Sweden. In Luxembourg, the share of FIA increased again to 26.5%.

Developments in the share of individual segments in value added were also reflected in the share of these segments in employment in the EU15 (see Table 2). The WRT segment had the largest share of employment throughout the period. The second was the PDE segment and the third IND segment. However, the share of IND was significantly lower and declined over the whole period. On the other hand, the share of both PDE and WRT segments had grown over time.

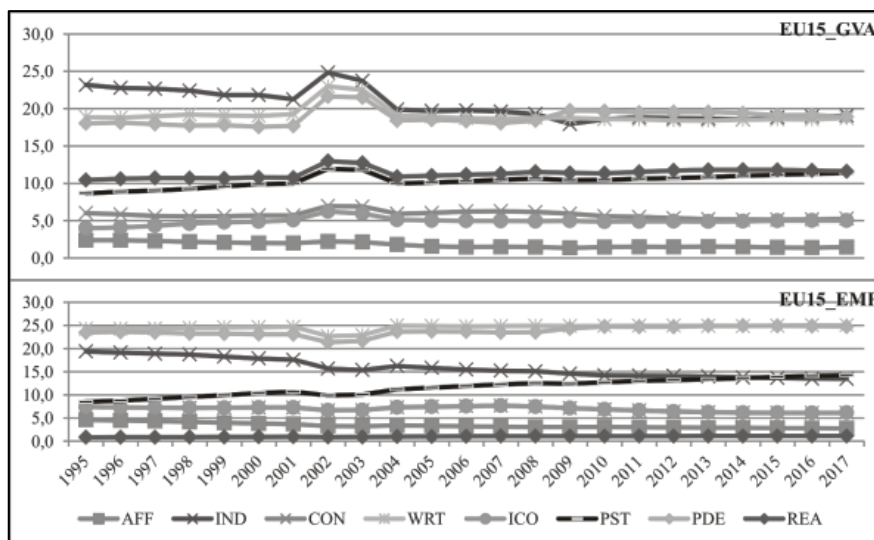
Table 2. The structure of EU15 economy according to EMP in 2000-2017 (%)

GEO/TIME	EU15/ 2000 - 2017								
	2000	2008	2012	2017	Employment	2000	2008	2012	2017
Employment	(thousand people)				Employment	(thousand people)			
AFF	3.82	3.06	2.97	2.77	FIA	3.03	2.90	2.87	2.63
IND	17.86	15.09	14.1	13.46	REA	0.96	1.11	1.11	1.13
CON	7.28	7.49	6.42	6.14	PST	10.38	12.51	13.2	14.24
WRT	24.62	24.88	24.93	25.02	PDE	23.08	23.52	24.70	24.74
ICO	2.80	2.88	2.95	3.1	AER	6.16	6.54	6.75	6.77

\*Dark Grey - decrease; Light Grey - growth

As the results show, in the case of traditional sectors such as AFF and IND in the EU15, the share of these sectors in the value added has been reduced. In the case of AFF, it is a decrease in all 15 countries. The decline in Industry was significant in several countries (Belgium, Sweden, Finland, UK). This was mainly related to the drop in the share of the MAN segment, which accounted for up to 81% of the IND value added. In the opposite situation, there was Ireland, where, especially in the last five years, there had been a sharp increase in the share of this sector. As Paschal Donohoe (Finance Minister) said, a large part of the surge was raised by Irish-resident multinationals increasing the amount of contract manufacturing they carry on outside Ireland. As a result, Ireland's economy had been the fastest growing economy in Europe over the last two years (Beesley, 2017).

Compared to traditional sectors, the service sector experienced a significant increase in the value added. The share of PST, REA, and ICO increased sharply. Additionally, developments in the area of value added support developments in employment. AFF and IND recorded the largest drop in total employment. In AFF, the most marked decline was in Greece and Ireland. Ireland, despite the fact that in previous years the IND's share in value added had sharply shrunk, the share of employment in this sector had fallen sharply (UNIDO, 2018).



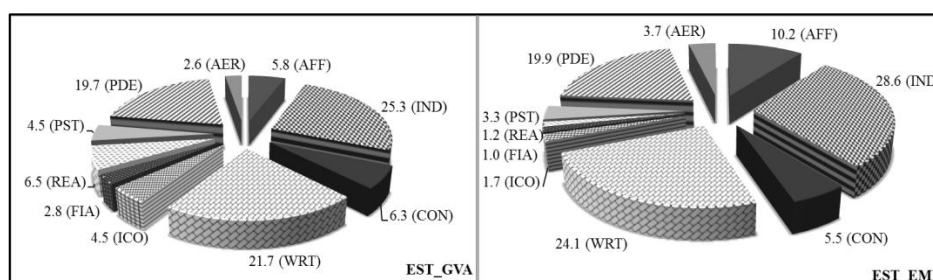
**Fig. 2.** The share of segments of GVA and EMP in EU15 (%)  
Source: own calculation based on Eurostat (Eurostat1, Eurostat2, 2018)

An increase of the PST’s share in value added also resulted in an increase in the share of this sector in employment (Fig. 2). At the same time, the share of PDE employees also increased. However, overall, there has been a marked increase in the share of service industries in total employment at the expense of traditional industries.

### 1.2 The structure of the Baltic (Estonia and Latvia) economies

#### Estonia

At the beginning of the period, the value added of Estonia was mainly generated by three segments: IND, WRT and PDE. Compared with the EU-15, WRT and PDE in Estonia contributed more to the value added than in the EU15. Another difference in the structures was the AFF’s share in value added which was significantly higher in Estonia than in the EU15. The AFF’s more prominent position in the structure of the economy was also supported by the high AFF share of employment in Estonia. In addition, in the economy of Estonia, the industry had the largest share in both value added and employment. In both cases, the value was higher than in the EU15. (Fig. 3)



**Fig. 3.** The structure of Estonia economy according to GVA and EMP in 1995 (%)  
Source: own calculation based on Eurostat (Eurostat1, Eurostat 2, 2018)

By comparing the share of individual industries to value added, we note that in 1995 the share of classical industries (agriculture, industry) was higher in Estonia than in the EU15. However, the share of WRT and ICO segments in Estonia was higher than in the EU15. On the other hand, the service sector (excluding the PDE) was more significant in the EU15 value added than in Estonia. (Tab. 3)

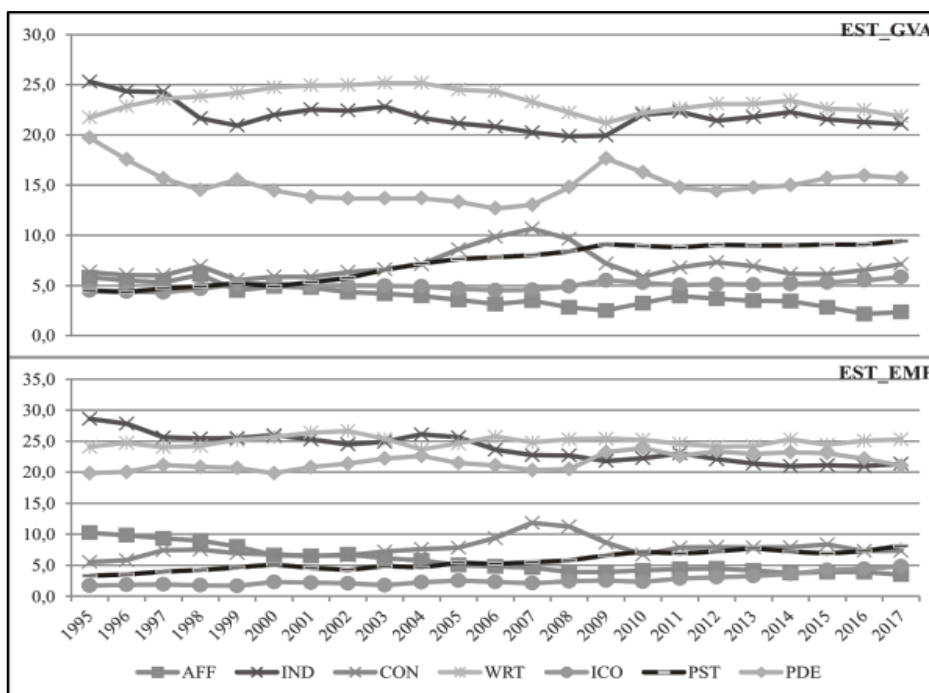
Table 3. The structure of Estonia and EU15 economy in 1995 (%)

TIME	1995								
	GVA		EMP		GVA/EMP	GVA		EMP	
	EST	EU15	EST	EU15		EST	EU15	EST	EU15
	(mil.Euro)		(thousand people)			(mil.Euro)		(thousand people)	
AFF	5.8	2.4	10.2	4.6	FIA	2.8	5.1	1.00	3.2
IND	25.3	23.2	28.6	19.4	REA	6.5	10.4	1.2	0.9
CON	6.3	6.0	5.5	7.4	PST	4.5	8.7	3.3	8.5
WRT	21.7	18.9	24.1	24.3	PDE	19.7	18.0	19.9	23.5
ICO	4.5	4.0	1.7	2.4	AER	2.6	3.3	3.7	5.9

\*Dark grey - the higher share of the segment in Estonia than in the EU-15

The period of restructuring and the transformation of the economy led to a significant increase of the share of the REA segment. There were also significant changes in the shares of other segments, such as IND and PDE, which declined, while WRT grew in the period 1995-2000 (the program for the restructuring of transport and trade was a key objective of the government). Public investments in the ICO segment (e.g. the Estonian school computerisation program Tiger Leap) positively influenced the development of the structure (Europa, 1998). The result was an increase in ICO's share not only in value added, but also in employment. Although the AFF segment's share in value added was only around 1%, it fell by 4% in the area of employment (a drop of 104.88 thousand people). This was the biggest change in the structure over 5 years.

In the following period, the main change in the structure of Estonia's economy was the decline in the AFF's share in both value added and employment. By 2008, the share of CON increased in value added (from 5.9% in 2000 to 9.6% in 2008). Since 2008 there had been a significant increase in PST segment share (from 8% in 2008 to 9.5% in 2017). In the period 2012-2017, the share of agriculture continued to decline – both in value added (from 3.7% in 2012 to 2.4% in 2017) and in employment (from 4.5% in 2012 to 3.5% in 2017).

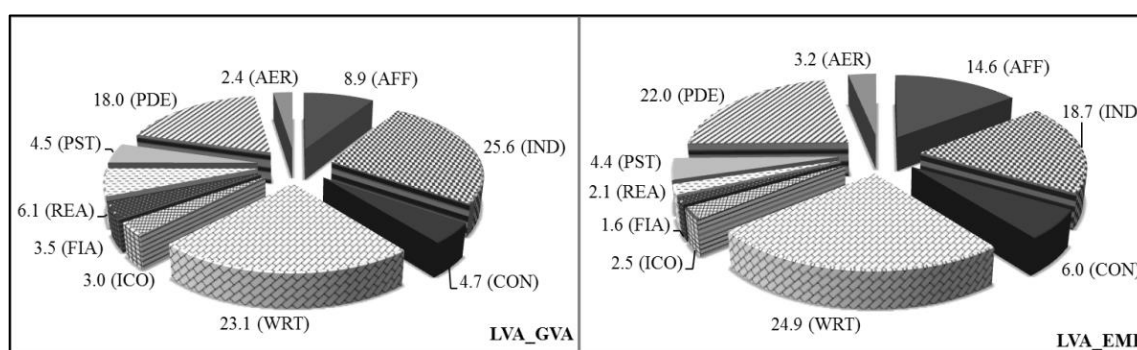


**Fig. 4.** The share of segments of GVA and EMP in Estonia (%)  
Source: own calculation based on (Eurostat1, Eurostat2, 2018)

For the economy of Estonia, overall, agriculture and industry fell sharply from their 1995 share in both gross value added and employment. (Fig. 4) On the other hand, the share of services grew in all categories, but the position of the IND segment as the second strongest segment in the gross value added did not change over the whole period (with an exception of 1995 when, according to the value added, IND was the first in rank). The share of ICO and CON increased.

### Latvia

The structure of Latvia's economy in 1995 was very similar to that of Estonia or the EU-15 average. It was built on four basic segments: IND (25.6%), WRT (23.1%), PST (18%) and AFF (8.9%). The AFF sector differentiates Latvia's structure from that of the EU-15 and also Estonia. However, employment did confirm the order of the strongest segments (Fig. 5). From this point of view, first was WRT (24.9%), followed by PST (22%), IND (18.7%) and AFF (14.6%).



**Fig. 5.** The structure of Latvia's economy according to GVA and EMP in 1995 (%)  
*Source: own calculation based on Eurostat (Eurostat1, Eurostat 2, 2018)*

Compared to the structure of Latvia and the EU15, the two segments are now significantly different. The AFF's share in gross value added in Latvia is 3.7 times and the share of employment is 3.2 times higher than in the EU15. Also interesting is the REA segment, which participates in the value added in Latvia much less than in the EU15 (the difference is -4.3%), but in Latvia it is more employment-intensive than in the EU15. PST is a segment that lags significantly in Latvia as compared to the EU15. On the contrary, the WRT segment is stronger in Latvia than in the EU-15, both in added value and in employment. (Tab. 4)

Table 4. The structure of Latvia and EU15 economy in 1995 (%)

TIME	1995								
	GVA		EMP		GVA/EMP	GVA		EMP	
	LVA	EU-15	LVA	EU-15		LVA	EU-15	LVA	EU-15
	(mil.Euro)		(thousand people)			(mil.Euro)		(thousand people)	
AFF	8.9	2.4	14.6	4.6	FIA	3.5	5.1	1.6	3.2
IND	25.6	23.2	18.7	19.4	REA	6.1	10.4	2.0	0.9
CON	4.7	6.0	6.0	7.4	PST	4.5	8.7	4.4	8.5
WRT	23.1	18.9	24.9	24.3	PDE	18.0	18.0	22.0	23.5
ICO	3.0	4.0	2.5	2.4	AER	2.4	3.3	3.2	5.9

\*Dark grey - the higher share of the segment in Estonia than in the EU-15

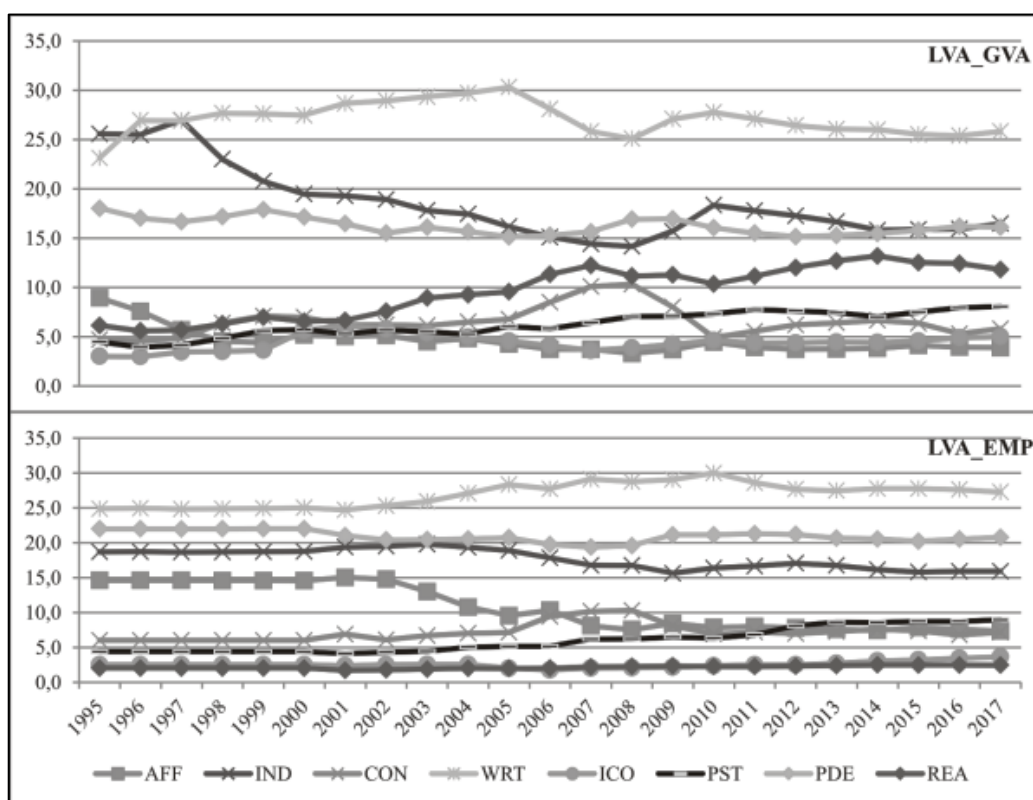
In the following period, the development of the economy was mainly driven by the positive development of the WRT segment (from 24.9% in 1995 to 27.5% in 2000) and the CON segment (from 4.7% in 1995 to 7% in 2000). Even as a result of the crisis that affected the economy in 1998, there was a sharp decline in the IND segment from 25.6% in 1995 to 19.5%



in 2000. New trends have been fed during this period. Their effect was a fall in AFF's share in gross value added from 8.9% in 1995 to 5.2% in 2000. However, the share of services in value added grew steadily. In the 2000-2008 period, this was particularly pronounced in the REA sector (from 6.5% in 2000 to 11.2% in 2008), FIA (from 3.3% in 2000 to 5.6% in 2008) and PST (from 5.7% in 2000 to 7.0% in 2008). At the same time, there was a declining trend in the IND and AFF segments. Developments in value added were also confirmed by developments in employment. AFF's share in employment dropped during eight years from 14.6% in 2000 to 7.6% in 2008. No other sector changed in the same way. The WRT sector confirmed the position of a major sector. Its share in value added was the highest in 2005 (30.3%), but the share in employment gradually increased until 2010 (30%).

In the post-crisis period, the IND segment picked up slightly and its share in gross value added increased. Growth was also recorded in the REA segment (11% to 12% in 2012). After a period of strong growth, the proportion of the CON segment declined (from 10.3% to 6.2% in 2012). This development was also confirmed in the field of employment. The structure in 2012 was built on WRT (26.4% in value added, 27.7% in employment) and on IND (17.3% in value added, 17.1% in employment) and on PDE (1% in added value, 21.2% in employment). However, the position of the service was strengthened.

The post-crisis trends had also been sustained over the next period, and the structure had not changed significantly by 2017.



**Fig. 6.** The share of segments of GVA and EMP in Latvia (%)  
Source: own calculation based on Eurostat (Eurostat1, Eurostat2, 2018)

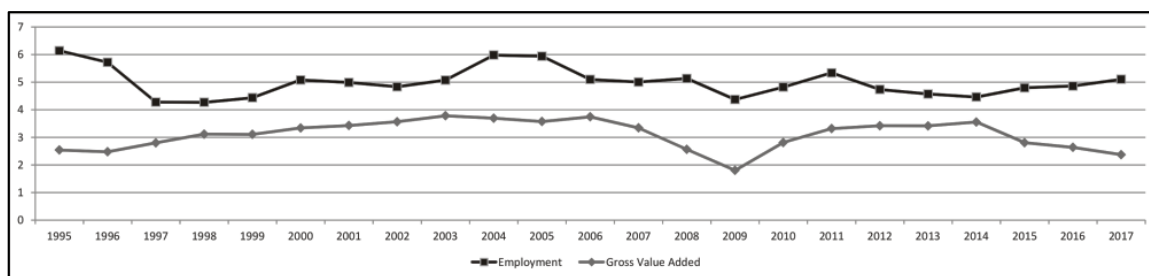
As in the case of Estonia, as well as for Latvia, the share of IND and AFF in value added and employment significantly decreased in the period 1995-2017. The decline in IND was even more pronounced than in Estonia. WRT retained its strongest position both in value added and in employment throughout the time. Significant positive growth was achieved by REA and PST (rather in value added than in employment).

### 1.3 The structural gap between the Baltics and the EU-15

The aim of any economically weaker countries is getting closer to the economically stronger countries. Countries that have joined the EU since 2004 are or were considered to be economically weaker countries than the EU-15. Our aim was to find out whether the countries of Estonia and Latvia were structurally approaching the EU-15 economy in the period 1995-2017. We have calculated the structural gap measured by structural deviation between Estonia/Latvia and the EU15 average as well as between Estonia / Latvia and each of the EU-15 countries. We wanted to eliminate the distortion that can occur due to the use of the average value.

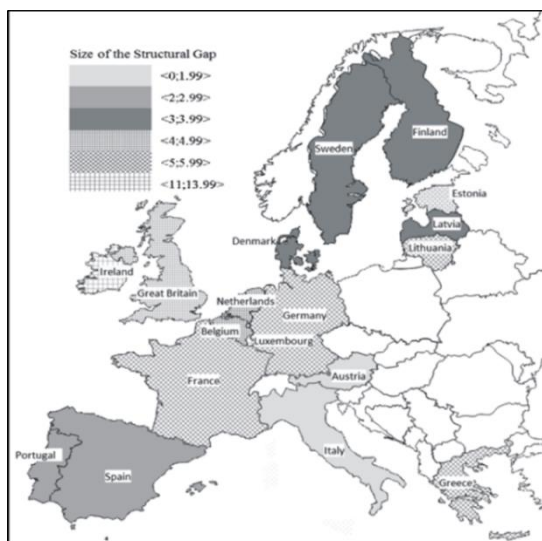
#### Estonia and the EU-15

The structural gap between Estonia and the EU15 average has been increasing since the beginning of the period. In particular, IND and AFF contributed to this. However, after 2006, the structural profile of Estonia's economy started to approach the EU15 average. The crisis was a short-term. At present, even with the gradual revival and stabilization of major segments such as IND, WRT and AFF, as well as the growth of ICO and PST, the structural profiles are re-approaching.



**Fig. 7.** The structural deviations between Estonia and the EU15 (%)  
*Source: own calculation*

The structural employment gap is higher than the value added over the whole reporting period. (Fig. 7) This means that the changes in the structural deviation in employment were much higher over the whole period than in the case of gross value added. On the basis of this, we note that the remoteness of the structural profile of Estonia from the EU15 by gross value added was due to more changes in employment than in labour productivity.

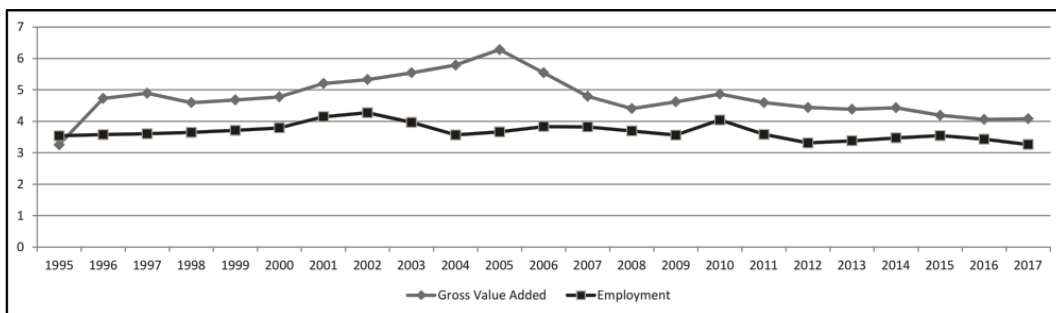


**Fig. 8.** The size of the structural gap between Estonia and the EU15 (%);  
*Source: own calculation*

The analysis of the size of the gaps in relation to individual EU15 countries shows that the structurally closest states under GVA to Estonia are Italy and Austria. (Fig. 8) They are linked by a large share of IND, WRT and PDS, and also a relatively high share of AFF in value added (rather Italy than Austria) in the EU15 ratios. While, the most remote in this respect are Ireland and Luxembourg. They are distinguished by the strong orientation of Ireland and Luxembourg to services that make a bigger share of value added than Estonia.

### Latvia and the EU-15

The evolution of the GVA structural gap in Latvia was similar to that of Estonia until 2005, when the value added increased, but since 2006 (with the exception of the crisis years) it has been gradually decreasing. On the other hand, the size of this gap is greater than in Estonia.



**Fig. 9.** The structural deviations between Latvia and the EU15 (%)  
*Source: own calculation*

The employment gap is significantly lower and more stable compared to the GVA gap throughout the whole period. (Fig. 9) It also has a declining nature, confirming that Latvia's structural profile is gradually approaching the EU15. In addition, we note that changes in labour productivity as well as in employment have contributed to the development of the structural gap.



**Fig. 10.** The size of the structural gap between Latvia and the EU15 (%)  
*Source: own calculation*

When comparing the structural gaps between individual EU15 countries, we note that the countries closest to Latvia are Spain and Portugal. (Fig. 10) The common features of these three countries are a relatively high share of IND and a very large share of WRT. At the same time, the countries have a fairly large share of AFF compared to other EU15 countries. The most remote in this respect are Ireland and Luxembourg. Although the economy of Ireland is based on IND, the share of IND is still significantly higher than that of Latvia. In the Luxembourg's economy, IND and AFF do not play such an important role as in Latvia.

## CONCLUSION

Since 1995, the Baltic countries have undergone several milestones that have changed the internal structure of the economy. In spite of the adaptation of the position of the service sectors to the trend of Europe, traditional segments (such as Industry and Agriculture) continue to be an important part of the structure of these countries (especially for the share of agriculture compared to the share of agriculture in the EU15). On the other hand, in the EU15 economy, segments such as REA, PDE and PST have more than 10% of value added (in the case of PDE and PST also for employment). Both Estonia and Latvia reach these shares only in the case of PDEs (in both variables). An important common feature of the structure of Estonia, Latvia and the EU15 is the position of the WRT segment, which is the main segment for all three in the field of employment. In terms of value added, WRT is first or second (EU15). The share of other service segments is growing slowly in Estonia and Latvia.

As to the Baltic countries' approach to the EU15, the results showed that for Estonia, the structural gap (by value added) has not exceeded 4%, but the structural employment gap has not even fallen below 4%. Overall, it appears that Estonia has not yet moved closer to the EU15. In Latvia, the situation is different. The structural gap (by value added) has ranged from 3-6%, but the employment gap has been gradually decreasing as well. Even in this case, however, it cannot be confirmed that Latvia is moving closer to the EU15.

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