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BULGARIAN ACADEMY OF SCIENCES

ИКОНОМИЧЕСКИ ИЗСЛЕДВАНИЯ

ИНСТИТУТ ЗА ИКОНОМИЧЕСКИ ИЗСЛЕДВАНИЯ НА БЪЛГАРСКАТА АКАДЕМИЯ НА НАУКИТЕ

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ИКОНОМИЧЕСКИ ИЗСЛЕДВАНИЯ
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RESULTS FROM A DYNAMIC MODEL OF CARGO FLOW MANAGEMENT OF A NETWORK AIR CARRIER

We discuss a dynamic model for managing network traffic flows of a network air carrier based: (i) on a detailed analysis of the pre-existing freight traffic along the routes of the air carrier network in terms of the volume of cargo being transported and the fares for key destinations, and (ii) on the analysis of current data on the existing traffic of the network air carrier. We observe irregularity in the freight traffic and fluctuations in the demand and in the fares with respect of the different destinations.
JEL: C6; R42; L93

Introduction

Research on flows in networks increases steadily in the last years (Ford Jr., Fulkerson, 2010; Newman, Barabasi, Watts, 2006; Vitanov, Vitanov, 2016, p. 108-114; Vitanov, Vitanov, 2018, p. 1277-1294). Much attention in this research is devoted to the issues of network modeling of air traffic, e.g., (i) shape of airline networks are measured by means of the methods of the social network analysis (Alderighi, Cento, Nijkamp, Rietveld, 2007, p. 529-549); (ii) networks of airports are studied (Opsahla, Agneessensb, Skvoretz, 2010, p.

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245-251); (iii) the concentration of the network air carriers on certain hubs is evaluated (Scholz, von Cossel, 2011, p. 62-70; Burghouwt, 2007). In (Gallego, Iyengar, Phillips, Dubey, 2004), a deterministic linear programming model was proposed that is based on the selection of the management of the customer choice for the case of airline carrier's network. In connection with this in (Lytvynenko, 2011, p. 83-88) the selection of a common set of activities and tools of economic and organizational nature was studied for the implementation of the process of re-engineering business processes at freight airlines and in (Lurkin, Garrow, Higgins, Newman, Schyns, 2017, p. 228-246) network planning model predicting the profitability of airlines has been discussed on the basis of multi-criteria solutions, including decisions on equipment acquisition and a route selection model for distribution of the total demand for various routes. A comprehensive analysis of the references mentioned above has revealed the absence of any effective mechanisms for implementing a freight carrier's network management system based on logistics. This fact led some of us to study additional models of the network carrier traffic flows (Voitsehovskiy, Gabrielova, Grygorak, 2017, p. 69-74; Voitsehovskiy, 2017, p. 50-55) and the study below is a continuation of the studies in these articles. Let us note here that we shall not describe in details below the long mathematical equations connected to the used model (interested reader can see such equations, e.g., in (Gallego, Iyengar, Phillips, Dubey, 2004; Voitsehovskiy, 2017, p. 50-55). Instead of this on the basis of the available data and computer simulations based on the model equations we shall present briefly our findings.

Data and results

The task of managing airline freight traffic of an airline network is an example of the problem of mathematical modeling of transportation networks. The dynamic model of the network carrier's air cargo flows assumes a higher dimension, continuous variables, fixed demand and transportation prices, and the cargo is considered as a part of the flow. Before making any calculations, it is necessary to conduct a detailed analysis of freight traffic along the routes of the network airline carrier. We have taken as a basis the volumes of freight transportation and fares of the former leader on the aviation market in Ukraine – Aerosvit Airlines as the initial data array. By analyzing data of Aerosvit Airlines for the period 2008-2012[8], the following observations are made.

1. During the above period, more than 65,000 shipments have been completed, out of which we have selected shipments between the cities of Almaty, Kiev, New York, Beijing and Tbilisi. The sample used for the analysis below accounted for about 14 thousand shipments. The traffic volumes of Aerosvit Airlines between the cities of Almaty, Kiev, New York, Beijing and Tbilisi for 2008-2012 are shown per week in Figure 1.
2. The largest traffic volumes were accomplished along the destination Kiev – New York, and yet the majority of these cargoes were transported in the opposite direction at a rate

[8] "AeroSvit" PJSC. Regular information (2017). Available at: https://smida.gov.ua/db/emitent/report/year/show/122213.

of 2-2.5 USD/kg, whereas by a direct flight a certain amount of cargo was delivered at rates ranging from 3 to 6 USD/kg. This is explained by the different traffic flows. The final rates of Aerosvit Airlines for transportation of goods between the points Almaty, Kiev, New York, Beijing and Tbilisi for 2008-2012 are shown on a weekly basis in Fig.

3. Considerable discrepancies in fares are also observed for the route Kiev- Beijing, as the direct flight fare is USD 1.5-2 / kg, whereas the return fare is USD 4-5 / kg.
4. Along the route Kiev-Almaty much larger amount of cargo is transport in the comparison to the cargo flow on Almaty-Kiev flights. However, by analyzing the fares in the direction of Kiev-Almaty, it should be noted that they fluctuate within the range of USD 1.5 to USD 2/kg, whereas in the opposite direction they are slightly higher and vary from USD 2/kg to USD 6/kg.
5. We note that the freight traffic and the amount of the fare for transportation in the direction of Kiev-Tbilisi in direct communication are considerably greater as compared to the opposite direction.

We have used the above data in the implemented models as described in [9,12,13] and we have performed series of computational experiments. As a result of these experiments we note that the models are capable to supply information about: systematize the process of cargo flow traffic management by the network air

1. Maximization of transportation revenue, exclusive of storage costs. Within the process of solving the problem, it is decided which cargo needs to be urgently shipped, and the cargo is to be dispatched to the carrier for storage.
2. It is also possible to reject the carriage of certain goods. It is believed that there is a specific demand for each period, for each cargo category and for each pair of airports. We note that a cargo category is to be understood as an abstract category of division into parts, which is embedded in a set. A three-dimensional table is generated, where each cell is considered as an element of this set, namely, urgent shipments, non-urgent shipments and that for each and every period.
3. There is a certain demand that the airline is capable to satisfy, i.e., it systematizes the process of cargo flow traffic management by the network air capable of providing transportation, and it may also refuse to carry out transportation.
4. The dynamic model decides what kind of cargo will be transported by a network air carrier, on the grounds of the capabilities, priorities, restrictions of the capabilities of the airline as regards delivery. The model selects those units of cargo that generate the highest revenue and require the lowest storage costs, while the restrictions indicate that the airline is not able to accept a cargo greater than the demand thereof plus those units of cargo that are left for storage at the airport. Those units of cargo that have been left for storage are picked up by the airline while the new ones are left for storage.

Figure 1

Carriage volumes of Aerosvit Airlines between the cities of Almaty, Kiev, New York, Beijing and Tbilisi in 2008-2012 by weeks, in kg. The filled circles are for the corresponding week of the year (when cargo was delivered)

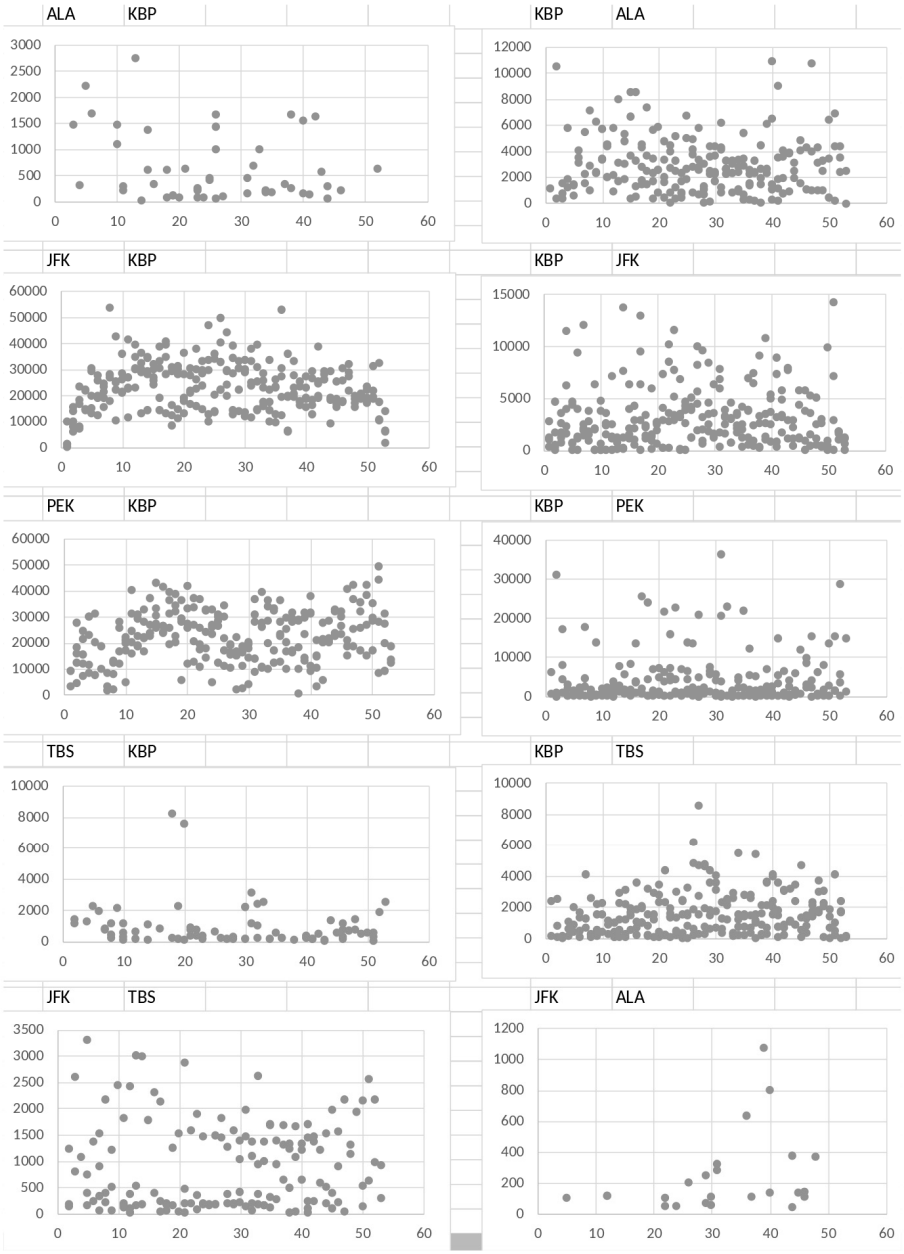
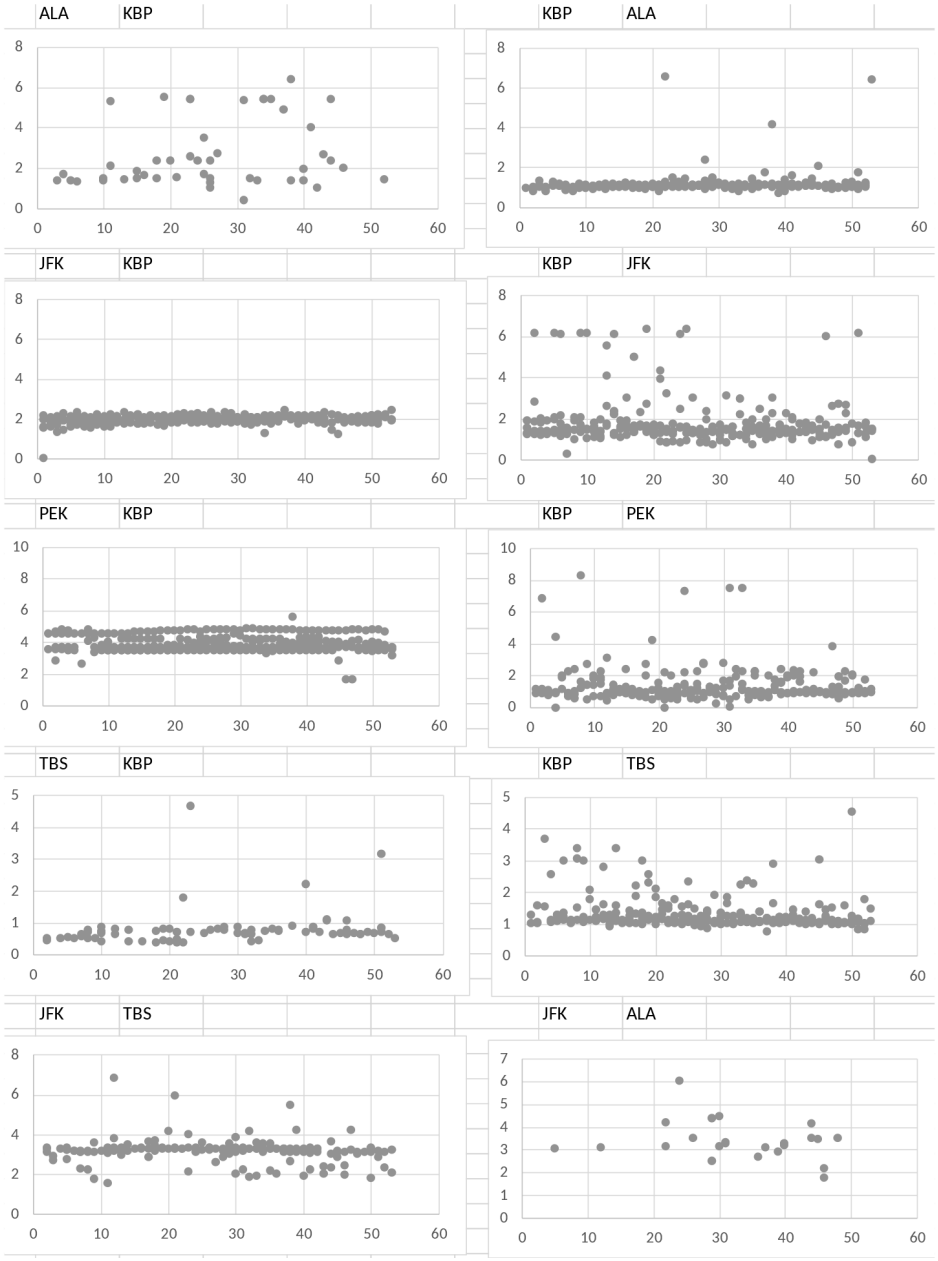


Figure 2

Tariffs of Aerosvit Airlines for the carriage of goods between the cities of Almaty, Kiev, New York, Beijing and Tbilisi in 2008-2012 per week, in USD/kg. The filled circles are for the corresponding weak of the year when cargo transport was delivered



5. Additional restrictions to the model are: the usual balance, the period of time, type, kind and category of cargo, intermediate airports. The usual balance within a network accounts for the fact that the cargo is transported from one airport to another and may not remain at an intermediate airport at all. The cargo is considered continuous, it may not be divided and left for storage; the essence of the restrictions is mathematically such that it is possible to take and transport a part of the cargo and leave another part into a warehouse. At each intermediate airport, through which the cargo will be transported, there should be a balance as to how much cargo has been brought, plus that left in storage. As per the departure and arrival airports, what was transported should be more than what was stored, that is, what is transported today should be more than what was left yesterday left, as today what was left yesterday should be transported together with today's carriage.
6. Transportation is considered for each category individually, there are syllabic restrictions, that is, it is impossible to leave more storage capacity. Once the cargo is taken for carriage, it may be divided into parts, and then all cargo flows are merged together at the destination point.

As a final remark, we note that because of the complexity of the airline cargo flows no effective mechanisms exist for systematization of the process of cargo flow traffic management by the air network. At the same time, the practical need for such is indisputable. A detailed analysis of freight traffic along the routes of the national network of air carriers of Ukraine shows irregular cargo flows, fluctuations in demand and tariffs in various areas, both in historical retrospect and in the current period of time. Our numerical experiments show that the models and considerations from (Gallego, Iyengar, Phillips, Dubey, 2004; Voitsehovskiy, Gabrielova, Grygorak, 2017, p. 69-74; Voitsehovskiy, 2017, p. 50-55) (i) capture key aspects of cargo flow traffic management in the ordinary course of operation of the airline, and (ii) can contribute to the systematization of the process of cargo flow traffic management by the network air carrier.

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ИКОНОМИЧЕСКИ ИЗСЛЕДВАНИЯ
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STRATEGIES OF HUMAN DEVELOPMENT IN THE CONTEXT OF GLOBAL DIGITAL CHANGE

Despite the fact that people are living in the early days of the upgrading digital economy, in the recent years, it has already had a huge impacts on their human development and the evolutionary progress of the modern society. The main problems that need to be solved are developing innovative strategies to manage human development and to consider the digital change influence. The current research purpose is to define an available institutional background to create different strategy models for human development under the condition of global digital change in Ukraine. The article is based on international indicators of human development and digital change in Ukraine, which has been analyzed to define current national economy positions and calculate probable strategies. The main constitutive characteristics, features, and functions of human development components are defined. The dynamic and static analysis of national human development positions is made (HDI, HCI, PI). The strengthening, neutral and weakening of national economy are researched (SNW analysis). A framework of macro-environmental factors for human development in the area of digital change is scanned (PEST analysis). The above mentioned strategic models create basic to calculate possible innovative strategies probabilities under conditions of global digital change (Transition matrix of Markov chain). The innovative human development and digital change strategies are represented within one-side, balanced and prevail models. The strategic national priorities realization is possible in case of balanced models both for human development and digital change realization in Ukraine.
JEL: G41; I25; I32; O3; M52

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Introduction

The rapidly growing tendencies of globalization are characterized both for economic and social development in the 20th and 21th century worldwide. The globalization process is connected with the increasing integration of diversified input and output. Central to the entire globalization theory is the concept of digital technologies that are rapidly changing our economy and society. Digital technologies play a critical role in the maintenance of human life, including constantly evolving, transforming and improving.

Despite the fact that people are still living in the early days of the upgrading digital economy, in the recent years, it has already had a huge impact on the social and economic development worldwide. The formation of a new socioeconomic model is decisive for the transition of the national economy and its main determinants. The digital transformations and social and economic changes are among the most important peculiarities of the Fourth Industrial Revolution (4IR). The digital capability model is developed as the new way for business upgrading that aims at transformation of technological process and changes in roles of humans in it. One of the most important peculiarities is that robots become humans' substitutes in a wide range of modern industries. The upgrading digital business conception is flexible, full of innovations and experiments. This conception will create new innovative business opportunities and boost their productivity (Vasilyeva, 2018; Antoniuk, 2017; Matyushenko, 2017).

The digital process means the integration of digital technology into business and everyday life. For instance, 71% of interviewed by DEL EMC and Enterprise Strategy Group (ESG) companies agree that they are not enough competitive without digital (IT) transformation; 95% of respondents pay their attention to the digital technologies unless these companies are able to lose their business competitiveness; the most companies that are recognized to be successful define informative and communicative technologies (ICT) as competitive advantage and profit center (DeMattia, 2017; Press…, 2017). Evidence suggests that the digital revolution is one of the greatest opportunities for social development. It becomes one among the strongest drivers for social and economic growth, life quality and well-being. Information and communications technology (ICT) influences existing business models, products and services.

The literature review and problem statement

Our society faces a great variation in the level and distribution of social and economic indicators across different countries. Early research on economic growth emphasized natural economic connections intended to describe how the national economy changes with economic growth, including income distribution. In the context of global transformations, the particular links between economic growth and human development are explored. For reasons of practicality recent studies began to present data on changes over time both in economic and social areas, identifying constantly technologies changes and revolutions. There is evidence that intensification plays a crucial role in regulating human development

and national economy competitiveness (Fields, 1989; Deininger and Squire, 1996; Ramirez, Ranis, Stewart, 1997).

The importance of the global digital transformation influence on human development is confirmed by the results of numerous studies. The formation of network management based on the benefits of digitalization has a pivotal role in Castells' research (1999), who defines the network structure as set of interrelated digital units and the network undertaking as particular entity able to generate knowledge, to process information effectively, to adapt itself to changing market conditions, to be flexible for rapid change in organizational and economic instruments under influence of radical cultural, technological, and institutional reforms, and to implement innovation as major competitive advantage (Matyushenko, 2017; Castells, 1999; Castells, 2000).

In the scientific context, the term "digital economy" appeared in the researches of American scientist Negroponte in 1995 (Negroponte, 1995). However, despite a rather long period of concept study, there are still a lot of different points of view. In particular, digitalization is supposed to be deeply connected with a knowledge, information or network economy (Semenyuk, 2017; Derviş, 2012; Galbraith, 2007). Due to the further rapid development and transformation in the business environment at the end of the 20th century, businessmen participated in digitalization researches. In particular, Tapscott and Williams focused on the digital economy formation and represented the definition of wiki economy (Tapscott, 1997; Tapscott, 2010). This is explained by the fact that business is still often inexperienced and expected to face huge challenges brought about by the new revolution, particularly in developing countries.

A key issue is that digitalization is not the only business challenge. Further company success depends both on the economic and social activity of companies. Socio-structural shifts, networking and technological increase, represent the major components of economic and dynamics, which is a fundamental constant in our world (Virilio 1989; Farjoun 2010).

Recent studies have shown the far-reaching integration of information and operational technologies. Surveys such as that conducted by Schwab (2015; 2017), Richards (2016) and Dittrich (2016) have shown the main specifications and possible effects of the Fourth Industrial Revolution (4IR). Moreover, several attempts have been made to underline a particular 4IR nature and differences between the Third Industrial Revolution and the Fourth Industrial Revolution. The benefits of upgrading digital economy development have been documented in world innovative industrial and consulting companies' reports, including McKinsey, Philips and Bosch.

There has been some research conducted in the area of human development and high-tech innovative changes by experts of international and regional organizations. In particular, some parts of above-identified problems have been reflected in:

- UN programs and reports (Transformation of our world: Sustainable Development Agenda 2030; World Investment Report 2017);
- NATO (The Shared Perspective of the World in 2030 and Beyond: Themes and Drivers; Multiple futures project – Navigating towards 2030);

- World Business Council for Sustainable Development (WBCSD) (Vision-2050. The new agenda for business).

Although a lot of foreign researches have been conducted on the above-mentioned problems, there are still a lot of questions that remain unanswered. There are only a limited number of published domestic studies that provide important information on digitalization and peculiarities of its advantages implementation in the context of human development in Ukraine.

Research purpose

The current research summarizes data from the social and economic reports of international organizations as well as other theoretical and practical evidence. The aim of this article is to define an available institutional background to create different strategy models for human development under the condition of global digital change in Ukraine. In particular, attention is paid to the national human development positions within the social and economical worldwide framework. The strengthening, neutral and weakening of national economy are researched (SNW analysis). A framework of macro-environmental factors for human development in the area of digital change is scanned (PEST analysis). The above mentioned strategic models create basic to calculate possible innovative strategies probabilities (Transition matrix of Markov chain).

The results should be viewed as establishing the stylized background for national innovative human development strategies rather than as tests of formal theories or models.

Research methodology and materials

The research methodology is based on foreign and Ukrainian scientific literature monographic, descriptive and meta-analysis, which is used for describing the problem statement. In the presented research the method of comparative analysis was also used. Its aim was to compare available theoretical concepts with already existing human development solutions. Analytical and quantitative information, namely international human development and digitalization rankings, statistical data and documents are used as background to analyze the tendencies of current institutional background for national innovative human development strategy.

The most popular composite statistic indicator of human development is the Human Development Index (HDI) that was created to emphasize that people and their capabilities should be the main criteria for assessing the level of country development, not only the indicators of economic development and growth. This index is used to compare national economies with the same levels of Gross National Product, paying attention to the indicators of their human development outcomes. HDI means an average measure of three main components, namely: health, education and standard of living. There are some HDI modifications, including Inequality-adjusted Human Development Index (IHDI), Gender Development Index (GDI), Gender Inequality Index (GII), Multidimensional Poverty Index

(MPI), which represent the deeper understanding of social development (Human Development Report, 2017).

Determining the impacts of human development on social and economic growth, the researchers of the International Food Policy Research Institute (IFPRI) calculate the Global Hunger Index (GHI). The World Economic Forum (WEF) deals with researches on the Global Competitiveness Index (GCI), which is deeply connected with human development indicators. The level of competitiveness of national health protection and culture resources is also calculated within The Travel & Tourism Competitiveness Index by WEF. The static basic of human development is human capital (Human Capital Index (HCI) by WEF). The dynamic characteristics and human development components are represented within Social Progress Index, Genuine Progress Indicator, Inclusive Development Index and Prosperity Index.

One of the most significant current discussions in human development is rapidly changing technology (3D-printing, robotics, neuro- and digital technologies) that is a permanent feature in the global economy and defines national economies' competitiveness. Therefore, governments and private investors around the world are investing in digital economy development. The world digital competitiveness ranking is yearly calculated (Cabolis, 2017).

By using some statistical tools, the important social and economic parameters, defining the level of indicators performances for human development under the condition of global digital change, are analyzed in our research. Matrix methods are used to create a framework for national social and economic competitiveness evaluation, identifying its strengths and weaknesses. In particular, digital economy opportunities are underlined within assessment models and strategies.

On the basis of research methods, the already existing institutional background for human development in Ukraine is compared to possible strategies of human development under the condition of global digital change. The suggestions and workable solutions, examples and propositions can be inspirational for future scientific research and especially in practical application of presented research models.

Results

In the new global economy, Ukraine is mainly considered as the economy with a higher than average level of human development. In particular, the Human Development Report (HDI) identifies the national policies and key strategies to ensure human development in Ukraine as an average, including the high potential to sustain and protect national social development and gains (Human Development for everyone, 2017). The Ukraine's Inequality-adjusted Human Development Index (IHDI) values and ranks are comparable to those that are higher than average in the world. However, the values of adjusted indexes are lower in comparison with HDI. Therefore, determining the impacts of social and economic instability on human development is important both on global and national levels.

Recently, there has been renewed interest in poverty in the context of human development. Ukraine's Multidimensional Poverty Index (MPI), which includes the poverty level in highly-developed as well as in the third world countries, is positioning our country between countries with rather high poverty levels. The national Gender Development Index (GDI) positions are higher Gender Inequality Index (GII) that has heightened a rather high level of education among women.

Since it was reported in the Human Development Report for Ukraine, the current indicators of human development have not been the only subject attracting considerable interest. Therefore, one of the greatest challenges for the national economy is sustainable human development potential. Up to now, far too little attention has been paid to HDI structural changes in Ukraine.

Our country belongs to the category with a rather high level of human development. However, the highest is the contribution of progress toward increasing tendencies in the area of education during the period between 1990 and 2015. Thus, the increase of the expected years of schooling value is 2.9 years compared to 2.2 years for the mean years of schooling value and 1.3 years for the life expectancy at birth value. Contrary to above mentioned tendencies, no increase in GNI per capita was detected. The decrease in GNI per capita is 31.9% since 1990. The above-mentioned data approve the dynamic concept on the national potential of human development.

At the same time, the knowledge and skills embodied in individuals that enable them to create economic value are defined as human capital. The Human Capital Index is calculated by the World Economic Forum. The main elements of human capital are capacity, development, deployment and know-how. The global human capital is assessed within five groups in accordance with generations, namely: 0-14 years, 15-24, 25-54, 55-64, and 65 years and older. Ukraine's rank is 24 among 130 countries that are taking into account. On average, the level of global human capital is only nearly 62%, compared to 70% in Ukraine (The Global Human Capital Report, 2017). In order to compare the dynamic and static indicators of human development in Ukraine, the SNW analysis is used in our study that sought to answer the specific research questions on strengthening (S), neutral (N) and weakening (W) of human development in Ukraine (Table 1).

The current SNW analysis recognizes the main elements of human development strengths and weaknesses in Ukraine. For example, our research determines the importance of literacy criteria, gender equality in higher education, staff-training and opportunities for their development and the number of part-time employees. However, the main part of human development weaknesses is connected with a number of problems related to the healthy life duration, vocational education coverage, high-tech industries employment and unemployment rate.

Debate continues about the best human development strategies for its elements that are represented both with social and economic components. Therefore, the particular attention of the international organizations is paid to sustainable human development that is deeply connected with prosperity. Prosperity Index (PI) is calculated by Legatum Institute in Great Britain. In 2017 Ukraine's rank was 112 among 149 countries. However, the prosperity

pillars are rather variable that are displayed in Table 2 (Sustainable Development Goals, 2019; State Statistics Service of Ukraine, 2019).

Table 1

SNW-analysis of human development elements in Ukraine

*Criteria***	***S***	***N***	***W***
1	*2*	*3*	*4*
Primary education coverage	***X***		
Secondary education coverage	***X***		
Vocational education coverage		***X***	
Gender equality in higher education	***X***		
Primary education enrolment	***X***		
Secondary education enrolment	***X***		
Education quality		***X***	
Unemployment rate			***X***
Partly employment rate	***X***		
Variety of professions (qualifications)		***X***	
Economic complexity		***X***	
The share of employed with average qualification			***X***
Healthy life expectancy at birth			***X***
Healthy life expectancy at 65			***X***
Employment rate in high-tech industries		***X***	
Staff training		***X***	

** The criteria are chosen in accordance with the World Economic Forum methodology.

The most strengthen is the education pillar that ranks countries on the access to education and its quality, human capital quality. Educational strength contributes to other pillars balancing. However, the weakest are social capital positions. Social capital pillar measures the strength of personal relationships and network support. The low social capital rank shows the particular need to activate available national education potential for sustainable human development in Ukraine. The Prosperity Index methodology provides the possibility to create different human capital models, which depend on levels of importance to each of the Prosperity Index's pillars. For instance, the feature of adjusting pillar weighting allows doubling the weight of educational component in Ukraine. In case of above mentioned changes, the national economy will be on the 106st position in the human capital rating comparing to the current 112th position.

The current study of the Prosperity Index shows recent trends in social and economic development and provides an important background for sustainable human development models creation.

Table 2

Legatum Prosperity Index in Ukraine

Time frame	PI Value	Economic quality	Business environment	Governance	Education	Health	Safety and security	Personal freedom	Social capital	Natural environment
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
Ranking										
2007	95	67	108	113	47	98	103	76	141	129
2008	95	73	113	115	49	103	82	82	141	119
2009	104	75	120	122	60	113	83	81	144	119
2010	103	76	96	117	51	129	76	92	115	120
2011	100	76	99	129	45	121	80	90	118	119
2012	97	87	97	119	43	110	86	90	125	117
2013	97	77	106	127	45	111	169	89	137	115
2014	102	77	101	124	39	110	118	86	128	110
2015	107	88	97	128	45	111	132	91	135	112
2016	107	88	97	128	45	111	134	93	135	112
2017	112	84	102	130	48	135	135	95	115	108
Value (maximum 100)										
2007	52.52	60.57	40.55	37.15	60.72	65.78	62.01	57.94	39.12	48.86
2008	52.86	60.06	40.60	37.74	60.71	64.67	64.48	55.39	40.17	51.98
2009	51.87	60.17	39.39	35.83	59.52	61.50	65.13	55.58	37.85	51.82
2010	52.56	60.06	45.90	36.90	60.61	56.75	66.39	50.17	43.53	42.73
2011	53.04	59.96	46.44	35.10	62.43	59.34	65.29	53.13	42.53	53.12
2012	53.38	58.34	48.47	35.86	62.33	63.66	64.30	51.31	42.22	53.96
2013	53.93	59.87	47.97	34.40	62.18	63.53	67.41	53.16	42.00	54.85
2014	53.38	60.00	48.67	36.00	63.20	63.36	57.30	53.35	42.71	55.83
2015	52.59	58.73	49.66	34.56	63.14	63.02	53.77	51.48	42.49	55.44
2016	52.44	58.73	49.66	34.56	63.14	63.02	53.47	51.48	42.49	55.44
2017	51.75	58.74	49.88	35.75	62.47	55.23	50.15	51.41	45.49	56.65

Note: Table is based on [39; 40].

The current research recognizes the critical role played by Prosperity Index pillars, which are considered in accordance with PEST (STEEPLE) analysis and represented in Table 3.

As can be seen from the table (above), a particular PEST-analysis modification has been used within our research to describe a framework of social and economic pillars in the context of human development strategies creation. Traditionally, PEST-analysis is based on four main pillars, namely: political, economic, socio-cultural and technological pillars. There are several expanded modifications of PEST-analysis. In particular, STEEPLE-analysis includes socio-demographic, technological, economic, environmental (natural), political, legal and ethnic factors. According to the main challenges faced by our researchers, the following pillars are highlighted: political and legislative pillars, economic, socio-cultural and environmental pillars.

Table 3

Pillars of sustainable human development in Ukraine

Political and legislative pillars	Economic pillars
1. Changes in the legislative framework on social issues. 2. Actions aimed to combine political and social priorities. 3. Changes in international social legislation. 4. Integration of national economy into international organizations promoting the idea of sustainable human development. 5. Elections to legislative and executive authority (changes in social policy directions). 6. Public regulation in the social area and public priorities of human development establishment	1. Structure of public local budgets expenditures review in the context of social expenditures growth 2. Actions to reduce inflation and unemployment. 3. Taxation mechanisms and instruments review 4. Review of social business expenditures standards. 5. Review of economic incentives system for social entrepreneurship.
Socio-cultural pillars	**Environmental pillars**
1. Transformations in the existing system of main values in society. 2. Life quality changes 3. Changes in education. 4. Change in attitude to research. 5. Change in attitude to work and rest. 6. Changes in medicine. 7. Changes in the cultural area.	1. Air pollution changes. 2. Changes in energy nature. 3. Increased access to the drinking water of high quality. 4. Measures to preserve the density of green plantations.

Note: The table is based on Property Index criteria.

Political and legislative pillars include tax policy, labor law, environmental law, trade restrictions, tariffs, consumer law, antitrust law, employment law, health and safety law and political stability. Moreover, the above-mentioned pillars influence health, education and infrastructure development. Therefore, sustainable human development is possible due to the changes in national and international legislative frameworks to support human development and social entrepreneurship.

Economic pillars are based on economic development and growth, interest, exchange and inflation rates, unemployment. These pillars act as an economic background for human development. The economic impact on human development effectiveness mainly depends on the possibilities to connect social priorities with available economic potential.

Socio-cultural pillars include health and cultural changes, gender and age distribution, career attitudes. These pillars impact how society and businesses operate in the social area and make social and culture decisions.

Environmental pillars are connected with ecological and environmental changes. The attention is paid to weather and climate changes, including tourism, farming, and insurance support. The highest impact of environmental pillars occurs when national and global social and economic development strategies include activities on environmental changes.

The national human development strategy represents the combination of above mentioned pillars. A key issue of human development strategy is the search of random variables X_1, X_2 … X_n, which are represented by possible scenario of pillars combination according to discrete-time Markov chain methodology. The state-space of the chain is 0.25 to adapt the available combinations to research needs (Table 4).

Table 4

Human development strategic models data

№	Strategic models	Human development pillars value			
		Political and legislative pillars	Economic pillars	Socio-cultural pillars	Environmental pillars
1	2	3	4	5	6
1	One-side	0	0	0	1
2		0	0	1	0
3		0	1	0	0
4		1	0	0	0
5	Balanced	0.25	0.25	0.25	0.25
6		0.5	0.5	0	0
7		0.5	0	0.5	0
8		0.5	0	0	0.5
9		0	0.5	0.5	0
10		0	0.5	0	0.5
11		0	0	0.5	0.5
12		0.75	0.25	0	0
13	Prevail	0.25	0.75	0	0
14		0	0.75	0.25	0
15		0	0	0.75	0.25
16		0	0	0.25	0.75

The main available combinations of human development strategy pillars are represented in the form of Matrix 1.

$$P = \begin{bmatrix} X_{11} \dots X_{12} \dots X_{1n} \\ X_{21} \dots X_{22} \dots X_{2n} \\ \dots \\ X_{m1} \dots X_{m2} \dots X_{mn} \end{bmatrix} \quad (1)$$

$$\begin{bmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}; \begin{bmatrix} 0{,}25 & 0{,}25 & 0{,}25 & 0{,}25 \\ 0{,}5 & 0{,}5 & 0 & 0 \\ 0{,}5 & 0 & 0{,}5 & 0 \\ 0{,}5 & 0 & 0 & 0{,}5 \end{bmatrix}; \begin{bmatrix} 0 & 0{,}5 & 0{,}5 & 0 \\ 0 & 0{,}5 & 0 & 0{,}5 \\ 0 & 0 & 0{,}5 & 0{,}5 \\ 0{,}75 & 0{,}25 & 0 & 0 \end{bmatrix}; \begin{bmatrix} 0{,}25 & 0{,}75 & 0 & 0 \\ 0 & 0{,}75 & 0{,}25 & 0 \\ 0 & 0 & 0{,}75 & 0{,}25 \\ 0 & 0 & 0{,}25 & 0{,}75 \end{bmatrix}$$

Using the above-mentioned matrix it is possible to calculate the main scenario of human development strategy. At the same time, one of the greatest challenges of our society is digitalization. In particular, the "Concept for the Development of the Digital Economy and Society of Ukraine for 2018-2020" was adopted in 2018 in Ukraine.

The key issues of the Concept are the following Ukraine's achievements in the international rankings till 2020: 30th place in the Networked Readiness Index (WEF) (64th place in 2016); 40th places in the Global Innovation Index (INSEAD, WIPO) (56th place in 2016); 50th places in the ICT Development Index (ITU) (79th position in 2016); 60th place in the Global Competitiveness Index (WEF) (85th place in 2016) (Table 5) (On Approval…, 2018).

Table 5

Digital models data

№	Goals achieving models	Index value			
		Networked Readiness Index	Global Innovation Index	ICT Development Index	Global Competitiveness Index
1	2	3	4	5	6
1	One-side	0	0	0	1
2		0	0	1	0
3		0	1	0	0
4		1	0	0	0
5	Balanced	0,25	0,25	0,25	0,25
6		0,5	0,5	0	0
7		0,5	0	0,5	0
8		0,5	0	0	0,5
9		0	0,5	0,5	0
10		0	0,5	0	0,5
11		0	0	0,5	0,5
12		0,75	0,25	0	0
13	Prevail	0,25	0,75	0	0
14		0	0,75	0,25	0
15		0	0	0,75	0,25
16		0	0	0,25	0,75

The state of the system is represented within our research as a vector (Matrix 2):

$$p_0 = [p_1\ p_2\ \dots\ p_n] \tag{2}$$

$$[0\ \ 0\ \ 0\ \ 1];\ [\ \dots\ ];\ [0{,}25\ \ 0{,}25\ \ 0{,}25\ \ 0{,}25];\ [\ \dots\ ]$$

The current system is in the state n. Two time periods later the system is in the state n+2 (Matrix 3):

The Matrix of different models probability in the state n+2 is represented in Table 6.

Table 6

Human development strategic models under conditions of global digital changes

Human development strategic models		Digital models							
		One-side				*Balanced 1*			
	One-side	1	0	0	0	0.25	0.25	0.25	0.25
		0	1	0	0	0	0	0.5	0.5
		0	0	1	0	0	0.5	0	0.5
		0	0	0	1	0.5	0	0	0.5
	Balanced	0.5	0	0	0.5	0.4375	0.1875	0.1875	0.1875
		0.5	0	0.5	0	0.375	0.375	0.125	0.125
		0.5	0.5	0	0	0.375	0.125	0.375	0.125
		0.25	0.25	0.25	0.25	0.375	0.125	0.125	0.375
		0.75	0.25	0	0	0.1875	0.3125	0.25	0.25
		0	0	0.5	0.5	0	0.5	0.25	0.25
		0	0.5	0	0.5	0	0.25	0.5	0.25
		0	0.5	0.5	0	0.375	0.375	0.25	0
	Prevail	0	0	0.25	0.75	0.0625	0.375	0.3125	0.25
		0	0	0.75	0.25	0.125	0.75	0.125	0
		0	0.75	0.25	0	0.125	0.375	0.375	0.125
		0.25	0.75	0	0	0.125	0.375	0.125	0.375
		Digital models							
Human development strategic models		*Balanced 2*				*Prevail*			
	One-side	0	0.5	0.5	0	0	0	0.75	0.25
		0.5	0	0.5	0	0	0.25	0.75	0
		0.5	0.5	0	0	0.25	0.75	0	0
		0	0	0.25	0.75	0.75	0.25	0	0
	Balanced	0.5	0.25	0.25	0	0.4375	0.437	0.062	0.062
		0.5	0.25	0	0.25	0.5	0.375	0.125	0
		0.5	0	0.25	0.25	0.5	0	0.375	0.125
		0.3125	0.3125	0.1875	0.1875	0.5	0	0.125	0.375
		0	0.25	0.25	0.5	0	0.5	0.125	0.375
		0.375	0.37	0	0.25	0	0.375	0.125	0.5
		0.375	0.12	0.25	0.25	0.1875	0.062	0.375	0.375
		0	0.5	0.37	0.12	0.5625	0.187	0.125	0.125
	Prevail	0	0.37	0.5	0.12	0.0625	0.75	0.187	0
		0	0.37	0.25	0.37	0	0.562	0.375	0.062
		0	0	0.5	0.5	0	0	0.625	0.375
		0.1875	0.75	0.0625	0	0	0	0.375	0.625

Conclusions

The previous section has shown that the great measure of human development strategies has a possibility to be implemented under conditions of digital change. The findings can contribute to a better understanding of:

- dynamic and static structure of human development that provides detailed information about the contribution of human development components in the general indicator growth. Thus, the Ukrainian economy holds rather high current positions in educational rankings that support national competitiveness in the part of social development. However, the national economy isn't still among the most competitive economies in the part of economic development, in particular current positions in GNI per capita rankings. Therefore, progressive changes in institutional background for human development are possible under conditions of sustainable social and economic development;
- main strengths and weaknesses of Ukrainian economy that support the view about human development in the context of the health industry, scientific, educational and cultural growth, considering its collaboration with innovation in technological development, new digital technologies growth;
- main pillars for human development and digital technologies use that shows the level of national commitment in the human development and digital technologies on the global level that shows the measure of the integration of the national economy into global digital society;
- human development strategic models under conditions of global digital changes and such models combinations, namely: one-side, balanced and prevailing strategies. The balanced strategy is a type of management and control, aimed at balancing different pillars of human development and digitalization. Such activities are generally divided equally between digital technologies' growth and main human development components. The one-side strategies aimed to develop the potential of the particular human development component. Prevail strategies represent the unequal division of resources between different human development components.

In conclusion, these studies show that the main part of strategic priorities realization is possible in the case of balanced models both for human development and digital change realization in Ukraine. This study should, therefore, be of value to practitioners wishing to combine available theoretical models methodology with available data from human development rankings to estimate the possibility to achieve new digital technologies goals.

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ИКОНОМИЧЕСКИ ИЗСЛЕДВАНИЯ
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ECONOMIC ASPECTS OF DEMOGRAPHIC CHANGES IN THE EUROPEAN UNION AND IN BULGARIA[3]

The article considers the specifics of demographic development in Bulgaria, compared to that of the EU-28. The natural movement of the population and internal migration in the country is analyzed. The focus is on the combined influence of the three main demographic processes – fertility, mortality and migration, which are considered as the main determinants of human resource development and economic activity. To illustrate these processes, a survey was conducted and described in the village of Smilyan, Smolyan municipality. The specificity and role of two demographic processes (population aging and depopulation) in several contexts are examined – the concept of active aging in the EU and its implementation in Bulgaria, their impact on labor productivity and economic growth, the health status of the elderly as potential for work and employment, etc.
JEL: J11; J14; J16; F22; R13

Introduction

In recent decades dynamic demographic processes in the EU, including Bulgaria, have been observed. They are related both to the natural movement of the population – reduction of its number (depopulation) and the so-called aging of the population, as well as to migration.[4] Sudden demographic changes in Bulgaria have been observed since 1990. Currently, Bulgaria is among the five EU countries with the most dynamic aging processes (measured by the highest percentage of adults aged 65 and over) and among the top six in the world (five in Europe and Japan). Bulgaria is also among the countries of Central and Eastern Europe (CEE) with a large number of emigrants – about 1.5 million, predominantly in

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[3] *The paper summarizes the main results of the first part of the project „Economic Aspects of Demographic and Migration Processes in the EU and Bulgaria", developed within the Research Programme of the Economic Research Institute at BAS. The project was accepted as successfully realized in January 2019.*
[4] The two types of processes are demographic, but the authors use the terms demographic and migration processes to specify them.

working and fertile age. As a result of both impacts, the population in the country has declined from 9 million in 1988 to just over 7.0 million in 2018.

Recent demographic and migration changes are unique in the economic history of EU countries and combined have a significant impact on its development. In the last 4-5 years there has been a new phenomenon – mass immigration of people from third countries, mainly from the Middle East and Africa to the EU countries. These processes are individually studied by international organizations, research institutes, universities and individual scientists (demographers, sociologists, political scientists, etc.), but far less attention is paid to a comprehensive study of their economic aspects.

Today's realities require exploring economic development opportunities in the EU and Bulgaria in conditions such as population aging and migration processes and in the context of ongoing innovation and integration processes. The article defends the thesis that demographic changes (natural movement of the population and migration) are an important determinant of production factors, especially in the context of globalization and integration. The period under consideration is the years of Bulgaria's EU membership – from 2007 to 2018.

Theoretical basis and research on demographic development

There are three main demographic factors for the population aging: *reducing mortality, reducing birth rates and external migration*. In long-term retrospect, the natural movement of the population in the world and in the individual countries goes through different transitions and stages of different duration. The overall observed trend is an initial gradual decrease in mortality and, at a later stage, a lasting decrease in fertility at different rates of change in the two indicators, accompanied by an increase in the average life expectancy. The role of external migration is also important, and its impact is relatively rapid on the population age structure.

The current stage of demographic transition in the developed countries is characterized by stable levels of low birth rate and low mortality rate. However, Bulgaria is characterized by low birth rate and a high mortality rate, which makes the issue of improving the demographic picture more specific and complex. The situation is further exacerbated by the persistent negative migration balance, which is significant for the working-age population.

The question is whether, in relation to the observed demographic changes, a *demographic crisis* is an adequate term. It is used in some Eastern European countries – Bulgaria, Russia, Latvia, etc. The objections to this term come mainly from two reasons. *Firstly*, the etymological meaning of the word crisis means a period of severe critical decline or a bout of illness (in the medical field), but it is assumed that it will be overcome and why not even create conditions for more successful development after overcoming it. However, the demographic development today does not have any such prospects, which is shown by the long-term forecasts (up to 2050 and 2070) of international organizations (such as UNs World Population Prospects, etc.), national institutes such as the National Statistical Institute (NSI) in Bulgaria and individual experts. If a more precise term is sought,

demographic collapse and even *catastrophe* can be mentioned for countries like Bulgaria. Many municipalities in Bulgaria are already critically depopulated, and this demographic collapse has led to the term catastrophe. *Secondly*, since the beginning of the 1990s, during the transition to a market economy, society has become sensitive to all major changes and could easily use the word crisis in various fields and cases, including in such important and slowly changing (inert) demographic processes.

The demographic aging process has two aspects. The *first one* is an increase in the size of the population of the elderly people, measured by their number or share in the general population. The *second aspect* reflects the decrease in the number of young people in the population. It is noteworthy that the efforts of scientists, experts, various institutions and international organizations focus almost entirely on the first aspect.

The population aging affects the economy of a country in many ways – reducing labor supply, reducing savings, increasing spending on pensions and health care, reducing economic growth, etc. The increasing share of the elderly also raises the question of changes in the transfer of resources between generations.

Population aging has implications not only for public finances but also for labour productivity. It is clear that *the future economic progress in developed countries must be made with fewer and older workers*. Presumably, this leads to a lower income per capita for at least two reasons: *firstly*, the increase in the proportion of older people compared to working-age population leads to a change in the ratio of consumers to producers, and *secondly*, a negative effect is expected for the labour productivity of the relatively older population.

Over the last two to three decades, work on studying demographic development and its economic impact has intensified internationally and nationally. It is assumed, that with so many scientific conferences, publications, developed and accepted projects, concepts, strategies, measures and policies, their results will be more obvious. The demographic issues in Bulgaria are considered, above all, as statistical tendencies with inventions for the resulting social and some economic consequences. Economists in the country are expected to get involved more directly and more actively in studying the economic consequences of the aging population and how the economy would function in such demographic realities. In other words, the current demographic situation should be accepted as a given that determines the basis of labour resources today and even more in the future, which will affect the whole economic system – production and economic structure, human capital, opportunities for innovation, competitiveness, etc. Due to the inertia of the processes, no noticeable positive results can be expected in the short and medium-term with the policies launched today. Efforts should be made to maximize the results from the available human resources, but at the same time real action must be taken to address long-term problems.

In the developed countries, particular attention is paid to the economic aspects of demographic change. It works systematically, there are science centers or departments, such as the Munich Center for the Economics of Aging. The cooperation and synergy between demographic, social and economic researches, as well as those in the fields of medicine, culture, ecology, etc., practically carried out in Bulgaria, would be useful. The ineffective cooperation in the country however, between the science units and those

responsible for the formation and implementation of economic and social policy in the field of demographic development continues.

The economic aspects of population aging are being considered by reputable institutions such as the World Economic Forum, the International Labor Organization, the World Health Organization and others. For years, they have been the subject of intense work by the European Commission in the field of active aging and the silver economy.

Demographic development of Bulgaria in the EU context

Since 1989, there has been a dramatic change in the demographic situation in Bulgaria.[5] Negative demographic changes began to manifest themselves clearly at the beginning of the transition to the market economy. The political and economic transformations in CEE, including Bulgaria, as well as the accelerated processes of globalization, have had a negative impact on demographic processes, and in particular on people's reproductive behaviour and their international mobility. Like other CEE countries, the structure of the population is changing, with the proportion of the elderly increasing, approaching that of the EU-15. Such demographic changes began earlier in Western European countries, but demographic policies in these countries over the last four decades have contributed that the aging process to be accompanied by a reduction in mortality and an increase in the average life expectancy. In the 1990s, the aging dynamics of CEE countries were more pronounced. The CEE countries face the challenge of dealing with the combination of three serious problems – population decline and aging, which is also seen in developed countries of Western Europe, but in the context of stronger economies in the latter, population with much lower incomes and significant emigration of the population mainly to the more developed EU countries.

The EU-28 population increase for 2018 towards the previous year (most recent data) is due to a 2.8‰ increase in net migration, while natural increase population rate is negative (Table 1).

In *the first group* of countries with the largest population growth are: Malta, Luxembourg, Sweden, Ireland, Austria, and so on. Most of them have both a positive natural rate and a migration balance. Germany, Finland and Poland register a negative natural increase rate, but due to the significant immigration flow, they achieve an overall increase in their population. The Western and Northern European countries take advantage of the emigrating young people of fertile and working age. *In the group of countries with a decreasing population* are those from Central and especially from Eastern Europe, also Portugal and Italy, with the largest decrease in Lithuania, Latvia, Croatia, Bulgaria, Romania, etc. This depopulation started about 30 years ago, both because of the negative natural growth and the significant emigration, mainly to the countries of Western Europe. The strength of the two factors manifests differently in different countries.

[5] Demographers in Bulgaria had previously predicted a negative natural increase by the end of the twentieth century, but this was recorded as early as 1990.

Table 1

Population change in EU-28 countries in 2018, ‰

	Total population change	including			Total population change	including	
		Natural increase	Net migration			Natural increase	Net migration
EU (28 countries)	2.1	-0.7	2.8				
Countries with increasing population				Countries with decreasing population			
Malta	36.8	1.6	35.3	Latvia	-7.5	-4.9	-2.5
Luxembourg	19.6	3.2	16.3	Bulgaria	-7.1	-6.6	-0.5
Ireland	15.2	6.1	9	Croatia	-7.1	-3.9	-3.3
Cyprus	13.4	4.1	9.3	Romania	-6.6	-3.9	-2.8
Sweden	10.8	2.3	8.5	Lithuania	-5.3	-4.1	-1.2
Slovenia	6.8	-0.4	7.2	Italy	-2.1	-3.2	1.1
Belgium	6.1	0.7	5.4	Greece	-1.8	-3.2	1.4
Spain	5.9	-1.2	7.1	Portugal	-1.4	-2.5	1.1
Netherlands	5.9	0.9	5	Hungary	-0.6	-3.9	3.3
United Kingdom	5.6	1.7	3.9	Poland	-0.1	-0.7	0.6
Denmark	4.3	1.1	3.2				
Estonia	4.3	-1	5.3				
Austria	4.1	0.2	4				
Czech Republic	3.7	0.1	3.6				
Germany	2.7	-2	4.8				
France	1.5	2.2	-0.6				
Slovakia	1.3	0.6	0.7				
Finland	0.9	-1.3	2.1				

Source: Eurostat.

The described population figures in the EU countries largely explain the reasons for the demographic policy applied in them and within the Union as a whole. While countries such as France, Germany, and others tend to rely on immigrants from Eastern Europe, Africa and the Middle East, CEE countries, including Bulgaria, are overwhelmingly seeking a national solution to demographic issues regarding natural increase rate and retention of emigration, including policies aimed at returning emigrants.

By all major demographic indicators, Bulgaria was and still is below the EU-28 average, and in many cases, it is in the last positions regarding these indicators. EU membership since 2007 has not led to a reversal of long-term negative trends. Over the last ten years, the EU-28 average birth rate has remained relatively stable around and slightly above 10‰ (Table 2). For Bulgaria, it decreased from 10‰ in 2007 (which is slightly lower than the EU-28 average) to 8.9‰ in 2018, widening the gap with the Union average.

Table 2

Demographic indicators for Bulgaria compared to EU-28, 2007-2018

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Birth rate (per 1000 people)												
ЕС-28	10.7	10.9	10.8	10.7	10.5	10.4	10	10.1	10	10.1	9.9	9.7
България	10.0	10.4	10.9	10.2	9.6	9.5	9.2	9.4	9.2	9.1	9.0	8.9
Mortality rate (per 1000 people)												
ЕС-28	9.7	9.8	9.8	9.7	9.7	9.9	9.9	9.7	10.3	10	10.3	10.4
България	15.0	14.8	14.5	14.9	14.7	15	14.4	15.1	15.3	15.1	15.5	15.4
*Total fertility rate**												
ЕС-28	1.56	1.61	1.61	1.62	1.59	1.59	1.55	1.58	1.58	1.6	1.59	
България	1.49	1.56	1.66	1.57	1.51	1.5	1.48	1.53	1.53	1.54	1.56	
Share of the population aged 65 and over in the total population, %												
ЕС-28	17.0	17.1	17.3	17.5	17.6	17.9	18.2	18.5	18.9	19.2	19.4	19.7
България	17.6	17.8	18	18.2	18.5	18.8	19.2	19.6	20	20.4	20.7	21.0
Life expectancy at birth (years)												
ЕС-28	79.1	79.4	79.6	79.9	80.2	80.3	80.5	80.9	80.6	81	80.9	
България	73.0	73.3	73.7	73.8	74.2	74.4	*74.9*	*74.5*	74.7	74.9	74.8	
Expected Life expectancy of people aged 65 (years)												
ЕС-28	18.9	19	19.2	19.4	19.6	19.5	19.7	20	19.7	20	19.9	
България	15.0	15.3	15.6	15.6	15.8	15.8	16.2	16	16	16.2	16.1	

* Shows the average number of children (boys and girls) that a woman would give birth to throughout her fertile period (15 to 49 years).
Source: Eurostat and NSI

The fertility rate in 2017 in Bulgaria is 9‰ and continues to fall to **8.9‰ in 2018**, compared to the average of EU-28 countries of 9.7‰. In 5 of these countries the birth rates are lower than in Bulgaria – the lowest in Italy (7.3‰), followed by Spain (7.9‰), Greece (8.1‰), Portugal (8.5‰) and Finland (8.6‰).

The total mortality rate in Bulgaria in 2017 is 15.5‰, and in the following year it stays at almost the same high levels – **15.4‰**[6] (at 10.4‰ EU-28 average), while the mortality rates in the countries with lower birth rates than Bulgaria are lower: Greece – 11.2‰, Portugal – 11‰, Italy – 10.5‰, Finland – 9.9‰, Spain – 9.1‰.[7]

The mortality rate in Bulgaria is the highest in Europe and among the highest in the world (Table 3). After Bulgaria, much higher than the EU-28 average is the value of this indicator

[6] The total mortality rate in Bulgaria is increasing even at a declining child mortality rate, which is a positive fact in itself – from 13.2 in 2002, 9.2‰ in 2007, 8.5‰ in 2011 and 6.4‰ in 2017, although it remains among the highest in comparison with other countries, at an average of 3.6 ‰ for the EU-28. The lowest is the child mortality rate in Cyprus (1.3‰), Finland (2‰), Slovenia (2.1‰) and Estonia (2.3‰). In the Bulgaria's case, the negative role of the relatively high rate of premature mortality should be added.

[7] The lowest mortality rates are in Cyprus (7‰), Luxembourg (7.1‰) and Malta (7.6‰), which is more than twice lower than in Bulgaria.

only in Latvia and Lithuania.[8] Among the EU-28 countries with the lowest mortality rates are Ireland, Cyprus and Luxembourg, and on a European scale – Andorra, Kosovo (UN), Turkey, Azerbaijan, Iceland, etc. Low mortality combined with high birth rates determines the relatively high positive natural increase for these countries.

Table 3

Mortality rates in European countries in 2018, ‰

Countries	Mortality rate
Bulgaria (15.4), Latvia (15)	15 and more
Serbia, Lithuania	14 – 14.99
Ukraine, Russia (2011), Romania, Hungary	13 – 13.99
Croatia, Belarus, Georgia	12 – 12.99
Estonia, Germany, Greece, Portugal	11 – 11.99
Poland, Czech Republic, Italy, Bosnia and Herzegovina (2016), Montenegro, Moldova (2016), **EU-28 (10.4)**, Slovakia	10 – 10.99
Slovenia, Finland, Belgium, Denmark, Austria, Northern Macedonia, United Kingdom, France, Spain, Sweden	9 – 9.99
Netherlands, Armenia	8 – 8.99
Switzerland, Norway (2017), Malta, Albania, Liechtenstein, Luxembourg, San Marino	7 – 7.99
Cyprus, Monaco, Ireland, Iceland	6 – 6.99
Azerbaijan (2017), Turkey	5 – 5.99
Kosovo, UN (2017), Andorra (4.4)	4 – 4.99

Source: Eurostat

As a result of the described trends in Bulgaria, an increasing negative natural increase of the population emerges (Table 4). *The problems for the decreasing population in Bulgaria are above all in the high mortality rate, apart from the declining birth rate.*

The high mortality rate in the country is terrifying and it cannot be said that the measures taken to reduce it are adequate to its scale and seriousness. *Such high mortality should be accepted with all its importance in the concept of the current demographic processes in Bulgaria and reflected in the main demographic policies against depopulation and population aging.*

[8] According to CIA data for 2017, Bulgaria ranks third in mortality in the world (14.5 per 1000 people), with only the Republic of Lesotho (15 per 1000) and Latvia (14.6 per 1000 people) ahead of Bulgaria. The ranking is dominated mainly by African, Balkan and former Soviet republics. Lithuania has similar to Bulgaria's death rate. Ukraine, Guinea-Bissau, Chad, Serbia, Russia and Afghanistan, which is a site of military conflict and terrorism, also rank in the top 10 of the black chart. In recent years Bulgaria has always been among the leaders in this ominous ranking, but for the first time it has climbed up and is now in the top three. Central Intelligence Agency (US), the World Fact Book. Available at: https://www.cia.gov/library/publications/the-world-factbook/rankorder/2066rank.html.

Table 4

Live births, deaths and natural increase in population in Bulgaria in 2007-2018, numbers

	Live births	Deaths	Natural increase
2007	75 349	113 004	-37 655
2008	77 712	110 523	-32 811
2009	80 956	108 068	-27 112
2010	75 513	110 165	-34 652
2011	70 846	108 258	-37 412
2012	69 121	109 281	-40 160
2013	66 578	104 345	-37 767
2014	67 585	108 952	-41 367
2015	65 950	110 117	-44 167
2016	64 984	107 580	-42 596
2017	63 955	109 791	-45 836
2018	62 197	108 526	-46 329

Source: NSI.

The total fertility rate (Table 2) also shows Bulgaria's weaker position than the EU-28 average. It decreased from 1.81 in 1990 to 1.23 in 1995 and then increased to 1.56 in 2018, but remained below the EU average of 1.59. Most CEE countries have an even more pronounced decrease in this indicator. Countries such as Spain, Greece, Italy and Malta have a markedly low total fertility rate throughout the period (around 1.30). With highest values are France (1.9), Sweden, Ireland, Denmark, United Kingdom, Romania (all in the order of 1.71 to 1.78).

As a key indicator of the population aging of in a given country in the EU, the relative share of the population aged 65 and over is taken. In this regard, Bulgaria has a higher percentage than the EU-28 average (Table 5).

Table 5

Relative share of the population over 65 years in total population, 2018, %

Share, %	Countries
under 9	Azerbaijan (6.5), Kosovo UN (8.1), Turkey (8.5)
11.0-11.9	Moldova (2017), Armenia
13-13.9	Russia (2014), Albania, Northern Macedonia, Ireland
14.0-14.9	Iceland, Luxembourg, Georgia, Montenegro
15.0-15.9	Belarus, Slovakia, Cyprus
16-16.9	Ukraine, Norway
17.0-17.9	Poland, Liechtenstein
18-18.9	Romania, United Kingdom, Switzerland, Belgium, Austria, Malta, Hungary, Netherlands
19.0-19.9	Czech Republic, Spain, San Marino, Denmark, Slovenia, Estonia, Lithuania, **EU-28 (19.7)**, France, Sweden, Serbia
20.0-20.9	Croatia, Latvia
21.0-21.9	**Bulgaria (21.0)**, Germany, Finland, Portugal, Greece
22.6 (the highest)	Italy

Source: Eurostat.

The aging process in Bulgaria is more pronounced among women than men. The relative share of women over 65 is 24.8% and of men – 17.7% (2018). This difference is due to the higher mortality rate for men and, as a consequence, the lower average life expectancy. The male mortality rate in Bulgaria (16.5‰ in 2018) is significantly higher than the female mortality rate (14.4‰).

Because of the described trends, Bulgaria has the lowest life expectancy (74.8 years), which is over 6 years lower than the EU-28 average (80.9 years in 2017). The life expectancy is similar in Latvia and is slightly higher in Romania (75.3). At the same time, in 18 of the 28 countries, life expectancy is above the EU-28 average, with the highest being in Spain (83.4) and Italy (83.1). The situation with the life expectancy of the elderly people (65 years) is similar. In 2017, it is 16.1 years in Bulgaria, compared to 19.9 EU-28 average. Bulgaria has the lowest life expectancy of 65-year-olds in the EU-28 (similar to Serbia and Belarus), with Hungary and Romania at 16.7 each. At the same time in 15 countries in EU-28 the average life expectancy of these people is above the Union average. These differences directly reflect the nature of the economic and social policy within the EU countries in the context of an aging population.

According to all available national and international forecasts, the population of Bulgaria will continue to decline in the future and, according to most of them, will be just over 5 million by 2050.

Summarizing:

1. The demographic collapse not only reduces the number of the workforce, but also worsens its age and occupational structure. Such a structure increases the burden on the budget by spending on pensions and medical care for the elderly. There is an unfavourable change in terms of available human resources as a workforce in quantitative and qualitative terms. In these demographic conditions, it is difficult to achieve high productivity and accelerated catch-up development.

2. Alarming demographics indicators are complemented by (and explained by) other macroeconomic ones: Bulgaria is the country with the lowest average incomes among other EU countries; also the country with the highest risk of poverty and social exclusion for the population and even more for the elderly; the country with the most widespread corruption in the Union. The income gap of the population is growing strongly and rapidly. According to Eurostat data, in the period 2012-2017, the gap between the incomes of the richest and the poorest 20% of Bulgarians increased from 6.2 to 8.2 times.

3. The achieved GDP growth (3.6% in 2017 and 3.1% in 2018) cannot fulfill the role of inclusive catch-up development and hasn't a noticeable impact on poverty reduction and economic and social inequalities. At the same time, the deepening of demographic change creates a serious strain on social security and a growing need for budgetary funding. The conclusion is that unless a drastically different socio-economic approach is implemented to bring about a significant change in demographic development, the status quo will not change.

Demographic processes in Bulgaria in a regional aspect as a basis for economic development

Natural increase in population

The imbalance in the territorial population distribution in Bulgaria is deepening. These trends are more dramatic in villages than in cities. In 2018, half of the country's population lives in South-West and South-Central Bulgaria (30 and 20.1% respectively), with the lowest share in the Northwest – just 10.6%. The latter region also marks the largest negative growth rate. Four of the six cities with a population over 100 thousand are in Southern Bulgaria – Sofia, Plovdiv, Stara Zagora and Burgas, and only two – Varna and Rousse, are in Northern Bulgaria. This creates specific conditions for the economic development of the country in territorial terms. In addition to having the lowest economic level among EU countries, Bulgaria, measured in terms of GDP per capita, also has the highest regional disparities.

Apart from the population concentration, there are also significant economic differences in its age structure. Viewed by districts, the share of persons aged 65 and over is highest in Vidin (29.6%), Gabrovo (28.6%) and Unsteadily (27.3%). In twenty districts, this share is above the national average (21%). The lowest is the share of the elderly in the districts of Sofia (capital) – 17.5%, and Varna – 18.9%. The aging process is more pronounced among women than men.

The unfavorable tendency of population aging and the relative decrease of people of working age can be traced by the change of the ratio between people of over-working age and those of working age. It shows a relative increase in the elderly population over 65 years compared to that of working age. It is the least pronounced in the Southwestern region – by 6.8 percentage points and the strongest in the North Central region – by 13.1 percentage points followed by the Northwest – by 11.1 percentage points (Figure 1). The increase in this ratio is not proportional to the regions and indicates the greater economic potential of the Southwest and South Central region compared to other regions in the country.

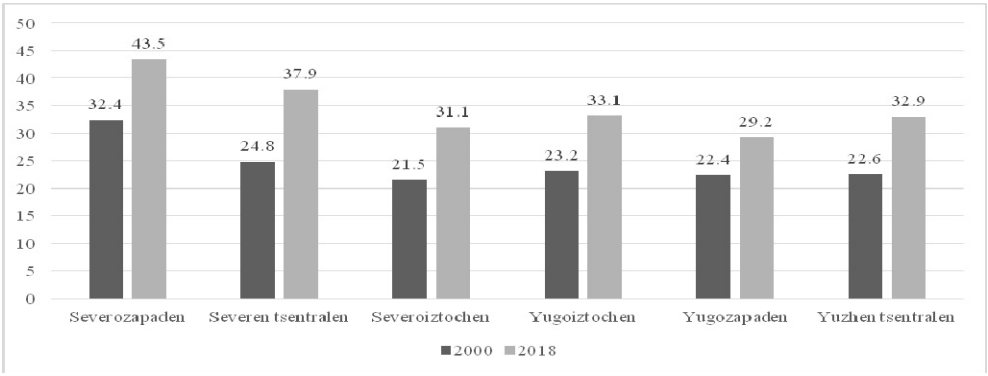
The indicators regarding the natural increase of the population that determine its natural growth are the fertility and mortality rates. The data by districts follow the trends for the country as a whole for declining birth rates, high and increasing mortality rates. With a birth rate of 8.9‰ for 2018 (and 9‰ for 2017), the highest birth rate is in Sliven district – 12‰, followed by Sofia (capital) (9.8‰) and relatively high and above the national average and in the districts: Yambol, Plovdiv, Pazardzhik, Stara Zagora, Kardzhali, Varna and Burgas, in which are located largest cities in the country, or are characterized by populations of different ethnicities. The lowest birth rate is in Smolyan – 6.3‰.

There are large variations in mortality rates in different regions. It is the lowest in Sofia-capital (11.7‰) and the highest in poor cities such as those in the Northwestern region (Vidin – 23.2‰, Montana – 21.7‰). The described trends also predetermine the natural increase population in the districts. These regional imbalances further complicate the country's demographic problems. Viewed in a regional plan, the highest average life expectancy is in the district of Kardzhali – 76.61 years and in Sofia (capital) – 76.58. In

districts, mainly with large cities, average life expectancy is between 75 and 76 years and is above the national average – Blagoevgrad, Smolyan, Varna, Plovdiv, Burgas. The lowest life expectancy is between 72 and 73 years in the districts of Northwestern region Montana and Vratsa. In ten areas the average life expectancy is between 73 and 74 years and these are areas where other negative demographic and social phenomena are observed. The average life expectancy in the country and by region is increasing over time, with a higher life expectancy for women of about 6-7 years than for men.

Figure 1

Ratio of the share of the population over 65 to that between 15 and 64 by regions in Bulgaria in 2000 and 2018, %



Source: NSI. Residence structure, sex ratio and age dependency rates.

The average population age in Bulgaria is also rising – from 39.9 years in 2000 to 41.5 years in 2007 and 43.7 years in 2017. The most aging population is again in Vidin, with an average age of 47.6 compared to 41 in Sofia.

The consequence of demographic changes is the worsening age structure of the population in the various districts. Even for a relatively short period, such as 2010-2018, there was a marked decrease in the number and share of the working-age population (from 62.6% in 2010 to 60.0% in 2018) and an increase in the over-working age population (from a low of 22.7% to 24.7%) with a very slight increase in the already low percentage of incoming generation in under-working age – from 14.6% to 15.2%. These structural changes are more pronounced in rural areas than in urban and in women than in men. The proportion of people in over-working age in urban areas in 2018 is 22.7% and in rural areas – 30.4% The relative share of women in over-working age in 2018 in urban areas is 27.9% and of men – 17.1%.

Migration

Bulgaria is among the CEE countries, characterized by significant emigration flow since 1989, changing in size and structure over the years, but stable over time. Leaving so many people, especially the young, leads to a weakening of the economy and a threat to its

overall functioning in certain regions. It is not uncommon that one of the most important barriers to investment in underdeveloped areas is the lack of human resources (Zlatinov, 2010, p. 177-190).

Emigration was more intense in the 1990s, in the years of transition to a market economy than in the years of EU membership. Since 2007 the NSI has been keeping regular statistics on external migration, which enables it to be better studied. Despite the conditionalities of statistics, it is observed that the number of people leaving the country is generally increasing, with a peak in the years of the economic crisis (2009-2010) and then in 2014 and 2015, when the number of immigrants in the country has increased dramatically, but the migration balance has remained negative and even increasing.

The motives for the internal migration are the same as in the case of external migration - job search, higher pay, better working and security conditions, better professional realization and career, providing better or appropriate children education, etc.

A more general picture of the mechanical movement by districts can be obtained from the available NSI data on the total number of migrants, whether in or outside the country. In the period 2010-2017 the tendency for more emigrants than immigrants in Bulgaria continued, which resulted in a negative migration balance.[9] According to NSI data, in 2017 the number of immigrants in Bulgaria was 139 068, and of those emigrants – 145 057, as a result of which a negative migration balance of -5989 people was registered.[10] In some districts, there was a positive migration balance, most notably the biggest ones: Sofia (capital) – 3572, Plovdiv – 1698, Varna – 1148, Kardzhali – 863, Bourgas – 670 and Pernik – 174.

The territorial distribution of immigrants and emigrants based on 1 000 people shows their real impact on demographic processes. With a negative migration balance overall for the country, it is interesting from which districts are predominantly leave people (this would be useful to track by municipalities) and whether they go abroad or in another districts of the country (Table 6). It is hardly strange that the districts with the highest number of emigrants per 1000 people are those, which by other indicators show unfavourable development and unattractiveness: Vratsa – 32.9, Vidin – 31.2, Montana – 28.2, Targovishte – 27.5, Razgrad – 27 etc. Relatively few emigrants per 1000 people are from Sofia (capital) – 14.6, Plovdiv – 16.4, Pazardzhik – 16.7, Ruse – 17.1, etc. As a result, the effects of migration processes in individual areas are reflected in their migration balance. The Smolyan region is the hardest hit, followed by Vratsa, Vidin, Pleven, etc., and the best positions with a positive migration balance are the districts of Kardzhali, followed by districts with big cities – Sofia (capital), Plovdiv, Varna, etc. (with twice lower levels of the indicator).

[9] Since 2007, the migration of the population includes not only internal migration but also the movement of persons to and from the country.

[10] The migration survey monitors the number of persons who have changed their usual place of residence (current address). The data source for migrants is the Unified System for Civil Registration and Administrative Services (ESGRAON). According to the NSI methodology, the mechanical growth of the population in territorial aspect represents the difference between the number of immigrants and the number of emigrants in and from each settlement in the calendar year. The migration balance from external migration is expressed by the difference between the emigrants and the immigrants in the country in the same year.

Table 6

Immigrants, emigrants and migration balance per 1,000 people by district

	2010			2017		
	Immigrants	Emigrants	Migration balance	Immigrants	Emigrants	Migration balance
Total – number	155 212	179 402	-24 190	139 068	145 057	-5 989
Total for the country	20.7	23.9	-3.2	19.7	20.6	-0.8
Blagoevgrad	14.6	19.0	-4.4	17.5	20.9	-3.4
Burgas	26.3	26.3	0.0	23.3	21.7	1.6
Varna	23.8	23.5	0.3	21.3	18.8	2.4
Veliko Tarnovo	25.7	32.5	-6.8	22.1	26.1	-3.9
Vidin	23.1	29.4	-6.2	25.3	31.2	-5.9
Vratsa	21.2	27.7	-6.5	26.6	32.9	-6.3
Gabrovo	18.5	26.8	-8.3	16.9	21.3	-4.4
Dobrich	19.2	24.8	-5.6	17.4	21.6	-4.2
Kardzhali	19.0	25.8	-6.8	30.7	25.0	5.7
Kyustendil	16.8	24.4	-7.6	17.4	23.0	-5.6
Lovech	16.1	28.3	-12.2	20.4	24.9	-4.5
Montana	23.0	29.2	-6.2	23.2	28.2	-5.0
Pazardzhik	12.6	18.6	-6.0	12.6	16.7	-4.1
Gingerbread	24.5	26.4	-1.9	19.9	18.5	1.4
Pleven	18.5	23.8	-5.3	17.6	23.4	-5.8
Plovdiv	18.9	23.0	-4.1	18.9	16.4	2.5
Razgrad	16.8	30.0	-13.2	21.6	27.0	-5.5
ruse	19.6	23.1	-3.5	16.3	17.1	-0.7
Silistra	19.0	26.7	-7.7	19.6	23.4	-3.8
Sliven	16.0	27.8	-11.8	18.8	23.3	-4.4
Smolyan	14.5	28.0	-13.5	15.4	25.8	-10.4
Sofia (capital)	24.0	16.3	7.6	17.3	14.6	2.7
Sofia	20.4	22.5	-2.1	21.6	22.9	-1.3
Stara Zagora	22.6	27.5	-4.9	20.4	20.6	-0.1
Targovishte	21.2	30.7	-9.5	24.8	27.5	-2.8
Haskovo	18.3	24.8	-6.6	22.2	23.1	-0.9
Shumen	21.0	26.2	-5.2	23.4	24.5	-1.1
Yambol	22.5	34.3	-11.8	18.7	25.2	-6.5

Source: NSI, Demographic and Social Statistics.

NSI data by districts give an opportunity to determine the structure of the emigrants in the country – whether they do so within a given district, outside the district within the country or abroad (Table 7). It is obvious that the migration of the population is mainly within the country, with the predominance of the migration from one district to another before the movement within the district. Razgrad (36.6%), Kardzhali (33.3%) and Kyustendil (30%) have the highest share of emigrants abroad compared to all emigrants. With the smallest relative share of emigrants abroad (less than 15%) are the districts: Veliko Turnovo (12.6%), Stara Zagora (13.6%), Plovdiv (14.7).

Table 7

Structure of emigrants by districts in Bulgaria, 2017

Immigrants in:	Emigrants to:					
	the same district		other districts in the country		abroad	
	number	share (%)	number	share (%)	number	share (%)
Blagoevgrad	2467	38.4	2290	35.6	1669	26.0
Burgas	3892	43.6	3095	34.6	1945	21.8
Varna	3386	38.1	3514	39.5	1991	22.4
Veliko Tarnovo	2285	36.7	3162	50.7	785	12.6
Vidin	1199	44.1	996	36.7	521	19.2
Vratsa	2246	41.2	2157	39.5	1054	19.3
Gabrovo	693	29.5	1045	44.6	609	25.9
Dobrich	1464	38.6	1452	38.2	883	23.2
Kardzhali	1468	38.9	1048	27.8	1255	33.3
Kyustendil	715	25.7	1235	44.3	835	30.0
Lovech	1006	31.8	1485	46.9	674	21.3
Montana	1429	38.4	1603	43.0	694	18.6
Pazardzhik	1370	31.8	1947	45.2	990	23.0
Gingerbread	795	35.1	1089	48.0	384	16.9
Pleven	1912	33.5	2686	47.1	1106	19.4
Plovdiv	5483	49.9	3890	35.4	1618	14.7
Razgrad	892	29.0	1058	34.4	1125	36.6
Ruse	1390	36.7	1663	44.0	730	19.3
Silistra	952	36.8	1134	43.9	500	19.3
Sliven	1288	29.4	1980	45.1	1120	25.5
Smolyan	682	24.7	1352	48.8	732	26.5
Sofia (capital)	2127	11.0	12152	62.8	5082	26.2
Sofia	1467	27.6	2962	55.8	880	16.6
Stara Zagora	2751	41.9	2920	44.5	893	13.6
Targovishte	1229	39.7	1138	36.7	731	23.6
Haskovo	1799	33.7	2290	42.8	1253	23.5
Shumen	1494	35.3	1808	42.6	935	22.1
Yambol	898	29.6	1541	50.8	592	19.6

Source: Authors' calculations based on NSI data on migration of the population.

Demographic changes and imbalances lead to other territorial disparities by area. One very important indicator is the economic activity of people aged 15-64. With a coefficient total for the country (2018) 71.5% it is highest in Sofia (capital) – 77.2%, and in several districts is relatively high – Smolyan, Blagoevgrad, Sofia (region), Vidin, etc. The lowest is the economic activity in the districts: Kardjali, Vratsa, Montana, Razgrad. Another production factor (other than labor force) is that of investment, in this case, foreign direct investment (FDI). For them, the distribution is more than indicative, with more than half of them going to Sofia (capital), followed by a much smaller share of the districts with the big cities – Varna, Burgas, Plovdiv. Not surprisingly, the districts of Silistra, Montana, Kyustendil, Yambol, Vidin, Vratsa have the smallest share. If the average wage is considered to be the result of economic activity, again the very favourable position of Sofia (capital) is obvious

– 138.2% against the country total 100%. Long after it, but just below 100% is the average wage in Stara Zagora, Sofia region, Varna, Vratsa, Plovdiv, etc.

Summarizing:

1. Depopulation and aging processes will continue in the future, with depopulation even greater in some districts, leading to further disappearance of some administrative units or critical depopulation of individual settlements. The issue is not only to track down negative trends, but to urgently find policies to counter them. Because there are points of the situation after which settlements cannot function normally, and any efforts to create economic activity and infrastructure will not make sense and significance.
2. It is disturbing that the problems of territorial imbalances did not find at least a partial solution during the period under consideration, during which the country received significant ESF funding. The imbalance in the territorial distribution of the population is exacerbating. The EU focused on the cohesion policy of European regions and cities in the economic, social and environmental spheres covered by the two programming periods: 2007-2013 and 2014-2020. The European Commission report for Bulgaria on the evaluation of cohesion policy programs in 2007-2013, focused on the European Regional Development Fund and the Cohesion Fund, noted that the gap remained relatively unchanged over the period.[11]
3. The logical and most commonly proposed policy to reduce regional disparities is the proposal to redirect resources to the least developed territorial units. The income gap between less developed districts and Sofia may be reduced by greater efforts to attract local and foreign investment, quality and continuing education and training, infrastructure development and a better business environment that fosters entrepreneurship. To this end, an adequate and targeted *strategy* is needed, outlining how to achieve these goals. Such a strategy must be based on the endogenous (internal) economic potential of the regions, as well as strive to match regional policy with economic efficiency.
4. Regional development would be sustainable if implemented on the basis of well-combined economic, social, environmental and institutional development. It implies that there are working institutions involved in addressing the problems of creating and reviving (where applicable) economic activity, reducing income inequality, activating the labor market and reducing unemployment. There is a general understanding of the lack of systematic success in this area.
5. The territorial redistribution of the population in the country is proving to be one of the reasons for the widening of the differences in living conditions between towns and villages. The spatial dimension of poverty (cities versus small settlements) is exacerbated by poor infrastructure. The change in the territory of the six statistical regions in the country, which has been planned and discussed in the last few months,

[11] An interesting analysis of the peculiarities of the agricultural structure and policy in Bulgaria, as well as the absorption of funds from the European funds, see: Boyukliev, 2016, pp. 145-165.

can suppress on paper some drastic territorial differences, but in the districts and municipalities it cannot be relied on territorial reconstruction.

Demographic and migration processes in the Smolyan district

Smolyan District has a relative share of 1.52% of the total population in the country (2017). Lower is the share only in Vidin district (1.23%) and with a little higher proportion are Gabrovo (1.56%) and Silistra (1.57%). The authors' research interest in the Smolyan district is driven by the desire to analyze a less studied regional unit, which is among the smallest in the country in terms of population and territory, with rapidly deteriorating demographic characteristics and a poorly developed economy. There is an uneven distribution of the population by municipalities, with more than 1/3 of the people living in the municipality of Smolyan (the largest in the district). The population in Smolyan is declining at a higher rate than the total for the country (Rangelova, Bilyanski, 2018, pp. 80-101).

In the Smolyan district, demographic development is expressed in low birth rates, very high mortality rates, negative natural increase, depopulation, migration of young people caused by lack of employment and well-paid/attractive jobs in small settlements. The age structure continues to worsen, with the share of older people increasing. This is more pronounced in women than in men and more strongly in villages than in towns. The contingent of the younger generation is becoming smaller, which has a negative impact on human fertility and other characteristics of the natural increase of the population, and thus on the state of human resources in the area. Although the negative migration balance is diminishing, active emigration from the Smolyan district, permanently depletes its human resources. The processes of depopulation and population aging pose a serious problem for the economic development for this part of the country.

Economic activity, employment and unemployment are undoubtedly influenced by the demographic factor. There is increasing employment (with a slow decrease in the number of labor force), decreasing unemployment, improving the educational level of the workforce. The average wage level is below the median for the 28 districts in the country. The risk of poverty and social exclusion is among the highest in the country and income inequality is increasing. Compared to other districts, however, the distribution of income in the Smolyan district by the Gini coefficient is more even, meaning that social problems, including the risk of poverty and social exclusion, affect a wider part of the population.

A survey (questionnaire) was conducted in the village of Smilyan, Smolyan municipality. It was aimed at examining the demographic situation and the emigration mood there, and understanding the reasons leading to the depopulation of the municipality and to the current economic and social development. Through the survey, adequate recommendations are seeking for revitalizing the economy and raising living standards. [12]

[12] The survey was conducted during the summer of 2017. The respondents were 159, i.e. 10% of the total population in the village of Smilyan.

Main findings:

- Smilyan is *a typical present Bulgarian village* with a decreasing population, increasing share of elderly people and leaving young people. This not only reduces the workforce, but also degrades its age and professional structure.
- Respondents show personal monthly income below the national average. People in retirement age (65 and over) make up the largest low-income group, followed by those in pre-retirement age (51-65). It is understandable that the people receiving relatively higher incomes (between BGN 601-1000 and over BGN 1000 per month) are those of the most active working age 36-50 and 19-35.[13] According to the survey data, there is no significant financial support from relatives working abroad.
- Demographic changes pose the necessity for the elderly to be viewed as a human resource that, with experience and knowledge, can optionally continue their career in the forms they choose. However, *increasing the retirement age* is not considered justified by the respondents. Over four-fifths of the respondents (82.4%) disagree with it and only 12.6% answered positively.[14] The support for this measure comes mainly from people of retirement age. However, working pensioners are of great importance for small settlements where there are problems with the shortage of certain professions.
- According to the answers received in the questionnaire for the depopulation of Smilyan, emigration within the country is of greater importance, and that of foreign countries remains of secondary importance. *The emigrants are mostly young people* looking for a better job or education. In practice, almost everyone who went to study in a larger city remains employed there. And this tendency cannot be stopped, or at least diminished, unless attractive conditions for the professional realization and standard of living of young people in their places of origin are created.
- The increase in employment implies the development of economic activity in the Smolyan region. This covers a wide range of priorities and includes measures such as: infrastructure development – road, transport and communication; promoting projects from international and national programs and local initiatives; stimulating entrepreneurship and attracting foreign investment; development of tourism using natural, cultural and historical assets, cross-border cooperation in the interest of people and others.[15]
- However, there are quite a few opportunities for the economic development of the region that can be realized relatively quickly. These opportunities, in turn, can be the turning point of these negative processes. Firstly, these opportunities must be sought in the development of existing economic activities to create higher value-added. Specific

[13] The Bulgarian Lev is pegged to the Euro, with 1 € = 1.95583 BGN.

[14] When analyzing such a question, for many people the question actually changes from "Do you agree to increase your retirement age?" to "Do you agree to start receiving a pension in addition to your salary later?", to which the answer is clear.

[15] These measures are the subject of attention and discussion in various regional and national documents. See: Development Strategy of Smolyan District 2005-2015. Republic of Bulgaria. Smolyan District Governor.

examples are the woodworking industry (but aimed at furniture production, not exporting very low-processed products), rural tourism (but aided and co-ordinated by local authorities, not fragmented, with multiple individual hotels and houses for guests offering only overnight accommodation and food and the increasingly-asked question of why tourists do not return again), livestock breeding and plant growing (which can be easily organized under natural conditions, but again with the help of local authorities), food industry, trade and others. In the next phase there is also room for development of new and modern economic activities, but they should take into account the specifics of the region, its traditions and the restricted labor market very well.

Active aging of the population as an economic factor

Active aging of the population contributes to increasing the country's development resource, and in particular its economic and social potential. This leads to more complete human realization and satisfaction, and ultimately to higher economic results. The concept of active aging brings returns by reducing the loss of valuable experience and, based on the wisdom of the elderly, to strengthen the human resilience of society in order to address the economic and social challenges in the long term. In this context, active aging strategies are being developed that aim to change the attitudes of different age groups and to develop a more effective approach to address the aging population.

In the EU, the concept of the Silver Economy has emerged, encompassing a number of different but interconnected strands aimed at improving the quality of life, social inclusion and participation in the economic activity of an aging population through innovative policies, products and services. The EC publishes the European Silver Economy Growth document, which outlines a wide range of policy initiatives related to the economy.[16]

Bulgaria has adopted a National Strategy for the Active Life of the Elderly in Bulgaria for the period 2019-2030 MLSP.[17] The Strategy responds to the challenges facing the aging population and supports policy-making and action in the social field, with an emphasis on promoting older people's employment and participation in public life. The main objective of the strategy is to create conditions for an active and dignified life of the elderly by providing equal opportunities for their full participation in the economic and social life of society. The following priorities of the Strategy have been identified: Priority 1: Promoting the active life of older people in employment; Priority 2: Promoting the active life of older people in the field of community participation; Priority 3: Promoting the active life of older people in the field of independent living; Priority 4: Creating capacity and a supportive

[16] See: The Silver Economy – an Emphasis on the Third European Standardization Summit. It was the focus of the Third European Standardization Summit, which took place from 10 to 12 June 2014 in Istanbul, Turkey. Available at: http://www.bds-bg.org/bg/pages/page_1963.html.

[17] It was developed by the Ministry of Labor and Social Policy and replaced the existing National Concept for the Promotion of the Active Life of the Elderly (2012-2020), in order to ensure continuity and adequate use of the experience gained. Available at: https://www.mlsp.government.bg/ckfinder/userfiles/files/politiki/demografska%20politika/nacionalni%20strategicheski%20dokumenti/National_agieng_strategy_2019-2030.pdf.

environment for the active life of older people at national and regional level. The EU concept of active aging is embodied in the project for calculating the Active Ageing Index (AAI).[18] It is designed to determine the extent to which older people can contribute to the economy and society and help policymakers and society develop appropriate policies for the active life of older people.

AII are composite measures calculated using 22 individual indicators and grouped into four areas that are components of the overall index:

- *Employment age 55 and over*, divided into four age groups: 55-59, 60-64, 65-69 and 70-74;
- *Participation in public life*: voluntary activity, child and grandchild care, adult care, participation in politics;
- *Independence of the elderly* – health, economic and social – access to health care, middle income, poverty risk, lifelong learning, etc.;
- *Capacity (potential) and favorable environment for an active and healthy life of the elderly* – life expectancy, life share of people in good health, use of ICT by the elderly, social cohesion, educational attainment of the elderly, etc.

The first three areas relate to the actual state of affairs, while the fourth area captures the capacity and favourable environment for active aging, which means factors that may facilitate or impede active aging.

Data for the period from the initial calculation of the AAI, year 2008 to 2016 have served to calculate the indices for 2018. There is an increase of this index on the EU average from 32 for 2008 to 35.8 for 2018.[19] There is an increase in all countries except Greece. The increase is highest in Malta (7.1 percentage points – p.p.), followed by France and Belgium (5.3 p.p.), Austria (5.1 p.p.) and so on. For Bulgaria, the increase is 4 p.p. reaching 32, which is lower than the EU average.

It is logical for countries with a high standard of living to have high levels of active adult life (Figure 2). In the EU, these countries are as follows Sweden, Denmark, the United Kingdom, the Netherlands, Finland, Ireland, etc. Of course, the ratio does not mean the most direct causal-effect relationship. Moreover, this relationship can work in both directions – a higher level of GDP leads to more active aging opportunities, but this dependence may not watching. For example, at a higher GDP per capita than in the rest of the EU-28, the AAI (in total and by component) should be higher. Estonia is another example because markedly better active aging in it than other CEE countries is achieved at a lower or similar level of GDP (like Slovenia, Slovakia). Bulgaria also presents a higher AAI overall than some CEE countries, which have higher GDP per capita – Slovenia,

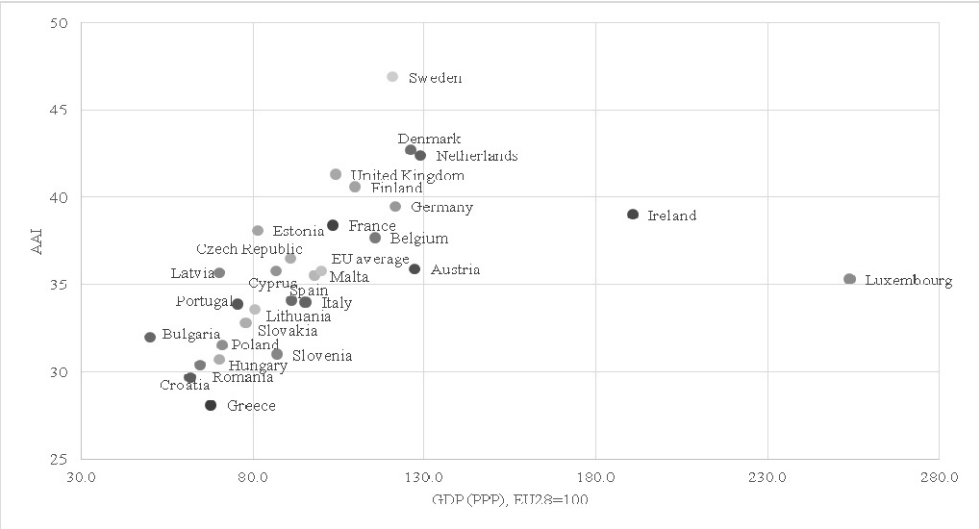
[18] Вж. Active Ageing Index 2014. Analytical Report, 2015. UNECE and EC (DG EMPL), 2015.

[19] UNECE/European Commission (2019) "2018 Active Ageing Index: Analytical Report", Report prepared by Giovanni Laura and Andrea Principi under contract with the United Nations Economic Commission for Europe (Geneva), co-funded by the European Commission's Directorate General for Employment, Social Affairs and Inclusion (Brussels).

Slovakia, Greece, Hungary, Poland, Romania. A weak correlation in such cases could arise in part because the development goals of some government policies are not directly targeted at specific priorities implied by the AAI.

Figure 2

GDP per capita dependency and active aging index – total, EU-28, 2018, %



Note: GDP data for Hungary is for 2017.
Source: Eurostat, UNECE.

Viewed by AAI area, Bulgaria is presented in the following way compared to the EU average: employment – 30.5 vs 31.1, participation in public life – 9.7 vs 17.9, independence of the elderly – 67.6 vs 71.8, capacity and favourable environment – 55.8 vs 57.5. These data show that in striving to approach the EU average, it is most urgent for Bulgaria to work towards better positions for older people in terms of their participation in public life and leading an independent life. This means that the National Strategy must be more fully integrated into contemporary economic and social policies and periodically report on the development of these complex issues.

Population aging and economic growth

The big challenge for countries experiencing intense aging processes is to maintain their competitive advantages over other countries. In particular, the question is what will be the impact of this process on total labour productivity, recorded as GDP per employee.

In practice, there are several main channels through which the aging population affects the economy: reducing labour supply, reducing savings and increasing health and pension costs. The growing share of older people in the general population is creating common

macroeconomic problems in financing intergenerational resource transfer. Population aging is also affecting economic growth through lower consumption of older people and higher rates of savings. They also consume less durable goods, housing, recreational services, etc., but use more medical services, medicines and more. According to life cycle hypotheses, older people are expected to spend the accumulated savings so that the overall savings available to the economy tend to decrease. Thus, demographic change will have an impact on economic growth.

The aging of the population affects not only public finances, but also directly labour productivity. It is obvious that in the future, technological progress will be achieved by fewer and older workers. By assumption, the latter leads to lower per capita income for at least two reasons: first, the increasing share of the older population is changing the producer-consumer ratio and second, the relatively older population is having a negative impact on economic productivity. Assessing the exact magnitude and direction of these impacts over time and how they will interact is a complex and difficult task.

It is generally accepted a priori that population aging is linked to a decline in labour productivity and, consequently, to economic growth. These studies relate to different economies (large or small open), different sectors and activities, reflecting different age structures, household incomes, household behavior, pension policy, etc. They use a variety of econometric methods and models, which incorporate mainly past trends, which inevitably predetermines the expected results. Whatever these trends are, they have useful implications for policymakers in the fields of economic and social policy.

Various published studies show that it is difficult to assess the impact of the aging population, in particular, the workforce, on labour productivity. They do not give definitive answers about the impact of aging populations on labour productivity. Many more empirical examinations and the search for appropriate tools are needed to arrive at clearer and categorical conclusions. This is all the more necessary in today's dynamic development of technological progress, digitalization, robotics, etc. The emerging digital (digital) economy is changing the world of business, changing the nature of working around the world, generating new job opportunities. It will radically change the participation and nature of labor in economic activity in a diversified way – the need for a smaller number of labour force as a consequence of much higher labor productivity, demands for higher specialized education, etc. In some developed countries, this is already being observed, even sooner than expected in Bulgaria.

Given the aging population in Bulgaria, and in particular the changing workforce, a model of the International Labor Organization was applied, which allows different scenarios to be created depending on the experts' assumptions about the future change in the main economic and demographic indicators, in particular the change in the number of labor force given three variants of changing the average life expectancy (slow, medium and fast) in the long run by 2050 (Rangelova, Sariiski, 2013, pp. 124-139). The question was asked whether this process affects overall labor productivity. The main results are as follows: (1) There are differences in the GDP produced per one employed person (albeit very small) in absolute terms, respectively in terms of growth and indices, according to the three options for improving life expectancy. The differences between the results obtained with medium and slow improvements in life expectancy are smaller than those obtained with medium

and rapid improvements. (2) The faster the improvement in life expectancy, the lower the economic performance measured by labor productivity. The differences between the indicators of the three options in absolute terms are small, which makes them even smaller at the annual average rates and indices; The outlined trends from the calculated figures are more important. This means that the negative effect (though unconvincing) of the aging population on labor productivity is confirmed in this case. (3) The results obtained show that the model is stable and relatively insensitive to small changes in the other main input parameters. For two main reasons, namely: the inevitable limitations of any given model construction, as and in this case it is a simple extrapolation of current trends and ongoing economic and social processes and a rather long period of nearly half a century when a wide range of changes can occur in economic, social and demographic life, the results obtained should be interpreted with caution. Possible policy decisions on technological progress and innovation, boosting GDP growth, and policies for active aging or activation of the elderly must be taken into account: increased participation, extending of working age (rethinking retirement due to the slogan: longer life, longer learning and longer work), developing a favorable migration policy from and to the country, a more successful demographic policy (promoting births, longer duration of birth) life) and more.

Among the most commonly used economic measures and policies in developed countries to address the problems of a declining workforce and the expected impact on labor productivity arising from an aging population are the following: raising the retirement age (which relies on the relatively high observed age) and increasing average life expectancy), a favourable policy to promote fertility and immigration, the introduction of lifelong learning, the concept of active aging, and others.

Retirement in the context of an aging population

In the EU countries, the population aged 20-59 is decreasing, reducing the number of workers and increasing the number of pensioners. The same tendency is observed in Bulgaria, while maintaining the low share of the coming generation in the working-age group. For EU countries, the declining working-age population poses a threefold challenge, on the one hand, with lower income to finance pensions, on the other, more pensioners in need of maintenance and a third, labor shortage. Extending working life proves to be the most effective measure to reduce the burden on workers. The logic is: a longer life (understand average life expectancy), a longer period of study, a longer period of employment and a better life for the elderly. The EU fosters the understanding that older workers are a resource, not a problem.

The implementation of successful policies to improve the position of older workers in the labor market is important in various aspects, the most important of which is that if the participation of older workers does not increase, the aging of the population will severely affect the availability of employment and hence the economic growth and sustainability of social protection systems. The EC proposes that the retirement age should be raised in stages, reaching 70 by 2060. The aim is to link retirement to the increasing life expectancy of Europeans, which is expected to average by seven years by the middle of this century

high than today. Bulgaria has successfully joined the step-by-step system of extending the retirement age.

The inevitable increase in the retirement age has specifics in Bulgaria, which are expressed along several basic lines. One of them is the observed activation of the elderly in the labor market in Bulgaria. The share of the elderly, their economic activity and employment is increasing and unemployment is decreasing. The share of employees in the 55-64 age group has almost doubled – from 10.7% in 2004 to 18.1% in 2017. The share of the oldest group is also growing – to 65 and over. For example, employment increased overall over the period considered, with the largest increase for the 55-64 age group – 25.7 p.p. and the lowest for the youth group (15-24 years) – 1.4 p.p., which is less than even the growth of the oldest group (65 years and over) – 1.9 percentage points (Table 8).

Table 8

Employment rates by age in Bulgaria, 2004-2017, %

Age	2004	2007	2008	2009	2011	2014	2016	2017
15-24	21.5	24.5	26.3	24.8	22.1	20.7	19.8	22.9
25-34	67.4	76.2	78.2	75.1	67.8	68.3	69.9	73.6
35-44	76.2	82.8	84.6	82.6	77.4	79.0	79.9	82.7
45-54	69.8	78.4	80.6	79.0	74.7	75.8	78.2	81.4
55-64	32.5	42.6	46.0	46.1	44.6	50.0	54.5	58.2
65 +	3.3	3.0	3.8	3.3	2.8	3.8	4.3	5.2

Source: Calculated according to NSI Labor Market Data.

With the policy of regulated stepwise increase of the retirement age in Bulgaria since 2012 onwards, it is interesting to track the change in the effective retirement age (Table 9).[20] In a short period such as 2009-2017, there is a first decrease and then a gradual increase in the effective retirement age to reach the starting year, both for men and women and for the difference between them. Further analysis is needed to explain this trend, as well as its relationship to the gradual legal increase in retirement age. Compared to EU-28, it appears that the effective retirement age in Bulgaria for men is closer to the Union average than the average position for women. The rank of the difference between men and women shows that it is not big. However, due to the higher average life expectancy of women, but the higher effective retirement age for men compared to women, the policy of gradually raising the retirement age in Bulgaria is being implemented faster at women with a view to its equalization in the future.[21]

[20] An effective retirement age is one that leaves the labour market for any reason, but mainly because of retirement. The EU effective average retirement age is calculated as the average age of leaving the work.

[21] According to National Soscial Security Intitue data, the average age of people who received their first pension in 2013 is 56.2, 56.5 for men and 55.8 for women. This relatively low age is influenced by the significant number of early retired persons in the first and second categories of work and the short periods of insurance. The average amount of pensions for men is BGN 349.27, which is significantly higher than the average size of pensions for women, which is BGN 202.33.

Table 9

Effective retirement age by gender in Bulgaria, 2009-2017, years

	2009	2010	2011	2012	2013	2014	2015	2016	2017	Ranking Bulgaria versus EU-28 average, 2017
Men	64.2	62.9	61.8	61.0	61.7	61.8	62.5	63.1	64.1	9
Women	61.0	60.5	60.1	59.5	60.2	60.7	61.0	60.7	61.1	17
Gap men/women	3.2	2.4	1.7	1.6	1.5	1.1	1.5	2.4	3.0	4

Source: Eurostat

The trends described in the elderly are in line with those in developed countries and should be looked at in perspective. The arguments of possibly diminishing employment opportunities for young people due to adult involvement are unfounded, and the international practice has proved this. Moreover, the influx of new workers is diminishing. There are approaches to the specific nature of the individual's pursuit of activity that do not violate the interests of both groups, such as forms of flexible employment, offering better jobs for both adults and young people who are educated at the same time. Another factor affecting a longer period of paid or self-employed work is the labour market – either with lower demand for older people's labour, even more in times of economic recession, or vice versa – labour shortage and demand for labour in a time of recovery and boom.

One of the main arguments of the opponents against increasing the retirement age is the fact that the average life expectancy of the population in Bulgaria and especially of men is among the lowest in the EU. So increasing the retirement age will shorten the period people can live as retirees. Another well-founded argument is the deteriorated health status of the population over the last two decades, which counteracts the increase in years of older people's employment.

The nature of the policy pursued must be tailored to the individual capacities of each adult according to their health status, educational level and the specificity of the profession (in the great diversity of: builders, teachers, doctors, philologists, nurses, etc.), desire and choice, etc. Raising the retirement age should also be differentiated by clear rules that are known much earlier than when they take effect.

Healthy employment potential for people of later age

Health is a very limiting factor in increasing the longevity and employment of older workers. The link between health status and the supply of work to people of later age is the subject of research by specialists and of particular interest by those pursuing socio-economic policies in developed countries, for which the phenomenon of population aging is typical. The aim is to determine how health affects workability and thus what can be expected in terms of employment. If health is a hindrance and politicians are interested in raising employment rates, it may be necessary to devote more resources, care and time to understanding and reducing this limitation.

A large-scale research project called International Social Security (ISS), involving teams of analysts and experts from twelve economically advanced countries in the world for about twenty years, is of interest in this topic.[22] The project aims to outline a summary assessment of the health potential of the elderly (for those aged 55 or over, or mainly between 55 and 69), but not to suggest how long each individual can work in higher age groups, or how directly to reform the retirement system in different countries.

To illustrate the results, it will be noted that for one of the three applied calculation and analysis methods with an average of 5.5 years for the potential for additional work for men aged 55 to 69 in all 12 countries considered, these years range from 3.2 (at smallest) for Sweden to 8.4 (at most) for the United Kingdom. The general conclusion for countries is that higher educated people are more likely to be included in employment at the age of 55-74 than less educated people. Conversely, work potential is lower among the less-educated groups, reflecting the fact that, on average, they are in poorer health than those with higher education. Another conclusion is that higher education helps to create more complementary potential in both sexes, with differences between countries, for example in Spain this is more pronounced in men than in women.

Unfortunately, there are no long enough time series (4-5 decades) of adequate indicators for Bulgaria – employment and mortality to make a similar empirical study. However, for those years in which data is available, the data show an unfavorable trend. While for developed countries the increase in employment, although more smoothly correlates with a decrease in mortality, *in Bulgaria there is an inverse dependence – increasing employment and increasing mortality*.

With such a large-scale study on a solid methodological basis as described, it is tempting to try to apply the methods used based on Bulgaria data, or to adapt to its conditions. A very restrictive condition is the requirement for data over several decades (at least since the 1960s) for age mortality rates, probabilities of dying and employment, which has been in collection even before 1989. The other reason is the economic development of the country during this period – from full employment and lack of information on unemployment to the fall of the central planning system, strong changes in employment and unemployment in the creation of the labor market during the transition to a market economy. In recent years, there has been a general *increase in the employment rate* and a decrease in unemployment, but this must be considered in combination with demographic changes and the absolute decrease in the population in the country, including the workforce, which arithmetically increases these indicators. However, there is certainly an activation of older people in the labour market (Table 10).

[22] The project is "Social Security Programs and Retirement Around the World", International Social Security – ISS – Grant P01 AG012810. It is organized within the National Bureau of Economic Research, supported by the US National Institute on Aging. See: Coile, Milligan, Wise, 2016. Project supported by the National Institute on Aging.

Table 10

Mortality rates, probability of dying and employment rates for selected age groups in Bulgaria, 2011-2018

Mortality rates, ‰								
	2010	2011	2012	2013	2014	2015	2017	2018
Total	14.6	14.7	15.0	14.4	15.1	15.3	15.5	15.4
Men	15.8	15.8	15.9	15.5	16.1	16.3	16.5	16.5
Women	13.5	13.7	14.0	13.3	14.1	14.4	14.6	14.4
Probability of dying – total men and women								
	2011-2013	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018		
50-54	0.035677	0.035764	0.035836	0.036163	0.035506	0.035337		
55-59	0.05394	0.053679	0.054117	0.054978	0.054832	0.055204		
60-64	0.077404	0.077387	0.078011	0.07995	0.079665	0.07969		
65-69	0.109392	0.107778	0.110274	0.110529	0.110887	0.110852		
70-74	0.162395	0.156705	0.158085	0.158369	0.158559	0.157288		
Employment rates of people aged 45 and over								
	2011	2012	2013	2014	2015	2016	2017	2018
45-54	74.7	74.2	75	75.8	77.7	78.2	81.4	82.7
55-64	44.6	45.7	47.4	50	53	54.5	58.2	60.7
65 +	2.8	2.8	3.3	3.8	4	4.3	5.2	5.7

Source: NSI

Concerning *mortality rates*, their high and increasing levels were commented. It reaches 15.4‰ overall for the country in 2018, at a higher rate for men than women and much more pronounced in rural areas than in cities – 22.2‰ against 13.2‰. In terms of the *probability of dying*, the high age groups that are relevant to the problem studied here are of interest. In the current decade (specifically 2011-2018), the probabilities of dying by age group show an increase in time in three of them and in two – a decrease, which are the first age group (50-54 years) and the last (70-74). These values are relevant to the calculation of the increasing average life expectancy over time, which raises questions about the matching of trends between it and the mortality rates. The odds of dying in the age groups in question are higher in men than in women.

In addition to the overall mortality rates, an important indicator is the premature mortality caused by noncommunicable diseases among people of active economic age. According to the current demographic statistics of the NSI, they are alarmingly high in Bulgaria, noting the opposite trend over time. While in 1990 the total mortality rate was 12.5‰ and the premature death rate was almost 30% (29.7%), the former steadily increased and in 2011 it was 14.7‰, while the second decreased to 23.3%, but still remained high. For this reason, Bulgaria is among the countries that lose people the most potential years of productive life associated with non-communicable diseases.

According to a joint study by the OECD and the EC, with 410 premature deaths per 100,000 people, more than twice the EU average, Bulgaria holds another black record (Health at a Glance: Europe 2016). This means that there are about 17,500 deaths per year for Bulgarian citizens between the ages of 25 and 64. According to estimates in this study, this significant loss of the increasingly scarce workforce in the Bulgarian economy equals

the annual loss of more than 2500 potentially productive man-years for every 100,000 Bulgarians. In addition to the fact that the money for health care in Bulgaria is extremely insufficient, it is also spent very inefficiently.[23] The Bulgarians live in good health 6 to 9 years less than citizens of many other countries. At the same time, Bulgarians are big optimists – two-thirds of them say they are okay. To cope with premature mortality, the OECD and the EC propose to implement in the country an adequate policy for information and clinical prevention of the most significant fatal diseases. After his retirement, the Bulgarian remains in good health for about 8-9 years, and then has a sharp breakdown. This probably means that there is no good care for the health of the elderly when they are in need.

Health and labour market policies are formulated independently of one another, but the data show the need for greater cross-sectoral cooperation. Both the labor market situation and health outcomes would benefit many from a combined policy. For Bulgaria, this also means that an emphasis ***should be placed on improving the health status in order to increase people's working lives while seeking to further increase their retirement age***.

However, raising the retirement age should not be seen on its own to solve budgetary and labor market problems, but to focus on raising the health status of workers, linking pay and pensions to life expectancy etc., which means with many indicators, not only budgetary parameters and increasing but still relatively low life expectancy. Generally, a favourable environment for raising the retirement age should be created.

Link between demography and migration

Politicians and demographers concern for more than two decades about an aging population in Europe. The demographic vacuum (depopulation) is thought to be filled in two ways – either by achieving super-fertility, which cannot be expected either in Europe or in Bulgaria, or by allowing over-immigration. International migration is at the forefront of the European political agenda. European labor markets need immigrants. Some politicians have suggested increasing immigration to the EU from third countries to compensate for the aging of the population, or so-called replacement migration. This has happened in history. Population aging has already created labor shortages, but immigration also raises concerns about distribution conflicts.

Much more has been elaborated in the scientific literature about the economic and demographic effects of immigration, that is, on the *host countries* compared with *sending countries* (also called countries of origin). In the recent and distant past, some European

[23] In a quoted study (Health at a Glance: Europe 2016), this fact was commented as follows: "Poor organization, poor social and regional coverage and high cost of medicines, medical devices, clinical trials and procedures – even for insured patients – put healthcare in place, with poverty, aging and the escape of young people, among the main reasons for the continued rise in the already high mortality rates in the country. "According to OECD and EC data, Bulgaria is firmly ranked last in Europe by the share of Watts allocated to preventive clinical studies and long-term care for the elderly and seriously ill patients.

countries had experienced periods of high and prolonged emigration without being offset by immigration, such as Ireland, Italy, Greece, Spain, Portugal, Malta and others.

United Nations (2008) studies on migration show that in order for international migration to overcome the problem of an aging population in Europe, net migration levels must be much higher than in the recent past. But even such high levels of immigration would not be able to stop the aging population. International migration could not have a significant impact on the age structure of most developed countries, mainly because of the accelerated aging process.[24] It reflects both previous changes in fertility and mortality rates and the cumulative effect of migration over the years. Demographers estimate that a very high (and probably insolvent) level of immigration will be required, and it is not known whether national societies in Europe will support international migration as a potential solution to the aging population.

Demographic measures in both dimensions – natural and mechanical movement – are closely linked, first and foremost, to economic aspects. Since 1990, there has been a sharp and consistent decrease in the population and mass emigration of Bulgarians to developed countries, which continue to this day. However, the low birth rate with high mortality has had a greater impact on reducing the population than the intensive migration processes in the country. It should also be borne in mind that the emigration of young people and women of fertile age contributes significantly to reduced fertility.

A significant reserve for improving the demographic status is to create favorable conditions for emigrants to return to their homeland (with the popular expression, "I'll come back when they set up the country"). This factor seems to be neglected against the backdrop of efforts by employers in the country over the past 1-2 years to attract immigrant workers from other countries. A nationally responsible demographic policy would show that *attracting migrant workers has a complementary but not a substitute function, and is a viable solution only after the other prerequisites for normalizing the labour market are available.*

These and other issues related to the development of migration processes from and to Bulgaria are discussed in detail in the second article on the cited project.[25]

Conclusion

1. The current demographic profile of countries is at the heart of future population aging, reflecting previous changes in fertility and mortality rates, as well as the cumulative effect of migration. The high rate of aging and depopulation of the population is created by past demographic trends. The future trends in these three components of population change determine what its structure will look like in perspective. This means that in Bulgaria and in most countries experiencing similar demographic processes, the

[24] According to NSI data from the 2011 Census, the population in the country decreased by 581 750 compared to the 2001 census, with more than two thirds of this decrease (68.9%) being caused by the negative natural increase and less than one-third (31.1%) – due to external migration.
[25] Bobeva, Zlatinov, Marinov, 2020.

population will continue to age even if fertility, mortality and migration rates remain at their current levels.

2. Bulgaria has been affected itself in a particularly unfavorable way in comparison with most of the EU-28 countries. This is very important, especially for our country, an interdisciplinary scientific problem in which economic issues and solutions must find an increasingly adequate place. Bulgaria's demographic development is unfavorable to the country's economic development and it faces many challenges. The reduction of the significant income gap with other EU countries is more difficult because Bulgaria is experiencing less favourable demographic changes in depopulation and population aging. Lack of manpower is a constraint on growth. Human capital is difficult and slow to form. Given the very high mortality rate in Bulgaria, it is imperative that we have a responsible attitude towards the health status of the Bulgarian population and the problems in healthcare.

In intra-regional terms, Bulgaria has a strong demographic, economic and social imbalance between the capital and the rest of the country, between North and South Bulgaria, which continues to deepen.

3. By itself, Bulgaria's EU membership does not have a serious impact on reducing the long-term negative trends in the development of human resources. This issue is fundamental to the development of the whole economy, but it is not sufficiently solved both on the level of EU and national policy with the specificities of a catching up economy, that is, the economy is vulnerable in terms of stability and competitiveness. European and national policies through the European Structural and Cohesion Funds cannot be claimed to have had a beneficial effect. The specific analyzes on them show some successes, but also the disadvantages and deficits, which is why their insufficiently effective influence is outlined.

4. The biggest threat to Bulgaria among other challenges is the demographic situation as the processes are inert and the policies implemented have a delayed effect. Even if trends start to turn in a positive direction, which is extremely optimistic and unrealistic, they will not be felt soon, but at least after 1-2 decades. The demographic processes in Bulgaria show the lack of an effective policy towards them. Their nature is such that little can be done with effect in the short and medium-term. The recommended policy, however, is to take urgent measures to maximize what the country has at its disposal, and to take real action in parallel to address long-term problems. The policy stated by the governing bodies should be implemented in practice. Those measures that stimulate long-term and sustainable growth of public expenditures are those in health care (increasing life expectancy and good health), education (improving human capital – knowledge, skills) and in general raising labour productivity and improving economic infrastructure.

5. Due to the global nature of the problem of ongoing demographic processes and related economic aspects, population policy is gaining international importance. Demographic processes are a global problem and solutions must outweigh the interests of individual countries. Therefore, the public must make mutual efforts to achieve results in this field,

both in terms of its natural and mechanical movement. Population development has general patterns, the factors of which must be purposefully and jointly managed.

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ИКОНОМИЧЕСКИ ИЗСЛЕДВАНИЯ
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ECONOMIC ASPECTS OF MIGRATION PROCESSES IN BULGARIA[4]

The paper studies the development of migration processes to and from Bulgaria and their impact on the country's economic development. More specifically, it addresses the characteristics and trends of emigration from Bulgaria and those of immigration to the country. Its aim is to explore the complex internal structure and trends in individual migration flows in a very interesting historical period in which two strong external factors influence Bulgaria, the EU and the whole world in general – the global financial and economic crisis and the refugee crisis. In this environment, the processes are developing dynamically, changing the balances in the various migrant groups and increasing the unpredictability of migration. The paper firstly presents the European labour market and the free movement of people as external environment of migratory movements. It studies all structural features of outgoing migration, then the characteristics of incoming migration to the country. Lastly, it assesses the demographic and economic effects of immigration. Instead of a conclusion, the paper draws some recommendations on some effective policies to deal with the negative effects of emigration.
JEL: F22; J61; O15

Introduction

Recent decades have seen dynamic demographic processes in the EU and in particular in Bulgaria. They are related to the natural movement of population on the one hand – a reduction in the number of the country's inhabitants (depopulation) and the so-called "aging", and on the other – the mechanical movement of the population – migration. Significant demographic changes are observed in Bulgaria since 1990 (for a detailed analysis of the demographic changes and their impact on the country's economy in the

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[4] The paper summarises the main results of the second part of the project „Economic Aspects of Demographic and Migration Processes in the EU and Bulgaria", developed within the Research Programme of the Economic Research Institute at BAS. The project was accepted as successfully realised in January 2019.

period under review, see Rangelova and Bilyanski, 2020). Today Bulgaria is among the six countries in the world with the most dynamic processes of aging, as well as among the countries of Central and Eastern Europe (CEE) with the highest number of people emigrated – about 1.5 Million, predominantly in active labour and childbearing age. As a result of both processes the population has decreased from 9 Million in 1988 to less than 7 Million in 2018.

Migratory changes are unique in the economic history of the EU and reflect the combined impact on the economy of the region. In the last years, we have seen a new phenomenon – mass migration of people from third countries, mainly from the Middle East and Africa to EU countries. These processes are separately investigated by international organizations, research institutes, universities and individual scientists. However less attention is paid to the comprehensive study of their economic aspects, which is the main rationale behind this paper. These developments pose the necessity to investigate the complex impact of these trends on the economic development of Bulgaria. Based on studying the structure and dynamics of migration flows (in the crisis of 2008, which was virtually a stress test in real-time for migration) the paper identifies various migrant groups, the effects of migration processes, and finally – the effectiveness of migration policies.

The main objective of the paper is to analyses migration changes in Bulgaria from an economic standpoint and their impact on the economic development of the country. The aim is to explore the complex internal structure and trends in individual migration flows in a very interesting historical period in which two strong external factors influence Bulgaria, the EU and the whole world in general – the global financial and economic crisis and the refugee crisis. In this environment, the processes are developing dynamically, changing the balances in the various migrant groups and increasing the unpredictability of migration. Traditional methods for predicting migration prove to be ineffective under the strong influence of external factors, thus institutions are unprepared and consequently face policy challenges that create crises. The main thesis is that migration changes (mechanical movement of the population) are an important determinant of the movement of factors of production within the processes of globalization and integration.

The first section presents the macroeconomic dimensions of migration processes and explores the European labour market and the free movement of people as an external environment of migratory movements. The second section studies outgoing migration, analyzing all structural features of migration flows and using statistics of host countries to assess the emigrant flow from Bulgaria, thus estimating the range and scope of Bulgarian migration. A survey of Bulgarian students who went to Brigade abroad complements research on the motives and attitudes for emigration among young people. The third section analyses incoming migration flows. More specifically, it addresses the characteristics of immigration to Bulgaria, considering all immigration flows to the country on key demographic indicators such as employment status, duration of residence and reasons for immigration. It also discusses the labour market and employment of immigrants in Bulgaria, as well as foreign students in Bulgaria and the reasons and trends in returning migration. It also assesses the issues related to migrants from the EU and from third countries. It includes research on Bulgarian citizenship and migration, asylum seekers and refugees to find answers to questions about the effects of the refugee crisis. The last section

summarises the demographic and economic effects of migration, the consequences of the so-called negative migration (migration with negative net balance) and in particular the loss of population, migrant transfers, migration of retirees and pension transfers, which shows how in the changed environment migration balances of various migrant groups increase the unpredictability of migration. Finally, as concluding remarks the paper makes some recommendations on some effective policies to deal with the negative effects of emigration.

The paper discusses mainly the changes in the last 12 years (2007 to 2018), focusing on the last 2-3 years, to analyze current events and to draw adequate to the current reality conclusions and recommendations. The paper deliberately avoids issues that are more distant from the purpose of the study, or shift the focus out of identified issues, such as the children of immigrants from Bulgaria and their prospects for participation in Bulgarian economy, the economic rationale and effects of mechanical movement of people within the country and the regional aspects of migration (for a detailed analysis, see Rangelova and Bilyanski, 2018a; Bilyanski, 2018), as well as many others.

1. The single labour market and the free movement of people

1.1. Macroeconomic dimensions

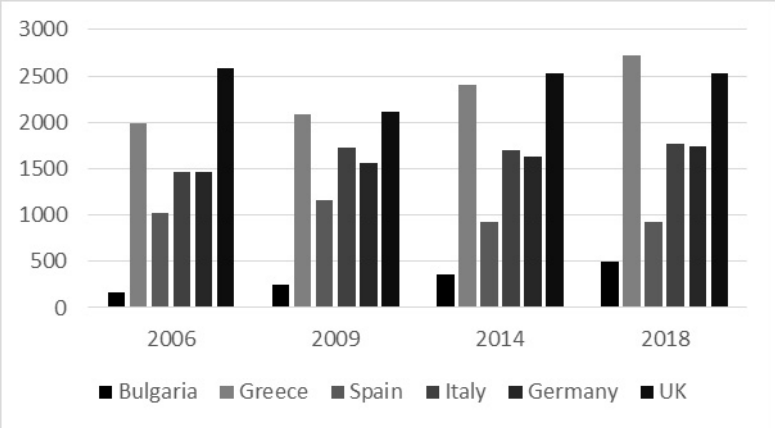
A theoretical review shows that economic migration is fundamentally related to the real economy situation (economic growth, income and unemployment) in both home and host countries, while socially, the quality of life, political stability and social infrastructure are leading (Stark&Bloom, 1985; Massey, 1988; Borjas, 1989; Taylor, 1999; World Bank, 2007; Bansak, Simpson, Zavodny, 2015; Simpson, 2017). At the same time, the importance of certain economic or social factors for emigration largely depends on the groups of people under consideration. The economic logic indicates that economic reasons will be much more important for underprivileged and poorly educated migrants, while for the more educated groups opportunities for personal and career development and social environment are of greater importance. Moreover, in today's globalised world economic development cannot be seen in isolation from regional and world processes whereby internal and external economic factors of migration interweave. This is particularly true for new EU Member States, most of which have moved from a command to a market economy. In these countries, the process of EU integration has been accompanied by mass labour emigration with much more positive economic effects for host countries than for sending ones, taking into account the importance of remittances for some of them.

Bulgarian economy showed signals of overheating in the period of EU accession and liberalization of EU labour market. The economic growth in 2000-2008 and price convergence with the EU Member States have caused high inflation, which amounted to 11.95% in 2008. The unemployment rate declined to historically low levels of 5.7%, current account deficit of -22% of GDP and inflow of foreign direct investment of 28% of GDP in 2007. The accession period of Bulgaria to the EU also coincides with high demand for labour in developed EU countries that motivates high emigration from new EU Member States, for which the restrictions of the EU labour market have gradually being lifted. Following these processes, Bulgarian emigration to the labour markets of the EU countries

and most notably Spain, Italy and the UK is the most massive. Despite the initially imposed restrictions on access to the labour market in the EU and the favourable economic development in Bulgaria before the global financial and economic crisis of 2008, the employment opportunities outside the Balkan country were a much stronger attraction for emigration under EU membership, which is mainly due to the low levels of income. According to Eurostat, the average wage in Bulgaria in 2006 was 6 times lower than Greece, 9 times lower than Italy and Spain, 12 times lower compared to Germany and 15 times lower when the UK is concerned. Such data warrants claiming that income disparities among the countries under consideration are a major factor driving Bulgarian emigration in the initial period of EU membership.

Figure 1

Monthly compensation of employees (euro, current prices)



Source: Eurostat.

In 2014-2018, a more significant decrease of Bulgarian emigrants was observed only in Spain, while in Italy Bulgarian immigration even increased with 3,5 thousand people between 2014 and 2018. A fundamental factor for this process remains still low purchasing power of incomes in Bulgaria. The rate of offsetting differences with developed countries is still not enough to reverse the migration trends even to the countries seriously affected by the crisis. The average real wage in Bulgaria in 2018 was 53% of that in Greece (16% in 2006) and 28% in Spain and Italy while in 2006 Bulgarian real wage was near 10 times lower as compared with both countries according to Eurostat. The differences in purchasing power of incomes in Germany and the UK are even more dramatic, which is sufficiently indicative of the ever-increasing Bulgarian emigration to these countries – the real labour remuneration in Bulgaria in 2018 accounts for 18% of that in Germany and 20% in the UK (respectively, 8% and 6% in 2006). Meanwhile, the relative increase in purchasing power in Bulgaria is associated with ever more increasing income inequality - the income disparity between the richest and poorest 20% of the Bulgarian population in 2017 reached 8.2 while the EU-28 average was 5.2 based on Eurostat data. This fact demonstrates the deepening of

social inequality in Bulgaria, which is also the reason Bulgarian emigration to increase, especially among the low-income groups.

Over the last 12 years, Bulgarian emigration was mainly driven by the persisting substantial income differences with developed EU countries despite macroeconomic stability in crisis times and current ascending economic development (5.3% unemployment rate in 2018 was the lowest level since the beginning of the 1990 economic transition). The cyclical fluctuations in European economy change the destinations for Bulgarian emigration by increasing migration inflows to Germany and the UK at the expense of Spain and Greece while maintaining the attractiveness of Italy as a migratory destination, which is due to the narrowing of the difference in average income in Bulgaria and Greece and Spain. The tendency to equalise purchasing power between Bulgaria and Greece and still ambiguous EU-UK relations may orient migration flows to the euro area core countries where the disparities in economic development with Bulgaria and the socio-political environment remain a significant reason for emigration.

1.2. European policy on migration and asylum

The EU migration policy goes through different stages since its creation: from the Schengen Agreement to the Dublin Convention, the Lisbon Treaty, signed in 2007 and entered into force in 2009, the European Pact on Immigration and Asylum (24.09.2008), the post-2015 European migration policy. Currently, it is obvious that there are difficulties in solving the migration issue because of its high political sensitivity (Jafarli, 2017). The tradition and practice in the EU is the gradual resolution of political issues through long-term technocratic discussions and the achievement of mutually acceptable compromise and agreement. In this case, however, this strategy can hardly be implemented. The national context complicates the real European debate and the finding of a pan-European solution.

EU countries are in a different situation with regard to the migration crisis and have different interests. Public attitudes in Western and Northern Europe are more liberal, where large immigrant communities already exist compared to the more negative attitudes in CEE countries that are unprepared to accept large flows of refugees. Western European countries are preferred by third-country immigrants over CEE, and Western countries are more likely to attract highly skilled people. Taking into account the ongoing globalization processes, CEE countries tend to seek a national solution to demographic issues and retain their national identity (Rangelova and Bilyanski, 2018b). Public opinion should be carefully and thoroughly studied before policies on immigration are developed and implemented.

In a number of countries, the general public is very worried about the risks associated with the large migratory flows, the magnitude of the costs to be incurred in adopting them, and the difficulties of integrating them into European society, as well as about the projected migratory flows through the following years (European Parliament, 2018).

Despite the claims by some economists and politicians that large numbers of immigrants will contribute to economic growth in European countries with serious demographic problems, one must not undermine the risks to the social and educational systems of the countries that have accepted many refugees, the difficulties of integrating them, the rise of

xenophobic and nationalist moods in society. These differing public attitudes strengthen the EU's inability to reach an agreement and provide a common response to the migration crisis.

Despite the many concerns and consideration of immigration as a danger and in a negative light, it should be noted that from an economic point of view, immigration flows to the EU can also be seen as a potential for Europe. To some extent, immigration can help address the challenges posed by population aging but, above all, it will play a role in tackling future labour shortages and skills in specific sectors, and will increase the EU's growth and prosperity potential, completing existing structural reforms.

The Common migration policy is a great test for the future of the European project (Krasteva, 2016). If the Member States, due to differences in interests and public attitudes, are unable to reach an effective common response, we cannot expect a more stable, stronger European Union. A variety of interests can lead to stagnation in European integration and even to a step back from its current level.

1.3. Liberalization of movement of Bulgarian citizens in the EU: legal and institutional framework

The free movement of people, including a workforce is a fundamental principle in the single market. This principle is fixed in Article 45 of the Treaty on the Functioning of the EU and is developed by secondary EU legislation. The liberalization of the movement of labour within the single market has created conditions for the formation of a genuine European labour market, in which the more developed countries and their labour markets, offering better working conditions, managed to attract competitive workforce with high qualifications. Synchronization of economic cycle in the EU shapes the dynamics of migration and particularly labour migration.

EU developed some networks that promote the free movement of persons within the Single Market as the European Job Mobility Portal – EURES. They operate on the grounds of cooperation between state employment agencies in the EU. The mobility of Bulgarian workers is promoted and operated by the National Employment Agency (NEA), which carries out a number of administrative activities such as daily exchange of information about ongoing labour market vacancies between the national database of EA and the European EURES portal. Within the European employment network the national agencies carry out administrative activities promoting and supporting labour mobility abroad by providing services in information, consultation and mediation of job seekers and employers from Bulgaria and other EU / EEA countries.

Before Bulgaria entered the EU several countries opted for a transitionary period before the free movement of Bulgarian workers is allowed. Those restrictions proved not efficient. The data below suggests that largest migration flows from Bulgaria happened during the transitionary periods. Since liberalization of access to the EU labour markets, migration flows from Bulgaria strongly depend on the economic conditions in the receiving countries. The increase of labour demand in the EU in the last years after the crisis is also reflected in the data for registered jobs in the EURES. Data shows a significant increase of both

consulted applicants and those who started job. The sectors where most job offers come are mainly low-skilled seasonal activities mostly in agriculture. For example, in Portugal and Spain collection of fruits is the most active sector in job offerings. Industrial sectors are not active in the EURES.

International labour mobility of Bulgarian citizens is encouraged by another network – "Workshop for Seeking a Job". Such an initiative is the German program "The job of my life", in which young Bulgarian citizens participate since 2015.

According to Regulation (EU) 2016/589 the EU member states should treat national labour market policies in the context of the EU employment policy. Synchronization of the economic cycles of EU economies means that the dynamics of labour demand also converge. In the upward economic trends, the demand for labour in all countries would increase and the competition for labour between the member states will strengthen. Less developed countries offer less favourable employment conditions and loose labour. In such periods domestic labour shortages widen in less developed EU countries.

The consequence of the free movement of labour policy and related tools is the formation of a single European labour market in which workers move from one to the other national markets according to the labour market supply and demand, and the difference in wages. The single labour market works since labour moves across borders in the EU and adjusts to the economic cycle. The outflow of labour increases deficits in less developed EU countries and boosts the labour costs in those countries. From the perspective of convergence, the migration, facilitated by the free movement people and encouraged by EU policies, should have a positive impact on European integration. The short-term economic consequences though are rather negative for emigration countries. The increase of labour costs impacts competitiveness and creates further imbalances for the economy.

Bulgaria is losing labour due to migration for a long period of time. Although in the short term, this type of migration can contribute to the reduction of tensions and unemployment in the national labour market in the long term emigration is associated with loss of workforce, economic and population growth. The persistent loss of workforce in catching-up economies of the EU reinforces inequality and divergence between them. Widening imbalances in the caching up EU economies should be addressed by the EU policies. The policy should target a reduction of disparities and overcoming distortions in the single European labour market (IMF, 2018).

2. Emigration from Bulgaria

Recent financial and economic crisis impacted emigration and immigration flows in Bulgaria. The slow post-crisis recovery of South European economies decreased the attractiveness of those countries for Bulgarian migration. As a result, there was a slight redirection of migration to the countries that were less impacted by the crisis and also the return migration increased. The return migration is linked with the degree of integration of Bulgarian emigrants in host countries.

2.1. Methodology and sources of information

Migration is a movement and it is hard to be captured. That is why several sources of information need to be used as well as a complex research methodology should be applied in order to apprehend the true migration. Last decade migration from and to Bulgaria became more complex and diversified. That is why in addition to general quantitative data we examine the complicated internal structure and trends in all specific migration flows. Within overall emigration flow, there are rather different flows that are driven by specific factors and their dynamics also diverge from the general trend. Although Bulgaria remains an emigration country, when studying particular inflows and outflows important exceptions may be noticed. For example, growing immigration of people over age of 50 leads to a positive migration balance, while the overall migration balance is negative.

In studying migration, two approaches may be applied – static and dynamic. The static approach aims at revealing the results of intensive migration processes, i.e. what proportion of the population has moved and is part of the host country population. In this case, the data is collected from the population statistics of both sending and receiving countries. Following this approach, the number who left the sending country and the number of those who reside in the receiving country could be captured. While population statistics of the sending country gives an idea of the decrease in population, the statistics of the host population contains data about how many foreign nationals accounted for in the host population. Harmonised data on this indicator is provided by Eurostat[5] and national population statistics.

Migration statistics are an important source of information that helps in capturing the movement of people. Dynamic approach based on flows and stocks statistics aims at tracing migration roots, the scope of migration as well as the composition of migration flows. In applying this approach both emigration statistics of sending countries and immigration statistics of receiving countries could be used. Migration statistics quality depends on the methodology and source of data. When the source is the declarations provided by the departing migrants the quality of emigration data might not be appropriate since respondents may not give the true length and reasons for the stay.

In order to overcome the weakness of migration statistics both emigration and immigration statistics of sending and receiving countries should be considered.

Since the objective of this analysis is to research the migratory trends and their effect on the population and economy, the analysis follows both approaches – dynamic and static.

2.2. General trends

Since the beginning of Bulgaria's membership in the EU, emigration to the Member States significantly increased and as a result, the Bulgarian population in these countries increased. In 2018, the number of Bulgarians in the population of the main destinations of

[5] Data for some countries is not presented in the Eurostat data. That is why the data is complemented by the population statistics of the country for which the data is missing.

Bulgarian emigration – the EU, the European Economic Area, Canada and Australia is about 858 thousand. Only 17% of Bulgarians in the population abroad are outside the EU. The total Bulgarian population abroad is about 12% of the total population in the country. Migration to major destinations outside the EU decreased steadily, while migration to the EU continues to grow, albeit at a slower pace than in the previous decade. The data show a concentration of Bulgarian emigration, the first four countries – Germany, Spain, Turkey and the UK account for over 50% of the Bulgarian population abroad (Table 1).

Table 1

Bulgarian citizens in the population of EM, EEA, USA, Canada, Australia (number)

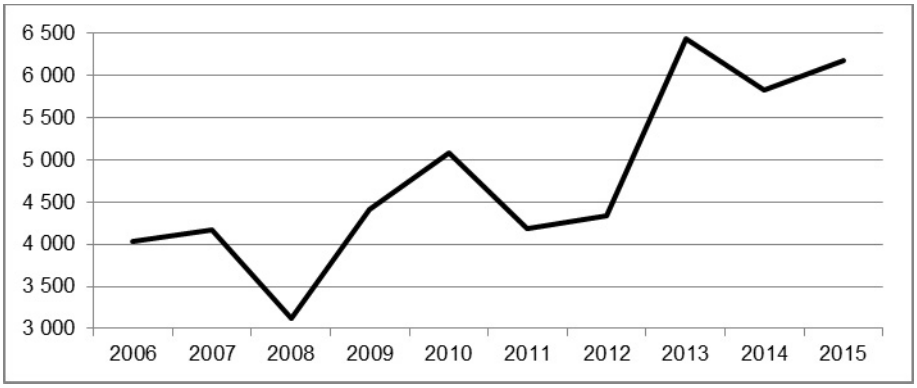
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Belgium		6 753	10 410	13 171	17 768	20 416	23 443	25 635	28 571	31 251
Czech Republic	4 285	5 046	5 926	6 402	6 926	7 434	8 221	9 144	10 074	11 004
Denmark	583	823	1 533	2 321	3 189	4 007	5 006	6 090	7 228	8 207
Germany	41 947	50 282	57 555	66 238		97 479	124 152	147 192	185 248	228 734
Estonia							71	90	264	278
Ireland	1 424	1 798	1 862	1 833	1 803	1 778	1 751	1 738	1 760	1 805
Greece			20 000	28 250						78 696
Spain	120 107	146 696	152 493	150 770	149 255	151 473	147 309	139 931	134 427	130 501
France										21 080
Croatia										200
Italy	19 924	33 477	32 283	35 818	39 161	42 000	47 872	54 932	56 576	58 001
Cyprus	3 239				18 536					20 000
Latvia	32					77	138	183	153	133
Lithuania								58	64	87
Luxembourg	265	446								1 224
Hungary	1 123	1 128	1 133	1 211	1 259	539	608	638	673	716
Malta										
The Netherlands	2 202	6 378	10 190	12 340	14 110	16 760	17 615	17 846	19 843	21 941
Austria	6 419	7 561	8 745			12 367	14 199		19 146	22 357
Poland	1 023	1 039								1 590
Portugal	3 575	5 076	6 456	7 202	8 174	8 606	7 439	7 553	7 037	6 722
Romania						210	1 072	1 137	1 561	2 223
Slovenia	118	780	599	770	1 084	1 501	1 789	2 079	2 453	2 615
Slovakia	547	985	1 767	1 871	1 987	1 842	2 002	1 595	1 645	1 794
Finland	357	477	618	721	835	1 036	1 279	1 509	1 727	1 904
Sweden	828	1 838	2 655	3 252	3 707	4 062	4 549	4 967	5 522	5 978
United Kingdom	15 000	29 000	35 000	46 000	44 000	56 000	48 000	59 000	66 000	69000
Iceland		97		79	71	71	86	112	163	214
Liechtenstein			3	2	3	3	5	4	6	8
Norway	596	717	1 088	1 440	1 986	2 584	3 468	4 576	5 479	6 328
Switzerland	2 259	2 295	2 377	2 648	2 997	3 654	4 429	5 167	5 826	6 443
Turkey	17 000	17 353	18 316	16000	11 777	12 970	12 157	14 147	9 153	10 049
USA	48000	50000	53516	62684	65202	64964	67941	63318	67377	70800
Canada	27260				30485					32460
Australia										3284

Source: Eurostat, national statistics of UK, Cyprus, USA, Greece, Canada, Australia.

A small part of Bulgarian citizens who migrated to EU countries had chosen to adopt the citizenship of the receiving country (Figure 1). This is a sign that there is a potential for a return migration eventually depending on the development of push/pull migration factors. The opportunity to return migration further motivates policies that encourage the ties with the home country and maintaining Bulgarian identity. Of course, this is related to the fact that the Bulgarian migration is relatively young – in significant part, it is just one generation. The question of the migratory behavior of the next generation – the children of migrants – will outline the prospects for the use of emigrant potential for development of the country in the future.

Figure 2

Bulgarian citizens who acquired foreign citizenship



Source: Eurostat.

The data show a shift in Bulgarian emigrant flow (but considerably smaller than the flow before the crisis in Southern European countries) to Northern European countries, which is related to the fact that the crisis affected more significant Southern European countries. These shows to a certain extend pro-cyclicality of migration flows from Bulgaria.

Migrant outflow from the country is not homogeneous. There are three groups of emigrants depending on their origin. It includes Bulgarian citizens, migrants EU citizens who have resided in the country and migrants who are nationals of third countries. The dynamics of the migratory behavior of these three categories vary due to the specific factors that motivate their movement. The main contribution to the growing emigration from Bulgarian is the domestic population with about 84.4 percent of outbound migration flow. There is a new emigration phenomenon – an increase in the number of foreigners who emigrate from Bulgaria. Third-country nationals form a significant part – 14.6 percent of the emigration flow from Bulgaria in 2018. If we add to this figure the growing number of nationals of foreign origin who received Bulgarian citizenship in order to migrate further we will come to the conclusion that the emigration to a large extend is driven by citizens with foreign origin.

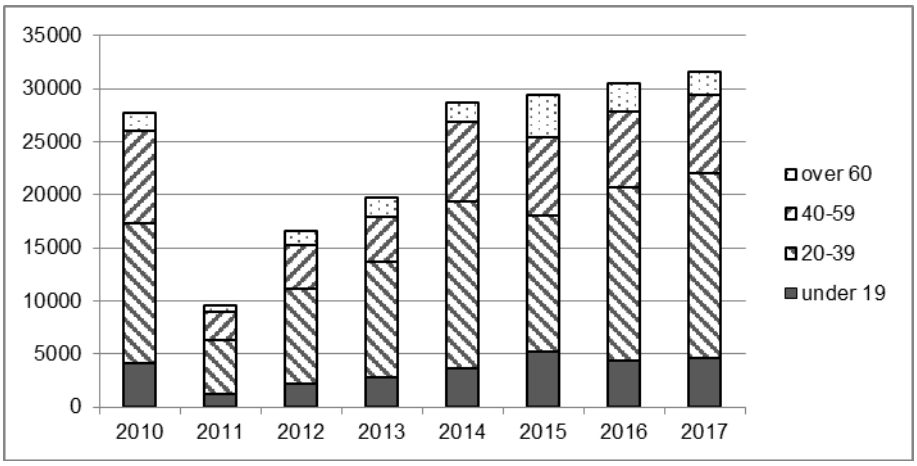
In recent years the emigration flows from Bulgaria are affected by two main factors the growth of real incomes in the country and the profound crisis affecting the countries to

which traditionally focuses Bulgarian emigration. But the impact of worsening economic environment in the receiving countries has not resulted in a significant and sustainable return since Bulgarian migrants are among those who adapt and well integrate into the host country. According to the OECD data around 65% (OECD, 2015) of the Bulgarian population in OECD countries is economically active and this share is almost identical with those born in Bulgaria and those with Bulgarian citizenship.

The emigration flow is concentrated in the age group between 20 and 30 years, and comprises to a large extend by Bulgarian students abroad (Figure 2). After this age the number of emigrants significantly reduces. Migration balance varies in the different age groups. While immigration prevails over emigration in the age groups below 19 and over 60, the total number of emigrants exceeds that of immigrants. The fastest-growing group of emigrants in absolute and relative terms is that of migrants between 20 and 39 years. This reinforces the negative trends of losing young people in the most active age.

Figure 3

Outgoing migrants by age (number)



Source: National Statistical Institute.

Taking into account the critical demographic situation and the deteriorating outlook, maintaining high levels of emigration from around 30 000 a year, mostly young people, is one of the most serious problems of socio-economic development of the country. The problem is exacerbated by the high levels of potential migration of young people. In 2016, the Economic and Social Council in Bulgaria conducted a survey of the migration attitudes of graduating high school students (Social and Economic Council, 2016). About 20% of respondents expressed a firm desire to emigrate before thy graduate while 60% intend to leave the country after graduation. The potential for migration is higher among students from families with highly educated parents in big cities and in much lesser extent than those less educated in smaller cities.

Two models of potential emigrants outlining the results of the survey of the Economic and Social Council. The first group are students who intend to continue their education abroad and consequently to find better professional development and standard of living. This is the group of students from larger cities and highly educated families. The second group potential migrants are those who are led by the possibility of earning higher incomes abroad, which is not related to continuing education, but rather a temporary or seasonal labour migration. Most students in the second group come from families with lower education and income mainly from small towns and villages. About 5% of respondents from families with the lowest incomes have the intention to go abroad in order to financially support their families.

It is important to note that among respondents that would emigrate from the country dominate the group of those with the highest scores in class. They also express much higher degree of dissatisfaction with the country's development. Migration attitudes of students are also associated with the established stigma that those students who remain in the country are less able than those who go abroad. A popular opinion within this age group is that staying in the birthplace is considered as a failure. The family has a very important role in the formation of attitudes towards migration and student attitudes in society.

2.3. Main destinations for Bulgarian emigration

Over the past decade, the destinations of Bulgarian emigration slightly changed. The number of immigrants with Bulgarian citizenship in the German population exceeds that of Bulgarian citizens in Turkey. Bulgarian immigration on the UK increases while the immigration in the United States and countries outside the EU substantially decreases. Bulgarian emigration is different in different countries – different in scope, dynamics, structure of migratory flows and the factors that determine the integration and positioning of the Bulgarians in local society and labour market. The review of the immigrant population in the countries where the Bulgarian population is concentrated – Germany, Turkey, UK, USA, Canada – makes it possible to outline prospects for future migration and the potential for return.

One of the main changes of migration destinations for Bulgarian citizens is that the largest emigration flow is directed to Germany. The stability of that economy encouraged more Bulgarians to choose this destination instead of South Europe.

An essential part of immigration from Bulgaria in the UK is the students. About 18,000 Bulgarian students were residing in the UK in 2018. Annually about 5,000 students are admitted into the English education system. Acquiring higher education in the UK is the key mechanism for attracting young and highly educated migrants from Bulgaria. The exit of UK from the EU will strongly impact the Bulgarian migration, both those who are already in the UK and the new entrants.

The structure of Bulgarian immigration in the United States shows that family reasons, including family reunification, prevail. This conclusion is confirmed by the large naturalization of Bulgarian citizens in the United States.

2.4. Bulgarian students' brigades abroad: results of the survey[6]

Conducted a survey of students Bulgarians were Brigade abroad complements research on the motives and attitudes for emigration among young people.[7] Although the practice of student brigades have been known for years, there has been no interest in their study. There are even no statistics on the participation of Bulgarian students in them.

Over half (56.4%) responded that the journey has not changed their intention to emigrate by 31.2% will remain in Bulgaria and 23.4% are willing to travel occasionally to earn money, but will not settle permanently abroad. Less than half of respondents (45.4%) would migrate to another country – 33.7% in any and 11.7% would try to migrate to the country in which they were brigade. Yet nearly one in two students to a potential immigrant is a significant proportion. It has been shown in life, however, and here it is quite possible and natural when you go to a new and more settled place for students to love the lifestyle and sometimes want to stay there, but when you get home, following a period of reassessment. Table 2 shows the rationale for students to apply for work and travel abroad.

As a result of their experience of what students recommended the organization of work and their practice could be borrowed in Bulgaria. Most often they note respectful attitude (tolerance and responsiveness) of the employer; compliance with laws; precisely defined obligations of the worker; teamwork where managers work on par with workers an inverse relationship between employer and employee; more emphasis on training of workers (than in Bulgaria); absence of extra staff to only report activity; observance of discipline; manifested devotion to work; willingness to work to contribute to the common cause; opportunities for growth thanks to the achievements of the worker; adequate and regular payment; hourly wage; additional bonuses (overtime); introduction of flexible and effective forms of work organization and human resource management – the ability to work in two places; time and facilities for the worker himself set the pace of work, working day at home, keeping the child in the workplace and more. However, students also express some criticism of the reality they encountered in the destination country (Table 3).

Most of the proposals are not alien in Bulgaria – if not strictly adhered to in practice, at least as intentions and best practices. The impact of this form of work organization is obtained in the country mainly by branches of foreign companies in the country. The trend and efforts in the organization of labour on the part of our employers should be focused in this direction. The positive thing is that these students are carriers of such influences and that they themselves have built for themselves their own criteria that will comply and require in their future professional realization and thus affect the overall environment.

[6] The survey was carried out and the results were analyzed by the authors together with Prof. Rossitsa Rangelova and Dr. Valentin Bilyanski.

[7] The total number of students surveyed was 106. They are from seven universities in n the country (Varna Economic University, University for World and National Economy, Sofia University, Veliko Tarnovo University, Plovdiv University, Blagoevgrad College of Tourism and New Bulgarian University). The vast majority of students were of a brigade in the US – 95 of them, followed by a much smaller number in the UK – 7, one in France and three in other countries.

Table 2

Rationale for students to apply for work and travel abroad

Rationale	Assessment	Number	Share, %
To see another reality	Very important	29	45.31
	Important	11	17.19
	Unimportant	11	17.19
	Of minimal importance	13	20.31
To get into a new environment and check myself	Very important	23	28.75
	Important	30	37.50
	Unimportant	18	22.50
	Of minimal importance	9	11.25
To broaden my horizons	Very important	23	30.26
	Important	20	26.32
	Unimportant	18	23.68
	Of minimal importance	15	19.74
To make money	Very important	23	35.38
	Important	10	15.38
	Unimportant	14	21.54
	Of minimal importance	18	27.69
To develop professional skills and acquire new experience	Very important	15	27.78
	Important	14	25.93
	Unimportant	10	18.52
	Of minimal importance	15	27.78
To get acquainted with the realities in the particular country selected	Very important	6	16.67
	Important	9	25.00
	Unimportant	12	33.33
	Of minimal importance	9	25.00
To meet other people	Very important	6	10.00
	Important	18	30.00
	Unimportant	20	33.33
	Of minimal importance	16	26.67
To study the conditions and establish a permanent future in this country	Very important	4	15.38
	Important	4	15.38
	Unimportant	9	34.62
	Of minimal importance	9	34.62
Something else	Very important	3	75.00
	Important	0	0.00
	Unimportant	0	0.00
	Of minimal importance	1	25.00

Table 3

Students' criticism to the reality they encountered in the destination country

Reasons for criticism	Assessment	Number	Share, %
You find others to be quite different in mentality than you	Very important	25	51.1
	Important	13	26.5
	Unimportant	11	22.4
You perceive a difference in your treatment because you are a foreigner	Very important	16	39.0
	Important	15	36.6
	Unimportant	10	24.4
You encounter weaknesses in their organization of work	Very important	13	41.9
	Important	10	32.3
	Unimportant	8	25.8
You are not treated well because you are an employee from Eastern Europe	Very important	6	37.5
	Important	4	25.0
	Unimportant	6	37.5
The pay is not as high as you expect	Very important	7	25.9
	Important	8	29.7
	Unimportant	12	44.4
Something else	Very important	6	85.7
	Important	0	0.0
	Unimportant	1	14.3

Lack of interest in student brigades from the state and researchers explains the absence of a developed and adopted concept of existence, and a national system for assessing the effectiveness of the activities of international student brigades. At the same time, should the forms of such brigades in Bulgaria (incl. On draft MES "Student Practices – Phase 1" funded by OP NOIR) organised by large and small businesses to become far more attractive to students and effective for business. In this way, businesses will begin to better prepare personnel for their needs than they felt a strong need now, and probably even more in the future.

3. Immigration in Bulgaria

There are large differences between refugees, asylum seekers, labour migrants, illegal migrants, etc. In the public debates, those categories related to migration are often used as synonyms. The terminology is important since public perceptions and attitudes should be built on a correct understanding of the difference between their legal, economic and social status and prospects.

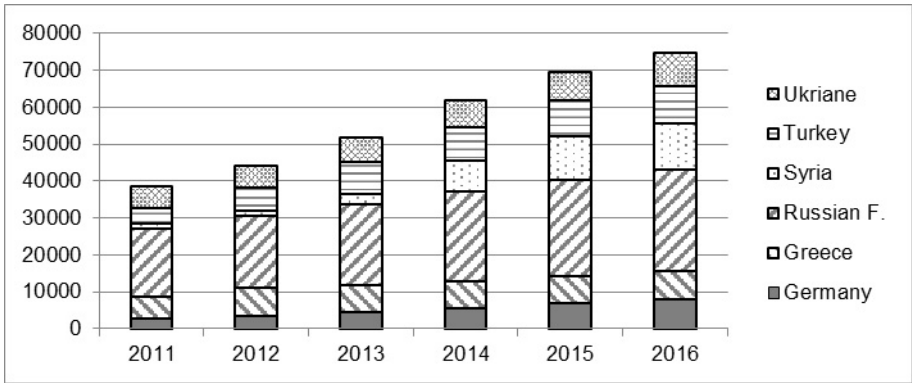
3.1. Foreign population and immigration in Bulgaria

At the end of 2018 the foreign population in Bulgaria reached the highest number for the last thirty years – 103 953 persons. The number of people born abroad that are included in Bulgaria's population is 174 272, which represents 2.5% of the total population – also a

record share for the last thirty years. The first four countries of origin account for 40% of the foreign population. In 2018 the population of third countries (non-EU) prevails. The citizens born in the Russian Federation represent 18.7%, followed by Syria (8.4%), Turkey (6.9%) and Ukraine (6%). These numbers are consistent with the development of immigration in the last years (Figure 3). The number of citizens from Moldova and Northern Macedonia slowly but steadily increasing, due to the ethnic proximity and legislative measures encouraging their immigration in Bulgaria. The effectiveness of these policies, however, is low because in spite of the granted privileged position of these migrants in Bulgaria, their total share in the population is marginal.

Figure 4

Incoming migrants by country of birth, %



Source: National Statistical Institute.

The latest refugee crisis added a new, albeit unstable (see below analysis of the mobility of foreign citizens in Bulgaria) population of Syria. The refugee crisis has shown that unexpected external events and factors could relatively quickly change the immigration situation and have a lasting impact on the population of the host country. The diversification and rapid change in the population challenge traditionally conservative immigration attitudes of Bulgarian society.

In the case of Bulgaria, the EU integration stimulates more the short-term movements of EU citizens to Bulgaria than permanent migration flows.

Over the past six years between 11 000 and 16 000 foreigners settled annually in Bulgaria. The immigration pattern in the country is very dynamic comprised of a small number of permanent settlement and changing structure of immigrants by nationality, gender, age and migration motivation. Immigration in recent years is dominated by political factors related to instability in the region, rather than economic factors. The total stream contains various national groups whose migration is driven by various economic and social factors. The peak of the immigrant flow was 2014 related with the Syrian crisis.

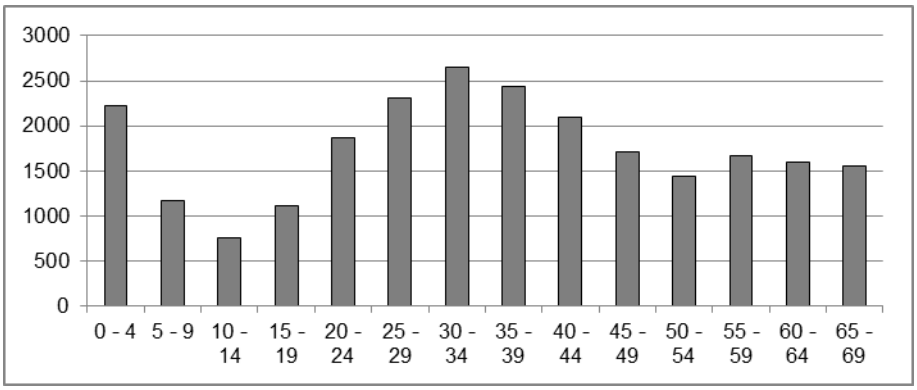
3.2. Outward mobility of foreign citizens in Bulgaria

The foreign population in Bulgaria contributes to the dynamics of population, migration and to a lesser extends to the labour market. Migrants from third countries are highly mobile. According to NSI migration statistics, the number of those migrants who leave the country is less than those settling in Bulgaria, which underpins the trend of increasing foreign population in the country. Unlike the overall migration balance, which remains negative balance in migration of population from third countries is positive as mainly driven by migration flows related to refugee inflow. After 2015 the balance shrank mainly because of the smaller inflow, while emigration of third countries nationals has also started decreasing. In 2018 net migration remains positive for both groups EU citizens (882 migrants) and non-EU migrants 10 546.

The age structure of outgoing and incoming migrants from third countries is different – younger dominate the outflow (in the age group between 20-29), while the remaining are in the group of the older population. Foreign migrants from the younger age groups and most in the group between 20 and 29 years leave Bulgaria while those who stay are equally distributed across all age groups between 19 and 60 years (Figure 4).

Figure 5

Incoming migrants by age, 2017 (number)

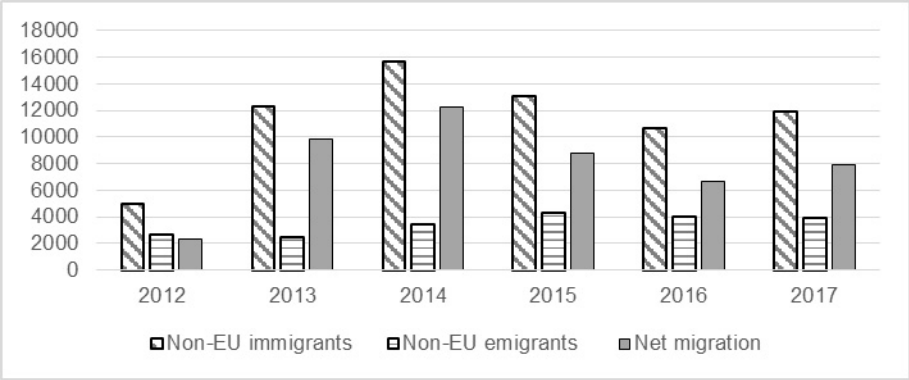


Source: National Statistical Institute.

Although immigrants from Member States of the EU are small in number, they contribute to the dynamism of migration situation in the country. In 2012 the number of such immigrants in the country hit the record of 4200 immigrants. The inflow is dominated by migrants from Greece, mainly related to the crisis in this country and the transfer of some businesses to Bulgaria. Freedom of establishment, free movement of capital and labour as dominant principles of the Single Market support the adjustment of businesses and the labour to economic volatility. The crisis has had an impact on migratory flows of EU citizens as movements between neighboring countries were revitalise (Figure 5).

Figure 6

Immigrants, emigrants and net migration from non-EU countries



Source: National Statistical Institute.

3.3. Effects of Immigration

The effects of immigration processes on the population in Bulgaria are weak. Net migration remains negative throughout the period from the beginning of reforms in the late 80s of the twentieth century. The foreign population is growing slowly. The external and regulatory factors /constraints play a crucial role. The economic factors play a role in short-term labour movements rather than in long-term migration.

Depending on the factors that determine immigration in Bulgaria several types of immigration could be distinguished. The impact of those groups on the population and the economy is different:

Ethnic migration. Bulgarian ethnic minorities from Moldova, Northern Macedonia, Ukraine and Serbia are attracted by the opportunity to obtain Bulgarian citizenship. Only a small part of them remains in the country and integrates into the labour market and society. This group actively migrates to Western Europe. In this case, Bulgaria acts as a transfer-immigration country. The share of this group is increasing steadily. The more the country's policy promoting access to citizens of those countries to Bulgaria, the greater the number of those who use the country as a stop to a further emigration.

Migration, related with vacation property. The increase of Russian citizens in the population of Bulgaria is associated with the development of the vacation property market and the access of foreigners to this market. Such are the determinants of growth in the number of citizens of the UK in the Bulgarian population; a process that has slowed since the beginning of the financial and economic crisis of 2008. Migrants purchasing property in the country desire permanent residence. This kind of migration does not affect the supply side of labour market. In addition, it does not exert pressure on the social security system. The most pronounced impact is observed in the dynamics of the housing market while the impact on the consumption of goods and services is located in touristic regions and in the hot touristic season.

Migration related to the refugee movements. This migration in the case of Bulgaria is mostly of a temporary nature since a significant portion of these migrants continues their migration to other countries and some of them return to their homeland, while a small part remains permanently living in the country.

Labour migration. Bulgarian labour market and the immigration policy remain very conservative as regards the accession of foreign labour on domestic labour market. This policy limits the adjustment tools of the economy and the labour market in good and bad times. Labour market situation worsens considerably due to deteriorating demographic situation and the economy suffers huge deficits of labour that hurdle the economic growth. An exception from the conservative migration policy trend is the recent introduction of recruitment of short-term labour for tourism sector. The expansion in recent years of tools to attract short-term migrants in the upward phase of the cycle has economic effect, but does not affect the demographic situation and does not solve demographic problems.

Although the above tendencies in immigration lead to a slight increase of foreign population in Bulgaria that weak trend cannot compensate for the demographic crisis and unfavourable trends in the labour market.

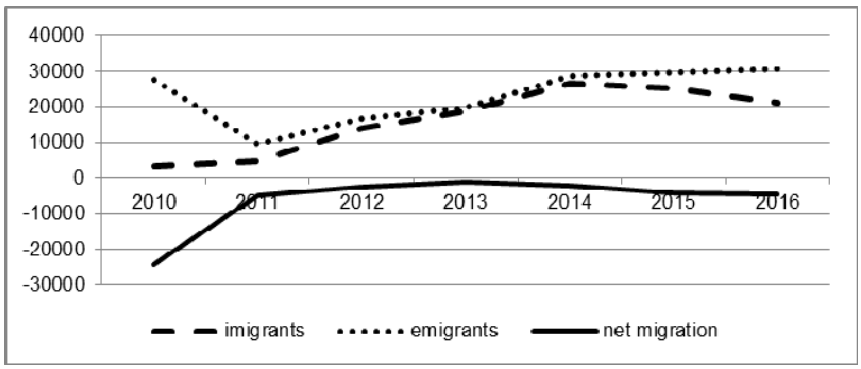
Immigration is related with an outflow of remittances. The data show a significant increase in transfers from Bulgaria – 23 Million in 2000 to 151 Million USD in 2015. Remittances from Bulgaria exhibit some resilience to economic fluctuations. Even in the years of highest economic downturn during the global financial and economic crisis the outflow of migrant transfers increased. An interesting trend was discovered that in the crisis outgoing transfers are more resistant than incoming, indicating that not only the conditions in the home country but also in the host affect the remittances. The financial impact of remittances could be assessed if compared incoming and outgoing remittance flows as well as the stock. The crisis in the main host countries for Bulgarian migration affected the value of transfers of Bulgarian migrants. Unlike the incoming migrant transfers, the outgoing is more diversified and focused on 15 countries, mainly to EU countries (which probably represent the income of highly qualified managers of subsidiary companies of European companies in Bulgaria). About 75% of the transfers go to the member states of the EU (Spain 13 Million Euro, Germany – 8 Million Euro, France – 7 Million Euro) (BNB, Balance of payment statistics). Transfers to Russia are around 12 Million Euro, Serbia and Ukraine are about 6 Million Euro. Increasing transfers between Bulgaria and the EU is a natural result of expanding cross-border business and the single market.

3.4. Net migration and return migration

The total migration balance of Bulgaria has been negative over the last thirty years. Total net migration is driven by the movement of the Bulgarian population but in the recent years unexpected external factors made a significant impact. The mass inflow of refugees in the period 2013-2015 almost managed to offset the number of outgoing migrants and almost closed the gap between inflows and outflows. After 2015, however, the reduction of refugee flows and rising emigration, increased again negative net migration to 9 329 in 2016 (Figure 6) and again began to decline in 2017 to 5 989 and 3 666 in 2018.

Figure 7

Incoming, outgoing migrants and net migration (Bulgarian citizens, EU and non-EU) (number)



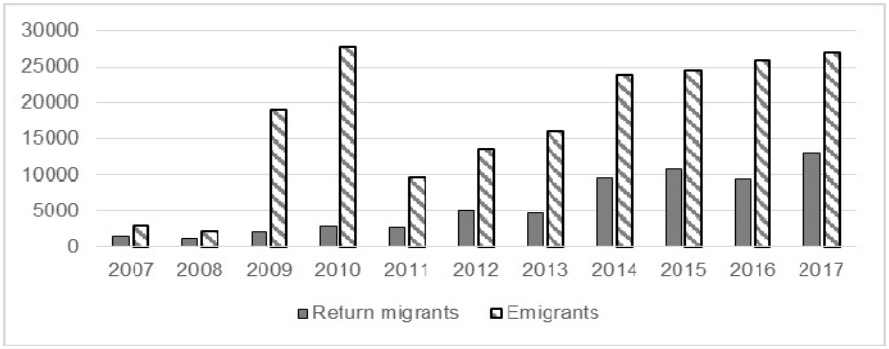
Source: National Statistical Institute.

Bulgaria continues losing population and migration continues to be one of the important factors for the worsening demographic situation. Data for the return migration shows that over the past decade a dynamic migration model is established. It is characterised by frequent changes of destinations and return, shorter duration of stay, diversification of outflows and their migration behavior.

Return migration could be measured using the data for immigrants with Bulgarian nationality. The scope of this process, however, could not be fully assess, as most of the returning migrants are not registered upon their return to Bulgaria, especially if they return from a member state of the EU. Therefore, the data can serve as setting the trend than to give exact parameters of the scope of the process. According to the NSI data, in 2017 return Bulgarians could be estimated to 13,060 and in 2018 at 16 169 (Figure 7). That number keeps increasing.

Figure 8

Returning migrants (Bulgarian citizens) (number)



Source: National Statistical Institute.

The increase of emigration is accompanied with an increase of the return migration (correlation coefficient 0.9), which once again confirms the thesis about the formation of a dynamic model of migration of Bulgarian population.

A significant part of return migrants from the EU register in the labour offices since they are eligible for unemployment benefit. There is growing number of those migrants which reached 20 000 in 2017 (Table 4). This is a new phenomenon for the Bulgarian labour market. It is the result of the application of the European labour market legislation according to which migrants are protected against unemployment and could receive their benefits in the home country where the living costs, in general, are less than in host country. This legislation stimulates the return after sufficient number of months are worked out in order to guarantee eligibility for unemployment benefit.

Table 4

Unemployed registered with the labour offices whose previous work was abroad

	2014	2015	2016	2017	2018
Number at the end of the year	8885	12775	15856	20 719	23469
% of total registered unemployed	2.3	3.3	4.6	9.1	9.5

Source: Bulgarian Employment Agency

The conventional wisdom suggests that international migration is a privilege of the youth. In recent decades, the data indicate a growing migration of persons before and after retirement. A kind of positive economic effect for countries with significant and sustainable emigration is the return of migrants who have acquired pension rights in the host country. Immigrant workers-retirees in Southern Europe, especially countries affected by the crisis of 2008, for the most part, returned to Bulgaria as pensioners while retired Bulgarians from Germany and other economically stable countries with active and effective integration policies are more likely remain in immigration country.

3.5. Employment of immigrants in Bulgaria

The labour market in Bulgaria is relatively small. The economic fluctuations lead to significant labour surpluses and deficits during different phases of the economic cycle. Historically, at the beginning of reforms and restructuring of the economy somewhat migration acted as a corrective to the oversupply of labour force. The demand for labour that time shrank due to the closure of industries and restructuring the economy. In the late 90s of the twentieth century, the situation changed and the labour force decreased substantially as a result of sustainable emigration and deepening demographic crisis. While at the beginning of reforms migration played a role of a buffer to the structural changes since late 90s migration creates labour market and economic imbalances.

The Bulgarian labour market is not competitive and in spite of that, the access of foreigners is restricted. There is a recent move to a managed openness of the labour market. The access is facilitated for limited professional groups that are present in the list of professions, which replaces the so-called market test for access to the labour market. While employers pushing for the expansion of the list trade unions seek to protect the local workforce and

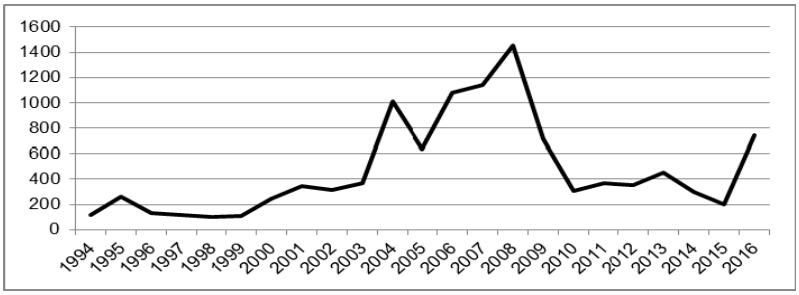
support the restrictions of access to the labour market. The position of the trade unions is to expand educational activity, reduce long-term unemployment and encouraging the return to the labour market it instead of attracting foreign labour. Despite the contradictions in the positions, the list of professions that are looking for foreign labour increases every year. In 2016, the list contains 10 occupational groups in 2017, the proposal is for 17, and in 2018 added three more groups. Most of the professions which are seeking foreign workers are engineering and technical engineering.

Another move to a more liberal labour marker is the new procedure for recruitment of foreign seasonal workers. They are accepted without complicated and lengthy market test. Work permits for jobs in tourism are issued for up to 90 days within a calendar year. Additional relief is that the employer is not obliged to submit documents for the education of the candidate for work and not necessary experience in the profession. The new rules also dismiss the requirement that the vacancy has to be announced in the media. This legislation produced an immediate effect. In 2017 the tourism sector employed 3 215 foreign seasonal workers for up to 90 days, and their number rose to 6 700 in 2018. For the first time in 30 years the labour market in Bulgaria absorbs such a large number of foreign workers. These are mainly young people, citizens of Ukraine and Moldova working in summer resorts and a few of them work in the winter resorts. Foreign persons working in the tourism sector, already represent 2.5% of those employed in the sector. This practice will be extended due to the increasing interest from employers in agriculture.

The prospect is that the Bulgarian labour market will gradually and selectively open the access for foreign workers, but as for now, issued work permits remain a small number (Figure 7).

Figure 9

Work permits issued to foreigners in Bulgaria



Source: Bulgarian Employment Agency

3.6. Bulgarian citizenship and migration

From 1990 to the end of 2017, 160,000 foreign citizens became Bulgarian citizens of which approximately 88.5% are of Bulgarian origin. The largest number of new Bulgarian citizens are those from Northern Macedonia. In 2016. 6 196 received Bulgarian citizenship). A remarkably growing number of citizens of Ukraine receive Bulgarian citizenship. In 2013 their number was 373 and in 2016 reached 2 254, which is the second largest group of foreigners receiving Bulgarian citizenship, followed by citizens of Moldova (Table 5).

Table 5

Persons received Bulgarian citizenship, by nationality (number)

Country of origin	*2013*	*2014*	*2015*	*2016*	*2017*
Northern Macedonia	4388	1874	4315	6196	1150
Moldova	1172	1135	1453	1209	207
Ukraine	373	964	1456	2254	710
Israel	222	266	395	454	303
Russian Federation	197	352	551	769	176
Serbia	197	304	580	911	194
Albania	123	98	331	255	78
Armenia	54	49	71	66	41
Turkey	48	130	281	363	294
Vietnam	32	20	73	35	34
Afghanistan	22	21	18	26	N.A.
Syria	15	24	42	72	18
Stateless	12	20	35	30	15

Source: Reports of the Republic of Bulgaria Vice-President.

The policy to attract foreign investors by granting them with Bulgarian citizenship does not give the expected result. In 2017 there were no applications for Bulgarian citizenship by persons who invested in the capital of a Bulgarian company no less than 1 Million BGN. [8]

According to the Indicator showing the number of persons acquired Bulgarian citizenship as a share of foreign-born population, Bulgaria is one of the leading countries in the EU (8.8% in 2016) (Table 6). The interpretation of this indicator is that a significant part of foreign-born population is highly integrated since they opt for Bulgarian citizenship.

Table 6

Number of persons acquired Bulgarian citizenship and number of residents

Year	Total number of persons acquired Bulgarian citizenship*	Number of persons acquired Bulgarian citizenship who reside in the country**	Difference (number)	Share of persons acquired Bulgarian citizenship who do not reside in the country (%) of all persons acquired Bulgarian citizenship
2009	9068	1000	8068	88.9
2010	14979	900	14709	94.0
2011	18473	600	17873	96.5
2012	18087	1750	16337	90.3
2013	6943	800	6143	88.5
2014	5429	900	4529	83.4
2015	11120	1275	11605	88.5
2016	12880	1600	11280	87,5

Source: (*) Committee on Bulgarian Citizenship and Bulgarians Abroad, (**) Eurostat

[8] Certified under the Law on Investment Promotion or performed and commissioned investment supported above the minimum threshold for a certificate for investment class A (Art. 14, para. 1, p. 2 and para. 2).

The reading of the data though is misleading since a large part of those who receive Bulgarian citizenship migrate further and the purpose of acquiring citizenship was not the integration in Bulgaria. There is no statistics on migration behavior of those who receive citizenship but a possible method to estimate the magnitude of this phenomenon is the difference between statistics on the nationality of Eurostat and the data from the Commission for Bulgarian citizenship. Less than 20% of the new Bulgarian citizens reside in Bulgaria. Based on these data it can be concluded that generous policies for the increase in population by integrating citizens from Bulgarian ethnic minorities abroad produce more emigration of persons granted citizenship than immigration. The actual effect of acquired citizenship on the size and structure of the population is insignificant.

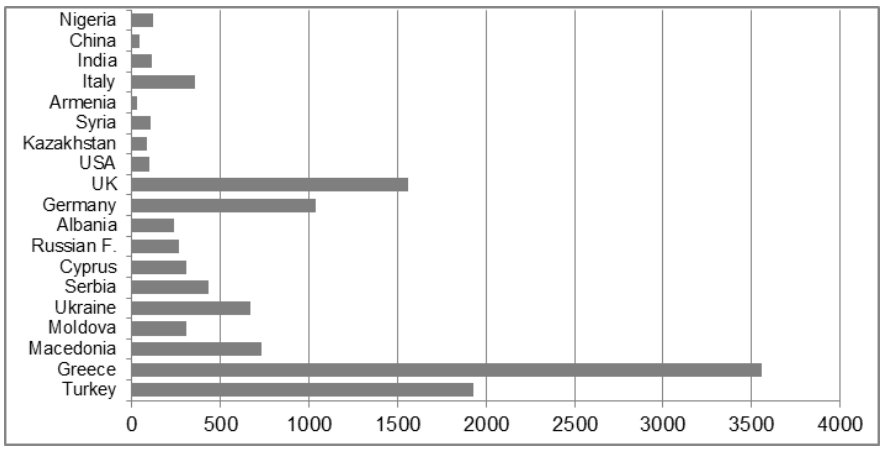
3.7. Foreign students in Bulgaria and migration

The flow of foreign students in Bulgaria shows a steady increase in recent years while maintaining a relatively stable structure according to the countries of origin. Students from neighboring countries prevail and they comprise 80% of the total number (Figure 8). Leading source countries are Greece, Turkey and Northern Macedonia. Students from more distant countries of origin form a small group of foreign students in Bulgaria. Over the past three years there is a certain dynamism in the number of students from Turkey that reduce, and those from Greece are growing. The proportion of students from Greece is 27.2% in 2017 and is nearly two times larger than that of students from Turkey.

The structure of foreign students by gender is dominated by men, while women are 32% as opposed to Bulgarian students where the share of women is higher – 54% of all students. The proportion of female foreign students is different in different countries of origin. For example, women predominate in students from the Russian Federation, Moldova, Serbia and Ukraine, while men are the main group of students from Turkey and Greece. Men predominate in the courses in engineering education and medicine.

Figure 10

Number of international students, by country of origin, 2016



Source: National Statistical Institute

Bulgarian universities provide relatively easy access to foreign nationals and recognition of Bulgarian diplomas gives a chance for further migration of graduates. The impact of the growing number of foreign students in Bulgaria on migration has not been studied. There is no data for the number of students who remain in the country after their studies. Education could be a factor for immigration in Bulgaria as well as for further migration to other EU countries. However, the procedure for obtaining visas for education purposes is long and complex, which discourages students from third countries to study in Bulgarian universities.

Bulgaria is pursuing a policy of promoting students from countries with Bulgarian minorities to train in the country. Information days are held in the Bulgarian diaspora in Moldova, Ukraine, North Macedonia, Albania and Kosovo and in Serbia. An additional incentive is the annual quota for students from these countries, fixed annually by the Council of Ministers. In 2016 it was increased to 1 000 Bulgarians from abroad (with proven Bulgarian origin) that can be admitted as students and graduate students in state universities in Bulgaria.

There is no research on what the effect of this policy, meaning how already benefited from this expensive education budget remained in the country. In this respect, no link between education and migration policy aimed at the integration of graduates.

Foreign students are an important migration inflow as they reside in the host country for more than a year. On the other hand, this group could be a source of long-term immigration of highly skilled young migrants. Most developed countries have specific policies that promote keeping and attracting permanent and priority of this group of migrants (Makni, 2011) which in the aging population in developed countries is an important factor in mitigating the adverse effects of demographic processes. Unfortunately, Bulgaria does not maintain any policy that promotes the stay and integration of qualified young people who graduate in Bulgarian schools and universities. Currently, the temporary stay of students is promoted by the universities until the completion of the studies as the foreign students contribute to the deteriorating budgets of universities.

3.8. Asylum seekers and refugees

Being an external border of the EU Bulgaria was strongly affected by the recent refugee crisis. The unprecedented large inflow impacted the migration situation and immigrant population in Bulgaria. The unexpected inflow of asylum seekers found the society and the institutions unprepared and the consequences are rather controversial.

A large number of those who received a status remain highly mobile and leave the country legally or illegally. This process of re-migration contributes to the increase of emigration from the country. The other consequence from the last refugee crisis is that integration measures are hard to be implemented in case the target group prepares for departure from the country. The main question is whether the country could benefit from the hosting of large refugee inflow or the country just honors its humanitarian obligations

Bulgaria is a country with a small share of foreign population (under 3%) and a negligible number of foreign workers. The country is unprepared to accept large groups of foreign asylum seekers. Traditionally, society and politics in the last thirty years is very restrictive in terms of access of third-country nationals (excluding those with Bulgarian origin). It is a great challenge the acceptance in a short period of time of 70 000 people who sought protection in Bulgaria as a result of military and political conflicts in the region.

Bulgaria is located in geographical proximity to unstable regions and therefore it is of utmost importance to create a sustainable policy and efficient institutions and an early warning systems to cope with the incidents of a large refugee. The minimum objective is to strictly implement the international commitments of the country while keeping the public costs at an acceptable level. Beyond this minimum target could be integration of those who received status and utilization of their high potential.

The structure of asylum seekers' inflow (2014-2016) was dominated by Syrians and most of them with Kurdish ethnicity (Figure 9). In 2016 and 2017, the number of non-Syrian applicants for a status increased and the composition of the inflow also changed. Young men aged between 18 and 34 years constitute about 60% of the entire inflow in the last three years. In all nationalities, men prevail. The share of women decreased steadily from 2015 onwards, as they accounted for only 24% of the total flow in 2017 and 2018. The largest proportion of women is among the Syrian applicants – 39%. The proportion of children is also the highest in the group of Syrian citizens.

Figure 11

Top 5 countries of origin by number of applications submitted during the period 01.01.1993 – 31.12.2017

Source: State Agency for Refugees.

Asylum seekers in Bulgaria have a low level of education and only 5% have a university education. This educational structure is very unfavourable for the implementation of an effective integration policy.

The data outline a clear downward trend in migration pressure from asylum seekers. The lessons of the last refugee crisis are that the situation could quickly change that requires a mobilization of resources, creation and maintenance of expertise to address current

problems and to a strategic plan to conduct ongoing awareness campaigns about the nature, character, effects country of refugee processes. Society needs to be prepared for the challenges associated with mass migration from areas of instability and conflict.

The Republic of Bulgaria grants several statuses to foreigners who seek for protection – asylum, international protection and temporary protection. The number of those who received international protection since 2013 (the beginning of large number of applicants for protection) till June 2019 the total number of those who received international protection in Bulgaria is 16 616, including 11 864 granted with a refugee status and 4 752 with a subsidiary protection status.

4. The consequences of migration

The enlargement of the EU and the Single labour market accelerated the movement of labour across the borders of the member-states. The winners in the competition between the national labour markets to attract the demanded labour are the economies, which offer more attractive employment conditions. That is why migration from the new member states to developed EU economies acts as a buffer to cyclical fluctuations in the labour market in the receiving countries. While emigration from Central and Eastern Europe is unique and of significant benefit to the EU as a whole, the effect on the economies of sending countries is significantly negative (2016) (Atoyan et al, 2016). The outflow of skilled labour force reduces productivity growth and contribute to the growth of wages and undermining competitiveness. Central and Eastern Europe take huge fiscal losses from emigration, as far as social spending grow faster than GDP. Overall, emigration reduces the potential economic growth and slows the convergence with the EU.

The research on migration from and to Bulgaria confirms the thesis of the changing nature of inflows and outflows. The destinations, structure of migration flows and temporal dimensions are often changed. Bulgarian emigration in the EU has a positive effect on the Single European labour market. Large migration inflows of skilled labour, as well as the high level of integration of Bulgarian migrants in host countries, contribute to their economies. The effects on the Bulgarian economy, however, are rather unfavourable. The positive impact is not sufficient to offset the costs. As far as the convergence of the Bulgarian economy in European one is slow it can be expected that the negative migration balance will remain in the coming years. That means that adverse effects of migration will be maintained for a relatively long period of time.

The main negative economic consequences of emigration are the loss of population, fostering procyclicality of labour market dynamics, widening of labour market deficits and related loss of competitiveness.

The loss of population could be associated only with that part of emigration that is fully integrated into the host country and particularly those who canceled their citizenship. The scope of this group is small compared to other Bulgarian emigrant groups. The chance for a return of that group and their children is marginal, that is why the concept of the lost

population could be associated with this group. The estimations is that this group comprises of about 400 000 persons.

Bulgarian nationals residing in another country for more than one year form a rather non-homogeneous group. They comply with the classical definition of migrants and also maintain their Bulgarian citizenship. Migration plans of this group are hard to be predicted since the reasons for migration and residence status are rather diverse (among those are long-term labour migrants, family reunion migrants, students enrolled in universities, business and entrepreneurship related migrants, etc.). This is the largest migration group estimated at about 700 000 Bulgarian citizens. There is a potential for a return in this group. The data about the return of retired migrants suggests that at least 20% would return upon retirement. This category includes persons who have acquired full or partial pension rights abroad. The data show that each year about 2 000 persons entitled to pensions abroad, returned to Bulgaria. For the younger migration return is also possible upon the development of Bulgarian economy, convergence of incomes, improvement of institutions and stability in the country. Having in mind the forecasts for the economic development and convergence process it cannot be expected in short period of time a large return of Bulgarian migrants. The process would be of a more gradual nature. The experience of Baltic countries whose economies converged rather rapidly to the Euro area economy suggests continuing net emigration. Migration is a complex process of multifactorial dependence that makes the forecasts and particularly the return very difficult.

As regards the short-term migrants the concept of "lost" population is least applicable. These are highly mobile migrants that take advantage of the free movement of labour and take employment in seasonal and short-term assignments abroad mainly in the EU. The magnitude of this group is hard to assess. Although in the public debate and in the academic literature this group is considered as migrant group the definition of a “migrant” does not apply to the frequent short-term movements across the borders of those people. Some of them would choose to reside abroad for more than one year or for good, but their headquarters is Bulgaria.

Migrant remittances are considered as one of the main benefit for the economy of the origin of migrants. The dynamics of migrant transfers to Bulgaria over the last 20 years shows high growth between 2000 and 2004, when they reach 8% of GDP and then start to decline to about 2 percent of GDP (Figure 10).

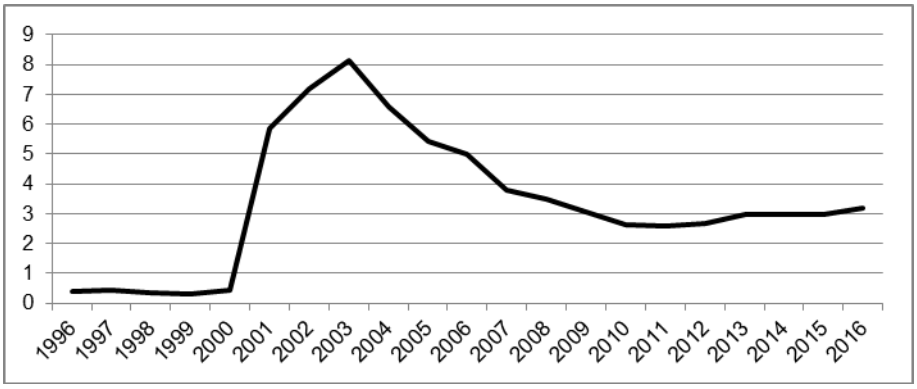
The recent global economic crisis hit hard the economies of countries which labour markets depend on foreign labour. The data suggest that both migration and migrant remittances over the past decade of an economic downturn are strongly influenced by the economic situation in host countries. Migrant transfers to Bulgaria decreased in the period 2010-2013 and slowly began to recover in the last two years, but are still about 3% of GDP. The macroeconomic impact of remittances of such a magnitude is negligible.

The main flow of migrant remittances comes from Turkey (about 50% of the total flow), which is associated with mass emigration to this country in the late 80s of last century. The second source of migrant transfers to Bulgaria is Spain (12% of the inflow) – a country with significant Bulgarian immigration, followed by Germany (Figure 11). Although the

Bulgarian population resides in many countries of the world, migrant transfers are concentrated in seven countries, where about 80% come from.

Figure 12

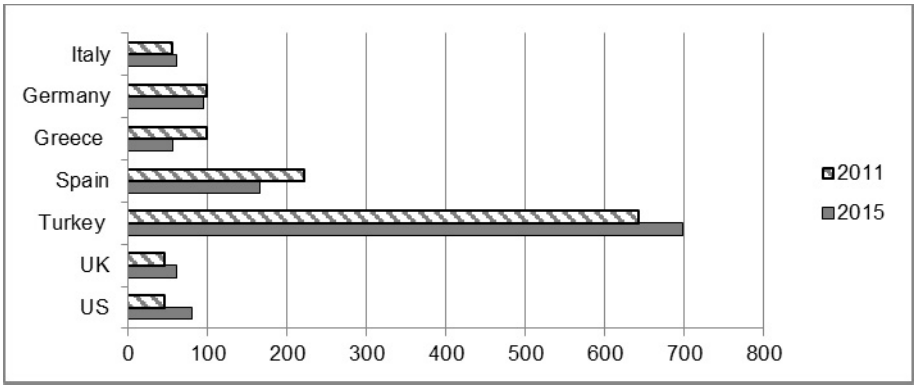
Migrant transfers to Bulgaria, 1996-2016 (% of GDP)



Source: World Bank. Migration and Remittances data.

Figure 13

Migrant remittances to Bulgaria by source country, 2011 and 2015 (million USD)



Source: World Bank. Migration and Remittances data.

The data show relative stability in the sources of transfers, mostly in relation to those of Germany and Italy (Bobeva, 2017). The crisis affected most severely Greece and Spain and this resulted in a substantial reduction in transfers from these countries, while despite the economic instability and refugee crisis in Turkey transfers from this country to Bulgaria are still significant. This trend is difficult to explain, taking into account the declining Bulgarian population in Turkey. Migrant transfers depend on the changing nature of migration. Several studies show that the more sustained immigration is, the less are migrant transfers, but in the case of transfers from Turkey to Bulgaria this theory is not confirmed.

A recent phenomenon is the increasing inflow of pension transfers. Bulgarian emigrants who have acquired pension rights and decided to return to Bulgaria could transfer their pension. The rule is that the pension follows the pensioner. According to the IMF balance of payment methodology, those transfers are reported as incoming financial flows, while in the case of pensioners who are entitled to pensions in Bulgaria and their pensions are sent abroad represents financial outflow. The data show an increase in the number of pensioners who return to Bulgaria. If the trend continues it could be expected that around two-thirds of migrants who qualify for a pension abroad would return to Bulgaria. This would have significant positive effects on the population and the economy. Transfers of pensions of return migrants to Bulgaria have a positive effect on the current account of the balance of payments. Over 36,000 persons already use in Bulgaria their pensions acquired abroad. It is about 433 Million Leva per year (Table 7). This is a substantial financial resource that boosts domestic demand.

The impact of pension transfers on the pension system is controversial. If those people were living and working in Bulgaria instead of abroad they would had contributed to the national pension funds. From this prospective, the pension funds missed substantial financial inflow. At the same time, these persons bring their pension to the country and do not impact social security system.

It is hard to predict what will be the behavior of returning pensioners on the labour market and whether some of them, as most of those retired in Bulgaria will work. Since they earned abroad much higher pensions than those in Bulgaria it can be expected that only a small share of pensioners would appear on the labour market in the country. However, with increasing deficits in the labour market and high demand for labour it is possible to expect an active behavior of retired returning migrants.

In demographic aspect returning retirees will affect the population in the following areas:

- The additional contribution to the population of about 36-40 thousand annually represents 0.6% of the population. This cannot compensate the loss of population due to migration and natural demographic processes, but would reduce the negative migration.
- The sustainable inflow of elderly returnees will further worsen the age structure of the population and will add to the aging of population.

Table 7

Number of pensions and benefits by ERMD for persons with labour experience in other countries for 2012-2016 by country

	2012	2013	2014		2015		2016	
	Pensions and benefits	Pensions and benefits	Pensions and benefits	Retired persons in 2014 г.	Pensions and benefits	Retired persons in 2015 г.	Pensions and benefits	Retired persons in 2016 г.
TOTAL	22 297	25 867	27 790	25 793	31 979	29 817	36 336	33 925
Germany	5 794	6 201	6 377	5799	6 775	6 175	7 246	6 626
Poland	625	700	747	665	817	736	859	773
Slovakia	403	417	429	388	429	386	433	392
Hungary	262	272	289	263	300	273	308	280
Czech Republic	2 769	2 861	3 003	2383	3 089	2 453	3 147	2 490
Macedonia	208	215	231	202	219	191	228	197
Croatia	34	32	35	32	34	32	35	33
Slovenia	29	38	50	47	69	66	83	80
Serbia and Montenegro	153	157	149	133	157	140	163	145
Bosnia and Herzegovina	9	9	14	11	14	10	12	8
Ukraine	379	478	561	543	669	646	762	733
Spain	2 039	2 649	2 821	2689	3 543	3 374	4 210	3 994
Austria	971	1 097	707	669	794	754	919	870
Romania	32	32	39	37	47	45	55	52
Albania	4	4						
The Netherlands	49	59	63	59	87	84	108	104
Belgium	128	123	108	103	134	130	188	181
Cyprus	559	713	874	844	1 044	1 013	1 210	1 173
Estonia	15	21	27	27	37	37	42	42
Finland	42	53	52	51	63	62	79	77
France	283	335	337	325	420	404	481	460
Greece	3 968	4 547	4 712	4543	5 344	5 153	6 038	5 817
Ireland	13	24	16	16	23	22	32	30
Italy	1 343	1 832	2 082	2036	2 753	2 692	3 404	3 326
Lithuania	16	20	23	22	29	28	31	29
Portugal	168	245	317	300	391	370	474	444
Sweden	172	203	177	170	206	197	237	227
Great Britain	268	358	466	453	643	624	896	871
Luxembourg	10	15	19	18	20	19	24	23
Denmark	14	18	22	21	29	28	36	35
Latvia	20	22	34	32	41	39	55	53
Malta	12	14	13	12	17	16	23	22
Norway	30	49	56	55	87	85	111	106
Switzerland	63	101	97	97	117	117	153	150
Israel	240	304	362	356	461	451	550	537
Moldova	26	36	47	45	58	55	81	77
Korea			1	1	1	1	1	1
Iceland	1	1			2	1	2	1
Russia	1 146	1 612	2 424	2338	2 981	2 874	3 557	3 407
Canada			9	8	35	34	63	59

Source: National Statistical Institute.

Conclusion and policy recommendations

The study of migration refers to the current period, which is too dynamic and specific in its manifestations – the global financial and economic crisis and the refugee crisis, which have a significant influence on Bulgaria. The paper demonstrated how migration balances across migrant groups change in this environment and enhance the unpredictability of migration. The known methods of forecasting migration are ineffective, strongly influenced by external factors, and institutions and policies are unprepared for the challenges posed by crises.

The study is based on a large and reliable database, using new sources and approaches to obtain data and comparing them to others to capture and evaluate true migration. In this way it goes further into the topic than conventional research, assessing real migration and finding new moments in its many manifestations in addition to general quantitative data. The complex internal structure and trends in individual migration flow under the influence of various causes are investigated. One of the highlights in the study of migration is the assessment of real and potential return migration - an issue that is not usually explored.

Some specific guidelines can be given for the future development of the policy in the field of migration. Reducing the negative effect of outgoing migration and reducing migration potential could be realised within three groups of policies:

1. Migration policy over the last decade is characterised by inertia and inefficiency. A number of policies that have proven ineffective should be discontinued and effective long-term migration policies should be put in their place:
    - Instead of a policy of sending Bulgarians abroad through EURES, which has been operating successfully for decades in the country, serious investments must be made to attract back migrants. There is no policy for the reintegration of returning migrants. The Employment Agency should develop special services and programs for returning migrants.
    - The policy regarding incoming migration of Bulgarian minorities in neighboring countries is ineffective. Over the last ten years, a significant number of people have migrated to our country, but for now, the policy towards them is only to attract them, rather than to keep them in the country. Thus, they are essentially a source of transit migration, and not of incoming migration to the country. This policy lacks effectiveness, that is, the cost of this policy, has no economic returnability.
    - There is a lack of a clear refugee policy and, above all, policy on incoming migrants integration, with specific goals and instruments. This deprives the country of the opportunity to keep young and highly qualified refugees.
    - There is also a lack of policy for students, both Bulgarians studying abroad and foreigners studying in Bulgaria, with a view to attract them to stay in the country.
2. The general economic policies should help keeping the workforce in the country. The specificity of Bulgarian outgoing migration and its heterogeneous character means that the policy must consider the specificities of individual migration groups. For example,

limiting the outflow of highly qualified professionals could lead to a decisive improvement in the work of the institutions and the general economic environment. Research shows that weak and inefficient institutions are among the main factors for the emigration of highly qualified specialists. As the reports of the EC and the ECB show, one of the major weaknesses of the Bulgarian economy and an obstacle to convergence is the unsatisfactory institutional development (ECB, 2018). All policies that promote job creation and economic growth would reduce the negative effects of outgoing migration and limit it, but without institutional development and the rule of law, no decisive change could be expected. The data show that in the years of high economic growth, labour market deficits and high wage growth, outgoing migration, including of highly qualified specialists, do not decline. It is a process driven by many social, economic and personal factors, which is why the policy to reduce it must be complex. A large number of highly skilled professionals choose to go to technology and innovation centers abroad. Therefore, prioritizing such centers with appropriate preferences could help retain and attract highly qualified professionals.

3. Within the framework of European policies, in addition to national measures and policies, the EU must recognise the issue of outgoing migration from the new CEE Member States and develop active migration and cohesion policies within the EU. As the IMF said in its report: "... it must be emphasised that free movement of labour is a key factor in the integration of the EU economic area, but it is crucial some steps to be taken to reduce the negative impact of outgoing migration for sending countries." (IMF, 2018).

Due to the global nature of the issues of the ongoing demographic and migration processes and the related with them economic aspects, demographic policy is gaining international importance. Demographic and migration processes are a global challenge and solutions must outweigh the interests of individual countries. Therefore, the public must make mutual efforts to achieve results in this field, both in terms of its natural and mechanical movement of people. Population development has general patterns that must be addressed consciously and jointly by the society.

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ИКОНОМИЧЕСКИ ИЗСЛЕДВАНИЯ
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CORPORATE CULTURE AS FACTOR FOR ORGANIZATION'S RESILIENCE

The feeling of an increased, intrinsic uncertainty, due to the rapidly changing situation in the financial sector, consumer attitude changes, growing employees' expectations and the significant political uncertainty in a digitally transformed world, forces organizations to invest in developing new coping strategies. Thus, in this changing environment, along with the issue of efficiency, the need for the organizations to protect themselves from and pass through a variety of potential shocks and crises becomes of a primary importance.

The article outlines the thesis of the organization's resilience as a competence to overcome the shocks and to retain organization's main purpose by creating an adequate corporate culture that encourages the continuous exchange of information, the empowerment of every employee to react independently and in a timely manner, and the employees' dedication for work. An essential part of this type of corporate culture is also the acceptance of the idea that disruptions represent a part of the functioning of each organization and therefore a special attention has to be paid to conditioning for such extreme situations.

JEL: L2; M140; M2

Introduction

The dynamic developments in today's environment constantly expose organizations to various kinds of challenges – entire industries are collapsing, financial markets are experiencing disruptions, consumer preferences and expectations are changing rapidly, employees express new attitudes and look for flexible working conditions and all that in a situation of significant political uncertainty in a digitally transformed world. The feeling of increased, intrinsic uncertainty, arising from these increasingly complicated processes, forces organizations to invest in developing new coping strategies. Thus, in this changed environment, along with the issue of efficiency, the need for organizations to protect themselves from and pass through a variety of shocks and crises becomes of a primary

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importance. To designate the competence of organizations to cope with all this, researchers develop the concept of organization's *resilience*[2].

This drives the organizations – on one hand – to increase their sensitivity to dynamic changes in the environment and on the other – to develop their inner potential to address unexpected and difficult to predict situations. Thus, the attention is focused on building a corporate culture, structuring processes and promoting relationships in a way that supports resilience.

The aim of the paper is to explore the concept of organization's resilience and to highlight key corporate culture features that favor the development of organization's resilience.

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The Concept of Organization's Resilience

The feeling of a growing uncertainty leads organizations to a more complex understanding of their relationships with the environment inside and outside of them. At the heart of this understanding lies the concept of the flexible, responsive and tough organization, also referred to as *organization's resilience*.

According to Brand and Jax the concept of resilience is one of the most important research topics in the context of achieving sustainability. They make a thorough review of key papers related to resilience. They found that first introduced as a descriptive ecological term (Holling, 1973), resilience has been frequently redefined and extended by heuristic, metaphorical, or normative dimensions (e.g., Holling, 2001, Ott and Döring, 2004, Pickett et al. 2004, Hughes et al. 2005). Meanwhile, the concept is used by various scientific disciplines as an approach to analyze ecological as well as social-ecological systems (Anderies et al., 2006, Folke, 2006). As such, it promotes research efforts across disciplines and between science and policy (Brand and Jax, 2007).

Brand and Jax clearly state the difference between two views of resilience. It has been coined engineering resilience (Holling, 1996) and is largely identical to the stability property, i.e., elasticity (Grimm and Wissel, 1997). The second meaning of resilience refers to dynamics far from any equilibrium steady-state and is defined as the amount of disturbance that a system can absorb before changing to another stable regime, which is

[2] The term derives from the Latin verb „*resilio*", meaning *to ricochet, to rebound*; In English *resilience* – flexibility, elasticity, toughness, mobility (Chambers English Dictionary, 7th Edition, 1988); in Oxford dictionary *resilience* is defined as "the capacity to recover quickly from difficulties" (Soanes & Stevenson, 2006).

controlled by a different set of variables and characterized by a different structure. It has been termed ecosystem resilience (Gunderson and Holling, 2002) and it is applied almost interchangeable with the words ecological resilience (e.g., Holling, 1996, Gunderson and Pritchard 2002, Anderies et al. 2006) or resilience (e.g., Holling, 1973, 1986, Arrow et al. 1995, Perrings et al. 1995, Carpenter et al. 2001, Folke et al. 2004, Carpenter and Folke, 2006).

The term *resilience* could be found in a number of disciplines such as economics, ecology, politics, cognitive science, digital technology, corporate governance, etc. in the context of many important questions like these: What causes one system to break and another to rebound? How much change can a system absorb and still retain its integrity and purpose? Which features make the system adaptive to change? How to build a shock absorption mechanism for yourself, for the communities, for the company, for the economy, for the society and for the planet? All these questions desperately needing their answers today.

In engineering, *resilience* refers to the degree to which a structure like a bridge or a building can return to a baseline state after being disturbed. In emergency response, it suggests the speed with which critical systems can be restored after an earthquake or a flood. In ecology, it signifies ecosystem's ability to keep from being irrevocably degraded. In psychology, resilience is associated with the individual's capacity to deal effectively with traumatic experience. In business, it often means putting in place back-ups (of data and resources) to provide continuity of operation in the face of natural or man-made disasters.

Facing hard challenges organizations nowadays refer to the concept of resilience in order to find adequate approaches of overcoming difficulties. "If we cannot control the volatile tides of change, we can learn to build better boats," say Zolli and Healey and continue, "We can design - and redesign - organizations, institutions and systems to better absorb disruptions, operate under a wide variety of conditions and shift more fluidly from one circumstance to the next." (Zolli and Healey, 2012, p 5). In this context, they justify their understanding of *resilience* and define it as *"the capacity of a system, enterprise, or a person to maintain its core purpose and integrity in the face of dramatically changed circumstances"(*Zolli and Healey, 2012, p.7). This definition is an appropriate one to be taken as a basic one for the goals of this paper related to outlining the interconnections between resilience and corporate culture.

Close to this understanding is also Yossi Sheffi, who in his book, „The Resilient Organization" studies the ways in which companies can recover from high-impact disruptions. The focus is on the actions they should take to lower their vulnerability and increase their resilience. Sheffi refers to the importance of the concept of resilience in the materials sciences, where resilience represents the ability of a material to recover its original shape following a deformation. For companies, it measures "their ability to, and the speed at which they can, return to their normal performance level following a high-impact/low-probability disruption" (Sheffi, 2005).

Houston represents the *resilience* of a community as "the capacity to 'bounce forward' following an adverse event such as a disaster or a crisis (Houston, 2015, p. 176). The bouncing portion of this resilience metaphor represents a return to a pre-crisis baseline level on one or more indicators (e.g. well-being, functioning) following a temporary disruption in

those variables caused by the adverse event. The forward component of the resilience metaphor represents the passing of time that occurs and is necessary for the return to baseline (Houston, 2018). The forward element also captures the reality that the return to baseline is not simply a return to how things were before the event, as it includes adjustments to the new reality that has been shaped by the event.

Based on these observations two main aspects related to resilience could be pointed out: the continuity of operation and the restoration in the case of dramatically changed circumstances. More generally, the concept of resilience leads to disclosure of the basic principles on how to build social, economic, technical and business systems able to anticipate disruptions, to recover when disturbed and reorganize in a way to perform their main objective under radically changed circumstances.

To improve organization's resilience, according to Zolli and Healy, is to enhance its ability to resist being pushed from its preferred state, while expanding the range of alternatives that it can embrace if needed (Zolli and Healy, 2012). This is what resilience researchers call preserving the adaptive capacity - the ability to adapt to changed circumstances. According to Brand and Jax it also should be stressed that community resilience is exhibited by adaptation following an event, but resilient communities are also able to anticipate and plan for events before they occur (Brand & Jax, 2007).

In this sense enhancing the resilience of an eco-system, economy or community comprises of two abilities: ability to resist being pushed past these kinds of critical, sometimes damaging thresholds and by preserving and what is really more important – expanding the range of niches to which a system can healthily adapt if it is pushed past such thresholds. At the times of unpredictable disruptions and volatilities it is of key importance for the organizations to encourage corporate culture which nurtures these two abilities.

Defining Corporate Culture as Management Tool

Corporate culture as a linking force creates stability for the organizations. It strengthens organization's integrity thanks to the employees' commitment to a coherent system of agreed values. This is the essence of the definition of Andrew Pettigrew, who points out that corporate culture is "the system of such publicly and collectively accepted meanings operating for a given group at a given time. This system of terms, forms, categories, and images interprets a people's own situation to themselves" (Pettigrew, 1979, p. 574). These are the underlying assumptions that the members of the organization adhere to in their behavior and actions. These assumptions are related to the individual's perception of the surrounding environment and the values to which he adheres. In this sense, organizational culture has a regulating function due to the fact that people have mastered models of perception, interpretation and response to situations that provide them with sense and comfort. Thus, corporate culture, based on continuity, provides sustainability.

The importance of corporate culture for synchronizing processes within an organization and for integrating it into an entity has been pointed out by researchers in various aspects. Formal and informal social processes in an organization are viewed by (Dutton and Pener,

1993) as being realized within the corporate culture – by communicating the basic assumptions, values and norms around which the members of the organization come together and identify with it.

Corporate culture is also an effective tool to help achieve some of the strategic goals of the organization, such as the employee motivation, engagement, and the overall recruitment process (Hutch and Schultz, 1997).

Schein outlines the interconnection between corporate culture development and the process of solving the problems of external adaptation and internal integration by defining the corporate culture as "a pattern of shared basic assumptions that the group has learned as it solved its problems of external adaptation and internal integration that has worked well enough to be considered valid and, therefore to be taught to new members as the correct way to perceive, think, and feel in relation to these problems (Schein, 1992). Once these patterns have been learned they function to reduce anxiety and provide a moment to moment meaning and predictability to daily events. So if the concept of culture is to have any utility, it should draw our attention to those things that are the product of our human need for stability, consistency, and meaning. Culture formation is always, by definition, a striving toward patterning and integration.

These basic assumptions form the basis of Schein's three levels corporate culture model (Schein, 2013). The model comprises of: (1) visible and feelable "artifacts", (2) espoused beliefs and values and or (3) less visible, taken for granted shared basic assumptions. The artifacts include the visible, hearable, feelable manifestations of the underlying assumptions (e.g., behavior patterns, rituals, physical environment, dress codes, stories, myths, products, etc.). Shared values include the espoused reasons for why things should be as they are (e.g., charters, goal statements, norms, codes of ethics, company value statements). Shared basic assumptions include the invisible but superficial reasons why group members perceive, think and feel the way they do about external survival and internal integration issues (e.g. assumptions about mission, means, relationships, reality, time, space, etc.).

According to Schein once a set of shared basic assumptions is formed by this process, it can function as a cognitive defense mechanism both for the individual members and for the group as a whole. In other words, individuals and groups seek stability and meaning. Once achieved, it is easier to distort new data by denial, projection, rationalization, or various other defense mechanisms than to change the basic assumption. Culture change, in the sense of changing basic assumptions is, therefore, difficult, time-consuming, and highly anxiety-provoking – a point that is especially relevant for the leader who sets out to change the culture of the organization. The most central issue for leaders, therefore, is how to get at the deeper levels of a culture, how to assess the functionality of the assumptions made at that level, and how to deal with the anxiety that is unleashed when those levels are challenged (Schein, 2004). So it becomes a question of primary importance for the leaders how to manage the cultural evolution and change in such a way that the group can survive in a changing environment.

When the organization faces challenging events some of these culture elements may appear to be dysfunctional and then changes have to be made. It is not an easy thing because the very function of the culture is to strive to patterning but nowadays there are growing

numbers of situations when the patterns do not work and actions should be taken very urgently in order to protect the organization.

So developing a corporate culture adequate to cope with rapid disruptions needs a complex approach in order to maintain the existing culture in its functional aspects but also be able to detect the right direction and be sensitive enough to adapt corporate culture specifics to meet the main challenges.

Corporate Culture Characteristics of Resilient Organization

The corporate culture of resilient organizations focuses on enhancing the adaptability of the organization by determining the set of principles that guide the development of a strategy to overcome new and unforeseen circumstances. The framework of principles embedded in the corporate culture of a resilient organization makes it possible to observe processes in the triangle problems-solutions-motivation of employees from a different point of view. Adequately motivated and empowered employees become capable of generating a vision of change and finding ways and resources to implement it. Positioned as proactive actors in the organization, they are able to coordinate their efforts for product innovation, alternative solutions and the introduction of new working practices in organizations.

Sheffi brings out four leading features of the corporate culture of resilient organizations that apply to organizations from different spheres of activity (Sheffi, 2005). At a first glance, the free movement of ideas and activities in Dell, efficiency based on stringent regulations in UPS, and the command and control structure of the US Navy appear to have little in common. Yet, says Sheffi, these three organizations are flexible and resilient - they react quickly to disruptions, ensuring that small shocks do not get big. The main features of corporate culture that allow these organizations to respond quickly and flexibly can be defined as:

- Continuous communication among informed employees
- Distributed power
- Passion for the work
- Conditioning for disruption

These characteristics represent a combination of established practices, shared beliefs and values and shared basic assumptions which means that they are successfully integrated into all three levels of corporate culture as defined in Schein's model.

Based on these practices, values and assumptions a network of adequate relationships within the organization is created so that changes in the environment are timely reflected and response is given on time and on the spot, taking into account the overall picture and the organization's role in it.

Continuous Communications among Informed Employees

Fast and flexible organizations continuously transfer information about all aspects of their activities in all directions. For example, Toyota continually gives information about its production to the various units; Dell updates production data to all its managers every hour; UPS maintains its broad network through constant communications; aircraft carrier deck operations are performed under the control of the air wing commander and through constant communication in several interconnected communication networks. When a disruption occurs, these communications provide employees with information about the immediate state of the system so that they can respond intelligently and instantly.

However, intensive communications, under certain conditions, may not achieve the desired result and people may "tune out" if data they receive is irrelevant to them, if they do not trust the sender, if they are not empowered to act in accordance with the information they receive. It is therefore important that they receive the information they need from a source they trust to and have the opportunity to act in accordance with it. This comes into relation with the second characteristic of the corporate culture of resilient organizations - distributed power.

Information on how things are done within the organization is delivered through formal training, job descriptions, and standard operating procedures. Since the organizations described here are large, one can hardly comprehend the complexity of the whole operation. So people can be placed in different positions to build a comprehensive and in-depth understanding of the whole business. Examples include Dell's project teams that are periodically formed and dismantled, as well as the changing positions on an aircraft carrier and between navy ships and shore services, as well as the redirection of UPS managers to different positions in the various subdivisions.

The high intensity of communications brings benefits only if the managers have a thorough knowledge of the activity so that they "know what they are talking about". The leaders of the organizations mentioned here are the ideal examples of such managers. David Abny, CEO and Chairman of UPS, started with the company in 1974 in a small division in Mississippi. Mike Eskew, the former Chief Executive Officer, has been in the company since 1972 and has begun as an engineering trainee. Michael Dell founded Dell and is still very committed to the day-to-day operations of the company. Also the chief petty officers, who in practice can run any navy ship, change positions on different ships, so with their long experience they transmit the "naval way" to the new officers.

All these organizations constantly train new people and develop processes to ensure that they hire the right people. In this sense, hiring a large number of people is not seen as a problem, but rather as an opportunity to employ the types of individuals most likely to fit into the company and then be indoctrinated within the corporate culture.

Since 1984 Dell has grown from a single entrepreneur in a Texas dorm room to a global manufacturer with more than 50,000 employees. UPS from the Seattle bicycle messenger service (founded in 1907) became the world's largest package delivery company, then became a technology company, an international operator and an airline. Each phase

requires the recruitment of thousands of people and they become part of the corporate culture.

When Toyota expands to the United States, it employs thousands of American workers to produce cars of comparable quality to their Japanese counterparts. Toyota avoids hiring American car industry workers and prefers to hire employees without previous manufacturing experience to train them in their own processes and culture. Their success has shown that it is the processes and culture that make Toyota successful, not the origin of the workforce.

The US Navy is also an example of a truly impressive success in recruiting and indoctrinating people in the organization. The Navy continually introduces new employees to their aircraft carriers, educates them and gives them significant responsibilities at an early age (the average age of 9000 sailors in Theodore Roosevelt battle group and of 5000 Amphibian sailors is 22-23 years old).

All these organizations constantly transfer knowledge and cultural norms to new people and people to new positions. This knowledge transfer supports the organization's culture and the way it functions. It takes place through the artifacts (such as the dress code, the benefits for the employees, etc.), the accepted values (stated in the mission) and the shared basic assumptions, integrated with the corporate culture. In this way the proper understanding about the functions and the place of each employee within the organization represents an adequate basis for taking part in the process of continuous communication. This refers also to the high-level managers who also have a deep understanding of the specifics of different positions and thus they are able to adapt their communication messages and behavior since they have usually gained tremendous experience before taking the command.

In a conclusion Sheffi points out that communicating with employees on a strategic level (regarding the mission and the strategy of the company), a tactical level (the main hurdles and main initiatives this quarter and this month), and an operational level (the current status of the production, shipments, cash flow, inventories, and commitments) keeps everybody "on the same page." (Sheffi, 2005). Coupled with empowering employees to take actions when necessary, such extensive communications allow them to contribute efficiently to flexible operations.

Distributed Power

In situations that require an immediate response, flexible organizations allow and empower individual actions by the "first responders". These are the people who are on the front line and have to act immediately. They will most likely notice the problem first and their immediate reaction can prevent expanding it.

The distributed power and empowerment is an indispensable feature of successful and flexible organizations. For example, every Toyota worker can report a quality problem if he finds one. Within seconds, supervisors and specialists will get to the spot and try to solve the problem. If the problem cannot be eliminated within 60 seconds, the production line will stop and the problem will be resolved before restarting the line. Providing such

responsibilities at the lower levels in the organization is one of the ingredients of Toyota's success; this allows the system to react quickly before a large number of defective cars continue down the line, which would then require a costly production to be processed.

To be successful, the employees need to know and accept the organization's overall mission, as well as to be aware of what its current situation is, so that they can take the right actions, which is the essence of the first corporate culture characteristic of the resilient organizations – continuous communication among informed employees. In addition, they must have the power and orientation to take action and, moreover, to be rewarded for their initiatives and not to be penalized for wrong steps when under pressure.

Similarly, some retailers are much more flexible and faster than others to meet the inconsistent demand of fashion clothing consumers. The Japanese retailer World and the Spanish Zara need only three weeks production lead time (compared to the industry average of six to eleven months) and it takes a total of six weeks for them to introduce a new product (compared to the industry average of one to two years), and also managed to turn their inventory ten times a year (compared to the industry standard, which is six times). An important component in their success is the empowerment of product development, production and marketing teams so that they can cope with the challenges immediately and without headquarters approval. Managers from these departments meet every day to plan their response according to daily sales data from the stores. They have the power to change the product design in order to respond to sales trends and solve the shortage of goods.

When Southwest Airlines faces the problem of paying tens of millions of dollars per year for the use of the computerized reservation systems of the major international companies, their competitors in fact, Herb Kelleher decided to develop Southwest Airlines own electronic system (Kelleher, 1997). It turns out that people from several departments have already gathered, they have taken into account the situation and have already been working on a system, without even Kelleher or the other Southwest Airlines leaders to know about it. Such an initiative is an example of how the empowerment principle works, which includes anticipating the crisis, taking action without asking for permission, bringing together a group of experts and working on a solution. This is possible precisely because Southwest Airlines culture encourages and rewards such an attitude.

Similarly, within high-reliability organizations to take responsibility is encouraged, which allows decisions to "migrate" together with problems. According to Kareva, when decisions are needed, they depend not so much on the organizational structure or the hierarchical rank, but on the expertise and the experience. As a result, a wider range of options and solutions are available to overcome a wider range of issues (Kareva, 2019).

In his book on World War II, Stephen Ambrose states that part of the superiority of the US Army is rooted in the empowerment of soldiers to make decisions on the ground (Ambrose, 1998). In the complex situation of the battle, he said, the senior officers had no clear idea of the battlefield, and neither the Americans nor the Germans were prepared for some of the cases. Advantageously, the US commanders of the battle units are on the move to take the initiative and improvise. His argument is that, as a whole, the German army is rather commanding and controlling and, as a result, reacts too late or inappropriately to the changing conditions and requirements of the battlefield.

Similar is the concept of the East for the governance, where it is believed that "the Emperor of All-under-Heaven Empire" must rule "at the will of Heaven" in an indirect but as wise manner" (Ivanov, 2018, p. 107) for which he has rulers and generals – enough prepared for that and sensitive to the changes in the environment (internal and external). Qualities that are set in direct correlation with the third characteristic of a resilient organization, namely passion for the work.

Sheffi concludes that teams trained to morph quickly as the rules of the game change respond better not only to demand fluctuations, but also to unexpected disruptions. In the context of disruption management, hectic environments may actually condition an organization to manage disruptions well (Sheffi, 2005). Examples include Zara's continuously changing product designs, Dell's stretch goals, and UPS's continuously exposed operations. These environments help "sensitize" employees to the demands imposed by the high-impact disruptions.

Passion for the Work

Flexible organizations have yet another common element that usually underlies the values and corporate culture. This element is the personal, deep-rooted concern and responsibility to work for the company, called passion for the work. This type of attitude towards work may still be defined as urgency, alignment, or mindfulness[3]. The notion of mindfulness refers to the corporate culture of high-reliable organizations such as airline companies, nuclear power plants, and others. For them, the culture and the climate of safety are of a key importance and are a subject to an in-depth research regarding the role of the technical, human and organizational factors (Kareva, 2016).

In the private sector, this dedication and alignment with corporate goals is often promoted by the possibility to acquire shares and other success-sharing mechanisms that synchronize the financial success of the organization and the individual success. 3,500 of the people in Dell own shares from the company and this is a serious incentive to work for the company's success. The UPS has thousands of employees and managers who own stocks, and they actually hold 90 percent of the shares and 99 percent of the voting rights (Kelleher, 2003). However, cash incentives or stocks are not the only or even the most effective way to encourage passion for the work. Many companies provide the option to acquire shares and do not achieve such results, while others do not make it but still they are very flexible and resilient and have employees who are very careful in their jobs. Neither Toyota nor the US Navy give the opportunity to acquire shares to motivate their employees.

Flexible and fast-reacting companies bring employees' interests into a line with the interests of the organization. They seem to succeed in this at a fundamental level – their employees are deeply identified with their company. Such employees fulfill their personal needs when the company succeeds since they are achieving self-actualization in this process (Maslow,

[3] The term mindfulness is used to describe high-reliability organizations (such as aircraft carriers, nuclear power plants and firefighting crews) by Karl Weick and Kathleen Sutcliff, Managing the Unexpected: Assuring High Performance in the Age of Complexity, University of Michigan Business School Management Series (San Francisco: Jossey-Bass, 2001).

1970). While the employees of most organizations are looking to do their job well, the members of resilient organizations really take their commitment to this, creating the flexibility and resilience of the organization.

This passion for the work usually manifests itself as a combination of pride and humility. Pride is a part of the belief that the company's business represents a cause and not just a business venture: UPS people truly understand that the packages they deliver are a part of their clients' lives and therefore the packages must be delivered on time. Don Schneider, chairman of Schneider National, the largest truck company in the United States, motivates its employees, stressing that Schneider National is not actually in the truck business. According to him, Schneider works to raise the living standard of its clients and of the nation as a whole by providing a cheap transport service. Since the transport is included in the price of all products, the company brings value to the nation by providing affordable goods. As the CEO of Southwest Airlines says that it is important that the builder understands that he is building a home rather than just laying bricks (Kelleher, 1997). Fleet officers also think about what they do not in the terms of driving big ships, but as a dedication to the nation's defense of sovereignty and freedom.

The other part of the dedication manifested by the flexible organizations is humility. The employees of these companies are never satisfied, always recognizing that they can do better. When a Dell unit got excellent results, Michael Dell says he is pleased ... but not satisfied because they can do more and better. Although such senior managers are proud of their organizations, they are also humble about what they have not yet achieved, knowing they could and should improve.

Andrew Grove, former CEO of Intel, promotes the idea of a so-called "paranoid" culture that constantly seeks threats and potential interference. He proclaims a way of thinking that constantly questions common wisdom and beliefs in order to maintain vigilance against new and evolving threats. Instead of looking at himself as the dominant market leader as he is, Intel follows every move of his competitors and customers and looks after his own future, fearing new competition from unexpected countries. And perhaps because of this healthy skepticism, Intel continues to dominate the industry.

At Toyota, any form of inefficient spending of resources creates dissatisfaction. The company is constantly making efforts to prevent practices that lead to resource spending without adding value: overproducing; wasting time; unnecessary transportation; overprocessing; excess inventory; excess motion of operations and workers; and scrap and rework (Mika and Sensei, 2001). The company disseminates information about inefficient spending of resources internally so that employees and managers be able to focus on what is rather wrong in their business than on the impressive market results of the company. UPS's founder, Jim Casey, calls this combination of pride and humble "constructive dissatisfaction," given the company's striving to constantly improve by saying that "once you decide you're pretty good, you will no longer feel the desire to do something better" (Sheffi, 2005).

Such culture means that employees are treated with respect and are given information and training, yet they are expected to go beyond the call of duty and "go through walls" to achieve corporate goals. Such attitudes not only characterize high-performing organizations

in general, they are likely to be the difference between making it or not making it during a disruption.

Conditioning for Disruption

Resilient organization appear to be conditioned to be innovative and flexible in the face of low-probability shocks and a high degree of impact by being forced to meet often and almost continually "small" challenges. UPS, like FedEx and other carriers, operates a huge network depending on weather, traffic congestion, city construction and many other daily disruptions. Dell operates in the hi-tech industry, subject to widely changing demand patterns, continually introducing new components and a global supply chain where something new happens every day. Intel, in addition to daily business fluctuations, tests additional situations of process uncertainty through simulated shocks and response training, preparing the company for a wide range of possible threats.

Preparedness for shocks develops the culture of the organization and its readiness to respond to the situations that have arisen. The frequency and broad range of "normal" (or simulated) shocks builds a "be prepared for everything" mentality that penetrates the company. Albert Wright, of UPS, defines a quality new state of thinking that is being reached in response to daily interruptions, saying it includes the understanding that shocks are seen as something really normal in UPS.

In this sense, regular, small failures are actually essential to the development of resilience - they allow the system to release and then reorganize its resources. More broadly, resilient systems fail "elegantly" – they apply strategies to avoid dangerous circumstances, detect breakthroughs, minimize and isolate damage, diversify the resources they use, operate with reduced capacity when needed, and self-organize to recover in the event of a concussion. No such system is perfect, in fact it is the opposite. Zolli and Healy make the following analogy: "the resilient organization is like life, unordered and imperfect, but it survives" (Zolli and Healy, 2012, p. 14). Systems that look perfect are often the most fragile, while dynamic systems, which happen to fail from time to time, are actually the most resilient.

In conclusion

These key features of corporate culture stay at the heart of the development of resilience in organizations. Continuous communication between informed employees is a prerequisite for a clear assessment of the actual situation in the organization at a given time and for filtering the important from the minor. Passion for the work is a prerequisite for a careful tracing of the opportunities and threats in different situations. Preparedness to act in turbulent conditions develops the overall capacity of the organization and creates skills for dealing with them by each employee.

In this way, provided with the necessary information devoted to what they are doing and prepared to respond to various unexpected situations, the employees of the resilient organizations are really able to act quickly and adequately on the spot in case of shocks.

That is why they have been delegated power to do so as a fourth element, forming the corporate culture of resilient organizations.

Trained and empowered in this way, the employees located on the periphery of the organization where the challenge first arises, operate on the basis of their delegated rights and support from senior management at the center of the organization. Using this synergy, resilient organizations are able to respond adequately to external pressures and continue to fulfill their primary purpose.

The combination of these four features makes it possible for the organization to respond adequately to changing circumstances on the one hand and also to find niches to perform within which are basically the two main aspects of resilience. The possibility to find a niche is directly related to the idea that depending on the challenge faced by organizations, resilience does not always mean returning the system to its original state. Although some resilient systems really return to their baseline condition after a concussion or radical change in the environment, this is not always the case. It is possible that resistive systems do not have a basic state to return to - they can reconfigure themselves continuously, to make changes in their corporate culture as well and fluently to adapt to ever-changing circumstances while at the same time continuing to do their job.

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ИКОНОМИЧЕСКИ ИЗСЛЕДВАНИЯ
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THE APPROACH TO TAX DEBTORS SEGMENTATION

A segmentation-based tax debt management is the most perspective way to improve tax collection. Despite the innovations in the tax debtor segmentation the amount of the tax debt in most countries continues to be grown. Especially the share of an "old" debt remains high. It actualizes the further search of the alternative ways to tax debtor segmentation. The authors suggest to segment tax debtors on the debt nonpayment risk estimation. They form the segments that mean the risk category. Each segment consists of the sub-segments divided according to the criteria of the tax debt amount and age. Using the method of risk integrate estimation the authors determine the marginal indicators according to which the tax debtors should be distributed under the sub-segments. The indicators chosen for risk estimation mirror the propensity to pay and capacity to pay. The authors suggest the strategies of tax debt management for each sub-segment of the tax debtors. They reflect such way of interrelations between the fiscal authorities and tax debtors, in which the tax debtors have the opportunity to pay independently without enforcement, and each subsequent stronger impact on the debtor depends on its reaction to the previous intervention. The debtor moves to the next category of risk, if within a certain time he did not respond to a softer strategy. The main goal of such approach is to provide the tax debt repayment on the early stages of its emergence and prevent it from aging.
JEL: C38; C58; G41; H26

1. Introduction

Despite the innovations in tax administration the amount of tax debt each year increases. According to the State fiscal service of Ukraine official data, since 2000 to 2019 the tax debt increased by 10 times (from 10 bln UAH in 2000 to 101 bln UAH as of 2019) but the

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highest rate of increase was observed since 2014. At the moment the total sum of tax debt equals 10% of GDP of Ukraine.

The problem of tax debt is of a crucial importance not only for Ukraine. Most counties of all over the world, as mentioned in the OECD reports (2014, 2015, and 2017), have increasing tax debts trends. The correlation analysis between data of GDP and tax debt in Ukraine shows that along the GDP growth the tax debt also races. It may indicate a particular type of taxpayers' behavior. We mean that increase in the tax base leads with the increases in the amounts of tax liabilities. Some taxpayers conduct business but do not pay taxes. Such behavior has negative impact on both state budget revenues, tax culture and business climate in the region or in the country at all. The constant increase in the tax debt and low level of paying tax liabilities by tax debtors' evidence that the methods of tax debt management in Ukraine have to be improved. And extremely important for this is to improve the strategies of tax debt management.

The experience of numerous countries demonstrates that the segmentation-based tax debt management is the most resultative one. The state fiscal authorities in Ukraine have never previously made a segmentation of tax debtors in order to develop appropriate strategies of working with such tax debtor and improve tax debt management at all. Now it is one of the main tasks of the fiscal authorities in Ukraine. Moreover, despite some advance in the topic of the taxpayer segmentation in the European countries the revenue authorities of a lot of them search new alternative approaches how to group tax debtors and what strategies should be applied to them for providing tax collection. Therefore, the case of Ukraine could be valuable and informative to the authorities and researches in the European countries too.

2. The Related Works, Database and Methodology

2.1. The related works

The various approaches to the segmentation of tax debtors are systematized and represented in the reports of OECD (2013, 2014, 2017), IOTA (2016) and consulting firm McKinsey & Company (2008-2009). They state that the stages of segmentation in the analyzed countries are different. It means that there is no unified logic of this process. The criteria and indicators that are used for segmentation also vary. But despite differences, most of segmentation strategies are based on risk estimation. The taxpayers' behavior is taken into consideration in segmentation process. All approaches and technologies of segmentation mirror scientific findings in the field of tax compliance (Wenzel, 2002), tax morale (Erzo, Singhal, Singhal, 2014), tax avoidance and tax evasion (Hacking, 2006; Schneider, Kirchler, Maciejovsky, 2003).

Dohrmann and Pinshaw (2009) use three groups of performances for tax debt and debtors segmentation: 1) taxpayers' characteristics; 2) debt characteristics; 3) risk/complexity to collect tax. Such characteristic as compliance history (the first of mentioned groups), value of debt (the second group), financial situation of taxpayer and taxpayer trustworthiness and willingness to pay (the third group) are very important and will be used in our approach to tax debtor segmentation. We also have to note that in most cases the scholars reveal a

segmentation of taxpayers, not tax debtors. But the approaches and fundamentals of such segmentation is extremely useful for our research. The fact is that the segmentation of taxpayers is important for the proper organization of tax administration. It is built on the study of the behavior of taxpayers, their attitude to tax compliance. The taxpayers are divided into some groups, to each of which the respective management strategies are applied. Similarly, the taxpayers who have a debt may have different reasons for failure to pay taxes on time, and also have a different attitude towards their obligation to pay off tax debt. Very often the taxpayer segmentation is the starting point for further segmentation of tax debtors. Usually taxpayers are divided into such groups: 1) large; 2) medium and small; 3) separate taxpayers (OECD 2014). Rassel (2010) divides them into: 1) individuals; 2) micro and small businesses; 3) medium-size businesses; 4) large businesses; 5) non-profit organizations; and 6) government organizations. Than the sub-segments are formed under the amounts of the tax debt and behaviour of taxpayers.

Stankevicius and Kundeliene (2017) suggest following taxpayer's behavioural risk stage: 1) determined not to comply; 2) unwilling to comply; 3) want to comply, but doesn't always succeed; 4) have an intention and can comply. The same we can say about tax debtors. We are using this approach for segmentation tax debtors in Ukraine. More detail explanation is presented in section 3 of this article.

2.2. Database and methodology

First of all, we should provide an answer to "What should be segmented?". Answering this question, we have to understand what exact information about tax debtors is available for researchers. In Ukraine such information is represented on the official webpage of the State Fiscal Service of Ukraine (as of 01.02.2019) and designed in the following way (table1).

Table 1

Frame of the information base about the tax debtors in Ukraine

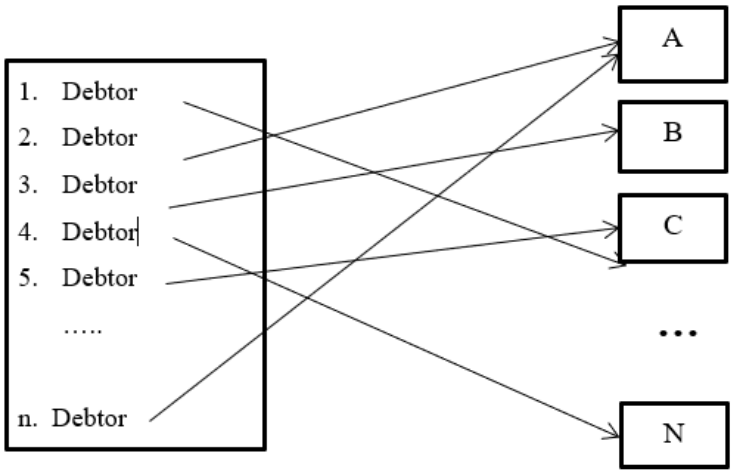
№	Name of legal entity Name, surname of physical person	Code in the Unified State Register of Enterprises and Organizations of Ukraine	Name, surname of the legal entity or entrepreneur head	Name of the territorial body of the State Fiscal Service of Ukraine (SFSU)	Name, surname of the SFSU unit head	The amount of the tax debt to the State budget	The amount of the tax debt to the local budget
1							
2							
…							
n							

According to the data officially presented on the site of the SFS of Ukraine as of January 1, 2019 the number of the total tax debtors equals to 953.9 thousand (physical and legal entities) and the aggregate amount of the tax debt is UAH 99498 million. To manage such a huge quantity of tax debtors is not an easy thing. Our task is to segment 953.9 thousand

debtors into some groups on the risk-based approach (figure 1). We mean the risk of tax debt nonpayment.

Figure 1

The task of tax debtors' segmentation



Comparing table 1 and figure 1 we can conclude that the available official information is not enough for the achievement of the set goal. There are not any indicators to determine propensity to pay and capacity to pay. So, we should define the necessary indicators, substantiate the stage, segments and sub-segments and then suggest the strategies for each segment of the tax debtors.

The research methodology relies mostly but not only on statistical and economical-mathematical methods of analysis. On the basis of analyzing frequency and grouping of tax debtors by the sum of tax debt, the optimal intervals of tax debt's value and subgroups of taxpayers' debt duration are discovered. The risk category of tax debtors is defined on the basis of applying integral assessment, probability intervals and method of coefficients. As a result of the coefficient analysis under the proposed groups the integral indicator for each segment of tax debtors is calculated. The method of logical conclusions was applied to substantiate the indicators and their weighing coefficients that should be used for integral assessment of tax debtors' behavior risk as well as for the description of variants of the strategies that can be applied to each of the defined segments of tax debtors. The idea of the research is to show approach to the segmentation of tax debtors into groups and subgroups and highlight the possible strategies that could be applied to each segment of tax debtors, but not conduct the actual segmentation of tax debtors. The statistical data on total sum of tax debt and within tax debtors is based on official data of State Fiscal Service of Ukraine, Accounting Chamber of Ukraine and Ministry of Finance of Ukraine. It is expected that the further researches will be focused on approbation of the developed methodology of tax debtor clustering in collaboration with the State fiscal service of Ukraine.

3. Results

Considering, that the risk of not paying tax debts by a certain taxpayer is in the basis of tax debtors' segmentation, it is necessary to determine the indicators which should be used for risk assessment.

According to our point of view, tax debt repayment depends on:

1) Liquidity and debtor solvency;

2) Property status of the debtor;

3) Behaviour of the debtor concerning the performance of tax liabilities.

The coefficients of debtor's liquidity and solvency should be estimated on the basis of financial statements analysis. From the entire set of possible indicators to conduct such an assessment, the following indicators should be used:

- Absolute values: gross income from the sale; profit; balances on accounts;
- Relative values: coefficient of current liquidity; coefficient of quick liquidity; coefficient of absolute liquidity; profitability of sales; profitability of assets; coefficient of financial independence; ratio of own and borrowed funds; credits-to-receivables ratio; balances on accounts to tax debt amounts ratio.

In the context of the prospects of tax arrears repayment the property status of the debtor should be assessed on the basis of the following indicators:

- Absolute values: residual value of fixed assets;
- Relative values: fixed assets' residual value to the tax debt amount ratio; equity to total sum of fixed assets ratio.

The debtor's behaviour and attitude to tax compliance could be assessed on the basis of his payment discipline in the retrospective (in previous reporting periods) and indicators of business' fictitiousness

The taxpayers' payment discipline can be estimated by the following indicators:

- volume of the aggregate tax debt (in dynamics);
- frequency of the tax debt occurrence during the last 3 years (times);
- period of the tax debt repayment (days).

Business fictitiousness could be estimated by a set of indicators:

- addresses of registration (the registration at the addresses of taxpayers' mass registration may indicate the fictitiousness of legal entity);
- residual value of fixed assets (is already included into the group of indicators characterizing the property status);

- number of employees in the company (for example when director and accountant is one person, or the enterprise has fewer than 2 registered employees).

These groups of indicators (liquidity, solvency, debtor's property state and its behaviour) should be described (and prioritised) in the degree of significance (weighting) in terms of the probability of the tax debt repayment. In our opinion, debt repayment depends primarily on the solvency of the debtor, because, even if the residual value of the assets does not cover the amount of debt, but the degree of business activity is high, so it generates incoming cash flows on the enterprise and raises the likelihood of paying off debts. Therefore, this group of indicators ranks first in our rating of significance. To quantify the parameters of risk, in order to apply a methodology of integral assessment, this group of indicators is provided with a weighted value of 50% (or 0.5).

The indicators of property state should be on the second rank, as the sufficiency of property is the guarantee of tax debt repayment due to the sale of property, if even the debtor cannot repay for its obligations within a specified time. The weight coefficient for this group is 30% (or 0.3).

The behaviour indicators are important, but we give them third rank, as even if the payer's wish to repay the debt, it will be impossible to do this if there is no property or business activity. The weight coefficient for this group is 20% (or 0.2).

There should be noted that accuracy is not of a crucial importance for quantify weight coefficients. The main task is to preserve the group order of indicators depending on their priority.

Considering that we outlined three groups of indicators to reveal the risky debtors' categories, we need to define the possible combinations of these groups of indicators. Taking into account the above weighing coefficients, the following matrix of combinations was received (table 2).

Table 2

The risk categories of debtors based on the possible combinations of matrix groups selected for risk assessment

Risk indicators	Combination of groups of indicators for risk assessment							
Liquidity and solvency	+	+	+	+	-	-	-	-
Property status	+	+	-	-	+	+	-	-
Debtor behaviour	+	-	+	-	+	-	+	-
Group of risk	I	II	III	IV	V	VI	VII	VIII

The data in table 2 indicates eight possible combinations of the indicators listed above. So, 8 risky debtors' categories can be defined. The results of the parameter estimation of risk, taking into account the weighing coefficients presented in table 3.

Table 3

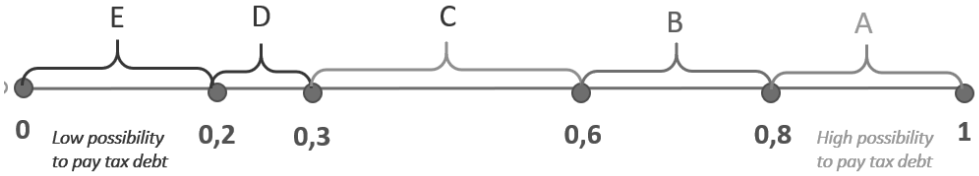
The quantitative estimation of the parameters for distinguishing risky categories of debtors

Group of risk		I	II	III	IV	V	VI	VII	VIII
Indicators	Weighing coefficient of group indicators								
Liquidity and solvency	0.5	0.5	0.5	0.5	0.5	0	0	0	0
Property status	0.3	0.3	0.3	0	0	0.3	0.3	0	0
Debtor behaviour	0.2	0.2	0	0.2	0	0.2	0	0.2	0
The integral indicator to determine the risk category (when risk grow and the probability of debt repayment decline)		1	0.8	0.7	0.5	0.5	0.3	0.2	0
Risk category (where A is the lowest risk, E is the highest risk)		A	B		C		D		E
The probability interval of tax debt repayment		0.8-1.0	0.6-0.79		0.30-0.59		0.20-0.29		0-0.19

Table 3 shows that there is a possibility of combining those groups where the same integral indices are obtained, or the indices with a nonessential deviation. At the same time the priority to repay the debt is guaranteed. In particular, groups II and III, IV and V, as well as VI and VII can be combined. Thus, we get 5 risk groups of debtors, which are assigned with abbreviations A, B, C, D, E (Figure 2).

Figure 2

The scale of the risk categories of nonpayment tax debt



Group A includes debtors, the probability of repayment of tax debts for which is from 0.8 to 1. Group B includes debtors, the probability of repayment of tax debts for which is from 0.6 to 0.79, in group C – from 0.3 to 0.59, in group D – from 0.2 to 0.29, in group E – tax debtors, the probability of tax debts repayment for which is less than 0.2.

It is also necessary to determine a zero category of tax debtors (0), whose debt is not more than 1020 UAH. In accordance with Ukrainian legislation, the State fiscal service of Ukraine cannot apply any measures of influence in order to recover the debt to this category of debtors. At the same time this group of debtors is quite numerous: as of February 2019 almost 40% of debtors-legal entities had the tax debt in the amount that not exceeded 1020 UAH. We consider, that some economically efficient measures of influence on such tax debtors must be applied. If do not react on such amount of debt, in the future they can grow. By reducing a significant number of the debtors with small amounts of debt, which have a high probability of repayment in case of timely response and informing it is possible to improve the performance of the State fiscal service of Ukraine, as well as to facilitate the management of the tax debtors with significant amounts of debt, or with low risk of failure to pay.

To determine the risk category for each individual debtor, it is necessary to establish the quantitative parameters. In relation to these parameters each of three selected groups of indicators (liquidity and solvency, property state and business fictitiousness) will be assessed.

We consider that to assess the risks, the actual indicators should be compared to their normative values, and take into account the weight coefficients within the separate groups (table 4). For liquidity, financial independence, financial stability and credits-to-receivables ratio we propose to use generally accepted values, which are theoretically justified and are being used in the analysis of the financial state of the entity. It is quite difficult to substantiate the normative value for profitability indices, because the average indices differ by branches of economic activity. We offer to use a minimum indicator that indicates revenue (return on assets) and profit (sales profitability). It means that the company is economically active and has the potential of debt repayment.

When setting the normative value for indicators of property status, in particular, the ratio characterizing the balance of funds on accounts and the amount of tax debt, we proceeded from the fact that the risk-free situation is a state where the amount of funds is sufficient for repayment of the tax debt, that is, both indicators are approximately equal. Consequently, normative value is 1. Similarly, we reasoned on the substantiation of normative values for fixed assets' residual value to the tax debt amount ratio, equity to total sum of fixed assets ratio. Thus, for the first of these two indicators, "1" means that in the case of the sale of fixed assets, the amount of proceeds will be sufficient to repay the tax debt. This is a risk-free situation for the state as a subject of taxation. For the second indicator, "1" means that the fixed assets are not in credit purchased; therefore they can be transferred to the tax pledge. That is why it increases the probability of the tax debt repayment (Table 5).

Table 4

The algorithm for calculating the risk index for the group of indicators of liquidity and solvency (α)

Indicators	Symbolic marking	actual value	Table/normative value of indicator	The correspondence of the actual value to the table (0-1)	weighing coefficient	Estimated	Condition for Calculating Column 3
		1	2	3 (see 6)	4	5 = 3*4	6
Coefficient of current liquidity	K1		2	Automatically calculated	0.1	Automatically calculated	If ≥ 2 = 1, if < 2 = 0
Coefficient of quick liquidity	K2		0.6	Automatically calculated	0.1	Automatically calculated	if ≥ 0,6 = 1, if < 0,6 = 0
Coefficient of absolute liquidity	K3		0.1	Automatically calculated	0.1	Automatically calculated	if ≥ 0,1 = 1, if < 0,1 = 0
Profitability of sales	K4		0.01	Automatically calculated	0.1	Automatically calculated	if ≥ 0,01 = 1, if < 0,01 = 0
Profitability of assets	K5		0.01	Automatically calculated	0.1	Automatically calculated	if ≥ 0,01 = 1, if < 0,01 = 0
Coefficient of financial independence	K6		0.5	Automatically calculated	0.1	Automatically calculated	if ≥ 0,5 = 1, if < 0,5 = 0
Ratio of own and borrowed funds	K7		1	Automatically calculated	0.1	Automatically calculated	if ≥1 = 1, if <1 = 0
Credits-to-receivables ratio	K8		1	Automatically calculated	0.1	Automatically calculated	if ≤ 1 = 1, if < 1 = 0
Balances on accounts to tax debt amounts ratio	K9		1	Automatically calculated	0.2	Automatically calculated	if ≥1 = 1, if <1 = 0
Total							

Note. The table only shows the actual values of the indicators (in column 1.) All other indicators are calculated automatically, taking into account the constraints indicated in column 6 and the weighting factors indicated in column 4. For further calculations of the risk index, the value of the amount by column 5 is used.

Table 5

Algorithm for calculating the risk index for a group of the property status indicators (β)

Indicators	Symbolic marking	actual value	Table/normative value of the indicator	The correspondence of the actual value to the table (0-1)	weighing coefficient	Estimated	Condition for Calculating Column 3
		1	2	3 (see 6)	4	5 = 3*4	6
Fixed assets' residual value to the tax debt amount ratio	K10		1	Automatically calculated	0.6	Automatically calculated	if ≥1 = 1, if <1 = 0
Equity to total sum of fixed assets ratio	K11		1	Automatically calculated	0.4	Automatically calculated	if ≥1 = 1, if <1 = 0
Total							

Note. The table only shows the actual values of the indicators (in column 1.) All other indicators are calculated automatically, taking into account the constraints indicated in column 6 and the weighting factors indicated in column 4. For further calculations of the risk index, the value of the amount by column 5 is used.

For a group of indicators that characterize the debtor's behavior, we also proceeded from logical considerations. Thus, the increase of the total tax debt, firstly, increases the risk of its failure to pay, and secondly, can characterize a certain stereotype of the taxpayer's behavior, especially if indicators of solvency are normal. The rate of the tax debt frequency should be justified on the basis of taxpayers' personal cards analysis, at least, for sample of debtors. Since we do not have excess to such data, we came out with the fact that according to the legislation the tax period for VAT is 1 month, and for the income tax is 1 quarter (these two kinds of taxes, on the one hand, have the highest fiscal significance in Ukraine, and on the other hand the value of the tax debt for these taxes is the highest too). If the tax debt of VAT appears 2 times per year, and income tax is 1 time, plus the fourth case we "reserved" for any other tax, then this situation is not a risky or has little risk for the state. Although our opinion on this issue is not uncontroversial and could be discussed. The debt repayment period also characterizes the taxpayer behavior. If the debt is repaid within 60 days by the taxpayer independently, then this situation is not risky. The average period of tax debt repayment can be determined for the previous year or previous 3 years based on personal tax cards data. In assessing the risk of nonpaying tax debt, we also need to consider the address of the payer. The address at the place of mass registration of business entities may indicate the fictitiousness of the business entity, and therefore the risk of failure to pay is increasing. To the number of employees we can say that unfortunately, the

current legislation does not establish a number of employees, which is minimal for the recognition of the subject of business as a legal entity. We consider the fact that the company should have at least a head (director) and financially responsible person (accountant). Therefore, the number of employees must be at least 2 (table 6).

Table 6

Algorithm for calculating the risk index for a group of the tax debtor's behavior indicators (γ)

Indicators	Symbolic marking	actual value	Table/normative value of indicator	The correspondence of the actual value to the table (0-1)	weighing coefficient	Estimated	Condition for Calculating Column 3
		1	2	3 (see 6)	4	5 = 3*4	6
volume of the aggregate tax debt increases	K12		no	Automatically calculated	0.2	Automatically calculated	if yes = 0, if no = 1
frequency of tax debt occurrence during the last 3 years	K13		4 times	Automatically calculated	0.25	Automatically calculated	if ≤ 4 = 1, if > 4 = 0
period of tax debt repayment	K14		60 days	Automatically calculated	0.25	Automatically calculated	If less 60 days = 1; if from 61 to 1 year = 0,5; if from 1 year to 3 years = 0,2; if more than 3 years = 0
addresses of registration (registration at the addresses of taxpayers' mass registration)	K15		no	Automatically calculated	0.2	Automatically calculated	if yes = 0, if no = 1
number of employees in the company	K16		2 persons	Automatically calculated	0.1	Automatically calculated	If ≥ 2 = 1, if < 2 = 0
Total							

Note. The table only shows the actual values of the indicators (in column 1.) All other indicators are calculated automatically, taking into account the constraints indicated in column 6 and the weighting factors indicated in column 4. For further calculations of the risk index, the value of the amount by column 5 is used.

In general, the risk-category identification algorithm for each individual tax debtor is that the actual value is compared to the normative (or table measure) and its correspondence is determined. Quantitatively the correspondence can be evaluated in different ways:

1) 1 – if corresponds to a criterion, 0 – if not responding;

2) from 0 to 1 according to the degree of deviation from normative value.

Then, a weight coefficient is applied and the evaluation indicator is determined. With the use of Excel software as a result of applying the appropriate formulas, the risk category for each tax debtor is determined automatically according to its actual indicators (taxpayer's tax card, financial statements No1, No2) and specified with above-outlined probability intervals (table 3).

The system of equations to assess the debtor's risk is as following:

$$\begin{cases} R = 0{,}5\alpha+0{,}3\beta+0{,}2\gamma \\ \alpha = 0{,}1\cdot K1+0{,}1\cdot K2+0{,}1\cdot K3+0{,}1\cdot K4+0{,}1\cdot K5+0{,}1\cdot K6+0{,}1\cdot K7+0{,}1\cdot K8+0{,}2\cdot K9 \\ \beta = 0{,}6\cdot K10+0{,}4\cdot K11 \\ \gamma = 0{,}2\cdot K12+0{,}25\cdot K13+0{,}25\cdot K14+0{,}2\cdot K15+0{,}1\cdot K16 \end{cases}$$

де, K1 = 1 *if* $\frac{\text{Current asset}}{\text{Current liabilities}} \geq 2$, *if not* K1 = 0

K2 = 1 *if* $\frac{\text{Current asset - Inventory}}{\text{Current liabilities}} \geq 0{,}6$, *if not* K2 = 0

K3 = 1 *if* $\frac{\text{Cash}}{\text{Current liabilities}} \geq 0{,}1$, *if not* K3 = 0

K4 = 1 *if* $\frac{\text{Profit}}{\text{Sales}} \geq 0{,}01$, *if not* K4 = 0

K5 = 1 *if* $\frac{\text{Profit}}{\text{Average annual value of assets}} \geq 0{,}01$, *if not* K5 = 0

K6 = 1 *if* $\frac{\text{Equity}}{\text{Total assets}} \geq 0{,}5$, *if not* K6 = 0

K7 = 1 *if* $\frac{\text{Equity}}{\text{Current liabilities}} \geq 1$, *if not* K7 = 0

K8 = 1 *if* $\frac{\text{Current accounts payable}}{\text{Current Accounts receivable}} \leq 1$, *if not* K8 = 0

K9 = 1 *if* $\frac{\text{Balances on the accounts}}{\text{Tax debt}} \geq 1$, *if not* K9 = 0

K10 = 1 *if* $\frac{\text{Fixed assets}}{\text{Tax debt}} \geq 1$, *if not* K10 = 0

K11 = 1 *if* $\frac{Equity}{Fixed\ assets} \geq 1$, *if not* K11 = 0

K12 = 0 *if* $\frac{Tax\ debt1}{Tax\ debt0} \geq 1$, *if not* K12 = 1

K13 = 1 *if* $H \leq 4$, *if not* K13 = 0

K14 = 1 *if* $less\ 60\ days$, *if more than 61 and less than 365 days* = 0,5, *if more than 366 and less than 1095 days* = 0,2, *if not* K14 = 0

K15 = 0 *if* yes, *if not* K15 = 1

K16 = 1 *if* $Kpersons \geq 2$, *if not* K16 = 0

$$\begin{cases} if\ R \leq 0,19 \rightarrow E, \\ if\ R \geq 0,2\ \&\ \leq 0,29 \rightarrow D \\ if\ R \geq 0,3\ \&\ \leq 0,59 \rightarrow C \\ if\ R \geq 0,6\ \&\ \leq 0,79 \rightarrow B \\ if\ R \geq 0,8 \rightarrow A \end{cases}$$

Each risk category must also be divided into subsegments, according to the value of the tax debt and its duration.

The distribution under the tax debt amount is necessary for further prioritization in tax management process. Having the same probability of debt repayment, first of all it is necessary to pay attention to those debtors, the amount of debt of which is the largest. These actions will improve the administration of tax debt.

Given the results of the preliminary analysis of the database of debtors-legal entities we suggest the following subsegments:

- From UAH 1020 to 10 000 (about 21% of all tax debtors-legal entities)
- From UAH 10 001 to 100 000 (about 14% of all tax debtors-legal entities)
- More than UAH 100 001 (about 10% of all tax debtors-legal entities)

These subsegments are assigned with a conventional designation: 1, 2, 3, respectively.

By the duration of tax debt it is necessary to allocate the following subsegments:

- Up to 60 days – a term during which, according to the legislation, the taxpayer is entitled to repay the tax debt by himself (on his own will);
- From 61 days to 12 months – a term during which there is a relatively high probability of tax debt collection;

- 1 year (inclusive) – up to 3 years – a term which indicates an imperfect collection procedure according to the world practice of tax administration;
- More than 3 years – a term in which there is almost zero probability of tax debt repaying and it can be recognized as hopeless. These subsegments will be assigned a conditional designations a, b, c, d respectively. To visualize the segmentation of debtors, pattern-matrix of tax debtors' segmentation model was constructed (table 8). The first column displays the tax debtors risk categories with the subsegments under the amount of the tax debt. The horizontal line shows intervals of the tax debt duration with subsegments of the number of debtors and general volume of tax debt.

As it been seen from table 8, as a result of the debtors' segmentation on the groups based on three criteria –the amount of tax debt, its age and probability of repayment (based on the risk assessment of entities activity) one can distinguish 64 variants of debtors combinations, to which 5 variants of strategies can be applied.

1) Categories - *00a, 00b* – only informing through the call-center, and the category of 00c, 00d – monitoring of the taxpayer's actions;
2) Categories A1a, A2a, B1a, C1a – only informing through the call-center, as it is either bona fide taxpayers with high probability of tax debt repayment, or taxpayers with minor amount of debt, therefore, in the case of their informing, they most likely to repay (or will ask for installments) within 60 days from the moment of debt occurrence.
3) Categories A1b, A2b, A3b, A3a, B2a, B3a, B1b, B2b, B3b, C2a, C3a, D1a, D2a – monitoring of the debtor's behavior in combination with informing through a call-center. The amendments to the Ukrainian legislation according to which such debtors are obliged to develop and submit a tax manager a list of measures he plans to perform in order to repay the tax debt are required. The schedule of tax debt repayment, in the case of its approval by the tax authorities, must be met. If the repayment schedule is not respected and the legal entity accumulates new tax debts, the bank accounts of the debtor should be automatically blocked until the tax debt repayment.
4) Categories A1c, A2c, A3c, B1c, B2c, B3b, C1b, C2b, C3b, C1c, C2c, D1b, D2b, D3a, E1a – blocking of the debtor's bank accounts and conducting the outbound tax audit with the expiration date only after the tax debt repayment.
5) Categories B3c, C3c, E2a, E3a, E1b, E2b, E3b, D3b, D1c, D2c, D3c - selling assets and property of the tax debtor, debiting money from accounts, conducting the outbound tax audit with the expiration date only after the tax debt repayment
6) Categories A1*d*, A2*d*, A3*d*, B1*d*, B2*d*, B3*d*, C1*d*, C2*d*, C3*d*, D1*d*, D2*d*, D3*d*, E1*d,* E2*d,* E3*d*, E1*c,* E2*c,* E3*c* – write-off of the tax debt with the preservation for 10 years of negative tax history of the owner, founders, managers, etc. of the company. In the case of founding (cofounding) new company (legal entity) by the same owners within the next 5 years from the moment of the tax debt written off, the mechanism of tax debts return of the previous business entity should be applied to the new enterprise. Before writing off the tax debt, the right of fiscal authorities to collect tax debts from the personal property of the owners of the debtor company has to be provided. We consider

that the limited liability should not have the power if it comes to tax debts to the government.

Table 8

Model layout of the tax debtors' segmentation

Category of risk	Amount of Tax Debt		Debt duration							
			Up to 60 days		from 61 days to 12 months		from 1 year to 3 years		over 3 years	
			a		***b***		***c***		***d***	
			K	∑	*K*	∑	*K*	∑	*K*	∑
0	less 1020	0		*00a*		*00b*		*00c*		*00d*
A (more than 80%)	1020-10 thousand	1		A1*a*		A1*b*		A1c		A1*d*
	10001-100 thousand	2		A2*a*		A2*b*		A2*c*		A2*d*
	exceeds 100 thousand	3		A3*a*		A3*b*		A3*c*		A3*d*
B (60-79%)	1020-10 thousand	1		B1*a*		B1*b*		B1c		B1*d*
	10001-100 thousand	2		B2*a*		B2*b*		B2*c*		B2*d*
	exceeds 100 thousand	3		B3*a*		B3*b*		B3*c*		B3*d*
C (30-59%)	1020-10 thousand	1		C1*a*		C1b		C1c		C1*d*
	10001-100 thousand	2		C2*a*		C2*b*		C2*c*		C2*d*
	exceeds 100 thousand	3		C3*a*		C3*b*		C3*c*		C3*d*
D (20-29%)	1020-10 thousand	1		D1*a*		D1*b*		D1c		D1*d*
	10001-100 thousand	2		D2*a*		D2*b*		D2*c*		D2*d*
	exceeds 100 thousand	3		D3*a*		D3*b*		D3*c*		D3*d*
E (less than 20%)	1020-10 thousand	1		E1*a*		E1*b*		E1c		E1*d*
	10001-100 thousand	2		E2*a*		E2*b*		E2*c*		E2*d*
	exceeds 100 thousand	3		E3*a*		E3*b*		E3*c*		E3*d*

The suggested categories are relevant at the beginning of segmentation, because at this moment the fiscal authorities should work with all tax debtors. If the work with the tax debtors would be conducted using the appropriate strategy in the future the certain clusters of this segmentation will become irrelevant (remain unfilled). If the number of tax debtors and the amount of tax debt declines it will evidence that the management of tax debt is getting better.

Conclusion

We suggested the model of the tax debtor segmentation based on the debt nonpayment risk estimation. The segments mean the risk category; subsegments are divided according to the criteria of the tax debt amount and age. The marginal indicators according to which the tax debtors should be distributed under the subsegments have determined on the base of the integrate estimation of risk. The indicators, chosen for risk estimation, mirror the propensity to pay and capacity to pay. The set of indicators can be changed in practice. The best combination can be found in experimental way and can vary in different countries. The strategies of tax debt management are suggested for each subsegment of tax debtors. They reflect such a way of interrelations between fiscal authorities and tax debtors, in which tax debtors have the opportunity to pay independently without enforcement, and each subsequent stronger impact on the debtor depends on its reaction to the previous intervention.

The suggested model of the segmentation can be implemented if all financial statement is filed in electronic form and the necessary indicators for risk estimation can be defined in automatic regime.

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ИКОНОМИЧЕСКИ ИЗСЛЕДВАНИЯ
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INTEGRATED REPORTING: ECONOMETRIC MODEL OF QUALITY ASSESSMENT

The issue of assessing the quality of integrated accounting of economic entities by means of an econometric model is outlined. It is established that the econometric model of integrated accounting quality assessment is a reliable tool for its estimation. The purpose of the study is to design an econometric model for better assessing the quality of integrated reporting. Because of the research, the criteria were allocated for constructing an econometric model for assessing the quality of integrated statements, the changes in the indicators that effect on the quality of the integrated statements of the subjects of economic activity was analyzed. The correlation matrix of the criteria included in the integrated statements was formed; the influence of the indicators included in an integrated statement for its overall assessment was defined; the results of an econometric model for assessing the quality of integrated statements of economic entities were analyzed. The theoretical substantiation and development of practical recommendations for assessing the quality of integrated reporting through an econometric model are relevant and important for users of such reporting. Particularly relevant is the importance of introducing an econometric model for assessing the quality of integrated reporting for countries with economies in transition. Approaches to assessing the quality of integrated reporting with the help of an econometric model are proposed. The obtained results are the basis for the output of integrated reporting of business entities to a qualitatively new level. The scope of research results is recommended to all economic entities during the preparation, compilation, submission and disclosure of integrated reporting. The conclusions and prospects of further researches in the direction of use of three other criteria for constructing an econometric model of estimating the quality of integrated reporting, namely: 1) disclosure of information on activities in the field of sustainable development; 2) compliance with the recommendations of the International Council for Integrated Reporting; 3) Interaction with stakeholders.
JEL: M40; M41; M49

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Introduction

Integrated reporting is a relatively new type of reporting in international and national reporting practices by business entities. An assessment of the quality of integrated reporting is a tool to increase the credibility of such reporting by all stakeholders, as well as the driver for its further development. According to the International Annual Competition on Integrated Reporting for 2017, the winner in the nomination's best-integrated report is the credit union Vancity, second in the energy company Iberdrola SA, at the third engineering company, JSC ASE. According to Integrated Reporting Surveys in South Africa in 2017, Ernst & Young Global Limited ranked the following companies in the TOP 10 as regards the quality of composite integrated reporting: 1) Kumba Iron Ore Ltd; 2) Redefine Properties Ltd; 3) Sasol Ltd; 4) Nedbank Group Ltd; 5) Oceana Group Ltd; 6) Barclays Africa Group Ltd; 7) Truworths International Ltd; 8) Liberty Holdings Ltd; 9) Vodacom Group Ltd; 10) Standard Bank Group Ltd.

The international practice of integrating accounting covers more than 190 enterprises from different sectors of the economy, among them Marks & Spencer, UniCredit, British American Tobacco, Mitsubishi Corporation, BASF, Philips, SAP, BP, Coca-Cola, Danone, Vodafone and others. In South and Eastern Europe, the integrated reporting of active dissemination has not yet gained. At the same time, for instance, it is being compiled and made public by such companies as NJSC Naftogaz Ukraine, BDO LLC, DTEK, Ukrzaliznytsya PJSC.

The Literature Review

Analysis of different existing approaches shows that most of the researches single out “better risk management” as one of the benefits of integrated reporting – Armbrester (2011), Budko (2014), Derun (2015), Druckman (2010), Eccles (2011), Gerasimova (2014), Komirna (2017), Malynovskaya (2016), Phillips (2011), Romanenko (2017), Safonova (2014), Watson (2011), Willis (2011). Thus, in accordance with the International Framework for Integrated Reporting, risks information is disclosed in a separate integral element of reporting framework “Risks and Management”. Part “Risks” is also presented at introduced into practice of integrated reporting “Management report”. According to Guidelines for preparing the Management Report, part “Risks” provides information on enterprise’ policies on managing operational and financial risks (market risk, credit risk, liquidity risk) with a description of their impact on the activity of the enterprise. It also describes approaches and tools that might be used by the enterprise to reduce the impact of such risks on its future activity. Therefore, the benefit described above refers to both integrated reporting and Management report.

Ensuring the possibility of more adequate assessment of the enterprise value and the results of its activity takes place in a row of benefits of integrated reporting (Komirna (2017), Malynovskaya (2016), Osadcha (2014), Phillips (2011), Romanenko (2017), Sikorska (2014), Vinokurova (2016), Watson (2011), Willis (2011). More adequate assessment of the enterprise value and the results of its activity can be achieved through the process of

creating value, which includes the following types of capital: financial, industrial, intellectual, human, social, natural.

Other group of explorers (Adams (2014), Burke (2016), Clark (2014), Eryigina (2016), Havlová (2015), Kostyrko (2014), Kundrya-Vyisotskaya (2016), Malynovskaya (2016), Maroun (2012), Serafeim (2016), Solomon (2012), Wandrag (2010) underline an opportunity of better interaction with stakeholders as an advantage of integrated reporting. This benefit involves the disclosure of information in the integrated reporting for all interested users who can take more effective management decisions studying the information.

Botha (2014), Budko (2014), Gerasimova (2014), Domashenko (2013), Komirna (2017), Leka (2018), Maroun (2012), Osadcha (2014), Rensburg (2014), Romanenko (2017), Sikorska (2014), Solomon (2012), Vinokurova (2016) consider higher level of trust in relationships among interested parties one of the benefits of integrated reporting. Authors emphasize that integrated reporting provides a higher level of trust in relationships among interested parties.

Botha (2014), Vinokurova (2016), Derun (2015), Domashenko (2013), Druckman (2010), Fries (2010), James (2013), Kennedy (2016), Komirna (2017), Osadcha (2014), Perego (2016), Rensburg (2014), Romanenko (2017), Sikorska (2014), Whiteman (2016) draw attention to other benefit of integrated reporting – better understanding of the business model and strategy of the company by the employees, increased awareness of sustainable development. Such benefit is common for both integrated reporting and sustainable development reporting, based on sustainability report Manual GRI 4. Part of description of the enterprise activity model, presented at Management report discloses the company's strategy in the direction of «Perspectives of prosperity». It provides information about perspectives of farther development of the enterprise considering risks and challenges it faces while operating.

Research of better reconciling of the reports with the investors' needs as a benefit of integrated reporting was made by Armbrester (2011), Burke (2016), Budko (2014), Gerasimova (2014), Eccles (2011), Clark (2014), Komirna (2017), Maroun (2012), Osadcha (2014), Romanenko (2017), Sikorska (2014), Solomon (2012), Vinokurova (2016). Appearing of this benefit of integrated reporting is caused by absence of regulated standard form. Therefore, the information provided by the integrated reporting can be adapted to requests of any users of prepared information, investors as well.

Derun (2015), Gerasimova (2014), Kostyrko (2014), Malynovskaya (2016), Vinokurova (2016) chose better management of different capitals as a benefit of integrated reporting. The benefit is achieved by the International Framework for Integrated Reporting indicating the appropriate forms of capital used by enterprises in their economic activity and how they affect the process of creating the value of the enterprise.

Maximizing competitive benefits was studied as a benefit of integrated reporting by Gerasimova (2014), Eryigina (2016), Kostyrko (2014), Malynovskaya (2016), Phillips (2011), Watson (2011), Willis (2011). The advantage is manifested through the disclosure

of information about products (goods, works, services) that the enterprise sells, and such information is not available in other published reporting forms.

Budko (2014), Gerasimova (2014), Kundrya-Vyisotskaya (2016), Maroun (2012), Serafeim (2016), Solomon (2012), include the availability of more accurate nonfinancial data to the benefits of integrated reporting. As a result, integrated reporting comparing to traditional reporting contains not only financial indicators, but also information about non-financial economic activity. This benefit is one of the features of integrated reporting.

Malynovskaya (2016), Phillips (2011), Safonova (2014), Watson (2011), Willis (2011) see increasing of transparency level of the company as a benefit of integrated reporting. Disclosed information in integrated reporting is qualitative, understandable for all stakeholders, comparable and is compiled based on generally accepted principles of reporting in accordance with the International Framework for Integrated Reporting. These particular qualities help to achieve a higher level of transparency of the company.

A better definition of opportunities, improvement of company image is also among benefits of integrated reporting (Budko (2014), Gerasimova (2014), Eryigina (2016), Watson (2011), Willis (2011). Better definition of the company's capabilities is manifested through provided by the integrated reporting information on the scope of activities, production technology, quantity and quality of employees. This gives customers an opportunity to get acquainted with the company's ability to produce one or another type of product. Improvement of the company's image is the result of transparency and openness of information about financial and economic activity of the company, as well as reflection of the financial, industrial, intellectual, human, social and natural aspects of its activity.

A few particular works (Domashenko (2013), Gerasimova (2014), Komirna (2017), Romanenko (2017), Vinokurova (2016) present improved reporting on sustainable development as a benefit of integrated reporting. Thus, an analysis of the connection between types of capital (Bezverxyj, 2018) included in the concept of integrated reporting of the enterprise and the goals of sustainable development has shown that among all types of capital the leading one revealing all goals of sustainable development (17 goals) is social capital. Financial capital takes the second place (it reveals 14 goals), the third place – human capital (12 goals), the fourth place – production capital (10 goals), the fifth – intellectual capital (9 goals), the sixth – natural capital (8 goals). Consequently, integrated reporting of an enterprise reveals all the goals of sustainable development through capital, therefore it improves reporting in the field of sustainable development.

Derun (2015), Maroun (2012), Serafeim (2016), Solomon (2012), Phillips (2011), Watson (2011), Willis (2011) distinguish the protection of reputation among the benefits of integrated reporting. Reputation protection is manifested through the provision of complete, comprehensive, reliable, unbiased information about the activity of the company to all interested users, and is reflected in the integrated reporting.

Druckman (2010), Fries (2010), Kundrya-Vyisotskaya (2016), Malynovskaya (2016) highlight reflection of the relationship between economic, environmental and social indicators as a benefit of integrated reporting. Thus, integrated reporting includes not only financial indicators, but also non-financial ones, which reveal the social and environmental

aspects of the enterprise's activity. Those are related to the types of capital that the enterprise uses in the process of creating the value of the enterprise.

Eryigina (2016), Kostyrko (2014), Malynovskaya (2016) highlight the opportunity of attracting more investment as one of the benefits of integrated reporting. The opportunity of attracting more investments as an advantage of integrated reporting is manifested through providing more information to interested parties than traditional reporting. This might influence positively on the decision to invest in this enterprise.

They include providing more complete and reliable information in the benefits of integrated reporting. The reflection of the social, environmental and social aspects of the company's activity extends the information field of integrated reporting comparing to other reporting that is publicized. The integrity of integrated reporting as an advantage can be interpreted more accurately by users due to the increased flow of this kind of reporting. Compliance with its framework, in particular the International Framework for Integrated Reporting, regulating the rules for the preparation, compilation, approval, presentation and disclosure of the reporting, is the reason as well. Balance and absence of errors affect the accuracy of the information. Integrity (often called precise presentation) is enhanced by mechanisms of a complete internal control and reporting system, interaction among interested parties, internal audit or similar functions, as well as independent external approval.

New data for management needs takes place among the benefits of integrated reporting (Cheng (2015), Domashenko (2013), Green (2015), Ko (2015), Vinokurova (2016). Integrated reporting provides information for management needs for value creation based on different types of capital (financial, industrial, intellectual, human, social, natural) and discloses the goals of sustainable development.

Increasing the relevance of the information used in decision-making process by managers as well as external stakeholders takes place in a row of integrated reporting benefits (Phillips (2011), Serafeim (2016), Turturea (2015), Watson (2011), Willis (2011). Increasing the relevance of information is being achieved through the expansion of the array of data in the integrated reporting, which is used by both managers and external stakeholders to make appropriate management decisions.

As an isolated case, the benefits of integrated reporting include a better understanding of the causal relationships between financial activity and social responsibility of the company (Krzus (2011), Malynovskaya (2016). Thus, financial activity generates the capital that an enterprise uses to ensure social responsibility to society, as well as directly to its employees. The information above is displayed in the enterprise's integrated reporting, and therefore the users can better understand such causal relationships.

By Kostyrko (2014), Phillips (2011), Watson (2011), Willis (2011) benefits of integrated reporting include increasing access to information from external and internal sources for expanding analysis capabilities. This benefit of integrated reporting is the result of publicizing of integrated reporting. It also has a larger amount of information than traditional financial reporting, which can be used for analysis.

Safonova (2014), Vinokurova (2016) single out reducing the cost of reporting making process as a benefit of integrated reporting. The benefit mentioned above is contradictory,

because the process of preparation, compilation, approval, submission, disclosure of integrated reporting requires the attraction of additional resources. The company will incur additional expenses for the compilation of integrated reporting.

Some works bring up increasing employees' loyalty as one of the benefits of integrated reporting (Derun (2015), Malynovskaya (2016). The increase of employee's loyalty is the result of disclosing information about company's social protection of employees, labor safety, the level of remuneration in the integrated reporting.

Kostyrko (2014), Malynovskaya (2016) single out improving the quality of corporate governance as a benefit of integrated reporting. Improving the quality of corporate governance comes from obtaining information of both types financial and non-financial, which are presented in the integrated reporting, and is absent in the traditional financial statements of the enterprise.

Derun (2015), Druckman (2010), Fries (2010) bring up increasing the company's profitability in the long run as a benefit of integrated reporting. Analyzing the information provided by the integrated reporting, it's possible to take appropriate management decisions that will help increase the company's revenue in the long run.

Among other benefits of integrated reporting, there is a wider perspective when considering the company (Domashenko (2013), Vinokurova (2016). Let's emphasize that integrated reporting of an enterprise presents all the essential aspects of its activity. Therefore the information field for the analysis of the prospects of the enterprise will be expanded in comparison with the traditional accounting of the enterprise.

As an isolated case, the benefits of integrated reporting include taking into account numerous changes in corporate reporting (Ageev, Galushkina, Kopkova, Smirnova, Shtukelberger (2016). As long as integrated reporting is a new form of reporting, it takes into account all the latest trends in corporate reporting and is flexible to the changes that shape modern approaches to the preparation, compilation, presentation, approval and disclosure of this kind of reporting.

Some works bring up de-offshorization of the economy among the benefits of integrated reporting of enterprises (Malynovskaya, 2016). The de-offshorization of the economy is a potential benefit of integrated reporting to a society that is manifested in providing information to all interested users of integrated reporting. Integrated reporting is aimed against concealing the incomes of Ukrainian enterprises formally owned by offshore companies.

Derun (2015) highlights a reduction in company's costs as the benefit of integrated reporting. The above-mentioned benefit cannot be accurate, because when creating the integrated reporting, the enterprise bears additional time spent on the preparation, compilation, submission, approval and disclosure of the reporting. Also the company will have additional labor costs, the expenses of hosting integrated reporting on the company's web site, the cost of translating integrated reporting into a foreign language, etc.

Highlighting reducing corruption as a benefit of integrated reporting was made by Malynovskaya (2016). Reducing the level of corruption is a social potential benefit of

integrated reporting, since it is a source of information about the activity of the enterprise. All interested parties that need relevant data have access to this information, which was inaccessible to the publicity and was some sort of goods.

Training specific stakeholder groups takes place in the list of benefits of integrated reporting (Domashenko (2013). Studying specific stakeholder groups involves gaining knowledge about understanding the indicators of an integrated reporting of the enterprise.

Domashenko (2013) presents operation with both indicators monetary and physical as a benefit of integrated reporting. Integrated reporting is reporting based on the International Fundamentals of Integrated Reporting and includes a set of financial baselines and calculated indicators, as well as non-financial indicators, provided at the request of accounting department by other business units of an enterprise. It also discloses information about value creation for effective capital management (human, natural, social, intellectual, industrial, financial, etc.) in the short, medium and long-term.

An increase in the credit rating singled out as a benefit of integrated reporting by Malynovskaya (2016). The analysis of non-financial information presented in the integrated reporting of the enterprise in comparison with traditional accounting reporting gives more complete picture of the activity of the enterprise. It allows creditors to make better management decisions regarding their credit policy, and increases the credit rating of the enterprise as well. Rudyk et al. (2018) have the similar opinion – they proved that using non-financial reports helps to improve the level of access to finance. In addition, they recommend to implement the Code of ethics, where running non-financial reporting is an equal part of company's performance as well as financial.

As isolated cases, improvement of relations with state authorities, tax and insurance privileges, reduction of data distortions presented in the report, promotion of reduction of atmospheric emissions were highlighted as benefits of integrated reporting by Derun (2015). Disclosure of information about the activity of the company, in particular on the completeness of charging and paying taxes and fees to budgets of different levels improves relations with state authorities. Information about tax and insurance privileges is provided in the integrated reporting. Reduction of data distortions in reporting is being achieved through compulsory audits of integrated reporting, verification of indicators by the relevant divisions of the enterprise that provide data for the compilation of integrated reporting, monitoring of integrated reporting by internal auditors who monitor the quality of the reporting. Contribution to reducing emissions to the atmosphere as one of the benefits is achieved by opening these data to all interested users. The increasing amount of emissions to the atmosphere damages the company's image as a polluter of the environment.

Research Methodology

Research methods such as analysis, synthesis, induction, deduction, abstraction, idealization, generalization and modeling were used to design an econometric model for assessing the quality of integrated accounting of economic entities. The theoretical substantiation and development of practical recommendations for assessing the quality of

integrated reporting through an econometric model is relevant and important for users of such reporting. The information base of the research is integrated reporting of enterprises, as well as the results of competitions for defining the quality of integrated reporting.

Integrated reporting: an econometric model of quality assessment

To evaluate the quality of integrated statements, we will analyze the methods of international statements contests, which evaluate the integrated statements. According to the majority of integrated statements quality assessment competitions, four evaluation criteria are used.

We construct a mathematical model for evaluating the first criterion and determine which variables most affect the quality of the composite integrated statements by this criterion. The first criterion is the disclosure of information about the main activity. So, according to the source, integrated reporting of an enterprise is evaluated according to the group of indicators that must be included in such a report of the enterprise. Determine the main input variables of the mathematical model according to the requirements for this criterion:

- information about the key events of the organization during the reporting period (variable Information);
- Key Performance Indicators for the Reporting Period (Results variable);
- The quality of information about the company's strategy, the results of its implementation, information about the responsibility for achieving the strategic goals of the organization (variable Strategy);
- information on the relationship and interdependence of «remuneration management» with the performance of the company (variable Management);
- The quality of information about the external and internal environment of functioning (market position) (Market variable);
- The quality of information about the company's risks and opportunities, their management (Risk variables);
- reflection in the Innovation Orientation Quality Organization report (Innovations variable);
- displaying information on the activities of key assets (variable assets);
- availability of indicators of economic performance, effectiveness of achievement of strategic goals (KPIs), their quantity and quality of disclosure (variable KPI).

Depending on how well the integrated report is compiled (whether all indicators are included, completeness of information, etc.), the evaluation of the provided integrated report according to the first criterion is presented. Assigned this estimate to the variable Score.

The main purpose of the study is to determine which of the indicators most affect the score, and which is less. This will allow reporting more qualitative and focusing on the indicators that have the greatest impact on the quality of the reporting.

Let's consider the above indicators on an example of the integrated report of the American company Excelon (USA), which are shown in table 1.

Table 1

Key indicators for Excelon's Integrated Reporting Quality Assessment

Reporting period	Score	Information	Results	Strategy	Management	Market	Risks	Innovations	Assets	KPI
2008	0.131	0.009	0.012	0.008	0.008	0.005	0.011	0.02	0.025	0.044
2009	0.653	0.024	0.02	0.021	0.058	0.032	0.032	0.069	0.036	0.082
2010	0.344	0.018	0.002	0.011	0.023	0	0.013	0.067	0.089	0.097
2011	0.657	0.069	0.062	0.014	0.048	0.014	0.016	0.074	0.147	0.07
2012	0.32	0.017	0.023	0.012	0.017	0.032	0.004	0.034	0.064	0.076
2013	0.188	0.018	0.003	0.019	0.012	0.005	0.007	0.03	0.035	0.036
2014	0.782	0.079	0.043	0.012	0.064	0.022	0.045	0.174	0.087	0.083
2015	0.094	0.006	0.009	0.001	0.007	0.001	0.002	0.006	0.015	0.021
2016	0.467	0.021	0.027	0.007	0.046	0.014	0.021	0.058	0.123	0.171
2017	0.512	0.008	0.021	0.035	0.022	0.045	0.011	0.041	0.089	0.185

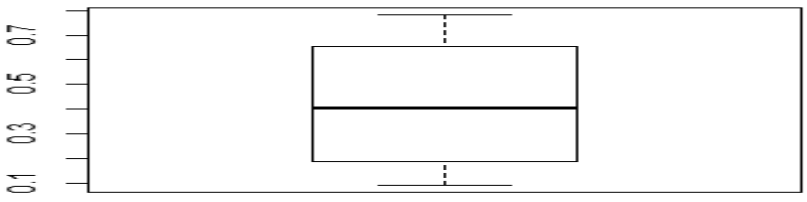
According to table 1, for example, in 2008, the integrated report of Excelon received a quality rating of 13.1%, with the full disclosure of the information on the indicator was 0.9%, on the indicator Results 1.2%, on the indicator of Strategy 0,8% and etc. So the question arises, it is necessary to improve the quality of completeness of information on all indicators, or to pay attention to key indicators. What are the key indicators, how to rank them?

Experts evaluated the quality of the company's integrated report (General Score Score) for 9 criteria (Results, Strategy, Market, Management, etc. from Table 1). On the basis of 9 criteria, according to the appropriate method, the overall score for the report was displayed on a scale from 0 to 1 (from 0 to 100%).

Figure 1 shows how the criteria change on a scale from 0 to 1.

Figure 1

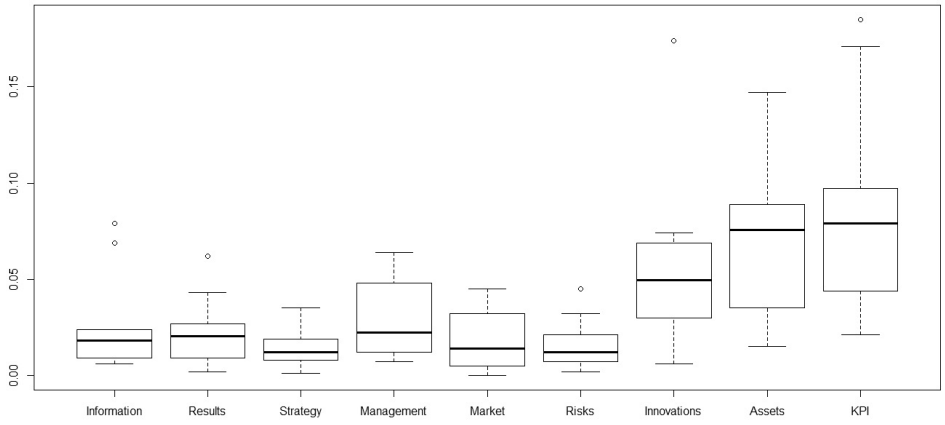
Modify Score Quality Score from 0 to 1



From Figure 2 shows that the greatest difference in the experts was caused by the criteria Innovations, Assets, KPI.

Figure 2

Change in metrics that affect the quality of an integrated report on a scale from 0 to 1



Next, consider how the criteria are related to each other and which of them more influence the overall score, but which have little effect. To do this, use the correlation matrix. The results of the construction of the correlation matrix are shown in table 2.

Table 2

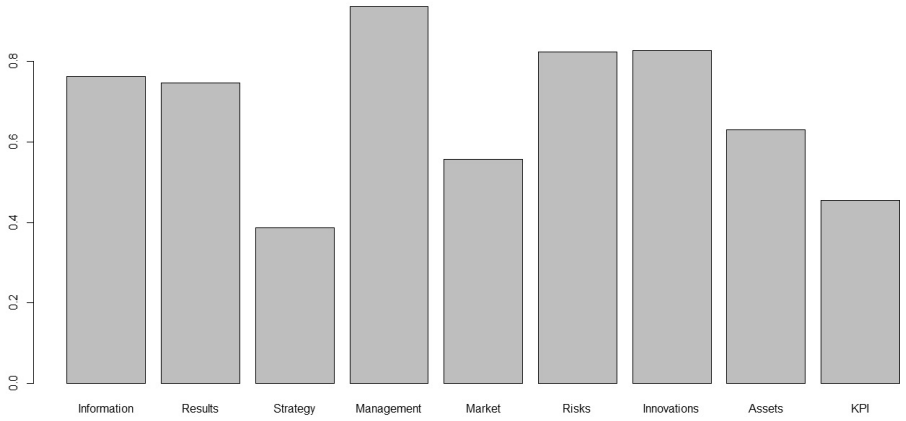
The Correlation Matrix of the criteria included in the Excelon Integrated Report (on a scale from 0 to 1)

Indicator (criterion)	Score	Information	Results	Strategy	Management	Market	Risks	Innovations	Assets	KPI
Score	1	0.762	0.746	0.387	0.935	0.557	0.822	0.826	0.629	0.454
Information	0.762	1	0.832	-0.046	0.755	0.067	0.695	0.851	0.567	-0.051
Results	0.746	0.832	1	0.051	0.685	0.322	0.475	0.57	0.711	0.18
Strategy	0.387	-0.046	0.051	1	0.131	0.734	0.102	0.069	0.142	0.508
Management	0.935	0.755	0.685	0.131	1	0.351	0.903	0.827	0.537	0.331
Market	0.557	0.067	0.322	0.734	0.351	1	0.268	0.207	0.19	0.58
Risks	0.822	0.695	0.475	0.102	0.903	0.268	1	0.9	0.275	0.222
Innovations	0.826	0.851	0.57	0.069	0.827	0.207	0.9	1	0.455	0.194
Assets	0.629	0.567	0.711	0.142	0.537	0.19	0.275	0.455	1	0.601
KPI	0.454	-0.051	0.18	0.508	0.331	0.58	0.222	0.194	0.601	1

From the 2nd column of table 2 shows that the most impact on the Score is Information, Results, Management, Market, Risks, Innovations, Assets (the correlation coefficient is greater than 0.5), and the Strategy and KPI factors affect the overall assessment slightly, as can be seen from figure 3.

Figure 3

Impact of the indicators included in the integrated report on its overall Score



Based on the results presented in table 2 and figure 3 we will construct a multi-factor econometric model of the dependence of the overall Score estimation from regressors Information, Results, Management, Market, Risks, Innovations, Assets:

$$Score = a_0 + a_1 Information + a_2 Results + a_3 Management + a_4 Market + a_5 Risks + a_6 Innovations + a_7 Assets, \quad (1)$$

where ai – model parameters.

The results of modeling by model (1), obtained using the specialized software Statistica 5.0, are shown in table 3.

Table 3

Results of construction of the econometric model (1)

Indicator	Rating parametera	Standard deviation (error) from the estimation of the model parameter	t value	Pr(>|t|)
Intercept	0.012	0.054	0.215	0.849
Information	5.051	5.977	0.845	0.487
Results	-3.826	5.682	-0.673	0.570
Management	5.167	4.740	1.090	0.039
Market	6.232	2.779	2.243	0.015
Risks	3.181	10.682	0.298	0.794
Innovations	-1.064	3.396	-0.313	0.784
Assets	1.382	1.343	1.029	0.004

The Pr parameter indicates whether the model parameter is a meaningful estimate. In the event that Pr> | t |, then the estimation of the model parameter is not significant and is eliminated from the model.

From table 3 it is seen that the significant parameters are Management, Market, Assets, and therefore the model (1) will look like:

Score = 5.167 * Management + 6.232 * Market + 1.382 * Assets (2)

For model (2), the determination coefficient is 0.981, the adjusted coefficient is 0.944, which indicates the high quality of the model and shows that the change in Score score of 98.1% is explained by the change in the indicators included in the model.

To verify the determination factor, use Fisher's criterion (F-statistic) and calculate it using the STATISTICA 5.0 software. So Fqr = 26.14, and the probability that the determination coefficient is a significant p-value = 0.011. This means that the model is qualitative and its results can be used in practice.

Consequently, the variation of the overall score of the Score by 98.2% is due to variation in the factors of Management, Market, Assets and 1.8% by the influence of other factors. The relationship between the dependent variable Score and each of the factors is directly proportional. With an increase in the Management estimate of 1, the Score will increase by 5.167, with an increase in the Market estimate of 1, the Score will increase by 6.232, an increase in the value of the Assets by 1, The Score will increase by 1,382, other factors affect the overall assessment insignificantly.

Conclusions

Thus, when preparing, compiling, submitting and publishing integrated accounting by entities, the first requirement is to pay attention to the criteria of Management, Market, Assets.

The use of an econometric model for assessing the quality of integrated reporting may be, in fact, as enterprises (compilers of such reporting) and audit firms during its confirmation, rating agencies (when compiling the ranking of economic entities based on the indicators of integrated reporting), organizers of annual national competitions quality integrated reporting.

The assessment of the quality of integrated reporting is necessary to ensure reliability, transparency of information that is necessary for sound management decisions, which is why in the course of the study was proposed an econometric model for assessing the quality of integrated statements.

The construction of an econometric model for assessing the quality of integrated statements allowed assessing the quality of such statements, and this approach to quality assessment undoubtedly proves the need for constant investment in information technology, training not only specialists of the accounting service of enterprises, but also specialists of other

departments involved in the process of preparation, compilation , submission, approval and disclosure of integrated statements.

An econometric model for assessing the quality of integrated statements will be useful for all enterprises that form integrated statements.

The scientific value of the study is to further development approaches to assessing the quality of integrated statements based on the econometric model. The practical value of this study is to apply an econometric model for assessing the quality of integrated statements in the practice of enterprises. Social value is in informing and familiarizing all potential compilers and users of integrated statements to assess its quality.

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ИКОНОМИЧЕСКИ ИЗСЛЕДВАНИЯ
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BLOCKCHAIN TECHNOLOGY IN THE FISCAL PROCESS OF UKRAINE OPTIMIZATION

The problem of corruption in Ukraine has been examined, as well as Blockchain technology application feasibility in combating the phenomenon has been analyzed in the article. Blockchain instrumental features and properties, making the technology unique and determining its potential applications in many sectors of the economy, have been covered with much attention. The authors have analyzed both advantages and obstacles for a distributed data registry implementation. Analysis of benchmarks and application of the best practices of Blockchain technology in the public sector, including the fiscal process, have been presented in the study. Profound interest in exploring the technology feasibility has been emphasized on the part of the world's leading governments. Information on pilot Blockchain projects in the public sector of Ukraine has been presented. The article focuses on the fact that alongside with the technology area and ways of scaling its application, a new era of digital society development is emerging.
JEL: L86; O33; E62; H26

1. Introduction

Macroeconomic stabilization in Ukraine is directly correlated with the country's corruption level. The importance and urgency of addressing the corruption issue in the public finance sector are due to its complex destructive influence. Thus, corruption, encouraging favorable developments for evasion from financial liabilities (taxes, fees), deforms budget revenues pumping up process. And on the other hand, corruption distorts competitive conditions of doing business, demotivates entrepreneurial activity in the country, promotes capital outflow and adversely affects the created jobs growth. Ultimately, the corruption-based behavior stereotype makes exit from the "institutional trap" and overcoming crisis phenomena in the national economy impossible.

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In our view, the problem solution is not in the plane of the mechanisms for corrupt activities facts disclosure and responsibility, but in development and implementation of the mechanisms for the corruption area suppressing and minimization. Application of the Blockchain technology in the public sector, including the fiscal process, may become a radical tool in the stated objectives achievement. According to V. Buterina, the Ethereum blockchain platform creator, it will enable to "... eradicate corruption and leave the bureaucracy behind" (Dubovoy, 2017).

2. Purpose of the Article

The purpose of the article is to study the instrumental value of the Blockchain technology in the fight against corruption in public sector, particularly in the fiscal process, as well as to analyze the best practices of distributed data registry application for developing recommendations for its optimization in Ukraine.

The need for management mechanism in the fight against corruption in the public sector optimization is due to the fact that it can have a positive impact on solution of the other systemic problems in the fratricide effect form: promote the supremacy of the law, improvement efficiency of the implemented system innovations and reforms, stability of democratic processes, formation of favorable investment climate, and free and fair competition in the country's economic area.

3. Research Methodology

The authors used formal-logical methods, empirical research and theoretical knowledge, as well as special scientific methods as the research methodological basis. Among the formal-logical methodological tools, the authors used dialectics, analysis, synthesis, generalization, analogy and modeling methods. From the group of research and theoretical knowledge methods, comparison, description, measurements, and hypothetical-deductive methods were used in the process of work on the publication. In addition to the above mentioned, synergetic, cybernetic, systematic, comprehensive, information, optimization of methodological approaches were used when writing the article.

4. The Research Results

Corruption has existed in all forms of government without exception and manifests itself both at the ruling establishments levels and in all spheres of the society. This social phenomenon is inherent to the most world countries in one way or another, and is characterized by overall negative impact; that is becoming a threat to national security and a socio-economic global problem. It was noted in the VIII UN Congress resolution "Corruption in the field of public administration" back in 1990 (Symonenko, 2006).

An analysis of historical development suggests that the most dangerous forms of crime and large-scale corruption in the financial sector are characteristic of the countries in socio-political and/or economic and financial crisis situation. All this is inherent to the Ukrainian

state. Its evolution over the last 27 years (since Ukraine's independence – auth. note) has resulted in the fact that the country is increasingly referred to as one of the most corrupt world countries in the studies of various international organizations.

According to the information, posted on the World Bank website: "Management weaknesses are governance, defined as the way in which public institutions perform their functions in a country which is strongly correlated with deficiencies in development. Poor governance is associated with corruption, distortion of state budgets, inequitable growth, social exclusion and distrust in the authorities. The inefficiency of the government formal institutions results in creation of informal institutions that substitute the functions that the first-mentioned can no longer perform" (3).

The Corruption Perception Index of Transparency International (CPI) is one of the public administration efficiency measures. CPI is essentially a composite indicator that annually describes the quality of public sector management for most countries of the world (180 out of a total of 197 recognized countries – auth. note) since 1996.

According to Transparency International experts, Ukraine has very modest Corruption Perception Index rates in the field of fight against corruption. Thus, in 2015, the country scored 27 points out of 100 possible, in 2016 – 29 points, and in 2017 – 30 points and took the 130th place. It is noteworthy that the points 0 to 30 indicate a significant level of corruption, and 31 to 60 – the government is trying to fight against corruption. Countries that ranked the same number of points are Myanmar, Gambia and Iran. Virtually all bordering Ukraine countries rank much higher: Poland – 36, Slovakia – 54, Romania – 59, Hungary – 66, Belarus – 68 and Moldova – 122 (4).

Among the reasons that influenced the rating increase in 2017, the following were noted in the report. Anti-corruption authorities (SAP/NABU) launched their investigative work in the reporting year and filed the first cases on suspicion of top corruption to the court. Electronic declarations register operation was continued. A year had already passed since the public procurement reforms with mandatory use of the ProZorro system implementation. Gas market reform was implemented. Ukraine had taken some positive measures towards deregulation.

In turn, TI Ukraine recommends the government to take the following measures to improve the country's performance in 2018: 1. Launch the Anti-Corruption Court and continue judicial reforms; 2. Strengthen the investigative bodies' power and stop the inter-agency struggle; 3. Recommission the National Anti-Corruption Bureau of Ukraine (NABU); 4. Deprive law-enforcement agencies of the right to interfere in economic activities; 5. Implement a new electronic public information system.

For example, according to the latest data on the Economic Freedoms Ranking published by the Wall Street Journal experts and the Heritage Foundation's analytical center, Ukraine ranked the 166th out of 180 countries in 2017, being in the group of countries with non-free economies, while gaining a slightly higher scores than in 2016. Angola (165th) and the Republic of Suriname (167th) became Ukraine's nearest neighbors (5).

The report authors set the lowest ratings for the following parameters of the Ukrainian economy: the government fair practices, freedom of investment, government spending, financial freedom and legal effectiveness (Table 1).

Table 1

Dynamics of Economic Freedom Index in Ukraine (%)

Parameter	2016	2017
Freedom of doing business	56.8	62.1
Freedom of trade	85.8	85.9
Tax burden	78.6	78.6
The government fair practices	26.0	29.2
Government spending	30.6	38.2
Monetary freedom	66.9	47.4
Freedom of investments	20.0	25.0
Financial freedom	30.0	30.0
Financial soundness	-	67.9
Property rights protection	25.0	41.4
Legal effectiveness	-	22.6
Freedom of employment relations	47.9	48.8
TOTAL SCORE:	46.8	48.1

Source: Markushevskiy, Ryabova, Kuharchik, 2017.

In the context of the phenomenon under study, the rating parameters dynamics indicates a low assessment of the business climate and significant obstacles to the revitalization of business activities, including the corruption component. As a result, corruption remains one of the main problems for businesses and ordinary citizens.

According to the Ministry of Economic Development and Trade of Ukraine, the losses from corruption and inefficient use of budget funds in the public procurement sphere account for about 20% of the annual volume, and amount to about 50 billion Hryvnia per year (Zinchenko, 2017).

The fact that corruption in Ukraine has penetrated virtually in all spheres of public relations and has become one of the fundamental reasons of the Ukrainian statehood crisis should be stated. As a result of defeat by the corruption virus, the socio-economic sphere is being destructed, degradation of law enforcement and judiciary, healthcare and educational systems, as well as budgetary-financial sphere of the country is observed.

Corruption leads to losses of the state and population due to inefficient use of budget funds, poor quality of public services, as well as increases uncertainty in business entities' operation environment.

Along with this, there is no denying that corruption and power are both antagonists and satellites. After all, corruption generates power, in the absence of which it becomes impossible as a phenomenon. Corruption gradually ”erodes” state structures like a social “corrosion”, and the government, respectively, seeks to eradicate the corruption.

The main incentive for corruption is the potential of obtaining economic or any other benefits associated with the use of authoritative powers. The main deterrent is the risk of disclosure and punishment. The most dangerous forms of corruption constitute criminal offenses. These ultimately include embezzlements (thefts) and obtaining of improper benefits. The embezzlement is an expenditure of resources, entrusted to the officers, for personal use.

Corruption in budget legal relations and in the budget field, in general, is the use of official position and excess of power for the purposes of unjustified enrichment by subjects of these relations, as well as budget process participants (both own and collective – author's note). It is about personal enrichment of a person or a group of persons, as well as about the facts when misconduct of a public official or officials results in illegal obtaining of funds to the banking accounts of budget institutions, managers and recipients of budget financing (Bodnar, 2016:300).

We fully agree with the scientific position of O. A. Musica-Stefanchuk who highlights the following key areas of anti-corruption activities in the fiscal area:

- ensuring maximum regulation of all budget process practices and procedures in the form of laws, regulations and instructions; full regulation of the officials' activities, enshrined in job descriptions and provisions;
- ensuring budget process and budget information maximum transparency and openness, i.e. their accuracy and availability for all parties involved for analysis and use purposes;
- increase of control and optimization of the mechanism for performing control functions for obtaining and use of budget funds at all levels of the hierarchy: departmental, interdepartmental, public;
- development and introduction of ethical codes for public officials, as well as monitoring their compliance with the requirements of anti-corruption behavior (Bodnar, 2016:304).

Technological innovations, including blockchain technology, in the public finance field, are a multi-functional tool of public administration in the information society, as well as a means of combating corruption in the process of media convergence.

In respect to the media space development the "convergence" concept "... means an erosion of traditional boundaries in the process of technological changes, which is accompanied by duplication of content and/or creation of alternative media sites" (Chernyih, 2007).

In our opinion, the modern stage of media convergence has entered into its active phase, which is consonant with the introduced "Web 2.0." term, proposed and described by Tim O'Reilly in the early 2000s. The process described by the scientist means "... independent production of content by a mass of users and active exchange of information between them" (Timofeeva, 2012: 42). It is fair to say that scientific works presented to the public by foreign and domestic authors do not fully reveal all aspects of the multidimensional phenomenon of media convergence in the increasingly complex conditions of civilizational development. This fully applies to the blockchain technology. According to the article authors, the technology has a huge potential for application, which can dramatically change modern management methods.

The blockchain technology is a distributed database that is formed as a continuously growing chain of blocks of recorded information on all previous transactions. The given technology emerged in the cryptocurrency market field. The technological basis of the Bitcoin transactions accounting system is in its functioning as an independent financial system. It has no center of influence, there is no organization or person who would manage it. The system is absolutely transparent and operates according to the principles laid in its basis from the very beginning. The entire transaction history is available to everyone, but it cannot be changed.

Further, blockchain-based solutions have spread to other sectors of the economy. Application of the technology elements in the future will allow for a certain decentralization of processes and increase of inclusivity while reducing maintenance costs.

The very Blockchain technology paradigm is based on any transaction data fixation in a public and safe for all participants' registry. It stores the transaction history with all amendments and modifications from the start to the finish. At that, the registry with amendments introduction update is only possible in the case if other members of the integrated system confirm the entry correctness or the transaction is authorized by the digital code. The Blockchain algorithm is based on all copies of the register constant synchronization after each update operation. That is, all transactions in a grouped form – blocks – are generated every 10 minutes, and each subsequent block of information contains a digital fingerprint of the previous one. Thus, a chain of blocks is generated, which represents inextricably linked transactions, where each new block is inextricably linked with the previous ones, and the previous ones can in no way be changed without changing the new (subsequent) one. By analogy, blocks can be compared with a notebook pages, where each entry made is assigned a sequence number. If the notebook page with the entries ends, the numbering of entries is continued on the next page. Thus, connectivity and integrity of all records starting from the first to the last is checkable. At that, all users of the integrated system have free access to the information contained in it virtually any time (Kravchenko, 2017).

The following main properties and characteristics of the Blockchain can be summarized:

1) *Sustainability* – lack of organization and management center, which administer the distributed data registry and have the key to their correction;

2) *24/7/365 operation mode,* that is, around the clock and all-the-year-round. Since the registry databases contents are copied to all computers on the network, even in the case if 99% of them are not online at some point, the data will still be recorded to the remaining computers and then updated to all without exception when they are back online. The only way to stop the technology is the power and the Internet outage worldwide;

3) *Security,* which is based on the application of the reliable cryptographic methods, namely, data hashing through different algorithms. The hashing essence in the Blockchain is in converting a set of information into a hash function, which represents the public key to the block. The hashing method peculiarity is in the fact that solving the function and converting it back to the source code is impossible. Accordingly,

knowledge of the transaction blocks public keys will in no way help the cybercriminals to gain access to the information recorded in the blocks. The fact that it is a clearly distributed database stored immediately at each member of the system, and not in a single copy on the server, is also a reliable method of protection from hacking. Copies are constantly updated, so if someone tries to record false information, it will immediately be rejected by the database and deleted. To hack the Blockchain, attackers need immediate access all database media, which is physically impossible;

4) *Transparency*. The Blockchain information blocks sequence cannot be changed, thus, tracking the entire chain of transactions made with any currency or other value through the database is very easy. It is due to this technology feature, cryptocurrency systems are open and transparent on the one hand, and completely anonymous on the other (10).

Due to the above-described properties, the introduction of Blockchain technology will achieve the following financial-economic effects:

- reduction of principal financial statements by 70% as a result of data quality and transparency optimization and the need for continuous financial control lack;
- compliance with regulatory requirements by 30-50% due to the increased transparency and simplicity of financial transactions;
- reduction in the total cost of centralized activities by 50% due to the improved digital identity mechanisms and simplified sharing of customer data for all participants of the process;
- reduction in the cost of business transactions, including mandatory procedures for monitoring, verification, clearing and settlement by 50% due to full or partial automation of all transactions and access to information (Volosovich, 2017).

Thus, the Blockchain can quite reasonably be considered as a multifunctional technology capable of forming a decentralized financial system, which correctness could be verified by any participant.

Based on this, the distributed registries technology is an ideal tool in the following cases of data accounting:

- offsets between financial institutions;
- state registers;
- public auctions;
- control over the use of budgetary funds;
- implementation of social assistance to the population programs;
- implementation of state policy in the social insurance sphere, etc.

The authors' position is consonant with V. Zolotukhin opinion, CRM on the distributed registry of EvoDesk founder, who believes that "... the Blockchain can and should be considered as a tool to fight against corruption. One of the first destinations of its

implementation should become the public procurement system. In addition, a chain of tracking the funds movement from allocating from the budget to particular estimates and expert assessments on their effective development building is feasible on its basis. And the information can neither be faked nor changed retroactively. Additionally, the results of supervisory authorities, law enforcement agencies, courts of law and other institutions operation can be tracked in distributed registries and this information will be available to everyone. This will improve the rating of public confidence in state structures and prevent many unpleasant events" (Lihodey, 2018).

It should be recognized that the state financial system of Ukraine subsystems, implementing the above objectives, is almost completely centralized and rather opaque at the moment. It is the very circumstances that make the corrupt practices possible.

The blockchain eliminates the influence of egoistic factors that lead to creation of fraudulent and corrupt schemes undermining public interest and state sovereignty. At the same time, an incentive to act and behave honestly emerges for participants of the unified system, since the rules are uniform and apply equally to everyone. In this way a new form of social responsibility arises.

In this context, the feasibility of creating a reputation system for public officials on the Blockchain basis should be mentioned. Implementation of the Revain project, accumulating reviews on crowdfunding campaigns and cryptocurrency exchanges on its platform can be considered as a successful example of such a reputation system functioning. Users leave their reviews, which cannot be falsified or deleted. User comments are available for review by everyone interested. The developers are planning to expand the technology to evaluate the scope of public services as well.

Revealing the technology importance in the fiscal process of Ukraine, the following can be designated: the Blockchain is an invariant tool of commitment economic transactions, enabling to eliminate information transparency barriers for the system entities, thereby making deliberate hiding of information impossible. Its main characteristics as a management tool, and at the same time advantages, are publicity and "integrity".

It should be noted that the practical implementation of the Blockchain technology in the public finance sector implies, above all, a change in management paradigm and transition from a hierarchical model to a flat one, and merely a political will is not enough. The key reasons that may hinder the introduction of this technology in our country are quite obvious. The point at issue is the difficulties in reaching a consensus of a large number of the process participants, lack of appropriate legislative framework, as well as inertia and just the reluctance of the main corruption subjects for the very fact of its implementation (Dubovoy, 2017).

Note that both cryptocurrency and Blockchain technology are in a legal vacuum in a number of countries, including Ukraine: they are neither allowed nor prohibited, their turnover is not officially recorded, and thus, remains in the gray background. However, the essential difference is in the fact that the Blockchain is not money, which issuance is monopolized by the State, but a technology that can be used by both the state and the citizens.

In addition to the above mentioned, the fact that the process of transformation and transition to the full implementation of the distributed data registry technology can be greatly stretched in time should be taken into account. It is logical enough that complication of mechanisms for data security, storage and transmission, as well as new options for scaling and transactions privacy will occur parallel to this. All this requires lability, reactivity and adaptation activity from the government structures in the face of growing risks and threats to national economic security.

But at the moment, the Blockchain technology is gaining ever-increasing global popularity, is rapidly expanding its scale and is gaining momentum of its implementation into many areas of economic activity.

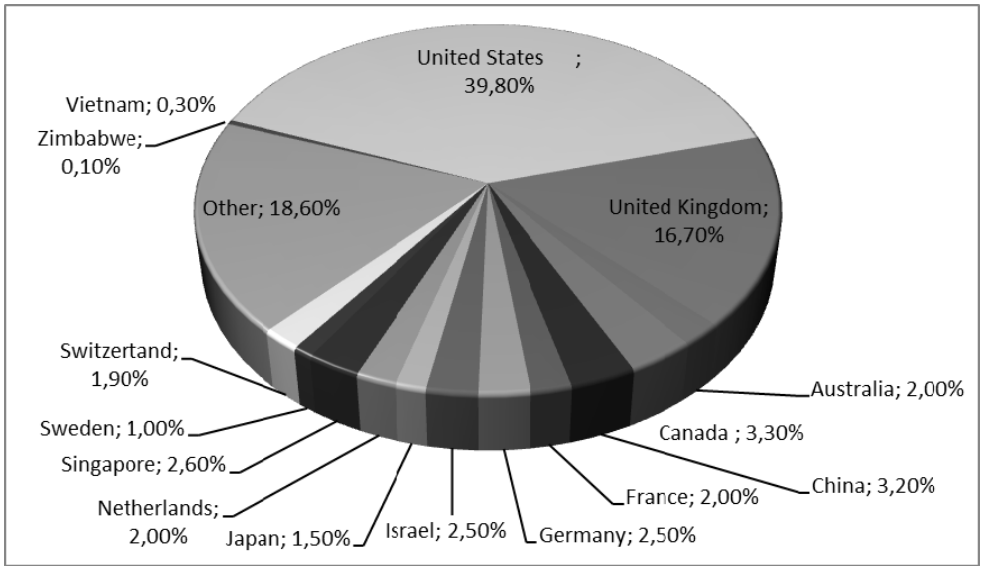
General analytical insights of the Blockchain startups distribution and their branch representation are presented in Figures 1 and 2.

Statistics of Outlier Ventures, a European venture capital company, which monitors Blockchain startups in the world and is engaged in their development has been used in the article.

Thus, according to the data presented, the United States is the leader in the Blockchain technology market, where 38.9% of the total number of Blockchain startups has been implemented. The United Kingdom occupies the second place in the structure with16.7%, Canada is the third –3.3% is concentrated there, while China occupies the fourth place with 3.2% of all start-ups located on its territory. Singapore (2.6%), Germany and Israel (slightly more than 2%) have not reached the 3% level (13).

Figure 1

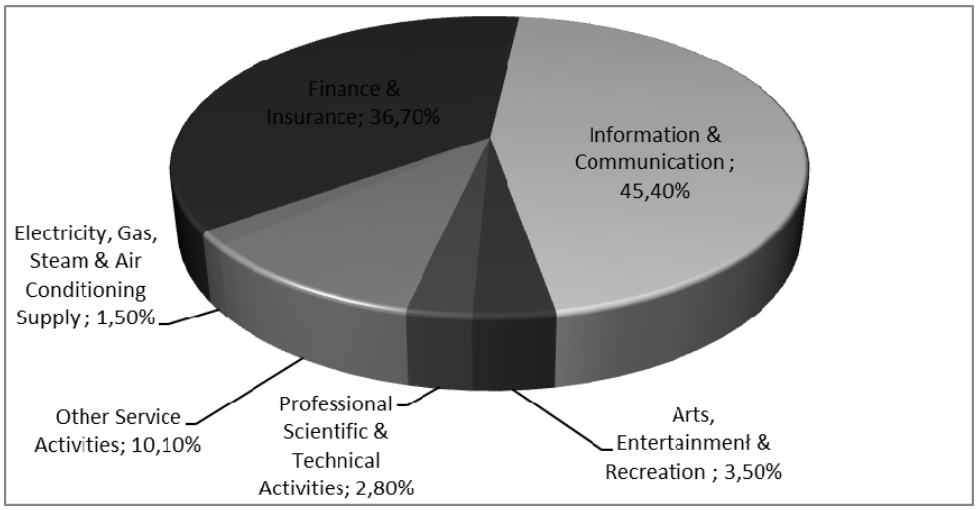
Review of Blockchain Startups Activities in the Countries (13)



Analyzing distribution of Blockchain startups by industries, it should be noted that 45.4% of their total number operate in information and communication field, 36.7% – in finance and insurance, 4.7% – other service activities, 3.5% – arts, entertainment and recreation.

Figure 2

Review of Blockchain Startups Activities by Industries (13)



A forecast for the period of up to 2020, in which dozens of key trends in the development of the international economy and finance were presented, was published by Gartner, an international analytical agency, in 2016. Agency analysts associate all of them with the increasing scale of the digital revolution taking place in the world, which cumulative gain area will only increase over time. Blockchain technology as a new technology that can change global economics and finance was named the first in rating. Agency analysts predict that blockchain-based business turnover will amount to USD 10 billion by 2020. Along with that, the technology insufficient maturity level at the moment is noted and the huge potential in terms of cost savings in the field of financial services in the future is emphasized in the published document (Veynberg, 2016).

According to the World Economic Forum participants survey, it is expected to be actively used by the leading countries and about 10% of global GDP (according to the OECD estimates) will be created with its direct application by 2023. The technology advantages are: reduction in operating expenses (73% of the survey participants), reduction of computation time (69% of respondents), risk reduction (57% of all respondents), the possibility of obtaining additional income (51% of respondents) (15, 16).

Estonia is a benchmark of the Blockchain technology application, where the integrated state electronic system is functioning successfully. The system's performance results in 2016 confirm its effectiveness: 94% of citizens had an electronic ID that allows them to use the system; 2% of GDP savings on the state paperless operations; over 4,000 services provided

electronically; Estonia is No. 1 world country in terms of fiscal performance and E-Economy Index (17, 18).

Procivis, a Swiss startup, in collaboration with e-government experts from Estonia, announced the launch of the app store, a blockchain-based e-government pilot version, by the end of 2017. Procivis aims to create applications that implement a full range of services for citizens — such as digital identification, voting, filing tax returns, maintaining inventory, etc [3].

The United Kingdom is another benchmark, which could become the epicenter of the Blockchain revolution. Over the past few years, significant steps to popularize cryptocurrencies, including Blockchain technology, to study the efficiency of their implementation in business and public administration have been taken in the country.

In his report on the issue, the Chief Science Adviser to the United Kingdom Government, Sir Mark Walport suggested the following areas where they can be applied efficiently:

- in ensuring operational control and transparency of international and humanitarian assistance funds expenditure;
- in protecting critical infrastructure;
- during registration and formation of data registers, such as state-owned assets, objects of intellectual property, wills, data on the population health in the national pension and health care systems;
- in order to reduce fraud in obtaining the State social assistance (20).

The Ministry of Labor and Pensions, with the support of GovCoin Systems Limited, has launched a pilot project of a blockchain-based platform for allocation of social assistance. The Cabinet Secretary Matt Hancock issued a statement saying that the Government sees the potential of using the technology for allocation of scholarships and grants. In addition, the country Central Bank has tested several blockchain-based developments and is exploring the project of issuing its own digital currency (Jemima, 2016).

China can be considered the best practice for the implementation of the state policy in the sphere of taxation and social insurance by means of the distributed data registry technology.

For example, a partnership agreement between THEKEY and the Information Center of the Ministry of Social Services and Welfare (MHRSS), as well as the Chinese Social Security Association (CSIA) was concluded on June 20, 2018. The partnership could potentially offer the opportunity to scale up the efforts to implement social security functions using the Blockchain technology and THEKEY's revolutionary digital identification technology to the Chinese authorities. The Chinese government may introduce a blockchain-based system through which it will fulfill its social insurance obligations, such as benefit payments, pension payments, medical insurance, etc. relatively soon. To achieve the objectives, the government will take advantage of THEKEY's developments in the field of digital identification and effecting fast electronic payments. The new collaboration, which implies the use of the technology for the benefit of 1.4 billion Chinese citizens, is an unprecedented case of large-scale application of the Blockchain technology (22).

In China the process of active implementation of the Blockchain technology into the tax system, in particular, in a radical change of the tax documentation filing procedure is being initiated even today. The choice of such introduction priority direction is attributed to the struggle with concealment of income by the taxpayers. Tax documentation procedure and transactions transfer to the Blockchain will contribute to the significant improvement of fiscal performance. Today, China has already transferred about 2.5 million accounts to the new blockchain-based document management system, and this figure is planned to be increased to 55 million by 2022.

The 17th Five-Year Plan, recently published by the Chinese government, positions the Blockchain technology as one of the main strategic directions for the development of the national economy. The Central Bank (CB) of China has also recently reiterated its support for the Blockchain, and the Head of the Central Bank added to the press that "significant resources have already been invested" in the technology research. The government is scheduling to defeat corruption in the country in the 20s of the XXI century through introduction of the new technology and allocates serious investments for this purpose (22).

In the context of Blockchain projects in the public finance sector implementing, the first pilot projects implemented in Ukraine should be mentioned. Thus, on September 6, 2017, the official launch of an electronic auction based on the BitFury distributed registry technology took place in Kyiv. The solution was applied to the system of selling the confiscated property of SE SETAM through the country's largest auction. The online auction, based on the distributed registry technology, held 11 thousand tenders worth almost two billion hryvnas over the past year (23).

SE SETAM issued the first transaction for the sale of lease rights to the public land through the OpenMarket Blockchain platform in October 2018. The total cost of the land lots sold on the OpenMarket reached UAH 348.5 million. It is referred to the arrested land and voluntary sale of the land. In general, there are about 10.5 million hectares of public land in Ukraine. The Cabinet of Ministers Resolution No. 688 dated June 21, 2017 set a procedure for arranging sales of lease rights for the public land through an electronic auction only (Tham, 2017). Implementation of this legislation through the Blockchain platform will facilitate the eradication of abuses in land auctions and ensure transparency in this sector.

The Board of the National Bank of Ukraine approved and presented the Cashless Economy roadmap (25). In particular, plans for the Blockchain technology application in Ukraine were first spelled out.

In the public finance area, the distributed data registry technology application concerns the following:

- Transparent Budget electronic system, which will contribute to strengthening public control over the use of budgetary funds. Thus, the operation of the i.data system module will allow any user to see data on public finance expenditure. The given module complies with the World Bank and the IMF standards. It will integrate information from the National Bank of Ukraine, the State Fiscal Service of Ukraine, the State Treasury Service and the ProZorro system;

- public procurement system, which is represented by the Ukrainian public e-procurement ProZorro system, which, according to the prestigious Open Government Awards, was recognized as the best in the world (Volosovich, 2017:20).

Definitely, some of the described above examples of the Blockchain technology application can be considered as the distributed registry projects testing and the first step towards constructing a new public administration system. It is about a fundamental restructuring of the very activity of the State, its total immersion in the Blockchain digital ecosystem. As a result, the State will gain a significant reduction in bureaucracy, practical elimination of paper documentation procedure, significant reduction in transaction costs, full control over the officials' activities, and, most importantly, creation of a favorable environment for the development of business and public life.

5. FINDINGS. Taking into account the above, it is necessary to state that the technology, if introduced into the fiscal process of Ukraine, will significantly increase the government spending accountability, make further legalization of the illegally received budgetary funds impossible and ineffective and will allow identifying the ultimate beneficiary of each national hryvnia at any time and also to visualize the full chain of transactions for the receipt of a monetary unit to such a beneficiary (Zinchenko, 2017).

Abhi Dobhal, Vice President of Business Development for Factom, said that from the State perspective the Blockchain has three "distinct advantages": "It has a distributed architecture, cannot be changed and is transparent. These features allow blockchain-based applications to fight against fraud and corruption. Alongside, they are more efficient" (26).

Thus, due to technological properties, Blockchain technology can become that invariant tool for the fiscal process efficiency improvement and corruption factors impact in Ukraine as a whole elimination, which will lead the country to the economic stability trajectory.

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ИКОНОМИЧЕСКИ ИЗСЛЕДВАНИЯ
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FORECASTING OF GROSS AGRICULTURAL OUTPUT OF AGRARIAN ENTERPRISES OF UKRAINE: CASE STUDY WITH STELLA SOFTWARE

The article is devoted to the forecasting of gross agricultural output of agrarian enterprises of Ukraine with an application of STELLA program. The STELLA economic modelling program, which combines mathematical differential equations with a developed graphical interface, has been used in the article. In this program a model was created and an attempt was made to forecast the gross agricultural output of agrarian enterprises of Ukraine by 2030. It has been the possible growth up to UAH 147319 mln UA of output of agricultural enterprises (PRODUCTION) with a slight reduction and further stabilization of the agricultural land (AREA) at the level of 22600 thousand hectares, a constant increase in fertilizers to 135 kg per hectare (FERTILIZATION) and a steady growth of enterprises up to 60900 (ENTERP). The most promising possibilities for applying STELLA program in economic forecasting have been outlined in the article.
JEL: H82; O21

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Introduction

As a result of the agrarian reform in Ukraine (1990-2010), based on collective agricultural enterprises, new economic entities, based on private ownership of property and collective forms of management, have been created. Functioning in the market conditions, characterized by a competitive environment, newly created enterprises can provide profitable activities at the expense of production in accordance with the needs of consumers. Enterprises need to ensure the production of goods, that are necessary for the target market segments. The globalization of processes and the entry of Ukraine into the WTO (the world trade organization) requires enterprises to produce goods that meet international standards.

However, in less than a quarter of a century, in most of the newly created enterprises, except large (high-value) enterprises, the necessary material and technical base for agricultural production is not yet fully formed, there are problems with obtaining land for use, due to lack of funds, there is not enough opportunity to apply progressive technology, lack of many years experience in managing enterprises in a competitive environment, not all marketing tools are used.

As a result, agricultural enterprises of Ukraine in the last years of 2012-2016 were able to provide only half of the gross output in comparison with 1990 (the base period for the beginning of agrarian transformations). Therefore, the task of increasing the gross agricultural output of agrarian enterprises of Ukraine, which concerns the agrarian sector of the economy, is extremely important. In this situation, forecasting of gross agricultural output of agrarian enterprises is relevant, and the results of the forecast can be used for further planning of agricultural activity.

The literature review

Problems of the gross agricultural output of agrarian enterprises are devoted to the scientific work of many economists (Hohulia, 2014, Andriychuk, 2002, Danylko & Kobylynska, 2014). Also, the methodological bases of calculation of production in Ukraine of gross agricultural output are being analyzed (Andriychuk, 2013, Luginin, 2007).

Gross output is considered as the final result of production activity in cash terms per year (Andriychuk, 2013, pp. 180). Gross agricultural output is expressed in comparable prices in a given year, has a material and value basis, and is represented by crop and livestock products manufactured during the year (Andriychuk, 2002). This is a statistical indicator in money, which characterizes the total amount of agricultural production per year (Great Dictionary of the Ukrainian Language, 2007), as well as the volume of agricultural and livestock products manufactured for a certain period and expressed in cost form (Economic Encyclopedia, 2000).

The gross output shows the total value of all kinds of production received by the company during a certain period (Gorbonos et al., 2010). It describes the total volume of production produced in agriculture, is part of the gross social product (Dusanovsky et al., 1997) and

acts as the initial result of the interaction of factors of production, which is represented by all products manufactured during the year by crop and livestock production.

Calculation of gross agricultural output is carried out at the expense of cost estimation of each particular type of agricultural product, regardless of place and conditions of production, and at the same price (Danylko & Kobylynska, 2014).

The peculiarity of agricultural production is the land – on which production is carried out and which is included in the production process as one of its conditions, and therefore it is the basis for the combination of all production resources (Matsybora, 2014). The achievement of the economic efficiency of land use characterizes the production of gross output per hectare of land (Dusanovsky, et al., 1997).

Forecasting gross agricultural production of agrarian enterprises in Ukraine, realized with the system dynamics modelling environment, STELLA (isee Systems, 2015) created by the American firm HPS (High-Performance Systems). The STELLA program allows the processing of original models of economic systems and their research (Kwaśniecki, 1998; Aschepkova, 2002). We chose STELLA because of its low cost, intuitive and user-friendly (no programming is required) interface, and widely recognized modelling iconography (Costanza & Gottlieb, 1998; Costanza & Voinov, 2001; Costanza et al., 1998; Richmond, 2001, Walters et al., 2016).

Forecasting is an important tool for agricultural policy, which offers possible alternatives for the development of agricultural enterprises taking into account the market impact and other factors while ensuring the accuracy of forecasts (Zabolotnia & Kurova, 2013). (c. 62,66).

On the basis of the forecasting of gross agricultural production of agrarian enterprises is a scenario which accumulates information on the forms and types of activity of agricultural enterprises, their financial results not only in the past, but also those that have to occur in the future (Panasiuk, 1998).

The purpose of the forecast is to investigate what agricultural holdings need to take in land use and how it will affect the future use of land resources (Tretiak, 2009).

Models of economic growth created by Ya. Tynberhen (1980) can be used in the construction of agricultural enterprise development models.

The forecast is a necessary tool for improving the efficiency of enterprises, which is especially important in the period of modern economic transformations that are taking place in Ukraine (Luchyk V., Koroliuk, 2017). This confirms the importance of forecasting as a component of planning, in developing prognostic changes in the gross agricultural output of agrarian enterprises of Ukraine.

The aim of the article was to present the results of forecasting the gross agricultural output of agrarian enterprises of Ukraine up to 2030 using STELLA software.

To achieve this goal, firstly, one needs an assessment of the state of study of the experience of effective operation of agricultural enterprises in market conditions for the period from 1990 to 2017. Secondly, ensuring the preservation of soil fertility by making the optimal

amount of fertilizers. Thirdly, to support the scientific and technical potential of the agrarian sector. And Fourthly, we have taken into account that volumes of production of gross output are formed according to demand and supply, adherence to agricultural requirements and market conditions. The above-mentioned shows that today the question of forecasting gross agricultural output of agrarian enterprises with the use of mathematical apparatus appears.

Research Methodology

The collected materials have been processed in the statistical program Statistica 13.1. In particular, the relationship between the indicators (variables) that have the strongest influence on the formation of gross agricultural output of agrarian enterprises (PRODUCTION) has been investigated. A multivariate analysis has initially been conducted between 8 indicators such as: area of agricultural lands (AREA), fertilization per 1 ha (FERTILIZATION), number of enterprises (ENTERPISE), gross agricultural output of agrarian enterprises (PRODUCTION), net income (INCOME), labor productivity per 1 employee (LABOR PRODUCTIVITY PER EMPLOYEE), perfitability level (PERFITABILITY), number of employees (NUMBER OF EMPLOYEES).

Only 4 indicators in the STELLA program have been selected for simulation, with a p value ≤ 0.05 (that is, only those rated as statistically reliable). These are such indicators as: area of agricultural lands (AREA), fertilization per 1 ha (FERTILIZATION), number of enterprises (ENTERP), the gross agricultural output of agricultural enterprises (PRODUCTION).

After statistical processing of the collected data, a mathematical equation has been obtained that characterizes the connections which appear between the selected indicators. Here we only remark that the collected data has been analyzed for the dependent indicators in order to exclude cases that could violate the established regression equation. In the final result, after eliminating non-significant samples, the regression equation is determined. All indicators have been checked for the probability test $p \leq 0.05$ in order to exclude those that showed a lack of statistical accuracy.

The resulting equation was introduced to the model created in the STELLA (Structural Thinking, Experiential learning Laboratory with Animation) program. The model is innovative for Ukraine and is based on the theory of system dynamics (Bertalanffy, 1976, Forester, 1978). The STELLA program successfully combines mathematical differential equations with a well-developed graphical interface (Kwaśniecki, 1998; Aschepkova, 2002; Kozak & Parpan 2009).

To create a model in the STELLA program, we applied the Stock element (*Stock*), to which the initial value of the gross agricultural output of agrarian enterprises (PRODUCTION) has been inserted since 1990. The second key element used in the model was the Flow element (*Flow*). The formula that was previously calculated in the Statistica 13.1 program was inserting in this element. Both elements were connected using such elements Arrows (Action *Connector*).

There converter elements (*Converter*) were created in the Model: area of agricultural land (AREA), Fertilizer per 1 ha (FERTILIZATION) and number of Enterprise (ENTERP). The Time function was used (using the Builtins configuration window).The graphical function (*Graphical Function*) was used. The graphical element of the STELLA program such as (*Graph Pad*) and tabular element (*Tabel Pad*), which show the results of the forecast were used in the model.

The data from 1990 have been introduced to the model. Data from 2016 were used only for verification of the created model. That is, the model was verified (results of the forecast for 2016 were compared with real data from 2016). A forecast of possible changes in the studied indicators by 2030 has been conducted after verification of the model.

The statistic data on volumes of the gross agricultural output of agrarian enterprises for the under-investigated period are given in constant prices in 2010.

Results of Analysis

Statistically significant results with $p \leq 0.05$ have been obtained for all 4 analyzed parameters. We see almost zero values of p in the results of regression analysis for the dependent variable PRODUCTION (Table 1).

Table 1

Results of regression analysis for PRODUCTION

	Test SS dla pełnego modelu względem SS dla reszt (3)										
Zależna Zm.	Wielokr. R	Wielokr. R2	Skorygow R2	SS Model	df Model	MS Model	SS Reszta	df Reszta	MS Reszta	F	p
PRODUCTION	0,985751	0,971704	0,963216	2,868860E+10	6	4,781433E+09	835398531	20	41769927	114,4707	0,000000

Source: Authors.

Based on *Beta*, it is estimated that the most significant contribution to the development of agricultural products (PRODUCTION) is such variables as the number of enterprises (ENTERP), and also the variable as the area of agricultural land (AREA) (Table 2).

The analysis of the standardized endpoints for the dependent variable showed a lack of values of greater than ± 3 sigma (Picture 1), indicating a lack of significant data deviations.

Created in Statistica 13.1. the formula has the following form:

*Productivity = 587404.312987-10.9398081604 *AREA+0.000203891387468 *AREA^2+278.500706483 *FERTILIZATION-1.52987453931*FERTILIZATION^2-29.8471051593*ENTERP+0.000409659858454*ENTERP^2*

This formula was inserted into the *Inflows Production* element (Picture 2) in the model. The figure shows the block diagram of the model. Links between variables are designed as graphic functions in the STELLA program. The convenience of this method is that the appearance of the function can be changed directly on the computer screen with the mouse cursor. We see the production rectangle created in the model as stock *(Stock)* for agricultural products (UAH mln.). This stock is replenished with Inflows Production with a

feedback arrow. The *Flow* is influenced by 3 *Convectors* (Fertilization, Area, Enterprises). On the right, there is a graph element (*Graph Pad*) and a table element (*Tabel Pad*).

Table 2

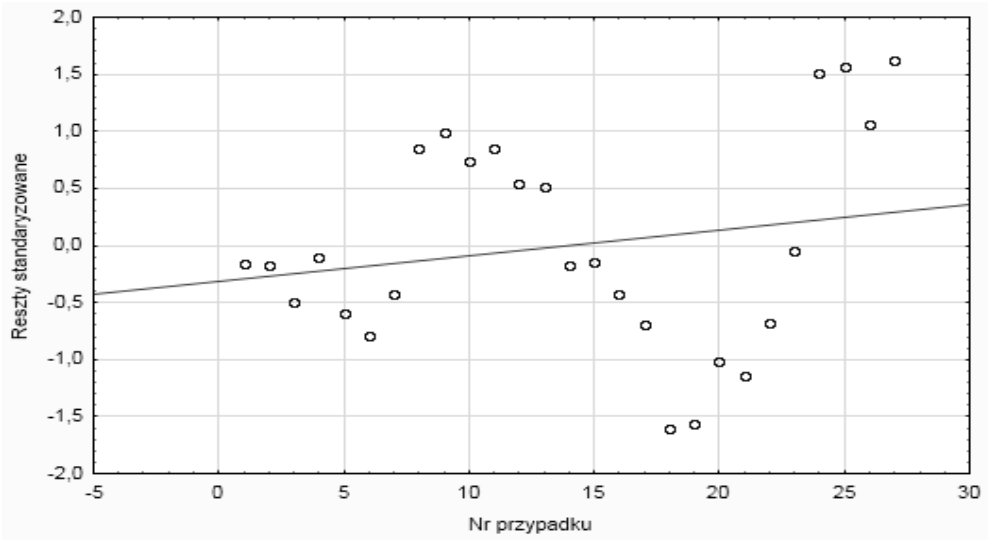
Essential results for AREA, FERTILIZATION, ENTERP

	Oceny parametrów (3) Parametryzacja z sigma-ograniczeniami									
Efekt	PRODUCTION Param.	PRODUCTION Bł. std.	PRODUCTION t	PRODUCTION p	-95,00% Gr.ufn.	+95,00% Gr.ufn.	PRODUCTION Beta (ß)	PRODUCTION Bł.Std.ß	-95,00% Gr.ufn.	+95,00% Gr.ufn.
Wyraz wolny	-1845626	351517,6	-5,25045	0,000039	-2578879	-1112373				
AREA	-38	8,9	-4,23619	0,000405	-56	-19	-8,1242	1,917816	-12,1247	-4,1237
AREA^2	0	0,0	5,37677	0,000029	0	0	12,0204	2,235613	7,3570	16,6838
FERTILIZATION	632	214,2	2,95307	0,007863	186	1079	0,6811	0,230651	0,2000	1,1623
FERTILIZATION^2	3	1,2	2,19313	0,040288	0	5	0,4610	0,210204	0,0225	0,8995
ENTERP	330	50,2	6,58462	0,000002	226	435	22,6490	3,439683	15,4739	29,8240
ENTERP^2	-0	0,0	-6,97419	0,000001	-0	-0	-27,8599	3,994712	-36,1927	-19,5270

Source: Authors.

Picture 1

Results of regression analysis, variable dependent Production

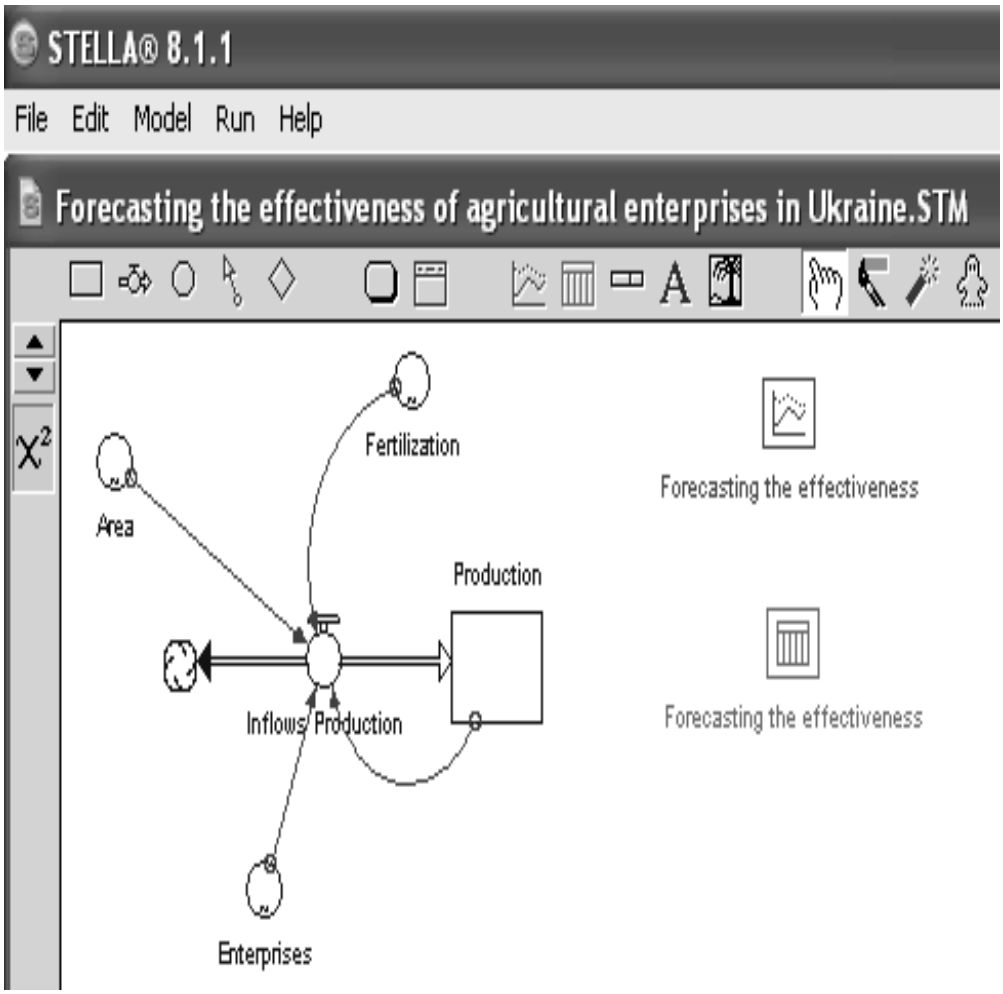


Source: Authors.

The model's verification consisted of a comparison of real data from 2016 (as data from 2017 were absent) with data forecasted in the model for 2016. We see that the model for 95-100% hit the real data in 2016. So in 2016, real data for the variable Production was UAH 145,119 million, for Fertilization 96 kg per 1 hectare, for Area 20,746 thousand hectares. Accordingly, the model showed in 2016 – for the Production variable 143475,77 million UAH, for Fertilization 95,5 kg of fertilizers per 1 hectare, for the variable Area 22100 thousand hectares.

Picture 2

The interface of the created model in STELLA program

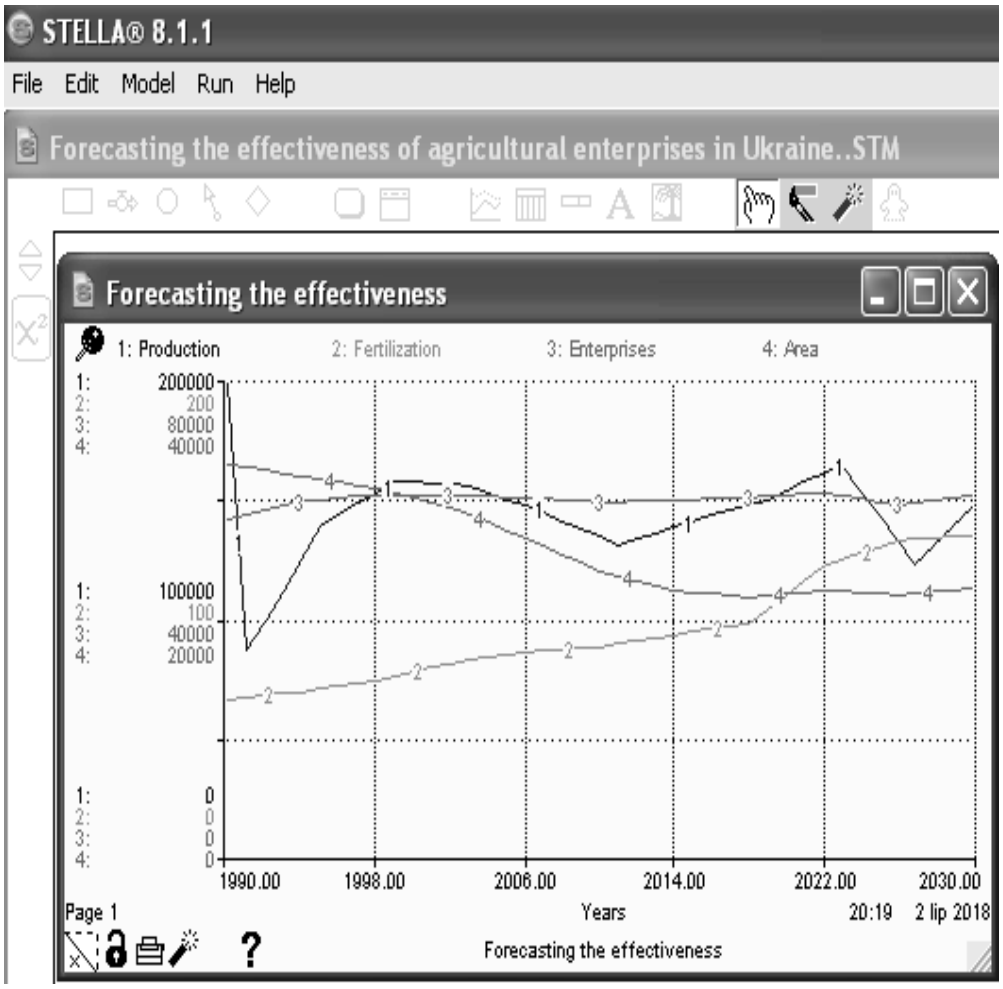


Source: Authors.

The results of the forecast (Figure 3) showed the possible increase in the gross agricultural output of agrarian enterprises (Production) with an increase in the amount of fertilizers applied per ha (Fertilization). At the same time, the increase predicted and stabilization of the number of enterprises (Enterprises) and the agricultural land area (Area) especially at the end of the forecast (in the figure, each variable has its own number which is highlighted in the left part of the picture and on the lines).

Picture 3

Graphical representation of forecasting results in STELLA program



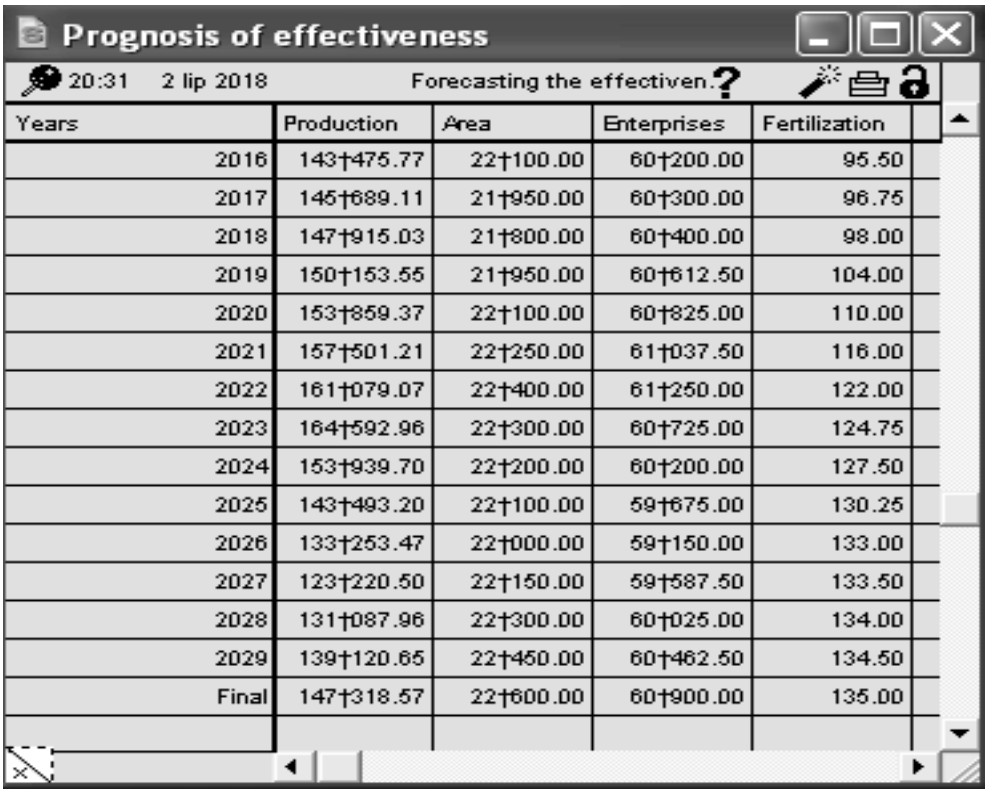
Source: Authors.

The specific values of the predicted analyzed variables by 2030 can also be seen (Table 3) in the table (the special character separates the millions and thousands of values).

As we see (Figure 3, Table 3), the model predicts that at stabilization of the number of agricultural enterprises (Enterprises) at the level of 60900 and Area (Area) lands at the level of 22600 thousand hectares, as well as with the increase in the amount of fertilizer per ha (Fertilization) to 135 kg of fertilizers per 1 hectare in Ukraine there can be positive changes in the gross agricultural output of agrarian enterprises (agricultural products can reach the level of 147318 million UAN).

Table 3

Table view of forecasting results in STELLA program



Years	Production	Area	Enterprises	Fertilization
2016	143†475.77	22†100.00	60†200.00	95.50
2017	145†689.11	21†950.00	60†300.00	96.75
2018	147†915.03	21†800.00	60†400.00	98.00
2019	150†153.55	21†950.00	60†612.50	104.00
2020	153†859.37	22†100.00	60†825.00	110.00
2021	157†501.21	22†250.00	61†037.50	116.00
2022	161†079.07	22†400.00	61†250.00	122.00
2023	164†592.96	22†300.00	60†725.00	124.75
2024	153†939.70	22†200.00	60†200.00	127.50
2025	143†493.20	22†100.00	59†675.00	130.25
2026	133†253.47	22†000.00	59†150.00	133.00
2027	123†220.50	22†150.00	59†587.50	133.50
2028	131†087.96	22†300.00	60†025.00	134.00
2029	139†120.65	22†450.00	60†462.50	134.50
Final	147†318.57	22†600.00	60†900.00	135.00

Source: Authors.

Discussion

The results of the study showed that after 2018, the forecasting increase in gross agricultural production may increase to 164593 mln. UAH. in 2023, showing growth compared to the size in 2016. The forecast, taking into account agricultural products, fertilization per 1 hectare of the area of agricultural crops, the number of enterprises and the area of agricultural land, showed perspective changes that may occur in the agricultural sector of Ukraine. Growth in gross agricultural production may indicate an increase in crop yields and an increase in livestock production (Danylko, & Kobylynska, 2014).

As we can see from the forecasting in the STELLA program from 2024 to 2027, a slight decrease in gross agricultural output can also be expected, with subsequent growth until 2030. That is, the model predicts fluctuations in the gross agricultural output of the agrarian enterprises of Ukraine.

The predicted data obtained by us using the STELLA program is confirmed by other authors' studies. In particular, Matviishin and his co-authors (Matviishin, et al., 2015) investigated trends of changes in gross production in Ukraine using the Trend Line tool. They described the equation by which one can calculate the forecast values of output and prove that its growth rate will remain at the level of average rates for previous years.

Predicted change tendencies of the analyzed indicators shown in the model are confirmed in the literature. For example, the effect of using fertilizers is increasing yields (Pidgorny, 2014). Although it should be remembered that only one effect can not be judged on the advantageous use of fertilizers. And to determine the efficiency of production it is necessary to compare the achieved effect with the costs that ensured its receipt.

The forecast of our model, the increase and stabilization of the number of agricultural enterprises at the level of 60900 may increase their share in the total production of agricultural products (Dobrunik, 2015). The optimal structure of the economy is the main factor that influences the efficiency of the production activities of agricultural enterprises. The essence of this is the rational use of natural resources, increasing the introduction of organic fertilizers, which is necessary in the production of high-quality, environmentally-friendly output (Kolos, 2013). The essence of both products and profit are the results of the enterprise (Osypov, 2016). Therefore, it is worth looking for ways to increase their number.

The literature suggests that reducing the number of agricultural enterprises may be due to the fact that most executives and specialists will be unprepared for the conditions that market economics would dictate to them (Markovych, 2011). As we see, our model predicts a slight decrease in the number of enterprises in 2023-2026. According to S. Demyanenko (1994), "... any enterprise should be based on a certain regularity in relation to its resource base", which is a stabilizing factor in increasing the number of enterprises.

The objective and subjective reasons that led to the quantitative decline of enterprises since the early 1990's include rising costs, instability of financial and credit policy and migration processes in Ukraine.

The reduction in the number of agricultural enterprises is due to the cessation of part of the farms due to difficult financial and material circumstances, the expiration of the term of lease of land and the seizure of its owners for the organization of individual farms without the creation of a legal entity, the transition to another category of farms (Shelenko, 2007). The value of gross output can be reduced due to changes in the total number of Ukrainian agricultural enterprises and land use volumes (Muzichenko, 2013). The provision of productive resources also affects the size of enterprises (Tsitska, 2012). The tendency to increase the share of agricultural enterprises in gross output is achieved by increasing the number of agro-holdings (Bogdanovych, 2016).

In Ukraine, there is no mechanism that reduces the riskiness of agricultural production due to competition from agro-holdings. This induces agricultural producers to sell products at reduced prices through intermediary structures, which in the future leads to a reduction in profits in agricultural enterprises (Kolos, 2013).

From the data obtained, we see a decrease in the area of agricultural land up to 2018. The decrease in the area of agricultural land in agrarian enterprises is affected by the fact that:

part of the village residents for various reasons did not renew the lease contracts or did not demand proper shares; others are private enterprises without the creation of a legal entity (Shelenko, 2007). Land in agriculture serves as the main means of production and the productivity of agricultural production depends on the location, the size of area and topography of agricultural land (Galushko & Berehovyi, 2011, pp. 21-22, 55).

After 2018, the model predicts a reduction in the area of agricultural land and even a slight increase in agricultural land. It is important. Increasing the amount of land resources in agrarian enterprises will ensure production growth of gross agricultural output (Yakubiv, 2014). After all, the size of land use is influenced by the gross agricultural output of the agrarian enterprises of Ukraine. The increase in cultivated land contributes to adherence agrotechnical requirements, scientifically based crop rotation, and the use of intensive technologies (Makarenko, & Melnyk, 2011).

With a pessimistic forecast, the low-level use of land resources of agricultural enterprises will lead to an increase in the cost of agricultural products (Hnydiuk, 2011)

Increase in the gross agricultural output of agrarian enterprises of Ukraine is a conscious and purposeful activity of workers on the use of natural, social and other resources concentrated in the enterprises. Accordingly, enterprises must deliberately and purposefully implement measures to ensure the achievement of a high level of economic efficiency.

Agrarian policy in Ukraine is realized through the economic and social development of each enterprise, in particular, due to the level of gross agricultural output. Here the regularity of counter-development is being shown, the state encourages the development of agricultural enterprises on the vertical where, at the end the effectiveness of agrarian policy, in general, is determined. Agrarian development of the state can be ensured directly only through the priority (primary) provision of interests of agricultural producers.

The volume of production of gross agricultural output in Ukraine with the use of the forecast model STELLA by 2030 compared with 2018 will be reduced by only 1%. It would be desirable that the further reduction of the production of gross output was realized at the state level, and by managers at both higher and lower levels, which could become the main negative factor for further reforms that will take place in agriculture of Ukraine.

The area of agricultural land, for the aforementioned period up to 2030, will be characterized by an increase of 1%. Lack of land from 1990 to 2005, in the absence of funds for the purchase of fertilizers, was an economic barrier to the effective development of agricultural enterprises. However, a general tendency to increase gross output was observed in Ukraine in the long run.

The applying of all types of fertilizers by 2030 will also tend to increase by 37.8%, which will have a positive effect on the growth of crop yields

As far as the number of agricultural enterprises is concerned, they will grow only by 1.0%, which will have low social and economic value, and it will be that by 2030 they must be organized on the basis of private ownership of land and property; to ensure the use of a single production complex; to bear complete economic and legal responsibility for the consequences of its activities.

So we can say that the current mechanism of management in agriculture in Ukraine will remain ineffective. The need for a radical change in the management system of agricultural enterprises and the provision of an economic mechanism for the development of the agrarian sector at the state level is being determined.

The main changes in the mechanism of operation of agricultural enterprises will underline in preserving the resource potential and consolidating the labour force in the countryside, creating an economic and legal environment for effective functioning in market conditions with a binding link to specific conditions of management.

The STELLA results obtained from the forecast, as well as the results of the research carried out, will contribute to the deepening of the methodological experience in the field of simulation with the use of dynamics of systems. Using STELLA's standard elements (Stock, Flow, Converter, Action Connector) allows very quickly to build your own economic model As STELLA models are inherently quantitative, it was necessary to define each of the model parameters, and normalized graphical functions. Graphical functions are useful tools within STELLA to invoke nonlinear relationships or trends between two variables (Walters et all, 2016).

Actually, our article is devoted to using STELLA as a special program of economic modeling in which we wanted to show the most promising possibilities of its application in the economy. It is worth noting that this type of model, based on the dynamics of systems and the program STELLA actively used in the United States and in European countries.

An example of the created economic model, executed with the help of the program STELLA has been considered in the article, has shown it as a quite accessible, transparent and visual. The effect of obtaining graphic results is important for the development of economic research methods with the use of modern computer programs.

Forecasting changes of the gross agricultural output of agrarian enterprises of Ukraine have been presented in the article and processed using STELLA program, which can be the basis for planning production of agricultural output.

Forecasting the production of gross agricultural output provides companies with the opportunity to focus on: improving the farming system, ensuring the growth of crop yields and animal productivity, and the rational use of resources.

Conclusions

Our research shows trends in the production of gross output, the change in the number and area of agricultural enterprises and the amount of fertilizer for the future. As the results of our research for agrarian enterprises showed, the main effective indicator of economic activity is the production of gross agricultural output. The forecasting production in the model shows cyclical changes (an increase to 2023, a further decrease to 2027 and a subsequent increase to 2030).

The total volumes of gross production in agricultural enterprises are mainly influenced by factors such as the number of enterprises, the area of agricultural land, fertilization per hectare of land area.

When forecasting the gross agricultural output of agrarian enterprises of Ukraine, an original model in the STELLA program was created, which determined the impact of the number of agricultural enterprises, the area of land and fertilizers applied on the production of gross agricultural output.

Created in STELLA program and presented in the article, the model predicts that in Ukraine, by 2030, in case of stabilization of the number of agrarian enterprises, the area of land, and with the increase of fertilizers per one hectare, it is possible to increase the production of gross agricultural output. In general, it can provide such an important for Ukraine expansion of production, increase of resource base of enterprises and development of social sphere of rural territories.

It has been proved that with the help of the developed model of forecasting of production of gross output and using calculations, agricultural enterprises will have an opportunity to predict the directions of their activities in the future.

New agricultural enterprises, created in Ukraine in the process of modern agrarian reforms, operate in market conditions. The effectiveness of their activities in a competitive environment depends on the resource provision of production in accordance with the needs of the target market segments.

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ИКОНОМИЧЕСКИ ИЗСЛЕДВАНИЯ
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AN EMPIRICAL APPROACH FOR OPTIMIZING THE PRODUCTION STRUCTURE OF A FARM OPERATING IN A MOUNTAIN AREA

This study analyses the effect and the impact of Common Agricultural Policy (CAP) subsidies on the production structure of a selected agricultural enterprise operating in a mountainous area. On the bases of mathematical model of the economy is to optimize the gross margin and the farm profit by allocating available resources according to the restrictions imposed. During the process of solving them, we considered into account many complex factors and dependencies. It is concluded that subsidies received under CAP have no impact on the structure of production. The article presents one case from which no general conclusions can be drawn about the effect of CAP subsidies on all farms. When applying the model in practice, it should be borne in mind that the model results have a number of conventions, which is a challenge for managers not to make hasty decisions based on the optimization of the task's solution.
JEL: C36; C54; C61; Q12; Q18

1. Introduction

The aim of this study is to test the mathematical model to examine the impact of CAP subsidies on optimizing the structure of production in the Bulgarian agricultural enterprise operating in a mountain region. Additionally, we want to check the level of applicability of linear optimization in studying the impact of the CAP subsidies. It should be stressed that only the effect of subsidies on the production structure of the farm is studied, not entirely from the CAP, which has many other mechanisms of impact on farms.

In the world's economic science literature there are publications in which linear programming is applied to optimize economics and mathematical models. Including: Dantzig, George (May 1987); Roger Fletcher (2000); Robert J. Vanderbei (2013); Piryonesi, S. M., & Tavakolan, M. (2017), etc.

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Some of the first publications in Bulgaria related to economics models are in the planning of domestic trade. Later there are researches on planning the production (Георциев, Т, 1973); for forecasting and planning the national economy (Владимирова, К., 1981); in trade (Младенов, З., кол., 1984), (Александров, Кр., 1986); linear optimization models (Аврамов, А., Грозев, С., 1991); in agriculture (Николов, Н., 1998), (Николов, Н., Иванов, Г., Стефанов, Л., 1994). In the more recent publications one can see Абрамова, Г, (2003); Ivanov, I. and Dobreva, J. (2007); Пушкарова, А. (2010); Добрева, Ю. (2011); Милкова, Михайлов (2016).

In regard to analyzes concerning CAP subsidies and productivity of the EU farms, some studies (Rizov, Pokrivcak and Ciaian, 2013) use a structural semiparametric estimation algorithm; Svobodová & Věžník, (2012); Bachev, (2013) – questionnaire survey; Galluzzo, (2016) using FADN Dataset. There have been studies, which analyze the effect of CAP subsidies according to the Econometric model (Arovuori, & Yrjölä, 2015). Some studies analyse marginal returns and level of subsidizing through stochastic models (Ivanov, 2016). Other (Křístková, Habrychová, 2011) analyze direct payments to agriculture by applying Computable General Equilibrium (CGE) models. Ciliberti & Frascarelli, (2015) – a critical assessment of the implementation of CAP 2014-2020 direct payments. Kaneva, et al. (2005) analyzes the efficiency of production structures in Bulgarian agriculture using the DEA model.

Agro-economic problems concern the group of the most complex (Николов, Н., 1998). During the process of solving them, we have to take into account the many complex factors and dependencies. This results in many possible solutions of the problems that can vary, depending on the goals set. However, with the help of the mathematical model, it is impossible to take into account the impact of all factors that affect the activity of agricultural enterprises. In practice, it is a hard task to find the best (optimal) solution. This is because reality is much more complex than what can be included into a model (Николов, Н., Иванов, Г., Стефанов, Л., 1994). More and more accurate (real) information is needed. Mathematics model does not allow to take into account informal relationships that do not have quantitative dimensions (habits, traditions, preferences).

2. Material and Methods

We constructed this task in a system of linear dependences. They should reflect the conditions to be taken into account when solving the task. The objective function expresses the optimality criteria (min, max):

$$A_{11}X_1 + A_{12}X_2 + \cdots + A_{1n}X_n \leq B_1$$
$$A_{21}X_1 + A_{22}X_2 + \cdots + A_{2n}X_n \geq B_2$$
.
.
$$A_{m1}X_1 + A_{m2}X_2 + \cdots + A_{mn}X_n = B_1$$

$$F = C_1X_1 + C_2X_2 + \cdots + C_nX_n \rightarrow \max\ (min), \quad (1)$$

Where:

- X_j – indicates the size (magnitude) of the activities or metrics,
- A_{ij} and C_j – indicate the activities that will be done,
- B_i – means the amount of available resources or the amount of activities (restrictions).
- The objective function F gives the optimality criteria.

The solution of the model will answer the following questions:

1. Establishing the optimum production structure according to the constraints and the optimality criteria;
2. Establishing the impact of the CAP subsidies on efficiency and production structure, depending on the chosen optimal criteria;

In order to establish the production structure of the selected agricultural holding, it is necessary to determine the area of the crops; the number of animals and other activities. When developing the model the optimality criteria will be (max Gross Margin). We will also study the influence of the CAP subsidies. Additionally, we will set another criterion for optimality – max profit (with and without CAP subsidies).

3. Exposition

3.1. Development of the model and an assessment of the impact of the CAP subsidies on the production structure of an agricultural farm operating in a mountainous area

According to established experts and researchers in agri-economic science, it is established that the agricultural farms in the mountainous regions have mixed specialization – agriculture and livestock.

Description of the farm

The necessary information was gathered with the assistance of specialists from the studied farm.

The farm is a legal entity registered under the Commercial Law as a solely limited liability company. Its activities are in a mountainous area on a territory of Sofia region. For this area are common cinnamon forest soils, falling in the group of infertile lands in the Bonity rating 0-20 ball, 10^{th} category. Climate conditions create prerequisites for growing the following crops of wheat, rye, vineyards, fruit trees, late vegetables.

The management is located in the lands of the former cooperative union. At the beginning of the 1990s, an agricultural cooperative for production and services was set up, but after 2010 it ceased agricultural activity.

The farm pays to the cooperative a rent, which is used for storage of grain – BGN 650 per year. The farm is equipped with modern equipment – John Deere tractors and harvesters.

Production

In its production activity, there is a mixed plant breeding specialization. The farm does not own land. It rents 2 thousand decares (da). It pays a rent of BGN 24/da. In addition, 1500 da of pastures / meadows are rented from the municipality for the feeding of the animals. They are used both for animal grazing (green food) and for hay. They are distributed as follows: 500 da of municipal land and 1 000 da of white spots. The municipality pays municipal rent of BGN 8 per decare per year. There is no additional opportunity for hiring land in the area because it is too organized as a production resource. There are no irrigation facilities built on the land.

Plant growing activity

On the rented land are cultivated wheat – 700 da; barley – 300 da; sunflower – 700 da; maize for silage – 300 da. Wheat, barley and sunflower are also grown for commodity crops, except for animal feed. The wheat could be sold at BGN 0.27 / kg, the barley – 0.26 BGN / kg, the sunflower – 0.65 BGN/kg. For the purpose of the model we assume that the products can be purchased at the same price. The yield of wheat is 400 kg/da; barley – 500 kg/da; sunflower – 200 kg/da. According to the studies, the amount of straw is about 40% of the yield. We assume an average of 180 kg/da. We do not apply the sunflower rotation requirement (1/6 of the area). The yield of silage maize is 1 tonne/da.

Livestock activities

The farm has the opportunity to grow up to 100 cows. At the moment there are 75 dairy cows with an average of 10 liters of milk per day or about 3600 liters per year. The breeds are the following: "Bulgarian Rhodope govedo" and "Iskarsko govedo". Due to the commitment because of the subsidy received, the farm is obliged to grow a minimum of 20 animals of every breed. Every day the produced milk is bought from a processing plant at a price of BGN 0.70 / l. At this stage, cows are fed on a level of 4000 liters milk per year. The necessary food for animal feeding is farms own production. Additionally for the ration of the animals can be bought concentrated fodder at the price of BGN 0.65/kg. On the farm, cows are fed according to a rationally determined by the zootechnics, in agreement with the farm manager.

The required Net Energy Lactation (NEI) per year for one cow will be determined according to the technical and economic standards. According to zootechnical requirements, we assume that the relative share of fodder to get the required NEI may vary within the following limits:

1. Concentrated Feeds from 20 to 40% from the necessary NEI;

2. Silage – from 30 to 48% of NEI;
3. Hay – from 5 to 12% of NEI;
4. Green fodder – from 10 to 20% of NEI;
5. Straw – maximum 10%.

The bred cattle are of the following breeds – "Bulgarian Rhodope Govedo" – 55. The milk of this breed is small, but due to commitments under Measure "Agroecology" and the subsidies taken are obliged to select them for 5 years. In addition there are 20 cows "Chernoshareno Govedo" breed.

Labor resources

There are permanently 9 people employed on the farm, distributed as follows: 3 mechanics with gross remuneration at 1100 BGN/monthly (13 200 BGN/year); 2 general workers with 1000 BGN (12 000 BGN/year); 2 breeders with 1100 BGN /month (13 200 BGN/year). These labor costs will be considered as variable costs because they depend on the amount of activity performed and may in practice vary. The salary costs of the administrative and managerial staff will be included in the column of permanent costs: 1 agronomist – BGN 1000 (12 000 BGN/year); 1 zootechnician – BGN 1000 (12 000 BGN/year); accountant (cashier and human resources) BGN 1,000 (12,000 BGN/year); manager – 15 000 BGN/year. Additionally, temporary support of 70 working days for general work and up to 90 working days for mechanized activities can be recruited on a monthly basis. Payments are BGN 30 per day for a general worker and 40 per day for a mechanic. Annually a single worker and mechanic can provide 240 working day, and one livestock breeder – 280 working days. The maximum number of permanent workers on the holding may not exceed 18 people. The months with the highest labor pressure are July, August and September. The number of days during which it is possible to carry out fieldwork in the months with high labor tensions are respectively: July – 26 working days; August – 26 business days; September – 24. When mechanics do not carry out mechanized activities, they can do a common job.

Additional information

According to the technological requirements, the following restrictions must be observed:

1. Autumn crops under non-irrigating conditions occupy not less than 45% and not more than 55% of the crop rotation area;
2. The sunflower does not occupy more than 17% of the crop rotation (1/6).

Since the aim is to assess the impact of the CAP on the efficiency and structure of production, information relevant to their application on this farm is needed.

The farm has received subsidies under 1 Pillar of the CAP for 2017 as follows:

1. 41 BGN/da, distributed as follows – BGN 19,50 under Single payment per area scheme, BGN 12.50 green payments, BGN 9 for disadvantaged areas;
2. 75 animals (419 BGN/animal) Scheme 11 for support for dairy cows and / or meat cows under selection control.

The development of feeding normative is an important step in collecting information. For different crops, livestock and other activities are developed a set of norms, depending on whether the activity is commodity or not. Commodities are the activities from which the final output is obtained, ie production for sale. These are wheat, barley, sunflower, cow's milk. Not commodity is the production that is used in the product cycle for producing milk like: 1 / fodder crops needed to feed the animals – wheat, barley, sunflower, silage maize; 2 / Animals for carrying out the reproduction process. For the different activities, norms are developed for 1 da or 1 tonne of production. The optimal ration is the one that satisfies the maximum zootechnical feed requirements of the respective group of animals. This includes obtaining the necessary NEI, energy, cost, etc.

3.2. Setting the model

In order to determine the production structure of the selected mountain farm, it is necessary to determine the area of the crops, the number of animals and other activities to achieve maximum economic impact. During the developing of the model, the criterion is to achieve the maximum gross margin with the inclusion of CAP subsidies and without applying them. The solution of the problem will also answer the questions regarding the most cost-effective production processes for crop production (for feed and commodities) and for livestock breeding (cows, feeding for 4000 l milk, ration: winter, summer). On the other hand, the model provides the opportunity to quickly and easily develop different options for optimizing the production structure in case of a change of production or some of the limiting conditions. Additionally, the decision will present the impact of CAP subsidies on the production structure and, accordingly, on the economic outcome. The production structure in the case at hand depends on the specifics of natural conditions and limiting factors. On the chosen farm, the organizational conditions are as follows:

1. The quantity and quality of the land (impossibility to rent more land, low bonitete estimate, non-irrigated conditions, etc.).
2. The amount of grazing meadows.
3. The quantity and quality of the main productions (breeds of selected animals, milking, presence of cowshed, warehouses, etc.).
4. Labor resources (number of permanently employed workers, plant breeders, stock-breeders, mechanics, zootechnics, agronomist, etc., a possibility for additional labor force hiring in periods of high labor stress).
5. Agrotechnical crop rotation requirements (minimum/maximum limits in which they may vary, green/dry weight ratio).

6. Zootechnical conditions regarding the feeding of animals according to the milking (ration/winter, summer, green, dry, concentrated, fodder).
7. Contracts to buy milk, sale of commodity crops.
8. Ability to purchase concentrated fodder.
9. Prices of marketed production and means of production.

For the purpose of optimization the objective function we use the Solver application in MS Excel. The solver is an application that can be used to find an optimal solution (minimum or maximum) of an equation that is subject to various constraints.

3.3. Development of the mathematical model

Constraints on land use

$$\sum X_{ij} \leq B_i \quad (2)$$

$j \in M_i$

Where:

M_i – a set of indexes, denoting the area of the j-culture;

x_{ij} – the area j-th crop on the i-th rented land;

B_i – rented land from category i.

Constraints on min / max size of the areas of the autumn crops

$$\sum X_j - k\sum X_i \geq 0 \quad (3)$$

$j \in M \quad j \in N$

where:

κ – min / max relative share of areas of autumn crops;

M – a set of unknown variables x_j, describing the area of autumn crops със слята

N – a set of unknown variables x_j, expressing the area of crops in crop rotation.

Constraints on agro-technological requirements of sunflower to crop rotation (1/6 of the crop rotation area)

$$X_j - k\sum X_j \leq 0 \quad (4)$$

$j \in N$

where:

κ – a coefficient representing the crop rotation area of the j-th culture;

N – a set of unknown variables x_j, expressing the area of crops in crop rotation.

Constraints on labor resources

$$\sum_{j=1}^{n} A_{ij} X_j \geq_i \leq B_2 \quad (5)$$

where,

A_{ij} – the quantity of the i – th resource required to carry out one unit of j – activity or the quantity of the i – th product obtained by the one unit of j – activity

B_2 – labor resources.

Constraints for min / max number of dairy cows

$$\sum X_i \geq_i \leq B_j \quad (6)$$

i∈I

where,

I – a set of unknown variables, indicating the number of cows of the i-th breed

B_j – min / max number of dairy cows;

Constraints for min number of dairy cows under selection control

$$X_i \geq S_i \quad (7)$$

i∈I

where:

I – a set of unknown variables, indicating the number of cows of the i-th breed

S_i – minimum number of cows of the i-th breed

Constraints on the feed balance

$$\sum p_{Mi} X_{Mi} - \sum d_{Mi} X_{Mi} - \sum d_{Mi} X'_{Mi} = 0 \quad (8)$$

м∈M i∈I

where:

M is the sum of the indices of the unknowns of the different feeds in NEI

I – a set of unknown variables, indicating the number of animals

p_{Mi} – the need for the fodder in NEI for one animal

d_{Mi} – NEI of a M-th fodder, produced in the farm

x'_{Mi}- the amount of M-th fodder purchased to feed the animals

Constraints on the minimum and maximum limits of the NEI of a given type of feed

$$X_{dit} - h \sum X_{dit} \geq_i \leq 0 \quad (9)$$

d∈S s∈U

where:

S – a set of indexes of the variables Xdit, expressing the NEI of the d-th fodder required for animal feed

U – a set of indexes of the variables Xdit, expressing required NEI for one animal

κ – minimum / maximum share of NEI of the s-th fodder

Linking activities (the amount of one depends on the amount of other activities)

$$\sum_k A_{ik} X_k \leq \sum_k A_{ir} X_r \quad (10)$$

where,

$X_к$ is the amount of activities that depend on the amount of other activities,

X_r is the amount of activities that depend on the amount of other activities,

$A_{iк}$ and A_{ir} are coefficients, which determine the proportions between-group *k* activities and activities form group *r*,

Objective function

Fmax (gross margin/profit) = $\sum_{j \in T}^{n} C_j X_j$ (11)

where:

C_j is (gross margin/profit) from j-th unknowns;

T is the aggregate of the indices of the unknowns from which the gross margin / profit is obtained;

X_j – is the j-th unknown variables.

3.4. Creating unknown variables and limitations

To determine the impact of CAP policies on the economic efficiency of the farm, we define the following unknown:

X_1 – wheat (da)

X_2 – barley (da)

X_3 – sunflower (da)

X_4 – maize for silage (da)

X_5 – pasture meadows (da)

X_6 – hay for feed, own production (t)

X_7 – Purchased concentrated fodder (CF) for cows (t)

X_8 – own concentrated fodder for cows (t)

X_9 – green feed (m)

X_{10} – straw for feed, own production (t)

X_{11} – purchased hay for feed (t)

X_{12} – cows – 4 tons of milk (number)

X_{13} – rented land (dca)

X_{14} – general workers, permanent workers (number)

X_{15} – mechanics, permanent workers (number)

X_{16} – livestock farmers, permanent workers (number)

X_{17} – Revenue (BGN, thousand)

X_{18} – variable costs (BGN, thousand)

X_{19} – labor costs (BGN, thousand)

X_{20} – fixed costs (BGN, thousand)

X_{21} – Gross margin (BGN, thousand)

X_{22} – Profit (BGN, thousand)

X_{23} – NEI (number)

X_{24} – administrative costs (BGN)

X_{30} – wheat, commodity (da)

X_{31} – barley, commodity (da)

X_{32} – sunflower, commodity (da)

After determining the unknown variables, we develop the necessary constraints expressing in a mathematical form the different conditions and requirements that we need to comply with in the optimal plan.

The constraints are:

I. First group of constraints on land use requirements

1. Constraints on rented land (da)

$$X_{13} = 2000 \quad (12)$$

2. Relationship between agricultural crops and rented land

$$X_1 + X_2 + X_3 + X_4 + X_5 + X_6 + X_7 = 2000 \quad (13)$$

3. Meadows constraints (da)

$$X_8 \leq 1500 \quad (14)$$

4. Autumn crops, at least 45% of the crop rotation area (da)

$$X_1 + X_2 + X_{30} + X_{31} \geq 900 \quad (15)$$

5. Autumn crops, max 55% of the crop rotation area (da)

$$X_1 + X_2 + X_{30} + X_{31} \leq 1100 \quad (16)$$

6. Sunflower, a maximum of 17% of the crop rotation area (da)

$$X_3 + X_{32} \leq 340 \quad (17)$$

II. A second group of constraints on the use of labor resources

7. workers, maximum (number)

$$X_{14} + X_{15} + X_{16} \leq 18 \quad (18)$$

8. workers, minimum (number)

$$X_{14} + X_{15} + X_{16} \geq 9 \quad (19)$$

9. general workers, maximum (number)

$$X_{14} \leq 6 \quad (20)$$

10. general workers, minimum (number)

$$X_{14} \geq 3 \quad (21)$$

11. mechanics, maximum (number)

$$X_{15} \leq 6 \quad (22)$$

12. mechanics, minimum (number)

$$X_{15} \geq 3 \quad (23)$$

13. livestock farmers, maximum (number)

$$X_{16} \leq 6 \quad (24)$$

14. livestock farmers, minimum (number)

$$X_{16} \geq 3 \quad (25)$$

III. A third group of constraints on animal feed

Balance of NEI needed to feed the cows (number)

$$489X_4 + 480X_6 + 1050X_7 + 1160X_8 + 170X_9 + 280X_{10} + 480X_{11} \geq 7100X_{12} \quad (26)$$

15. Silage, min 30% from NEI (number)

$$489X_9 \geq 2130X_{12} \quad (27)$$

16. Silage, max 48% from NEI (number)

$$489X_9 \leq 3400X_{12} \quad (28)$$

17. Concentrated fodder, min 24% from NEI (number)

$$1050X_7 + 1160X_8 \geq 1704X_{12} \quad (29)$$

18. Concentrated fodder, max 40% from NEI (number)

$$1050X_7 + 1160X_8 \leq 2804X_{12} \quad (30)$$

19. Green fodder, min 10% from NEI (number)

$$170X_9 \geq 710X_{12} \quad (31)$$

20. Green fodder, max 20% from NEI (number)

$$170X_9 \leq 1420X_{12} \quad (32)$$

21. Straw, max 10% from NEI (number)

$$280X_{10} \leq 710X_{12} \quad (33)$$

22. Hay, min 5% from NEI

$$480X_6 + 480X_{11} \geq 355X_{12} \quad (34)$$

23. Hay, max 12% from NEI

$$480X_6 + 480X_{11} \leq 852X_{12} \quad (35)$$

Processed Concentrated fodder which we feed the animals and the source from which we receive it (t)

$$0.4X_1 + 0.5X_2 + 0.2X_3 = X_8 \quad (36)$$

24. Relationship between straw and autumn crops

$$X_{10} \leq 0.16X_1 + 0.16X_2 \quad (37)$$

25. Balance between green fodder and hay that the farm can get from pasture meadows

$$4X_6 + X_9 \leq 2.2X_5 \quad (38)$$

26. Wheat, min. 20% of concentrated fodder

$$0.4X_1 \geq 20\%X_8 \quad (39)$$

27. Barley, min 20% of concentrated fodder

$$0.5X_2 \geq 20\%X_8 \quad (40)$$

28. Sunflower min 20% of concentrated fodder

$$0.2X_3 \geq 20\%X_8 \quad (41)$$

A fourth set of limitations for the minimum and maximum limits between which the specified crops and animals may vary

29. Cows, minimum (number)

$$X_{12} \geq 40 \quad (42)$$

30. Cows, maximum (number)

$$X_{12} \leq 100 \quad (43)$$

IV. Fifth group constraints, auxiliary

31. Income (BGN)

$$X_{17} = 108X_{30} + 130X_{31} + 130X_{32} + 2800X_{12} + 419X_{12} + 42X_{13} \quad (44)$$

Income (BGN) – 2-nd option without subsidies

$$X_{17} = 108X_{30} + 130X_{31} + 130X_{32} + 2800X_{12} \quad (45)$$

32. Variable costs (BGN)

$$X_{18} = 70X_1 + 62X_2 + 54X_3 + 50X_4 + 70X_{30} + 62X_{31} + 54X_{32} + 100X_6 + 650X_7 + 100X_{10} + 110X_{11} + 50X_{12} + 12000X_{14} + 13200X_{15} + 13200X_{16} \quad (46)$$

33. Labor costs (BGN)

$$X_{19} = 12000X_{14} + 13200X_{15} + 13200X_{16} \quad (47)$$

34. Administrative expenditure (BGN)

$$X_{24} = 40800 \quad (48)$$

35. Fixed costs (BGN)

$$X_{20} = 24X_{13} + 8X_5 + X_{24} \quad (49)$$

36. Gross margin (BGN)

$$X_{21} = X_{17} - X_{18} - X_{19} \quad (49)$$

37. Profit (BGN)

$$X_{22} = X_{17} - X_{18} - X_{19} - X_{20} - X_{24} \quad (50)$$

38. NEI – (number)

$$X_{24} = 489X_4 + 480X_6 + 1050X_7 + 1160X_8 + 170X_9 + 280X_{10} + 480X_{11} \quad (51)$$

39. Minimum contribution of fodder crops (dka)

$$X_1 \geq 20\%X_8 \quad (52)$$

40. Minimum contribution of fodder crops (dka)

$$X_2 \geq 20\%X_8 \quad (53)$$

41. Minimum contribution of fodder crops (dka)

$$X_3 \geq 20\%X_8 \quad (54)$$

In order to assess the impact of the policies implemented under the CAP, it is necessary to define the criterion of optimality. The gross margin will be used in this example. Additionally, the task will be solved with a maximum profit criterion.

$$F = 108X_{30} + 130X_{31} + 130X_{32} + 2800X_{12} + 419X_{13} + 42X_{15} - 70X_1 - 62X_2 - 54X_3 - 50X_4 - 70X_{30} - 62X_{31} - 54X_{32} - 100X_6 - 650X_7 - 100X_{10} - 110X_{11} - 50X_{12} - 12000X_{14} - 13200X_{15} - 13200X_{16} \rightarrow \text{MAX gross margin} \quad (55)$$

3.5. Solution of the task under different optimality criteria (gross margin / max profit, with and without subsidy)

The optimization was solved with the SOLVER software product.

Table 1

Parameters of the optimal solution with the criterion of optimum gross margin, with subsidy

Unknown Variables	Name	Da	Tonnes	Number	Thousand,BGN
x_1	Wheat	31			
x_2	Barley	275			
x_3	Sunflower	31			
x_4	Maize for silage		697		
x_5	Pasture meadows	514			
x_6	Hay for feed, own production		674		
x_7	Purchased concentrated fodder for cows		0		
x_8	Own concentrated fodder for cows		156		
x_9	Green feed		835		
x_{10}	Straw for feed, own production		0		
x_{11}	Purchased hay for feed		11		
x_{12}	Cows – 4 tons of milk			100	
x_{13}	Rented land	2000			
x_{14}	General workers, permanent workers			3	
x_{15}	Mechanics, permanent workers			3	
x_{16}	Livestock farmers, permanent workers			3	
x_{17}	Revenue				531,364
x_{18}	Variable costs				127,9
x_{19}	Labor costs				115,2
x_{20}	Fixed costs				*
x_{21}	**Gross margin**				**288,262**
x_{22}	Profit				*
x_{23}	NEI			710000	
x_{24}	Administrative costs				*
x_{30}	Barley, commodity	0			
x_{31}	Sunflower, commodity	656			
x_{32}	Wheat, commodity	309			

* are not taken into account

Source: Own calculations

Table 2

Parameters of the optimal solution with the criterion of optimum gross margin, without subsidy

Unknown Variables	Name	Da	Tonnes	Number	Thousand, BGN
x_1	Wheat	31			
x_2	Barley	275			
x_3	Sunflower	31			
x_4	Maize for silage		697		
x_5	Pasture meadows	514			
x_6	Hay for feed, own production		674		
x_7	Purchased concentrated fodder for cows		0		
x_8	Own concentrated fodder for cows		156		
x_9	Green feed		835		
x_{10}	Straw for feed, own production		0		
x_{11}	Purchased hay for feed		11		
x_{12}	Cows – 4 tons of milk			100	
x_{13}	Rented land	2000			
x_{14}	General workers, permanent workers			3	
x_{15}	mechanics, permanent workers			3	
x_{16}	Livestock farmers, permanent workers			3	
x_{17}	Revenue				531,364
x_{18}	Variable costs				127,9
x_{19}	Labor costs				115,2
X_{20}	Fixed costs				*
x_{21}	Gross margin				162,32
x_{22}	Profit				*
x_{23}	NEI			710000	
x_{24}	Administrative costs				*
x_{30}	Barley, commodity	0			
x_{31}	Sunflower, commodity	656			
x_{32}	Wheat, commodity	309			

* are not taken into account

Source: Own calculations

Table 3

Parameters of the optimal solution with the criterion of optimum maximum profit, with subsidy

Unknown Variables	Name	Da	Tonnes	Number	Thousand, BGN
x_1	Wheat	31			
x_2	Barley	275			
x_3	Sunflower	31			
x_4	Maize for silage		697		
x_5	Pasture meadows	514			
x_6	Hay for feed, own production		674		
x_7	Purchased concentrated fodder for cows		0		
x_8	Own concentrated fodder for cows		156		
x_9	Green feed		835		
x_{10}	Straw for feed, own production		0		
x_{11}	Purchased hay for feed		11		
x_{12}	Cows – 4 tons of milk			100	
x_{13}	Rented land	2000			
x_{14}	General workers, permanent workers			3	
x_{15}	Mechanics, permanent workers			3	
x_{16}	Livestock farmers, permanent workers			3	
x_{17}	Revenue				531,364
x_{18}	Variable costs				127,9
x_{19}	Labor costs				115,2
x_{20}	Fixed costs				46627,34
x_{21}	Gross margin				288,262
x_{22}	Profit				190, 635
x_{23}	NEI			710000	
x_{24}	Administrative costs				51,00
x_{30}	Barley, commodity	0			
x_{31}	Sunflower, commodity	656			
x_{32}	Wheat, commodity	309			

Source: Own calculations

Table 4

Parameters of the optimal solution with the criterion of optimum maximum profit, without subsidy

Unknown Variables	Name	Da	Tonnes	Number	Thousand, BGN
x_1	Wheat	31			
x_2	Barley	275			
x_3	Sunflower	31			
x_4	Maize for silage		697		
x_5	Pasture meadows	514			
x_6	Hay for feed, own production		674		
x_7	Purchased concentrated fodder for cows		0		
x_8	Own concentrated fodder for cows		156		
x_9	Green feed		835		
x_{10}	Straw for feed, own production		0		
x_{11}	Purchased hay for feed		11		
x_{12}	Cows – 4 tons of milk			100	
x_{13}	Rented land	2000			
x_{14}	General workers, permanent workers			3	
x_{15}	Mechanics, permanent workers			3	
x_{16}	livestock farmers, permanent workers			3	
x_{17}	Revenue				531,364
x_{18}	Variable costs				127,9
x_{19}	Labor costs				115,2
x_{20}	Fixed costs				46627,34
x_{21}	Gross margin				288,262
x_{22}	Profit				64, 735
x_{23}	NEI			710000	
x_{24}	Administrative costs				51,00
x_{30}	Barley, commodity	0			
x_{31}	Sunflower, commodity	656			
x_{32}	Wheat, commodity	309			

Source: Own calculations

3.6. Analysis of the results obtained

The results obtained from the optimization are shown in Tables 1-4.

On Table 1 are the parameters of the optimal solution for the gross margin target with a subsidy included. On Table 2 – the optimal solution of the gross margin target without a subsidy.

The objective function is designed to affect the area of different crops used for feed or for sale, cows and subsidies (when using optimization subsidies), the area of grazing grassland used and hay production, purchased fodder and labor costs.

In the management of the farm it is assumed that the rented land is 2000 decares and is used at its full capacity.

The solution of the optimization equation is expected to result in the area of the land to be sown with a particular crop, the optimal number of cows to grow. In determining the optimal structure of the farm, the requirements for an optimal ration of animals are taken into account by tracking the balance of the NEI.

The main effect on the results is the type of objective function, the constraints and the set price parameters. The type of the objective function is linear, as are linear and the constraints. Linearity influences the results in 2 ways:

- Maximizes the quantities produced from crops with a good price on the one hand.
- On the other hand, it minimizes the crops with a price disadvantage to the minimum.

That is why, the produced wheat for fodder is only 31 decares (the production costs of wheat are 72 BGN/da, while for barley and sunflower are respectively 62 BGN/da and 54 BGN/da) and the commodity wheat – 0. The latter results from the lower sales price of wheat set in the model – 108 BGN /da (130 for barley and sunflower).

The amount of land sown with sunflower fodder is also 31 decares. Although sunflower is financially profitable for cultivation at a cost of only BGN 54 per decares, its profitable market price is the reason for it to be sold as a commodity (309 decares) and for this reason the minimum quantity is set as a fodder according to the limitations introduced.

The moderate production costs and the good market price of barley cause it to be the optimal crop, both for feed (275 da) and for sale (656 da).

In fact, the difference between market price and production costs is greater for sunflower, which is why it is also mainly produced as a commodity crop.

The quantity of silage maize (697 t) is determined primarily by its low price and restrictions on its use for food.

In terms of the number of breeding animals (X_{12}), the function is maximized by maximizing the number of cows – 100 within our study. As already mentioned, the linearity of the gross margin objective function implies such a result when GM is positive.

It is interesting to note whether the availability of subsidies will change the results of optimization. The impact of the subsidies on the model is reflected by the animal subsidies of BGN 419 and the subsidies per unit area of BGN 42. The main result of the use of subsidies is the increase in the gross margin from BGN 162.32 thousand up to BGN 288.26 thousand (Tables 1 and 2). Accordingly, max profit is from BGN 64.735 thousand up to BGN 190.635 thousand (Tables 3 and 4).

All other parameters of the model – with regard to the structure of the areas for cultivation of different crops, grazing meadows, labor costs remain unchanged, whether or not subsidies are used.

The main conclusion from the optimization of the objective function of the gross margin is that the existence of subsidies does not affect the farmer's behavior with regard to the sown areas. His interest is to maximize the number of reared cows and maximize sown areas.

Table 3 and 4 show the results when the profit is taken for a target function. The results of the optimization conducted confirm the conclusions made so far. I.e. the addition of fixed costs to the model does not change the final conclusion for the optimum ratio of sown areas and the number of animals.

4. Conclusion

In this paper, we tested the impact of CAP subsidies on the production structure of an agricultural enterprise through a mathematical model. The main conclusion from the optimization model of the objective function of the gross margin/max profit is that the existence of CAP subsidies does not affect the production structure on the agricultural enterprises with regard to the sown areas and animals. The solution to the task gave the following answers:

1. The impact of CAP subsidies on efficiency and production structure has been established, depending on the chosen optimal criteria;
2. An assessment of the effects of CAP support on the market behavior of the agricultural precursor has been carried out;
3. The optimization model has been successfully adapted to the management of an agricultural enterprise, with the criteria for optimal gross margin and profit.

At the same time, we need to address some of the weaknesses we identified during the task development and after getting the possible solutions. The mathematical model is not able to take into account the influence of external factors (temperature, humidity, precipitation, atmospheric pollution, climate change), including current environmental, behavioral, social, etc. Also, the model cannot foresee the possible future changes in the market environment, the behavior of competition, the change in consumer requirements. The task's condition does not include the behavioral characteristics of managers, employees and stakeholders. The model would not identify the factors pertaining to threats to organization and potential imagination, and they are crucial criteria for making a decision.

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SUMMARIES

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RESULTS FROM A DYNAMIC MODEL OF CARGO FLOW MANAGEMENT OF A NETWORK AIR CARRIER

We discuss a dynamic model for managing network traffic flows of a network air carrier based: (i) on a detailed analysis of the pre-existing freight traffic along the routes of the air carrier network in terms of the volume of cargo being transported and the fares for key destinations, and (ii) on the analysis of current data on the existing traffic of the network air carrier. We observe irregularity in the freight traffic and fluctuations in the demand and in the fares with respect of the different destinations.
JEL: C6; R42; L93

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STRATEGIES OF HUMAN DEVELOPMENT IN THE CONTEXT OF GLOBAL DIGITAL CHANGE

Despite the fact that people are living in the early days of the upgrading digital economy, in the recent years, it has already had a huge impacts on their human development and the evolutionary progress of the modern society. The main problems that need to be solved are developing innovative strategies to manage human development and to consider the digital change influence. The current research purpose is to define an available institutional background to create different strategy models for human development under the condition of global digital change in Ukraine. The article is based on international indicators of human development and digital change in Ukraine, which has been analyzed to define current national economy positions and calculate probable strategies. The main constitutive characteristics, features, and functions of human development components are defined. The dynamic and static analysis of national human development positions is made (HDI, HCI, PI). The strengthening, neutral and weakening of national economy are researched (SNW analysis). A framework of macro-environmental factors for human development in the area of digital change is scanned (PEST analysis). The above mentioned strategic models create basic to calculate possible innovative strategies probabilities under conditions of global digital change (Transition matrix of Markov chain). The innovative human development and digital change strategies are represented within one-side, balanced and prevail models. The strategic national priorities realization is possible in case of balanced models both for human development and digital change realization in Ukraine.
JEL: G41; I25; I32; O3; M52

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ECONOMIC ASPECTS OF DEMOGRAPHIC CHANGES IN THE EUROPEAN UNION AND IN BULGARIA

The article considers the specifics of demographic development in Bulgaria, compared to that of the EU-28. The natural movement of the population and internal migration in the country is analyzed. The focus is on the combined influence of the three main demographic processes – fertility, mortality and migration, which are considered as the main determinants of human resource development and economic activity. To illustrate these processes, a survey was conducted and described in the village of Smilyan, Smolyan municipality. The specificity and role of two demographic processes (population aging and depopulation) in several contexts are examined – the concept of active aging in the EU and its implementation in Bulgaria, their impact on labor productivity and economic growth, the health status of the elderly as potential for work and employment, etc.
JEL: J11; J14; J16; F22; R13

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ECONOMIC ASPECTS OF MIGRATION PROCESSES IN BULGARIA

The paper studies the development of migration processes to and from Bulgaria and their impact on the country's economic development. More specifically, it addresses the characteristics and trends of emigration from Bulgaria and those of immigration to the country. Its aim is to explore the complex internal structure and trends in individual migration flows in a very interesting historical period in which two strong external factors influence Bulgaria, the EU and the whole world in general – the global financial and economic crisis and the refugee crisis. In this environment, the processes are developing dynamically, changing the balances in the various migrant groups and increasing the unpredictability of migration. The paper firstly presents the European labour market and the free movement of people as external environment of migratory movements. It studies all structural features of outgoing migration, then the characteristics of incoming migration to the country. Lastly, it assesses the demographic and economic effects of immigration. Instead of a conclusion, the paper draws some recommendations on some effective policies to deal with the negative effects of emigration.
JEL: F22; J61; O15

Anna Valkanova

CORPORATE CULTURE AS FACTOR FOR ORGANIZATION'S RESILIENCE

The feeling of an increased, intrinsic uncertainty, due to the rapidly changing situation in the financial sector, consumer attitude changes, growing employees' expectations and the significant political uncertainty in a digitally transformed world, forces organizations to invest in developing new coping strategies. Thus, in this changing environment, along with the issue of efficiency, the need for the organizations to protect themselves from and pass through a variety of potential shocks and crises becomes of a primary importance.
The article outlines the thesis of the organization's resilience as a competence to overcome the shocks and to retain organization's main purpose by creating an adequate corporate culture that encourages

the continuous exchange of information, the empowerment of every employee to react independently and in a timely manner, and the employees' dedication for work. An essential part of this type of corporate culture is also the acceptance of the idea that disruptions represent a part of the functioning of each organization and therefore a special attention has to be paid to conditioning for such extreme situations.
JEL: L2; M140; M2

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THE APPROACH TO TAX DEBTORS SEGMENTATION

A segmentation-based tax debt management is the most perspective way to improve tax collection. Despite the innovations in the tax debtor segmentation the amount of the tax debt in most countries continues to be grown. Especially the share of an "old" debt remains high. It actualizes the further search of the alternative ways to tax debtor segmentation. The authors suggest to segment tax debtors on the debt nonpayment risk estimation. They form the segments that mean the risk category. Each segment consists of the sub-segments divided according to the criteria of the tax debt amount and age. Using the method of risk integrate estimation the authors determine the marginal indicators according to which the tax debtors should be distributed under the sub-segments. The indicators chosen for risk estimation mirror the propensity to pay and capacity to pay. The authors suggest the strategies of tax debt management for each sub-segment of the tax debtors. They reflect such way of interrelations between the fiscal authorities and tax debtors, in which the tax debtors have the opportunity to pay independently without enforcement, and each subsequent stronger impact on the debtor depends on its reaction to the previous intervention. The debtor moves to the next category of risk, if within a certain time he did not respond to a softer strategy. The main goal of such approach is to provide the tax debt repayment on the early stages of its emergence and prevent it from aging.
JEL: C38; C58; G41; H26

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INTEGRATED REPORTING: ECONOMETRIC MODEL OF QUALITY ASSESSMENT

The issue of assessing the quality of integrated accounting of economic entities by means of an econometric model is outlined. It is established that the econometric model of integrated accounting quality assessment is a reliable tool for its estimation. The purpose of the study is to design an econometric model for better assessing the quality of integrated reporting. Because of the research, the criteria were allocated for constructing an econometric model for assessing the quality of integrated statements, the changes in the indicators that effect on the quality of the integrated statements of the subjects of economic activity was analyzed. The correlation matrix of the criteria included in the integrated statements was formed; the influence of the indicators included in an integrated statement for its overall assessment was defined; the results of an econometric model for assessing the quality of integrated statements of economic entities were analyzed. The theoretical substantiation and development of practical recommendations for assessing the quality of integrated reporting through an econometric model are relevant and important for users of such reporting. Particularly relevant is the importance of introducing an econometric model for assessing the quality

of integrated reporting for countries with economies in transition. Approaches to assessing the quality of integrated reporting with the help of an econometric model are proposed. The obtained results are the basis for the output of integrated reporting of business entities to a qualitatively new level. The scope of research results is recommended to all economic entities during the preparation, compilation, submission and disclosure of integrated reporting. The conclusions and prospects of further researches in the direction of use of three other criteria for constructing an econometric model of estimating the quality of integrated reporting, namely: 1) disclosure of information on activities in the field of sustainable development; 2) compliance with the recommendations of the International Council for Integrated Reporting; 3) Interaction with stakeholders.
JEL: M40; M41; M49

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BLOCKCHAIN TECHNOLOGY IN THE FISCAL PROCESS OF UKRAINE OPTIMIZATION

The problem of corruption in Ukraine has been examined, as well as Blockchain technology application feasibility in combating the phenomenon has been analyzed in the article. Blockchain instrumental features and properties, making the technology unique and determining its potential applications in many sectors of the economy, have been covered with much attention. The authors have analyzed both advantages and obstacles for a distributed data registry implementation. Analysis of benchmarks and application of the best practices of Blockchain technology in the public sector, including the fiscal process, have been presented in the study. Profound interest in exploring the technology feasibility has been emphasized on the part of the world's leading governments. Information on pilot Blockchain projects in the public sector of Ukraine has been presented. The article focuses on the fact that alongside with the technology area and ways of scaling its application, a new era of digital society development is emerging.
JEL: L86; O33; E62; H26

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FORECASTING OF GROSS AGRICULTURAL OUTPUT OF AGRARIAN ENTERPRISES OF UKRAINE: CASE STUDY WITH STELLA SOFTWARE

The article is devoted to the forecasting of gross agricultural output of agrarian enterprises of Ukraine with an application of STELLA program. The STELLA economic modelling program, which combines mathematical differential equations with a developed graphical interface, has been used in the article. In this program a model was created and an attempt was made to forecast the gross agricultural output of agrarian enterprises of Ukraine by 2030. It has been the possible growth up to UAH 147319 mln UA of output of agricultural enterprises (PRODUCTION) with a slight reduction and further stabilization of the agricultural land (AREA) at the level of 22600 thousand hectares, a constant increase in fertilizers to 135 kg per hectare (FERTILIZATION) and a steady growth of

enterprises up to 60900 (ENTERP). The most promising possibilities for applying STELLA program in economic forecasting have been outlined in the article.
JEL: H82; O21

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AN EMPIRICAL APPROACH FOR OPTIMIZING THE PRODUCTION STRUCTURE OF A FARM OPERATING IN A MOUNTAIN AREA

This study analyses the effect and the impact of Common Agricultural Policy (CAP) subsidies on the production structure of a selected agricultural enterprise operating in a mountainous area. On the bases of mathematical model of the economy is to optimize the gross margin and the farm profit by allocating available resources according to the restrictions imposed. During the process of solving them, we considered into account many complex factors and dependencies. It is concluded that subsidies received under CAP have no impact on the structure of production. The article presents one case from which no general conclusions can be drawn about the effect of CAP subsidies on all farms. When applying the model in practice, it should be borne in mind that the model results have a number of conventions, which is a challenge for managers not to make hasty decisions based on the optimization of the task's solution.
JEL: C36; C54; C61; Q12; Q18