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The Impact of Migration of Highly Skilled Workers on The Country's Competitiveness and Economic Growth

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ABSTRACT

The links between the migration of highly skilled workers and economic growth (in terms of GNI per capita) and the competitiveness of countries have been studied. The study is based on statistics from developed countries and using correlation-regression analysis and modelling, as well as cluster analysis using the package of processing and analysis of statistical information STATISTICA. The analysis found that the immigration of workers with higher education has a significant impact on strengthening the competitiveness and economic development of countries – this is confirmed by the impact of talent migration, which is assessed by the values of case studies ('The Human Flight and Brain Drain' sub-index Fragile States Index and 'Brain gain' sub-index' in the Global Talent Competitiveness Index and 'Highly educated workers' sub-index in the OECD indicators of talent attractiveness). Their impact on macroeconomic indicators is higher compared to the links with social development indicators. Of course, this does not mean that such links should not be seen as important in public economic development management, as they illustrate the level of efficiency achieved in creating favourable conditions for realizing the potential of highly skilled workers, including pull-factors for their immigration. But in the macroeconomic management of a competitive economy, according to our research, actions aimed at attracting highly skilled migrants have the most significant and obvious impact. Other links can be taken into account and used in modelling for the development of institutional support for proactive migration policy for highly qualified workers.

INTRODUCTION

In today's globalized world, there is a steady increase in international migration. The International Organization for Migration (IOM, 2020) estimates that the number of international migrants in 2019 was almost 272 million. At the same time, 35% of the total number are highly qualified migrants with higher education (McKinsey & Company, 2020b). The level of emigration of such persons is always higher than that of their less educated compatriots in all countries and at each level of development (Kerr et al., 2017). There are several reasons for this pattern: highly qualified individuals are likely to have relevant and in-demand skills; they tend to integrate more easily into the society because they have better linguistic and cultural knowledge of the foreign country; have better access to global sources of information through the use of social and professional networks; can access financial resources and loans to cover the financial costs of migration. As a result, higher emigration rates are observed in middle-income countries, where migrants can cope with migration costs (unlike many in poorer countries) while having incentives to emigrate (unlike many in rich countries).

According to experts, a further increase in the annual immigration flow of highly skilled workers is expected compared to other types of migration (Acostamadiedo et al., 2020). Compared to the average for 2009–2018, experts expect three times as many highly skilled workers to migrate to the EU-28 in 2030 (Ibid.). At the same time, under the implementation of the most probable scenario (unilaterality and economic convergence), the migration of highly qualified workers is expected to increase by 134%. The global shortage of talent, which is constantly growing in the era of the knowledge economy, also contributes to the spread of highly skilled workers (Fig. 1). At the same time, the shortage of talent is inherent in the vast majority of countries, as only 18% of countries do not report the lack of a sufficient number of highly qualified workers (ManpowerGroup, 2020).

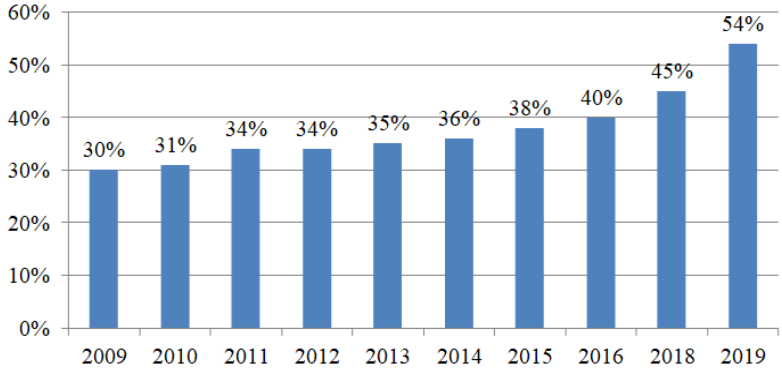

Figure 1. Global talent shortage

Source: compiled by the authors according to the data from (ManpowerGroup, 2020).

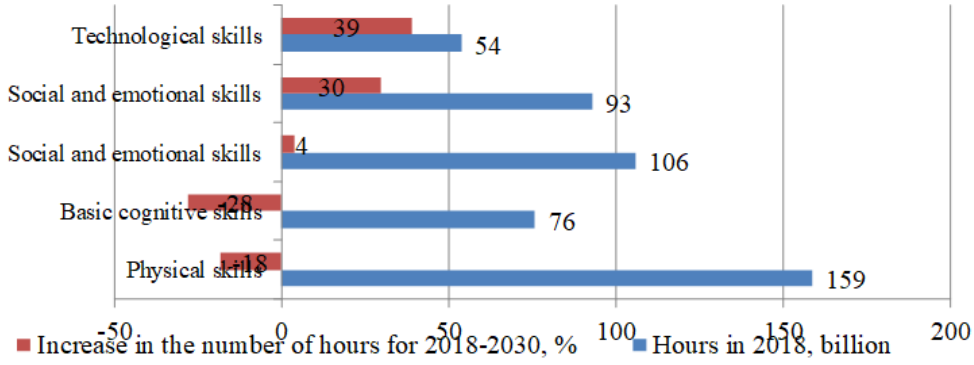

Figure 2. Expected growth in demand for technological, social and emotional skills in Europe

Source: compiled by the authors according to the data from (McKinsey&Company, 2020a).

At the same time, the knowledge and skills that modern workers must possess significantly change (Fig. 2). Thus, according to projected estimates, the demand for employees with technological skills (advanced IT skills / programming, research) will increase by 39% by 2030. Social and emotional skills (between personal skills and empathy, teaching and learning of others) will also become more popular. A relatively small increase will also be characteristic of higher cognitive skills (quantitative and statistical skills, project management). At the same time, a significant decline in demand for basic cognitive and physical skills is expected. To confirm the reality of the projected trends, we can cite the example of US industries with the largest shortage of highly skilled migrants, among which IT is the most attractive sector for employment of migrants with higher education (66% of the total in 2019) (McCarthy, 2019).The arrival of highly qualified migrants does not only create an increase in the human capital of the destination country, but also creates an appropriate competitive environment for local residents, stimulates training and acquiring new knowledge and skills. At the same time, this phenomenon allows obtaining economic benefits for the recipient country. Thus, a statistical analysis conducted in the United States showed that an increase in immigration by one percentage point leads to an increase in GDP growth of 0.1% (Malinovska, 2018).

1. LITERATURE REVIEW

The constant growth of migration flows, the shortage of workers with the appropriate level of knowledge, skills and abilities are attracting the attention of more and more scientists around the world to study the issue of migration of highly qualified workers. However, today there is no single approach to the definition of this concept. Thus, Czaika and Parsons (2016) define a highly skilled migrant as a person working in a profession that falls into the first three categories of the International Standard Classification of Occupations: managers, senior officials and legislators; professionals; technicians and specialists employed in jobs commensurate with higher education. Kone and Özden (2017) include all people with higher education as highly qualified migrants. It is worth noting that a fairly common approach is to identify the concepts of "migration of highly skilled workers" and "brain drain", using them as synonyms (Schiff, 2018). For more than 50 years of history of this term, the results of scientific research in this area demonstrate the diversity of approaches to defining the meaning of the concept of "brain drain" (table 1).

Table 1. Researchers' approaches to the definition of "brain drain"

Author	*Definition*
Adeyemi et al. (2018)	The movement of people, especially the most skilled and competent people or labour force, from less developed to more developed countries, where human capital is believed to be more valued.
El Saghir et al. (2020)	Migration of educated and skilled people from a less developed region or country to a more economically stable one.
Sundac and Stumpf (2016)	Migration of highly educated people who, dissatisfied with the situation in the country of origin, are looking for better living conditions abroad.
Karaduman and Çoban (2019)	Transfer of knowledge and skilled human capital through migration.
Bongers et al. (2018)	Emigration of highly skilled workers looking for better employment opportunities and better wages from relatively low-income countries to high-income countries.
Beaumont et al. (2017)	Migration of highly qualified and highly educated people from one country to another; consists of the transfer of human capital, which leads to the loss of highly educated people in the sending country, and the receipt of human capital in the host country.

Source: Authors' compilation

Analysing the above definitions, we should first note the direction of brain drain, which can be traced in most definitions: from developing countries to developed countries (with high incomes). This interpretation is quite controversial, as the brain drain can occur between countries with relatively the same level of income and quality of life. Thus, Beaumont et al. (2017) study the intra-European emigration (temporary or permanent) of highly qualified people, analyse its trends, substantiate its three main reasons: 1) opening borders between EU countries, 2) joint government agreements on hiring professionals to fill the labour market deficit, and agreements on studying abroad; 3) increase of internal mobility in the EU due to the development of budget airlines and reduction of telephone prices.

Cavallini et al. (2018) investigate the main directions of intra-European brain drain. The results suggest that highly skilled workers prefer the northern parts of the EU (Sweden, Ireland, Estonia, Denmark and several regions of the UK) and the urban environment. Less attractive regions for such professionals are largely located in Italy. Similar trends in circular migration by level of development of countries were found in the studies of Cseh Papp et al. (2018) and Máté et al. (2018). Some researchers also identify the main factors that motivate highly skilled workers to look for work abroad: better employment opportunities, higher wages, better living conditions. These are the so-called pull factors of labour mobility that lead to the immigration of human capital. When mobility concerns highly skilled workers, pull factors play a more important role than push factors. The social and economic conditions of the host regions are one of the most important factors determining the mobility of highly skilled workers. Among these factors are active economic growth, higher wages, strong social security, high per capita wealth, language similarity, cultural similarity, easier access to the labour market, higher employment (EC, 2018). At the same time, a two-pronged approach by researchers to the study of the migration of highly skilled workers is widespread. Thus, Beaumont et al. (2017) combine two concepts: brain drain (loss of highly educated people) and brain gain (human capital gain). Typically, these concepts are used as opposites, i.e. brain gain in the recipient country is generated by the brain drain for the donor country. Therefore, the study of the issue of brain drain also requires a focus on issues related to the phenomenon of brain gain. According to the generally accepted approach, brain gain is the increase of the number of people in a region/country who have high skills and/or competencies due to immigration (Cavallini et al., 2018).

Along with the concepts of brain drain and brain gain, the term “human capital flight” is gaining popularity in scientific circles, referring to the movement of highly qualified and well-educated people to countries other than their country of residence or the country where they learned these skills (Zfar and Kantola, 2019). Net losses during this process of emigration are called brain drain, while net benefits are called brain gains.In today’s world, the availability of highly qualified workers is one of the main prerequisites for sustainable economic development of any country. Governments seek to promote the proper education and training of their populations. At the same time, the migration of highly skilled workers has an impact not only on demographic and social processes, but also on the economic development of the country as a whole. In this aspect, there is a continuous scientific discussion on the consequences of the migration of such specialists for donor and recipient countries, on its impact on economic growth, on the ranking of countries in various global indices.Janeska and Lozanoska (2016) consider the trends in brain drain from the Republic of Macedonia and their consequences over the past two decades. Since 2008, the Republic of Macedonia is one of the ten countries with the most intensive brain drain. At the same time, the direct effect of brain drain is manifested in the reduction of economic growth and innovation opportunities of the country due to the reduction of human capital. The effects of feedback are also unfavourable, as the return of highly educated immigrants is insignificant and accidental. At the same time, the increase in brain drain is not accompanied by an increase in remittances, does not have a significant impact on the diaspora and technology transfer. The study also highlights the negative social consequences of brain drain, in particular, this phenomenon accelerates the aging population in general and the working age population in particular.

The impact of brain drain on the socio-economic situation in the Baltic States is analysed by Svazas and Liberyte (2019). The developed research methodology allows assessing the impact of brain drain on the national economy as a whole, including such indicators as life expectancy, school life expectancy, GDP per capita, etc. Socio-economic consequences of this phenomenon are changes in the labour market, exacerbate the shortage of skilled workers, aging population, inefficient use of funds invested in the education system, financial difficulties. After conducting a comparative analysis, the authors concluded that the problem of brain drain in Lithuania and Latvia is extremely relevant, and its consequences hinder the socio-economic development of these countries. At the same time, this problem is not a threat to Estonia at the moment, as Estonia has a positive migration balance. The close relationship between low economic growth and brain drain is evidenced by the results of a study (Adeyemi et al., 2018) on the example of Nigeria, Ethiopia and Kenya. This is facilitated by a number of factors, such as institutional failures, high levels of corruption, as well as the lack of social facilities such as a quality health and education system, roads and pipelines, etc. Using the least squares method and empirical analysis, the authors argue that remittances and human capital development play a significant role in how brain drain

affects economic growth in Africa, including the negative relationship between brain drain, remittances and economic growth.

The inverse relationship between brain drain and economic growth has also been demonstrated by the example of Pakistan (Farooq and Ahmad, 2017). The researchers used the OLS model to test the impact of brain drain on economic growth. The stationarity of the variable is demonstrated / confirmed by the extended Dickey-Fuller-test and the Phillips-Parron-test. Thus, the main problems associated with the brain drain are the lack of human capital and the loss of public funds spent on education, as the knowledge gained is applied in another country. At the same time, the phenomenon of brain growth is a phenomenon when a country acquires skilled workers without spending public money on their education. The aim of the study Knezackova and Vesela (2018) was to identify European countries that can attract highly educated migrants. Using statistical methods, the authors prove the hypothesis that highly educated migrants come to countries with higher economic levels. Therefore, the country's ability to attract highly qualified migrants is an important competitive advantage for the country's further development.

It should be noted that more and more researchers are using an integrated approach, using concepts such as brain drain, brain growth and brain return. Liminta and Serati (2016) introduced a new model that explains the common migration flows associated with brain drain, brain growth, and brain return. The developed individual country's well-being indicator (LISE) measures the level of individual well-being for each country. With this indicator, you can understand what are the drivers of migration flows, whether it is possible to prevent the phenomena associated with brain drain, or to stimulate the phenomena associated with brain growth in different countries. The authors empirically tested the reliability of the individual well-being index in a sample of 12 countries. At the same time, there is a close relationship between these concepts and the competitiveness of countries, the main measure of which is the Global Competitiveness Index. To confirm this thesis, Sundac and Stumpf (2016) used the method of linear regression. The author proves that there is a link between global competitiveness and brain drain: if competitiveness increases, brain drain will decrease and highly educated workers will remain in their country. Therefore, if a country wants to become a knowledge-based society, it must prevent a brain drain by providing highly skilled workers with decent working conditions, opportunities for continuous professional development, and a rise in living standards in the country as a whole.

This statement is also proved by the results of the Schiff's study (2017) on the example of migration from Islamic countries to the United States during the period from 2007 to 2015. Using the Generalized Method of Moments (GMM), the authors proved that the competitiveness index has a negative and significant effect on brain drain. In addition, the gap between well-being and wages has a significant and positive relationship with brain drain in the countries studied. The variable of the unemployment rate also has a positive and significant relationship with brain drain. According to the study, the low competitiveness of Islamic countries contributes to a significant brain drain from the above countries. Scientists like Mishchuk et al. (2019) considering the socio-economic impact of the intellectual potential of young people on economic and human development, used the regression method to predict the most obvious indicators of the loss of intellectual capacity of the country. On the example of data about Ukraine as a donor country, it is proved that intellectual migration can have significant devastating consequences for national competitiveness. In particular, the authors proved significant risks for the reproduction of the country's intellectual potential. As found in another study, such an impact is particularly noticeable in cross-border regions with the possibility of subjective comparisons of the effects of labour migration, which often becomes a risk of migration losses of highly skilled workers and problems in the business environment (Bilan et al., 2020). Thus, passive external migration policies can have a detrimental effect on talent-driven national competitiveness in terms of innovation and development.

2. DATA AND METHODOLOGY

To study the relationship between the migration of highly skilled workers, economic growth and competitiveness of the country, the authors formed and tested the following hypotheses:

H1 – migration of highly skilled workers significantly affects the change of the Global Competitiveness Index of the country;
H2 – migration of highly skilled workers significantly affects the change in GNI per capita.

To select indicators that assess the level of brain drain and growth, the attractiveness of countries for immigration of highly skilled workers and countries from which such specialists tend to emigrate, the authors analysed global indices in this area (Table 2). To confirm the hypotheses, Table 2 also lists global indices and indicators on which the migration of highly skilled workers can have a significant impact, as talented and skilled people play a key role in the country's prosperity, contribute to economic growth and better living conditions for the population.

Table 2. Indicators of migration of highly skilled workers in global indices

Title	*Coverage of countries*	*Components*	*Indicator*	*Symbol*
The Global Competitiveness Index (http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf)	141	Institutions; infrastructure; ICT adoption; macroeconomic stability; health; skills; product market; labour market; financial system; market size; business dynamism; innovation capability.	score	y_1
Global Knowledge Index (https://knowledge4all.com/Methodology.aspx?language=en)	134	Pre-university education; technical, vocational education and training; higher education; research, development and innovation; information and communication technologies; economy; general enabling environment.	value	y_2
Human Development Index (http://hdr.undp.org/en/content/human-development-index-hdi)	189	Life expectancy at birth; expected years of schooling; mean years of schooling; gross national income (GNI) per capita.	value	y_3
Prosperity index (https://www.prosperity.com/rankings)	167	Safety and Security; personal freedom; governance; social Capital; investment environment; enterprise conditions; market access and infrastructure; economic quality; living conditions; health; education; natural environment.	score	y_4
The Social Progress Index (https://www.socialprogress.org/?tab=2&code=NOR)	149	Basic human needs; foundations of wellbeing; opportunity.	score	y_5
The Global Innovation Index (https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2019.pdf)	129	Institutes; human capital and research; infrastructure; market sophistication; business sophistication; knowledge and technology outputs; creative outputs.	score	y_6
GNI per capita (https://data.worldbank.org/indicator/NY.GNP.PCAP.CD)	200	The dollar value of a country's final income in a year, divided by its population.	US$	y_7
The OECD indicators of talent attractiveness. 'Highly educated workers' sub-index (https://www.oecd.org/migration/talent-attractiveness/; https://fragilestatesindex.org/indicators/e3/)	35	Workers with Master or Doctoral degrees.	score	X_1
The Fragile States Index. 'The Human Flight and Brain Drain' sub-index (https://fragilestatesindex.org/indicators/e3/)	178	The economic impact of human displacement (for economic or political reasons) and the consequences this may have on a country's development.	score	X_2
The Global Talent Competitiveness Index. 'Brain gain' sub-index (https://www.insead.edu/sites/default/files/assets/dept/globalindices/docs/GTCI-2019-Report.pdf)	125	High-skilled migration.	score	X_3
The Hays Global Skills Index. 'Labour Market Flexibility' sub-index (https://www.hays-index.com/)	34	The influence of governments on the policy of employing talented people from abroad.	score	X_4

Source: compiled by the authors.

The choice of international indices is justified on the basis of the theoretical analysis of the essence of migration of highly qualified workers (Literature Review). Therefore, the authors selected international indices, the calculation methodology of which contains indicators related to assessing the attractiveness of countries for highly skilled migrants, brain drain and brain gain. These include OECD talent attractiveness indicators, the first comprehensive tool to identify the strengths and weaknesses of OECD countries

in their ability to attract and retain three categories of talented migrants: highly educated workers (those with Master's and doctoral degrees), foreign entrepreneurs and foreign university students. An important indicator of the migration of highly skilled workers is the Human Flight and Brain Drain Indicator, which assesses the impact of displacement on the country's economic development. Such migration can be both voluntary - due to the deteriorating economic situation in their country and the search for better opportunities abroad, and forced (persecution or repression). Estimates of this indicator should be interpreted on the basis that the lower the score is, the better it is. That is, a low score indicates an improvement in the area of brain drain and relative stability in this area, while an increase in the score negatively characterizes the situation with brain drain in a particular country.

The Global Talent Competitiveness Index contains the Talent Attraction sub-index, which in the context of national competitiveness should be considered both in terms of attracting foreign resources (through foreign direct investment) and talented people (through the migration of highly skilled workers). To assess the latter component, the indicator "brain gain" is used. The Hays Skills Index is an important tool for assessing the challenges that organizations face in finding the most in-demand skilled workers. As part of a study on the migration of highly qualified workers, the Labour Market Flexibility Sub-Index allows assessing the impact of governments on the efficiency of the labour market, in particular on the simplification of procedures for hiring talented people from abroad. The lower the value of this indicator is, the better the state policy is consistent with the dynamics of the labour market. Conversely, a higher score means that there are significant barriers to the employment of highly skilled migrants. To test the hypotheses about the relationship of the independent variables (X_1-X_4) and dependent variables that may be affected (Y_1-Y_7) in Table 2, we used the method of correlation-regression analysis with the calculation of Pearson's correlation coefficients in Excel environment. The STATISTICA data analysis package was used to further identify the patterns of influence of factor characteristics on the results in the form of competitiveness and GNI per capita. The combination of results made it possible to identify the most obvious links between the factors of migration of highly skilled workers to macroeconomic performance.

2. RESULTS

The relationship between the migration of highly skilled workers and individual international indices and economic growth was analysed on the example of 25 OECD countries in 2019, based on the calculation of Pearson's pairwise correlation coefficient (Table 3).

Table 3. The results of the correlation analysis of the relationship between the migration of highly skilled workers with global indices and GNI per capita

No.	*Country*	y_1	y_2	y_3	y_4	y_5	y_6	y_7	X_1	X_2	X_3	X_4
1.	Australia	78,7	61,3	0,77	78,64	88,02	50,34	54910	0,63	1	70,33	4,3
2.	Austria	76,6	64,7	0,75	80,26	86,40	50,94	51300	0,54	1,4	53,71	4
3.	Belgium	76,4	64,8	0,76	76,26	86,77	50,18	47350	0,53	2	58,8	3,7
4.	Canada	79,6	60,8	0,8	80,01	88,81	53,88	46370	0,61	1,7	78,86	4,1
5.	Chile	70,5	51,5	0,65	68,70	80,02	36,64	15010	0,46	3,8	60,97	6,5
6.	Czech Republic	70,9	57,5	0,75	73,43	84,36	49,43	22000	0,51	3	40,68	3,5
7.	Denmark	81,2	67,6	0,76	83,96	90,09	58,44	63240	0,57	1,9	56,41	3,5
8.	Estonia	70,9	59,9	0,78	76,31	83,98	49,97	23220	0,55	4,3	44,82	*
9.	Finland	80,2	69,7	0,8	82,39	89,56	59,83	49580	0,54	2	48,54	*
10.	Germany	81,8	64,6	0,75	81,14	88,84	58,19	48520	0,57	2,1	76,22	6,9
11.	Greece	62,6	47,2	0,69	66,51	82,48	38,90	20320	0,4	3,3	13,74	*
12.	Hungary	65,1	52,9	0,68	65,93	78,77	44,51	16140	0,49	3,6	26,51	*
13.	Latvia	67	54,3	0,71	69,94	80,42	43,23	17730	0,46	5,1	21,24	*
14.	Luxembourg	77	69,1	0,69	80,95	87,66	53,47	73910	0,58	1,7	86,4	3,6
15.	Mexico	64,9	47,2	0,61	59,53	71,51	36,06	9430	0,38	5,3	45,99	7,1
16.	New Zealand	76,7	62,6	0,78	81,24	88,93	49,55	42670	0,61	2,3	80,31	4,1
17.	Norway	78,1	65,3	0,77	83,96	90,95	51,87	82500	0,58	1,3	68,32	*
18.	Poland	68,9	54,1	0,75	69,30	81,25	41,31	15200	0,45	4,7	26,03	6,8
19.	Slovak Republic	66,8	54	0,66	70,25	80,43	42,05	19320	0,53	4	15,93	*
20.	Slovenia	70,2	58,6	0,77	73,66	85,80	45,25	25750	0,58	3,6	25,67	*
21.	Sweden	81,2	69,1	0,8	83,04	89,45	63,65	55840	0,63	1,1	62,16	4,9
22.	Switzerland	82,3	73,2	0,76	83,64	89,89	67,24	85500	0,62	1,7	100	3,8

23.	Turkey	62,1	44,1	0,65	55,42	67,49	36,95	9610	0,35	4,7	28,36	*
24.	United Kingdom	81,2	67,5	0,78	80,70	87,98	61,30	42370	0,55	2,5	94,59	5,1
25.	United States	83,7	69,7	0,7	77,75	83,62	61,73	65760	0,59	1,9	91,93	4,8
26.	Correlation coefficient (X_1)	0,832	0,845	0,720	0,895	0,863	0,786	0,759				
27.	Student's critrion	7,192	7,578	4,976	9,622	8,192	6,097	5,591				
28.	Correlation coefficient (X_2)	-0,843	-0,806	-0,609	-0,838	-0,819	-0,763	-0,869				
29.	Student's criterion	|-7,516|	|-6,530|	|-3,682|	|-7,365|	|-6,845|	|-5,661|	|-8,423|				
30.	Correlation coefficient (X_3)	0,843	0,744	0,367	0,678	0,569	0,726	0,763				
31.	Student's criterion	7,516	5,340	1,892	4,424	3,318	5,063	5,661				
32.	Critical value (X_1, X_1, X_3)	2,069	2,069	2,069	2,069	2,069	2,069	2,069				
33.	Correlation coefficient (X_4)	-0,444	-0,608	-0,489	-0,636	-0,643	-0,475	-0,624				
34.	Student's criterion	|-1,854|	|-2,865|	|-2,098|	|-3,084|	|-3,141|	|-2,020|	|-2,988|				
35.	Critical value	2,145	2,145	2,145	2,145	2,145	2,145	2,145				

* data is not available

Source: Authors' calculations

According to the results of correlation analysis, it can be argued that the indicators of talent attractiveness, brain drain and brain gain significantly and strongly influence the Global Competitiveness Index, which is currently the most comprehensive (contains 113 variables) and objective (calculated WEF) indicator to determine a country's ability to compete with other countries. The exception is X_4, for which the correlation coefficient becomes -0.444 and is statistically not significant. At the same time, the direction of their influence differs. Thus, "Human Flight and Brain Drain" is a disincentive, i.e. the migration of highly qualified workers for employment abroad contributes to a decrease in both the Global Competitiveness Index and other global indices. Talent attractiveness and brain drain have a significant impact on the Global Knowledge Index (the value of the correlation coefficient exceeds |0,8|), which recognizes the multidimensional nature of the knowledge system in all contexts and applications related to economic and social structures. Less significant is the relationship between the migration of highly skilled workers and the Human Development Index, which can be explained by the indicators included in the methodology for calculating HDI. In particular, the level of literacy of the population is measured by the average number of years spent on training and the expected duration of training, i.e. the process of formation rather than the use of knowledge is assessed.

There is a significant relationship between the migration of highly skilled workers and the Prosperity Index, which is a measure of the extent to which a country's potential is realized in terms of both productive capacity and collective (social) well-being. Thus, creating a space in which a person can reach their full potential, be healthy, educated and live in a safe environment depends significantly on the level of attractiveness of the country for highly educated migrants and the level of brain drain (correlation coefficients 0.895 and -0.838, respectively). The results of the correlation analysis also revealed a significant relationship between the studied indicators and the Social Progress Index – a multi-indicator index that evaluates the social and environmental indicators of different countries. A feature of the methodology for calculating this index is that traditional economic indicators, such as gross domestic product, are supplemented by data on social and environmental conditions. Thus, the migration of highly skilled workers directly affects the quality of life of the country's population. Thus, in modern conditions, the country's competitiveness is determined by the effective use of knowledge and competencies, the activation of innovation processes based on them, the ability to generate and implement innovations in a timely manner. Today, innovation is an important factor that can ensure the country's high position in the global space. To determine the impact of migration of highly qualified workers on the level of innovation in countries, the authors used the Global Innovation Index. Since the correlation coefficients with the indicators X_1–X_3 exceed |0,7|, it can be argued that the country's innovative development strongly depends on the indicators of brain drain and brain gain, as well as on the attractiveness of the country for highly qualified immigrants.

The results of the correlation analysis prove the existence of a close relationship between the migration of highly skilled workers and economic growth, the basic indicator of which is the GNI per capita (Gross national income per capita (US dollars)). At the same time, the greatest impact on the level of economic growth is exerted by the brain drain (correlation coefficient -0.869), i.e. the growth in the number of emigrants with higher education creates obstacles to the sustainable economic development of the country. To segment countries by the level of migration of highly qualified workers, the authors conducted a cluster analysis using the package of processing and analysis of statistical information STATISTICA. Because the results of the correlation analysis revealed a weak relationship between X_4 and the dependent variables, this indicator was excluded from the clustering procedure. At the initial stage, the standardization of the initial data was carried out (Table 4), the purpose of which is to bring all indicators into a single measurement scale (Table 3) according to the formula:

$$Z_{ij} = \frac{x_{ij} - \bar{x}_{ij}}{\sigma_i}, \quad (1)$$

where Z_{ij} is the standardized value of the *i*-th indicator for the *j*-th country ($i=\overline{1,n}$; $j=\overline{1,m}$); $\bar{x}_{ij}$ – the arithmetic mean value of the *i*-th indicator for the *j*-th country; σ_i – standard deviation of the *i*-th indicator.

Table 4. Standardised Values of Source Data

No.		X_1	X_2	X_3
1.	Australia	1,2511	-1,3492	0,5888
2.	Austria	0,0974	-1,0493	-0,0521
3.	Belgium	-0,0308	-0,5996	0,1442
4.	Canada	0,9947	-0,8245	0,9177
5.	Chile	-0,9281	0,7495	0,2279
6.	Czech Republic	-0,2871	0,1499	-0,5545
7.	Denmark	0,4820	-0,6746	0,0520
8.	Estonia	0,2256	1,1243	-0,3949
9.	Finland	0,0974	-0,5996	-0,2514
10.	Germany	0,4820	-0,5247	0,8159
11.	Greece	-1,6972	0,3748	-1,5934
12.	Hungary	-0,5435	0,5996	-1,1009
13.	Latvia	-0,9281	1,7239	-1,3042
14.	Luxembourg	0,6102	-0,8245	1,2085
15.	Mexico	-1,9536	1,8738	-0,3498
16.	New Zealand	0,9947	-0,3748	0,9736
17.	Norway	0,6102	-1,1243	0,5113
18.	Poland	-1,0563	1,4241	-1,1194
19.	Slovak Republic	-0,0308	0,8994	-1,5089
20.	Slovenia	0,6102	0,5996	-1,1333
21.	Sweden	1,2511	-1,2742	0,2737
22.	Switzerland	1,1229	-0,8245	1,7329
23.	Turkey	-2,3381	1,4241	-1,0296
24.	United Kingdom	0,2256	-0,2249	1,5243
25.	United States	0,7384	-0,6746	1,4217

Source: authors' calculations

In the process of cluster analysis, the authors used the method of hierarchical agglomerative clustering, which involves the sequential grouping of objects into larger segments. Then the smaller clusters gradually merge into larger ones. Euclidean distance was used to determine the similarities or differences of countries, i.e. to calculate the distances between observations. To determine the distances between the clusters, Ward's method was chosen, which is based on the procedures of analysis of variance (AOV). With this method, small clusters are normally formed. The resulting dendrogram is shown in Figure 3.

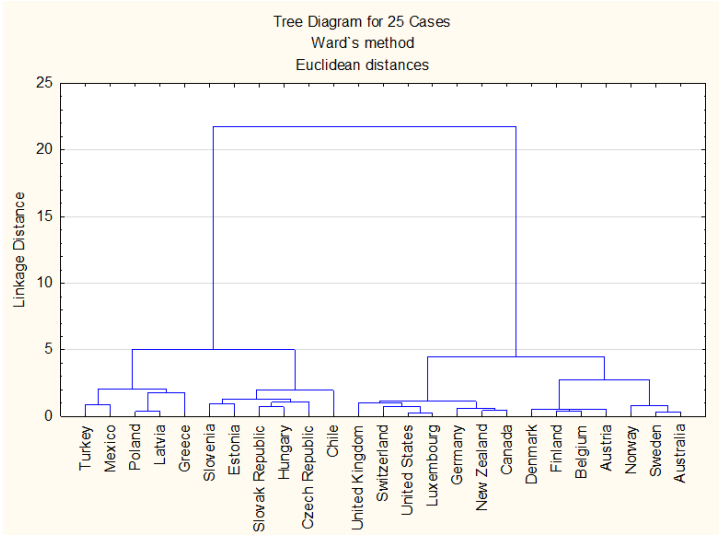

Fig. 3. Dendrogram of OECD countries on migration indicators of highly skilled workers

Source: authors' calculations

The final stage of cluster analysis is to check the quality of the clustering using discriminant analysis. The test resulted in the following statistics:

Wilks' Lambda = 0,02324;
approx. F (9,46) = 19,02631 p < 0,0000

The value of Wilks' statistics is always in the range from 0 to 1. Since the calculated value of Wilks' Lambda is close to 0, this indicates a high discrimination of objects. According to Wilks' Lambda and the value of the F-criterion, we can conclude that this classification is correct. However, to confirm the correctness of the classification, a classification matrix was formed (Fig. 4).

Classification Matrix (Spreadsheet1)
Rows: Observed classifications
Columns: Predicted classifications

Group	Percent Correct	G_1:1 p=,20000	G_2:2 p=,24000	G_3:3 p=,28000	G_4:4 p=,28000
G_1:1	100,0000	5	0	0	0
G_2:2	100,0000	0	6	0	0
G_3:3	100,0000	0	0	7	0
G_4:4	100,0000	0	0	0	7
Total	100,0000	5	6	7	7

Fig. 4. Classification matrix

Source: authors' calculations

Based on the data of the classification matrix, we can conclude that the objects in all four classes were correctly assigned expertly to the selected groups, which is confirmed by the absence of cases of incorrect assignment of objects to clusters. Therefore, clustering is correct. The obtained results confirm the fact of unevenness and asymmetry of the OECD countries' development according to the main indicators of global indices on migration of highly skilled workers, and are also the basis for finding directions of cluster convergence. The main tasks of the latter should be the state stimulation of brain drain by forming a policy of attracting highly qualified migrants, creating a single information system on the conditions and rules of legal employment abroad. Thus, brain drain and brain gain can be key factors in determining a country's level of competitiveness. Competitiveness is one of the most important prerequisites for economic development of the country, and human capital, i.e. the level of knowledge and skills, is a decisive factor in maintaining and increasing competitiveness. The quality of the workforce creates a country's ability to develop, expand, use knowledge and information in such a way as to make the country more competitive and improve the quality of life of its population.

To detail the relationship between the migration of highly skilled workers and the competitiveness of the country, as well as to confirm H1, the authors developed an appropriate economic and mathematical model using the built-in function "Regression" in Excel software. As a result of a step-by-step assessment of the impact of the parameters listed in Table 3 on the Global Competitiveness Index based on a multi-factor regression model, a three-factor model (2) was identified:

$$y = 57{,}482 + 27{,}478x_1 - 1{,}511x_2 + 0{,}114x_3, \quad (2)$$

where – y – Global Competitiveness Index, score; x_1 – OECD talent attractiveness indicator. Highly educated employees, score; x_2 – The fragility index of the country. Human flight and brain drain, score; x_3 – Global Talent Competitiveness Index. Brain gain, score.

The main statistical indicators that confirm the statistical significance and adequacy of this model are shown in Table 5.

Table 5. Results of checking the adequacy of the economic and mathematical model of global competitiveness according to the main statistical indicators

No.	*Indicators*	*Estimated value*
1.	Multiple correlation coefficient	0,936
2.	Coefficient of determination	0,875
3.	F-statistics	49,193
3.1.	The critical value for this model is F	3,07
4.	t-statistics	
4.1.	x_1	2,396
4.2.	x_2	|-2,165|
4.3.	x_3	3,962
4.4.	The critical value for this model is t	2,079

Source: authors' calculations

The obtained results of statistical indicators allow stating that the constructed three-factor model is characterized by high theoretical capacity and is suitable for practical use. Thus, the existence of a very close link between the migration of highly skilled workers and the country's competitiveness has been proven. At the same time, in modern conditions, the economic development of the country largely depends on the availability and level of human capital use. To detail the relationship between the migration of highly skilled workers and economic growth and to confirm H2, an appropriate economic and mathematical model was developed using the built-in "Regression" function in Excel software. As a result of a step-by-step assessment of the impact of the parameters listed in Table 3 on GNI per capita on the basis of a multifactor regression model, a two-factor model was identified (3):

$$y = 56522{,}38 - 11350{,}14x_2 + 279{,}73x_3, \quad (3)$$

where – y – GNI per capita, US USD; x_2 – the fragility index of the state. Human flight and brain drain, score; x_3 – Global Talent Competitiveness Index. Brain gain, score.

The main statistical indicators that confirm the statistical significance and adequacy of this model are shown in Table 6.

Table 6. The results of checking the adequacy of the economic and mathematical model of economic growth according to the main statistical indicators

No.	*Indicators*	*Estimated value*
1.	Multiple correlation coefficient	0,898
2.	Coefficient of determination	0,806
3.	F-statistics	45,817
3.1.	The critical value for this model is F	3,44
4.	t-statistics	
4.2.	x_2	|-5,051|
4.3.	x_3	2,419
4.4.	The critical value for this model is t	2,074

The obtained results of statistical indicators allow stating that the constructed two-factor model is characterized by high theoretical capacity and is suitable for practical use. Therefore, hypothesis H2 can be considered confirmed.

CONCLUSION

The results of the study confirm the close links between the migration of highly skilled workers and the competitiveness and economic growth of the country. In particular, the direct impact on the indicators of competitiveness and GNI per capita of such indicators as the level of attractiveness of the country for highly educated immigrants and brain gain, as well as the reverse effect of brain drain. The results of modelling these links suggest that in order to strengthen the competitiveness of their countries, governments should encourage the arrival of migrants with higher education. There is also a significant impact on economic growth in the case of highly skilled migrants, as the arrival of such professionals not only replenishes the intellectual capital of the recipient country, but also creates a competitive environment for indigenous people, motivating them to learn throughout life and constantly improve their skills. Therefore, further research should focus on the formation and implementation of public policy to create favourable conditions for immigration of such professionals, visa facilitation, development of both public and non-governmental services to support immigrants, providing appropriate conditions for living with families, training and care for the children of immigrants. Of course, it does not exclude the importance of efforts in other areas of public competitiveness management, including the indicators of social development we analysed. After all, the obtained connections with other indicators characterize the efficiency in creating favourable conditions for the country to be perceived as attractive for potential highly skilled migrants. But the dependences we have obtained allow understanding the directions of the policy of the state in this area, which will have the highest efficiency in the near future. Other links can be taken into account and used in macroeconomic management for the development of institutional support for proactive migration policy for highly qualified workers.

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Food Security in Times of Covid-19: Price Aspects in Ukraine and Neighboring EU Countries

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ABSTRACT

So far, all countries around the world have to deal with the Covid-19 challenge. As imperative, it includes providing food security subject to pandemic restrictions and consequences. The study purpose took focus on exploring price dynamics observed for basic crop and animal products. The research hypothesis supposed different volatility of their prices linked with a certain similarity across the considered Eastern European countries. The utilized methods involved candlestick charting and analysis of variance ANOVA to compare the food price indices and changes in times of the Covid-19 between February and December 2020 with regard to the corresponding pre-Covid-19 period. The research findings revealed stable pricing for bread and cheese with fluctuations below 4%. The study outcomes indicated the most disruptive Covid-19 impact on potato and pork. The latter largely associated with Hungary, Poland, Romania, and Slovakia. Prices for sugar and eggs in Ukraine gained by 46.2% to 30.4% and illuminated unhealthy shifts in dietary patterns. The basic research conclusions are as follows. Firstly, food chains in animal husbandry need special enhancements to face the Covid-19 crisis. Secondly, the evidenced price volatility coupled with the decreasing purchasing power are the reasons to concern on providing balanced nutrition and healthy diets in Ukraine and the neighboring EU countries.

INTRODUCTION

Currently, mankind has to face a new global challenge of the ongoing Covid-19 pandemic. It affects people's health and livelihoods, disrupts economy and exacerbates food security. The latter implies diminishing food availability and affordability owing to ruined food chains and reduced purchasing power of consumers across the world. It is hard to forecast exact scope, scale and duration of the unfolding Covid-19 consequences. Nevertheless, scholars should make their relevant contribution in order to mitigate such negative outcomes. One of plausible approaches originates from comparing experiences in fighting against Covid-19.

Given the similar natural and climatic conditions, close locations, lifestyles, and dietary patters, this research is focused on exploring the Covid-19 impact on food security in Ukraine and neighboring EU

countries including Hungary, Poland, Romania, and Slovakia. To confirm the marked involvement in the Covid-19 crisis, it is worth noticing that GDP in 2020 vs 2019 shrank by 3.6% in Poland, 4.8% in Romania, 6.1% in Hungary, 7.1% in Slovakia, 7.2% in Ukraine (IMF, 2020). Besides, as of 21 January 2021 there were 36.7 thousand of total Covid-19 cases per 1 million of population in Hungary, 38.4, 36.6, 41.9, and 27.1 those ones in Poland, Romania, Slovakia, and Ukraine (Worldometers, 2021). Unfortunately, the latter indicator is the signal of insufficient testing for coronavirus rather than the sign of a safer situation in Ukraine where food security even in the pre-Covid-19 period was far from adequate (Vasylieva, 2019).

Since the beginning of the Covid-19 pandemic the Food and Agriculture Organization of the United Nations put emphasis on price aspect in providing food security. Namely, on 14 February 2020 FAO established the FAO Big Data tool to monitor food prices on the daily basis in all countries (FAO, 2021). As of 21 January 2021, Covid-19 caused the growth in the consumer food prices by 3.7% in Slovakia, 5.3% in Romania, 8.2% in Poland, 8.8% in Ukraine, and 16.3% in Hungary. Certainly, these numbers are not crucial but they do not reveal a comprehensive picture about price dynamics for the most demanded crop and animal products whose imbalanced intakes would result in nutrition insecurity especially dangerous in the era of Covid-19. For such reasons, this research was intended to check hypothesis about different effects of Covid-19 on prices for prime food products and some common attributes of these effects experienced in Ukraine and four neighboring EU countries.

The remainder of this article is arranged as follows. Section 1 presents the specific literature review on the topics in question. The applied research methodology is covered in section 2. Section 3 incorporates empirical part of the study. The relevant discussion of the paper's findings is introduced in section 4. The last section contains the articulated research conclusion.

1. LITERATURE REVIEW

Agricultural pricing is the core topic of numerous studies. Inter alia, Tomek and Kaiser, (2014) detected agricultural and food price differences over space as well as their variability with the passage of time. Recently, the entrenched theories of agricultural supply and demand, food marketing channels and pricing schemes in both domestic and international trade were specified in Norwood and Lusk (2018). Rezitis and Sassi (2013) clarified that new millennium brought frequent coherent surges of food and agricultural commodity prices. It complicates capturing expected trends, seasonality, and cyclicality and also links with distorting food supply chains. Volatile prices mislead their relationships with nutritional value of diets assessed per unit of food mass, energy or portion and also entail food insecurity manifested via negative effects on human health and quality of life (Jones and Monsivais, 2016). This phenomenon is especially dangerous in times of Covid-19.

As such, Hobbs (2020) examined resilience of food supply chains influenced by the Covid-19 pandemic. He identified their short-run bottlenecks including low stocks incapable to meet initial customers' hoarding and quarantine restrictions on transportation. To tackle the long-run issues of the Covid-19 pandemic, Hobbs (2020) prioritized the workforce safety and shortage as well as investments in online food sales and delivery. In the same manner, Bene (2020) looked into 'ripple effects' across food systems when disturbances, shocks, and stresses of any chain actor like farmers, processors, wholesalers, retailers, and final food consumers are transmitted to both 'downstream' and 'upstream' actors. In more detail, with regard to food supply Siche (2020) showed food prices to be a measure of the Covid-19 impact on agriculture which can cope with this challenge through advanced diversification, cooperation, competition, entrepreneurship, insurance, and risk-management. In this fashion, food processors should rely on innovative enhancements (Karamushka et al., 2018). Wholesalers ought to adjust their trade costs (Xu, 2015). Retailers should give particular attention to logistic improvements (Christopher and Peck, 2015; Velychko et al., 2019). With regard to food demand, Schmidt et al. (2020) addressed real-time tracking of consumer preferences which appeared to be non-perishable food items, local food sourcing, takeout and delivery options, food aid and banks.

The latter are largely associated with the developing countries where additional 130 million individuals were affected by hunger by the end of 2020 (Workie et al., 2020). However, experience of China,

the first country encountered with the crisis of Covid-19, demonstrated successful food provision and minor instability in food prices (Yu et al., 2020). The anti-Covid-19 campaign is also the top issue on the European agenda. Among other things it concerns reinforcing nutritional food security (Toffolutti et al., 2020) and encourage new scientific studies on the topic in question.

Therefore, the research *goal* of this paper was focused on the selected Eastern European countries and aimed to explore dynamics in their current food prices relative to those of the pre-Covid-19 period. The research *hypothesis* supposed different volatility of prices for crop and animal products linked with a certain similarity across the considered Eastern European countries.

2. RESEARCH METHODOLOGY

The ongoing globalization and urbanization foster coinciding shifts in dietary patterns in both Ukraine and neighboring EU countries (Kearney, 2010). Thus, the basic food basket chosen for further examination contained five crop products including

- bread, vegetable oil, sugar, fruit, and potato,
- as well as five animal products comprising, and
- pork, poultry, milk, cheese, and eggs.

Granted, Ukraine is less developed country than Hungary, Poland, Romania, and Slovakia. Nevertheless, their food prices are mostly lower than average ones in the EU. In particular, in 2019 price level indices for food amounted to 65.4% in Romania, 68.8% in Poland, 84.7% in Hungary, 94.0% in Slovakia relative to 100% in the EU-27 on average. Besides, Romania was the least expensive country for bread, fruit, vegetables, potato, and meat. Sugar and dairy products had the lowest price levels in Poland (EUROSTAT, 2020). Thus, the experiences in providing food security in times of Covid-19 seem to be applicable to Ukrainian reality.

The first part of the presented study utilized a theory of the candlestick charting (Lambert, 2008; Corbitt, 2011). It made possible to accomplish a visualized comparison of price cycles in 2019 and 2020. For these purposes every analyzed food product k in country m was described by the price change (in %) like

$$PC_{nkm} = 100 \cdot (P_{nkm}^{2020} - P_{nkm}^{2019}) / P_{nkm}^{2019} . \quad (1)$$

There index n denoted a month starting from March. The annual time frame covered N months. P_{nkm}^{2019} and P_{nkm}^{2020} were the corresponding prices in 2019 and 2020. Index ranges were $n = 1...N$, $k = 1...10$, $m = 1...5$.

Candlesticks were specified by four indicators (1) as follows

$$(PC_{1km}, \underset{n}{Min}\, PC_{nkm}, \underset{n}{Max}\, PC_{nkm}, PC_{Nkm}) . \quad (2)$$

They revealed initial and final prices by food products as well as limits of their relative fluctuations and resulting trends over the Covid-19 period.

The second part of the presented study based on the analysis of variance ANOVA (Vik, 2013; Iacobucci, 2016). It made possible to delve into comparing price seasonality observed in 2019 and 2020. For such reasons every considered food product k in country m was characterized by the price indices (in %) like

$$PI_{nkm}^{2019} = 100 \cdot P_{nkm}^{2019} / P_{0km}^{2019} ,$$

$$PI_{nkm}^{2020} = 100 \cdot P_{nkm}^{2020} / P_{0km}^{2020} . \quad (3)$$

There P_{0km}^{2019} and P_{0km}^{2020} denoted the respective baseline prices as of February. Like before, index ranges were $n = 1...N$, $k = 1...10$, $m = 1...5$.

The ANOVA technique reduced to checking the F-test computed by means of a formula

$$F_{calc} = (2 \cdot N - 2) \cdot N \cdot ((API_{km}^{2020} - API_{km})^2 + (API_{km}^{2019} - API_{km})^2) /$$

$$/(\sum_n (API_{km}^{2020} - PI_{km}^{2020})^2 + \sum_n (API_{km}^{2020} - PI_{km}^{2020})^2). \quad (4)$$

There API_{km}^{2019}, API_{km}^{2020}, and API_{km} associated with the average price indices for a food product k in a country m in 2019, 2020, and over this period, i.e.

$$API_{km}^{2019} = \sum_n PI_{nkm}^{2019} / N,$$

$$API_{km}^{2020} = \sum_n PI_{nkm}^{2020} / N,$$

$$API_{km} = \sum_n (PI_{nkm}^{2020} + PI_{nkm}^{2019}) / (2 \cdot N). \quad (5)$$

Given an alpha level of significance as well as degrees of freedom 1 and $(2 \cdot N - 2)$ to set F_{crit}, the F-test inequality

$$F_{calc} \le F_{crit} \quad (6)$$

carried the message that seasonal dynamics of price indices were similar and their average values appeared to be relatively equal in the pre-Covid-19 period and at times of coronavirus pandemic. In contrast, the F-test inequality

$$F_{calc} > F_{crit} \quad (7)$$

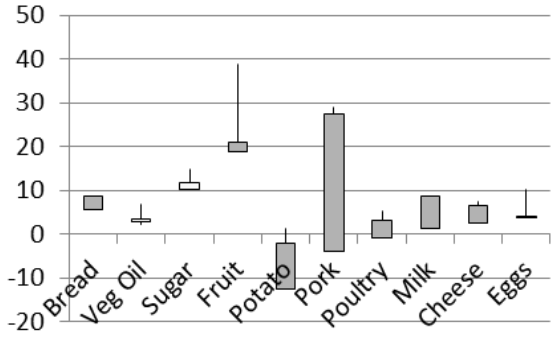
detected essentially different dynamics in price indices subject to the Covid-19 crisis.

3. RESULTS

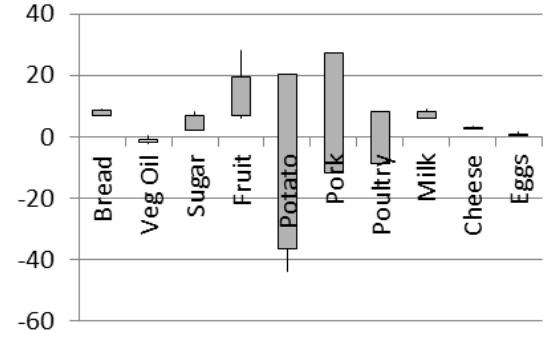
The research empirical outcomes derived from official statistics about Ukraine (State Statistics Service of Ukraine, 2021) and the EU countries (EUROSTAT, 2021). The performed calculations on comparing food price changes and indices drew on panel data about ten crop and animal products in five countries according to the accessible time frame of the Covid-19 period, i.e. March to December 2020 and $N = 10$.

The developed candlestick charts for the encompassed period of the Covid-19 pandemic were collected in Figure 1. Its composition enables picturing price changes by country and product in a uniform way. Namely, every candlestick chart converted numerical data of (2) into visual open and close food prices as well as their low and high levels distinguishing increasing from decreasing price dynamics by means of white and gray colors.

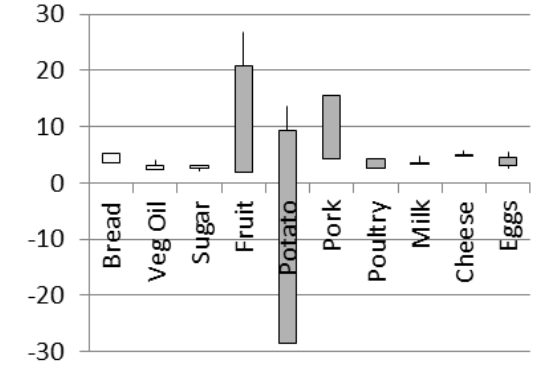
The output of ANOVA applied to the price indices (3) for the selected food products in five countries were aggregated in Tables 1 and 2.



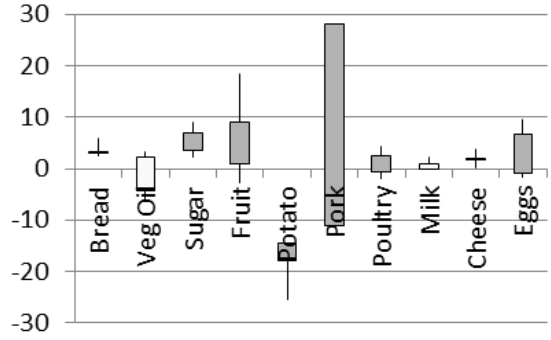
a – Hungary



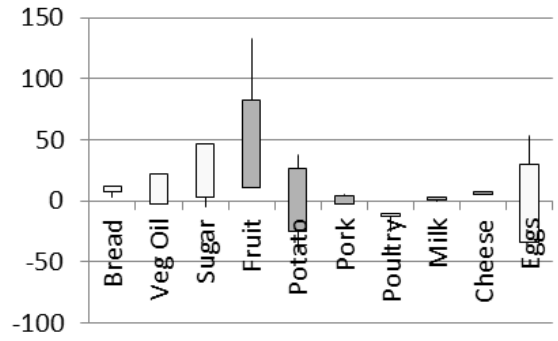
b – Poland



c – Romania



d – Slovakia



e – Ukraine

Figure 1. Food price changes by country, a – Hungary, b – Poland, c – Romania, d – Slovakia, e – Ukraine
Source: author's development, 2021.

Table 1. Dynamics of price indices for crop products

Product	*Indicator*	*Ukraine*	*Hungary*	*Poland*	*Romania*	*Slovakia*
Bread	API_{km}^{2020},%	104.1	102.4	102.7	102.9	101.7
	F_{calc}	0.28	0.23	1.64	17.41	1.28
	F-test result	EQ	EQ	EQ	DIF	EQ
Vegetable oil	API_{km}^{2020},%	105.2	102.9	99.6	101.7	100.5
	F_{calc}	4.77	19.36	32.58	30.15	15.52
	F-test result	DIF	DIF	DIF	DIF	DIF
Sugar	API_{km}^{2020},%	115.4	106.2	102.7	101.9	99.3
	F_{calc}	4.55	46.14	15.72	0.00	6.90
	F-test result	DIF	DIF	DIF	EQ	DIF
Fruit	API_{km}^{2020},%	144.2	123.0	103.1	107.4	100.4
	F_{calc}	0.31	6.54	0.51	0.06	3.03
	F-test result	EQ	DIF	EQ	EQ	EQ
Potato	API_{km}^{2020},%	93.0	100.7	81.3	90.3	97.7
	F_{calc}	22.98	0.00	43.66	5.70	12.17
	F-test result	DIF	EQ	DIF	DIF	DIF
Crop products in total	$API_{m\,crop}^{2020}$,%	112.4	107.0	97.9	100.8	99.9

Source: author's calculation, 2021.

Tables 1 and 2 report average food price indices $API_{km}^{2020}(5)$ by distinct products and according to their crop or animal origins, i.e.

$$API_{m\,crop}^{2020} = \sum_{k=1\ldots5} API_{km}^{2020} / 5,$$

$$API_{m\,animal}^{2020} = \sum_{k=6\ldots10} API_{km}^{2020} / 5.$$

The calculated values of F_{calc} (4) were utilized for running F-test with degrees of freedom 1 and 18 as well as the typical alpha level of 0.05 which established $F_{crit} = 4.41$. The F-test results are presented through the mark EQ linked with the true inequality (6) or the mark DIF associated with the true inequality (7).

Table 2. Dynamics of price indices for animal products

Product	*Indicator*	*Ukraine*	*Hungary*	*Poland*	*Romania*	*Slovakia*
Pork	API_{km}^{2020},%	102.5	98.6	95.2	101.7	95.2
	F_{calc}	8.18	28.80	58.26	8.38	43.52
	F-test result	DIF	DIF	DIF	DIF	DIF
Poultry	API_{km}^{2020},%	92.5	100.6	95.6	101.4	98.7
	F_{calc}	44.41	0.20	49.90	0.98	12.30
	F-test result	DIF	EQ	DIF	EQ	DIF
Milk	API_{km}^{2020},%	100.4	99.7	102.1	102.4	100.3
	F_{calc}	4.91	12.13	17.16	28.46	0.05
	F-test result	DIF	DIF	DIF	DIF	EQ
Cheese	API_{km}^{2020},%	100.5	100.9	101.3	102.1	100.4
	F_{calc}	2.13	4.40	20.98	4.39	21.41
	F-test result	EQ	EQ	DIF	EQ	DIF
Eggs	API_{km}^{2020},%	113.6	101.8	99.7	97.9	98.6
	F_{calc}	17.14	17.73	76.57	4.29	1.88
	F-test result	DIF	DIF	DIF	EQ	EQ
Animal products in total	$API_{m\ animal}^{2020}$,%	101.9	100.3	98.8	101.1	98.6

Source: author's calculation, 2021.

The offered compositions of Table 1 and 2 facilitate both horizontal and vertical analysis of food price resistance against the Covid-19 crisis by products across countries or within each country to compare price fluctuations for food of crop and animal origins.

4. DISCUSSION

The research findings retrieved from Figure 1 reported the similar stability and resilience in prices for bread and vegetable oil in all of the investigated countries. It agrees with conclusions of Brewin (2020) about effective handling the impact of Covid-19 on food safety, transportation infrastructure, and market access in the grains and oilseeds sectors.

All of the considered countries experienced essential cuts in prices for fruit and potato. It complies with the findings from Richards and Rickard (2020) concerning dramatic drops in the sales of perishable and even more storable fruit and vegetables down to the complete loss of some distribution channels in foodservice. The Covid-crisis brought benefits to sugar only in Ukraine. It correlates with the findings of Bracale and Vaccaro (2020) on unhealthy changes in dietary patterns caused by the Covid-19 restrictions when less wealthy people have to offset calories via excessive intakes of the sweetened food.

Figure 1 illuminated that the Ukrainian animal husbandry demonstrated stronger price resistance than those in the neighboring EU countries. In particular, their pork production appeared to be the most

vulnerable to the impediments in supply and distribution chains triggered by the Covi-19 pandemic (Seleiman et al., 2020). In times of Covid-19 eggs price in Ukraine gained the most. It is kind of expected, since eggs substitute more expensive meat protein (Kearney, 2010). Indeed, the latter is less affordable in Ukraine where GDP per capita in 2020 was only $3420 while those in Hungary, Poland, Romania, and Slovakia amounted to $15370, $15300, $12810, and $18670 (IMF, 2020).

The research findings emerged from Table 1 disclosed a prevailing distortion of prices for vegetable oil, sugar and potato in the explored Eastern European countries. Besides, the price index for potato mainly dropped below 100%. High price fluctuations appeared to be typical of fruit. The most advantages pricing of +12.4% for food of crop origin was observed in Ukraine. It reflects the existing misbalance in favor of crop industry peculiar to Ukrainian agriculture (Vasylieva, 2019).

According to the data from Table 2, animal products, except for cheese, featured major differences between contemporary pricing and that of the pre-Covid-19 period. Totally different seasonal trends were detected in prices for animal products in Poland which had to redirect its export to the domestic market. The most affected animal husbandry appeared to be in Slovakia where price indices for pork, poultry, and eggs reduced to 95.2%, 98.7%, and 98.6%. Clearly, the identified price changes for animal products aren't a threat to food security in the analyzed Eastern European countries. However, the observed price volatility hampers to provide healthy nutrition and balanced diets (Rippin et al., 2020).

CONCLUSION

The ongoing Covid-19 crisis penetrated into all spheres of economic activity and social life at the global scale which is evidenced by the total decrease in real GDP by 4.4% in 2020. To a great extent, it exacerbates providing food security and healthy nutrition. The world authorities express their unanimous commitment to addressing such pressing issue. In particular, the Food and Agriculture Organization of the United Nations launched the daily Food Price Monitoring to examine the impact of the Covid-19 pandemic on supply and demand in food chains.

Overall, the research hypothesis was verified positively.

Firstly, given the study focus on applying mathematical techniques to statistical data for the selected Eastern European countries, the research findings reported similar patterns of stable prices for bread and cheese. As of December 2020, they varied from 101.7% to 104.1% for bread and from 100.4% to 102.1% for cheese.

Secondly, the explored neighboring EU countries shared essential fluctuations and final falls in prices for complementary products such as pork and potato.

Thirdly, unlike the wealthier Hungary, Poland, Romania, and Slovakia, food prices for affordable sugar and eggs in Ukraine raised on average by 15.4% and 13.6% for February to December 2020 or by 46.2% and 30.4% with regard to the pre-Covid-19 period.

Finally, food chains in animal husbandry appeared to be less resistant to the stresses and disruptions caused by the Covid-19 pandemic which determine vital objectives to develop food industry and agriculture in the foreseeable future.

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Evaluation of Environmental Taxes Influence to the Business Environment

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ABSTRACT

Purpose: Environmental taxes present important indirect economic tool for achieving of environmental goals in the sense of environmental burden decreasing. The importance to deal with environmental taxes is connected also with European directives for waste management, reuse and recycling, energy recovery. The goal of the contribution is to analyse position and importance of environmental taxes establishment in Visegrad region. Methodology: To achieve determined goal, there was made analysis of environmental taxes in tax system of Slovakia, development of tax rates and collection of environmental taxes. Approach: Research of development and evaluation of environmental taxes had been done according to the newest available data from databases Eurostat, OECD, Ministries of individual Visegrad region countries, and Customs and Taxes Administrations of individual Visegrad region countries. Findings: Results of the contribution prove influence of the environmental tax introduction to the tax system and primary impact to the business behaviour with orientation to the eco-innovation processes. The further problems of environmental taxes evaluation should be orientated to the systematic tool for solving of environmental policy not only at the national, but also at the multinational level.

INTRODUCTION

Environmental policy and protection of living environment, orientated to the environmental burden decreasing becomes actual worldwide problem and part of national and multinational economic policies. Environmental taxes present important indirect economic tool for achieving of environmental goals in the sense of environmental burden decreasing. There are mainly indirect taxes with character of consumption taxes with afford to limit negative externalities, with acceptance of principles of revenue neutrality, relating to the economic subjects, sectors of national economy in area of impact to the cost decreasing,

technological changes, competitiveness, payment ability, etc. Except of fiscal and stimulation effect they have important impact to the establishment of eco-innovation activities and processes of business environment subjects.

1. LITERATURE REVIEW

Environmental or ecological taxes belong between indirect tools of environmental policy, orientated to the protection of living environment, which influence effectiveness of sources using and economic growth, employment and price level. The use of environmental taxes and charges in OECD countries increased by 50% between 1987 and 1994. The idea of this taxes in expert literature uses also naming as environmental, or energetic taxes (Casal, 2012), as it results from the Decree No 2003/96/ES, which in EU determines minimal tax rates for energetic products. By influence of harmonization and approximation processes, the idea had been moved also to the areas of ecological taxation. From the view of international space and from the view of influence to the living environment, number of authors (Ekins & Speck, 2011) is leaning to the idea as „environmental taxes".

However, in theoretic area we must regard general definition of taxes as obligatory, determined by law, not equivalent, commonly repeated payment, which tax subjects pay to the state in determined level and determined term. From this quantification there results definition of environmental taxes according to Gao et al. (2019), which mentions that these taxes have character of political tools, which assume economic and environmental efficiency (Tang et al., 2017), rarity of sources, carrying capacity of business sphere and inhabitants burden, as well as loading of polluters and internationalization of negative externalities. Pigou (2017) pointed as first to the consequences of negative externalities during definition of environmental taxes in his researches, when developed definition of environmental tax to the theory of wealth economy with emphasize to the ineffectiveness of sources allocation and costs, which rise due to the living environment pollution (Pintaric et al., 2019). Negative externality is defined as effect that rises in case when production or consumption of the one subject causes involuntary costs to other subjects (Gerlagh & Lise, 2005; Lin & Li, 2011). Economic subject does not share its all costs, caused by production or consumption, which are not included to the products prices, while there is market ineffectiveness and therefore there is necessary to impose a tax to such externalities, which are in expert literature defined as Pigou emission tax (Pigou, 2017). Pigou tax strictly reflects theory of externalities and is based directly on the pollution unit, mainly carbon dioxide sulfur dioxide - CO_2 and SO_2. Pigou confirmed that state intervention to the economy is necessary tool for solving of such externalities.

Spassova and Garello (2010), resulting from these theories speak that the state intervention by the way of environmental taxes and fees would enable decreasing of transaction costs and express common costs of production. With assumption of racial behavior of producers, Pigou suggested emission tax is effective economic tool of environmental policy. This emission tax has its positives as well as negatives. Pigou in his considerations about emission tax did not count with dynamic economic growth, deformation of the economy, which is caused for example by economies of scale and monopolistic power of the market. Gemechu et al. (2012) defined an environmental tax on products based on their carbon footprint. Therefore, it is worthwhile for policy-makers to pay attention to the implications of considering green tax or emissions tax in order to make their policy measures effective and meaningful. Hwang and Kim (2017) analyzed environmental tax, energy tax and the Emissions Trading System (ETS) using strong, balanced panel data from 19 OECD countries for 1996-2009. The results reveal that the static effect of energy tax on exports is negative, but the dynamic effect is positive. Silajdzic and Mehic (2018) we investigated the impact of environmental taxes on CO2 emissions in the context of emerging market economies, providing rather strong evidence in support of an inverted U-shaped relationship between economic growth and the environment. However, environmental taxes do not seem to be effective in modifying the behaviour of economic agents and in protecting the environment. In different conditions, Agnolucci (2009) made evaluation of the effect of the environmental tax reforms introduced in Germany and the UK, concluding that environmental tax reforms can deliver substantial reductions in energy consumption. The importance to deal with environmental taxes is connected also with European directives for waste management, reuse and recycling, energy recovery.

2. METHODOLOGY AND RESEARCH METHODS

The goal of the contribution is to analyze position and importance of environmental taxes establishment in Visegrad region (V4). To achieve determined goal, there was made analysis of environmental taxes in tax system of Slovakia, development of tax rates and collection of environmental taxes.

During realization of the research secondary data and database of tax subjects of environmental tax of electricity, coal and earth gas had been applied. The data had been obtained from tax system of Slovak Republic, obtained through portal of Financial Administration of Slovakia and portal of financial statements FinStat.sk, as well as information of taxation in Czech Republic, Poland and Hungary according to Eurostat database. We resulted from the decree of European Commission that defines environmental tax according to Methodology of Eurostat ESA 95 and Decree No 691/2011 about European environmental economic accounts as tax „when tax base is physical unit that has negative impact to the living environment“ (Eurostat, 2018). According to European Commission (2016) ecologic taxes includes for the Eurostat energetic taxes, taxes from transport, taxes from pollution and taxes of sources. As illustrated in classification, among ecological taxes belong also fees that are defined as obligatory, not refundable payment to public budgets and extra budgetary funds that could be seen as payment for certain ecologic services. Value added tax, given to the goods that have negative influence to the living environment, is excluded according to this methodology from the group of environmental taxes. For processing of obtained results, methods of description statistics, contingent tables and tools of graphical illustration had been used.

Complex function of the tax is in economic theory marked as tax incidence (Andreoni, 2019; Gao et al., 2019; Toprak, 2018) and it is distinguished in legal and effective level. Actual law, determining subjects that are obligatory to pay the tax in time and in full level, determines legal impact. Effect of such function could be effort of economic subjects to avoid payment, resp. to transmit tax burden to other subject (. According to position in distribution net the tax could be transited back and forth (Andreoni, 2019; Toprak, 2018), consumption tax could not be transited forth, but it has tendency to be transited back to the production factors (Rothbard, 2001). Transition is toward increasing of prices of taxed product, adaptation of prices of production factors is yet secondary. Final impact of taxation depends according to Rothbard (2001) mostly on the level of tax burden, not its type. As for the ecologic taxes there are searching also impacts to the living environment, economic subjects and sectors of national economy in area of impacts to the technological changes, costs decreasing, competitiveness, payment ability, etc. between most common effects of environmental taxes application belong:

- Effect of costs decreasing;
- Effect of eco-innovation processes;
- Fiscal effect;
- Stimulation effect;
- Effect of impact to competitiveness.

Producer during applying of environmental taxes tries to decrease pollution of living environment to the time when minimize maximally its costs. Level of costs savings is calculated as difference between levels of environmental tax that had been paid in case of not realizing of measurements. Effect of environmental tax to the effectiveness of financial sources allocation with goal to decrease living environment pollution is reflected during application of the same level of environmental tax for all polluters, which means without regard to their marginal costs for decreasing of living environment pollution. During application of environmental taxes, any polluters would decrease pollution only when his marginal costs of pollution decreasing will be equal to the level of environmental tax. Economic subjects with low costs of pollution decreasing will decrease emission more than subjects that invest higher costs.

Introduction of environmental tax enables economic subject to use innovation and top technologies and by this way to minimize the costs. It means that establishment of environmental tax in comparing with direct regulation creates for the polluters bigger stimulation space for eco-innovation applying

(Arouri et al., 2012). Effectiveness of sources is important not only from the ecological, but also from the economic view. Using of smaller volume of sources at the higher production is basic theme during environmental taxes introduction. Attributes of success of environmental taxes introduction had been studied by number of authors: Spratt (2013) in so-called 3E model, which evaluates effectiveness of environmental regulations (see Table 1), by the way of seven principles that correspond with general tax principles of effectiveness, righteousness, tax certainty, transparency, etc.

Table 1. Review of basic and supplementary criteria of 3E model

Criteria	*Relevant question*	*Character of criteria*
Environmental efficiency	Is demanded goal achieved by application of given criteria?	Basic
Economy	Is given tool implemented with minimal costs?	Basic
Effectiveness	Is achieved the best relation between contributions and costs?	Basic
Public incomes	What volume of public incomes is generated by given tool?	Supplementary
Innovation	What impact has implementation of given tool to the innovation activity? Is it speeding up or slowing down the innovation activity?	Supplementary
Impact to the economic subjects	What impacts to the competitiveness bring implementation of environmental tool?	Supplementary
Broader economic effects	What influences to the macroeconomic indexes has implementation of given tool?	Supplementary

Source: Spratt (2013)

Research of development and evaluation of environmental taxes had been done according to the newest available data from databases Eurostat, OECD, Ministries of individual V4 countries, and Customs and Taxes Administrations of individual V4 countries.

3. RESULTS

Development and evaluation of environmental taxes Following tables 2-4 there is illustrated development of environmental taxes in V4 region during 2017 according to tax burden, mineral oils and gas, development of tax from electric energy and comparing of rates for electricity, coal and earth gas.

Table 2. Comparing of tax burden for mineral oils of oil fuel and petrol in V4

V4 country	*Tax from mineral oils Oil fuels*	*Tax from mineral oils Petrol*	*Price in Euro*	
			Oil fuels	*Petrol*
Slovakia - basic rate - decreased rate	 386.40 368.00	 550.52 514.50	1.131	1.285
Czech Republic	415.94	487.73	1.120	1.151
Poland - basic rate - decreased rate	 342.74 -	 428.00 392.16	1.041	1.079
Hungary	356.90	388.11	1.158	1.147

Source: own processing according to Institute of financial policy, MF SR, Tax report

Tax rates had been calculated according to average currency in 2018: CZK 26.326; HUF 309.193; PLN 4.257. The lower tax rate is applied for fuels with volume of biogenic element – bioethanol in case of petrol and biodiesel in case of oil fuel.

Table 3. Comparing of tax from electric energy in V4 (to 1.1.2019)

V4 country	*For commercial goal (EUR/MWh)*	*For other goals (Eur/MWh)*
Slovakia	1.32	0.00
Czech republic	1.14 (28.30 CZK/ MWh, without 21% VAT)	1.14
Poland	4.73	4.73
Hungary	1.00	1.00

Source: OECD

Following table 4 illustrates comparing of tax rate of consumption tax from electricity, coal and earth gas in V4 in 2018.

Table 4. Comparing of tax rate for electricity, coal and earth gas in V4

V4 country	*Tax rate for electricity / MWh*	*Tax rate for coal / GJ*	*Tax rate for earth gas*	
			Fuel / GJ	*Oil fuel / GJ*
Slovakia	1.32	0.36 (10.62 / 1t)	0.37 (1.32 / MWh)	2.60
Czech republic	1.07	0.32	0.32	2.79
Poland	4.70	0.30	0.30	2.48
Hungary	1.00	0.28	0.30	2.66

Source: own processing according to Institute of Financial policy, MF SR, Tax report

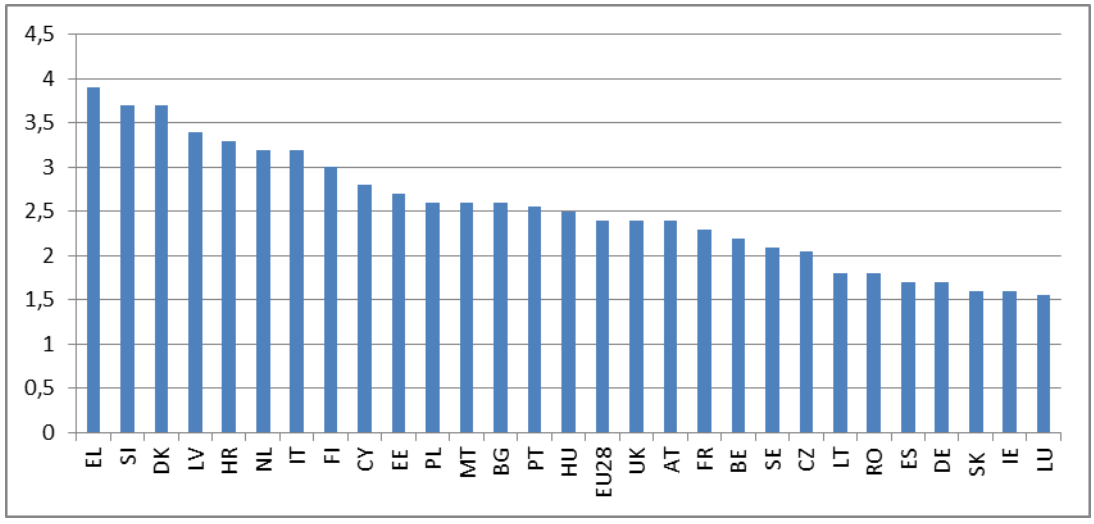

Figure 1. Environmental tax revenue as % of GDP in 2018

Source: Eurostat

From the mentioned there is resulting that consumption of electricity is mostly taxed (without VAT influence) in Poland. Tax rate in Poland is more than four times higher in comparing with the lowest taxation in Hungary. Final taxation of electricity and other energy depends also on used VAT rate in

individual countries (Slovakia 20 %, Czech Republic 21 %, Poland 23 %, and Hungary 27 %). Coal taxation in V4 region is not very different. Slovakia has after currency considering to the same measure unit the highest rate. Hungary does not achieve either minimal level of rate, determined by EU. Taxation of earth gas is divided to taxation of fuel for production of heat and taxation for production of CNG, used as oil fuel. Earth gas is taxed by lower rate for heat production, when Slovakia in comparing with other countries has the highest rate. Earth gas for production of oil fuels is mostly taxed in Czech Republic.

3.1 Analysis of environmental tax collection in V4

Slovakia

In spite, Slovakia knows necessity of taxes application as environmental tools for living environment protection, the contributions do not achieve demanded level, applied in developed economies of EU member states. Following table 5 presents incomes from environmental taxes in Slovakia in comparing with average 28 EU member states during 2009 -2017.

Table 5. Incomes from environmental taxes in Slovakia and EU average (% GDP)

Incomes	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*
SR	1.91	1.82	1.81	1.72	1.72	1.77	1.76	1.81	1.76
EU average	2.35	2.37	2.40	2.43	2.45	2.45	2.43	2.44	2.40

Source: Financial Administration SR; Eurostat

From mentioned there is obvious that incomes from environmental taxes in Slovakia are under EU average during all analyzed period. Consumption tax from mineral oils is from the view of incomes the most important selective consumption tax.

Czech Republic

In Czech Republic environmental taxes present national taxes with partial character of transnational taxes. Revenues of environmental taxes come in full level to the state budget. Transnational criteria are accomplished from the view of European Union and Decree No 2003/96/ES. Development of revenues from environmental taxes in Czech Republic according to individual types is given in Figure 2.

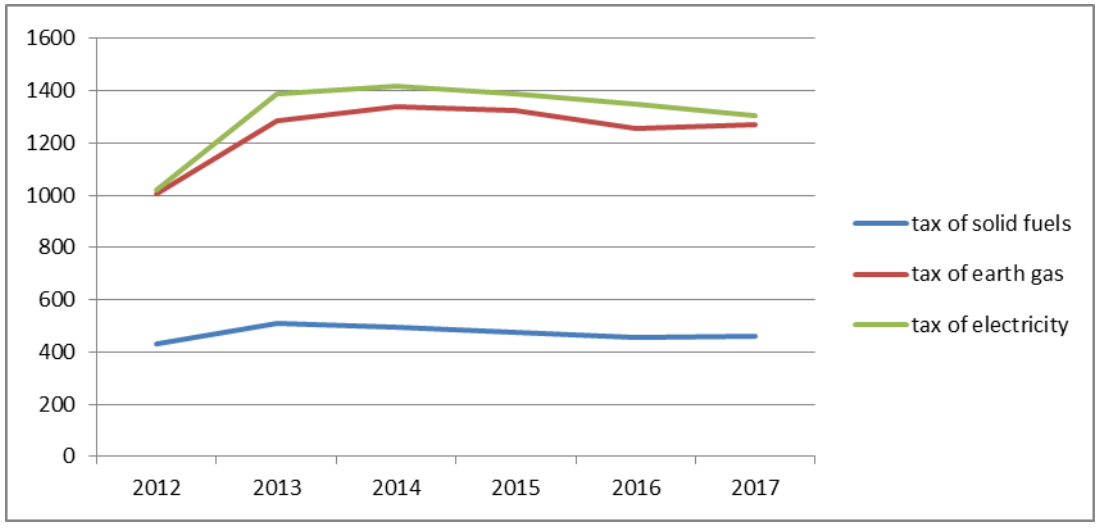

Figure 2. Revenues of environmental taxes in Czech Republic in mil. CZK

Source: own processing according to Customs Administration, CZ

As for the rate of incomes from environmental taxes on total taxes in state budget of Czech Republic, we see in Table 6 that the rate has fluctuated in the time development, when the biggest rate was in 2014, gradually decreasing to 3.04 in 2017.

Table 6. Rate of incomes from environmental taxes and on total taxes of Czech Republic state budget (in mld. CZK)

	2012	*2013*	*2014*	*2015*	*2016*	*2017*
Total incomes	1063.94	974.61	1000.38	1012.76	1051.39	1091.86
Incomes from environmental taxes	2.45	3.18	3.25	3.19	3.06	3.04

Source: Ministry of Finance, CZ

Poland

As a share of GDP, Poland has the 13th lowest environmentally related tax revenue among 34 OECD and 5 partner economies. In 2014, environmentally related tax revenues were at 1.79% of GDP, compared to 2.0% on average among the 39 countries. In Poland, taxes on energy represented 92% of total environmentally related tax revenue, compared to 70% on average among the 39 countries (OECD, 2017).

Table 7. Development of environmental taxes in Poland (in bil. Eur)

	2009	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*Ranking 2017*	*Revenue 2017*
Environmental taxes	*As % of GDP*										
Environmental taxes	2.5	2.7	2.6	2.6	2.4	2.6	2.7	2.7	2.7	11	12.5
Energy	2.1	2.3	2.2	2.2	2.1	2.2	2.3	2.3	2.3	7	10.9
of which transport fuel taxes	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.0	5	
Transport	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	22	1.1
Pollution and resources	0.22	0.22	0.22	0.18	0.09	0.16	0.17	0.14	0.12	8	0.6

Source: EU Open Data Portal

Hungary

Green taxation and environmentally harmful subsidies financial incentives, taxation and other economic instruments are effective and efficient ways to meet environmental policy objectives. The circular economy action plan encourages their use. Environmentally harmful subsidies are monitored in the context of the European Union and the energy union governance process. Hungary's revenue from environment-related taxes remains higher than the EU average. Environmental taxes accounted for 2.53% of GDP in 2017 (EU-28 average: 2.4%) (see Figure 8) and energy taxes for 1.91% of GDP (EU average 1.84%) 129. In the same year, environmental tax revenues were 6.6% of total revenues from taxes and social security contributions (EU average 5.97%). The structure of taxation shows a share of revenues from labor tax in total tax revenues in line with the EU average, with 46.1% in 2016, while the implicit tax burden on labor was 41.6% 130. Consumption taxes remained relatively high (40.2%, 6thin EU28), pointing at limited potential for shifting taxes from labor to consumption and in particular to environmental ones (Environmental Implementation review, 2019).

Table 8. Environmental taxes by the main categories (in mil. HUF)

	2013	*2014*	*2015*	*2016*	*2017*
Energy taxes	469 673	483 843	494 608	513 041	500 827
Pollution taxes	16 775	18 894	22 672	28 393	33 855
Resource taxes	17 588	18 229	16 948	19 415	19 116
Transport taxes	49 985	51 737	62 757	66 417	64 085
Total	554 021	572 703	596 986	627 265	617 883

Source: ACCACE, Tax Guide for Hungary

The structure of taxation shows a share of revenues from labor tax in total tax revenues in line with the EU average, with 46.1% in 2016, while the implicit tax burden on labor was 41.6%. Consumption taxes remained relatively high (40.2%, 6thin EU28), pointing at limited potential for shifting taxes from labor to consumption and in particular to environmental ones In its European Semester process, the Commission has repeatedly recommended that Hungary modify its taxation system. The 2018 country report noted that household energy consumption in Hungary is still exempt from energy tax and that car tax receipts had stagnated. However, there are some examples of sound fiscal measures for the environment. One is the load charge of air pollution that was introduced in 2003 and has helped reduce air pollution levels in some areas of the country.

Meanwhile, fossil fuel subsidies increased in the past decade, mainly thanks to new tax exemptions for district heating and fuel use for agriculture, railways and commercial purposes. Some subsidies remain in place for the decommissioning and reorganization of the coal sector. These budgetary transfers and subsidies added up to HUF 12 billion in 2016, and the tax exemptions (both local and central governments included) exceeded HUF 123 billion. Some progress has been made on reducing the 'diesel differential' (difference in the price of diesel versus petrol) since 2005. In 2016, there was still a 9% gap between petrol and diesel tax rates, while in 2005 it was 22%. Excise tax rates levied on petrol, and diesel in 2016 slightly decreased in comparison with those in 2015 (HUF 120 per liter for petrol and HUF 110.35 for diesel). The reduction was bigger for diesel than for petrol. Tax treatment for company cars is a cause for concern in Hungary. Tax subsidies still encourage the private use of company cars. Nevertheless, new preferential taxes for electric and hybrid company cars were introduced in 2018 (Environmental Implementation Review, 2019).

CONCLUSIONS

Problems of environmental taxes evaluation and their influence to the business environment pointed to the environmental taxes as the systematic tool for solving of environmental policy not only at the national, but also at the multinational level. The goal of the contribution was to analyze position and importance of environmental taxes introduction to the tax system and to search their influence to the business environment. According to the results, we concluded and recommended to realize in analyzed region systematic environmental tax reform, supported by information campaign with goal to support business environment towards pro-innovation activity, and at the same time to create innovation centers and innovation clusters at the national and local level. Results of the contribution prove also influence of the environmental taxes introduction to the tax system to the fiscal problems, and primary impact to the business subjects' behavior with orientation to their innovation activities and realization of eco-innovation processes that have positive influence to the living environment.

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Analysis of Factors Affecting to the Development of Sub-Production Industry of the Republic of Kazakhstan

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ABSTRACT

The entry of non-mining companies into the world market raises the problems of strategic planning and company management especially significant in a market economy. The considered model of strategic planning and management is versatile and suitable to the development strategy of companies taking into account regional and national interests. The aim of the study is to develop recommendations for the application of modern methods of strategic management in the non-mining companies to determine the main routes for the development of this industry in a pandemic. The information base of current investigation includes legislative and other normative acts of the Republic of Kazakhstan, statistical data of the Agency of the Republic of Kazakhstan on Statistics, analytical materials, materials of scientific economic literature and periodicals, materials of scientific and practical conferences, data of electronic resources, as well as financial statements of Top 40 foreign companies. Research methods. In this work, the following methods such as abstract-logical, economic-statistical, monographic, as well as methods of system analysis, economic comparison, expert assessments, economic and mathematical modeling were used. Conclusions: The main provisions and conclusions given in this work can be used in the development and implementation of strategic management policy and further planning of non-mining companies. In the process of analyzing the non-mining industry, a forecast was identified for the development of strategic planning for their further activities, since oil companies-subsoil users are basically important and active agents of economic and social development, receiving income as a result of the development and use of oil fields in Kazakhstan. Research out-comes: Using the provided statistical data on the indicators of non-mining companies, we analyzed the influence of some

factors affecting the final results of companies' activities by creating a regression model, and also analyzed the impact of investments in fixed capital in the non-mining industry of the Republic of Kazakhstan on the pro-duction volume (goods and services) achieved by this industry.

INTRODUCTION

The relevance and efficiency of strategic management of enterprises and numerous industries in modern economic conditions has been proven by varied previous scientific works. The key mechanisms of strategic management of enterprises in various sectors of the economy should take into account the main trends and specifics of the industry development; it is also necessary to adapt them to modern economic conditions. These circumstances confirm the feasibility of improving the processes and mechanisms of strategic management of enterprises, industrial complexes, as well as further investigations in this area. The developed non-mining industry traditionally demonstrates the technological power of the state. Nowadays, this sector is no longer a source of large-scale growth in employment and jobs in developed countries. However, it still remains as one of the key development tools in developing countries. To bring new industries into the zone of industrial activity, since 2010 the Republic of Kazakhstan has been implementing an industrial policy that aimed at creating a highly productive and export-oriented manufacturing industry including the non-mining industry.

The strategic importance of the country's non-mining industry predetermines the need of creation more flexible management structures and effective integration mechanisms to ensure the development of enterprises and industries that are part of it. The production efficiency and development of modern non-mining companies is largely determined by the degree of their adaptation to ongoing changes in the environment of functioning and development. The processes that characterize the domestic economic situation often do not suit into the framework of the generally accepted theory. Therefore, in order to solve the problems arising in these conditions, the enterprise is required to search for new and non-standard solutions and approaches.

The post-COVID reality is changing the economy, and the mining industry is no exception. The market is demanding that mining become more dynamic and flexible. Now there is a need to create the production that would work autonomously and be distinguished by an unprecedented level of efficiency and productivity. Such a "model company" invests in innovation and employees who clearly see their goals and realize the value of the result, and their workplace is as safe as possible not only for them, but also for the environment. Companies that can build fully interconnected supply chains will not only eliminate the silos of operational processes, but also ensure their transparency and reduce costs.

1. LITERATURE REVIEW

The problems of understanding the strategic future of an enterprise is always attracted interest in multiple scientific fields. A review of modern sources made it possible to highlight some definitions of strategic planning. I.A. Lieberman (2016) noted that "*the strategy is presented as a master plan of action, which determines the priorities of strategic objectives, resources and a certain algorithm of action in order to achieve strategic goals*". A group of economists T.N. Litvinova, I.A. Morozova and E.G. Popkova concluded that strategic planning is aimed at the management aspect of changes in the enterprise. The outcome of strategic planning is a strategic outline that determines the stages and resources that are needed to achieve strategic goals (Ivanova, 2016).

Yu.N. Ivanov emphasizes that modern competition has promoted the development of adequate models of firms' behavior, which led to start and continue intensive work on research in the field of strategic planning (Litvinova et al., 2016). I. Ansoff (1989) defines strategy as a complex and potentially powerful tool with which a modern firm can withstand changing environmental conditions. Financial planning undoubtedly influences to the financial strength of companies. In this case, it seems relevant to analyze available strategic tools that aimed at improving the efficiency of the enterprise and searching

for new methodological techniques to managing the development strategy of economic entities, taking into account the state of the external and internal environment, the current conjuncture of the Kazakhstan and world markets based on the materials of the oil and gas industry. According to the author, changes in any economic system are caused by the influence of the external environment, and also affect it. To avoid chaos, uncertainty and possible errors in system management, the international management practice actively employs the category and process of strategic management. Including the analysis of the environment, the definition of the mission and goals of the system, the choice of strategy, its implementation and evaluation make it possible to streamline and systematize all elements of the system and ensure its controllability. According to L.G. Zaitsev and M.I. Sokolova, "strategic management" is concluded as:

- type, scope of management activities consisting in the implementation of the selected long-term goals throughout making changes in the organization;
- the process by which the organization interacts with its environment;
- the area of scientific knowledge that studies techniques and tools, the methodology for making strategic decisions and ways in practical implementation of this knowledge (Zaitsev, Sokolova, 2015).

The non-mining industry is the most significant branch of the primary sector, that includes extraction, processing and enrichment of raw materials - energy, ore, mining chemical construction materials. Its fraction in the total industrial production of developed countries and countries with transitional economy is around 8-10% (in Australia, Norway and Canada - 15-20%, in most developing countries - 30-50%, in some of those - over 80%, for example, Persian Gulf countries, Zambia). The export quota of mining products in developed countries usually does not exceed 5% (exceptions are the above developed countries and South Africa). This number fluctuates from 15-20 to 80% (or above) in developing countries. As the most important field, high-quality and efficient development of mining resources requires broad cooperation with the world's largest oil companies, which have a great experience in geological exploration, production, and processing of hydrocarbons, as well as their transportation. According to V.A. Kulakovskaya (2016), the positioning of the non-mining industry as an income-generating sector of the economy is due to several factors such as the presence of massive reserves of minerals, existing structure of the domestic economy and system of the industry taxation. A.I. Dmitrieva (2017) stated that the key task of the firm's strategy should be develop a model for searching, adapting and introducing innovations that create a steady stream of investments and innovations that provide competitive advantages and achieve the strategic goals.

By forming the priority directions of the region's industrial policy, it is essential to take into account that the resulting indicators should be achieved at the level of key industrial companies in the region. This makes it necessary to increase their profitability and innovativeness in a strategic perspective (Zhogova et al., 2017). Consequently, the efficiency of production and development of modern non-mining companies is largely defined by the degree of their adaptation to the ongoing changes in the environment of functioning and development (Krasnikova, 2019). Innovative and investment indicators of the development of the world economy were analyzed by many scientists over the past ten years. These display in search of competitive advantages and effective technological solutions, the world's largest corporations have begun to increase investments in R&D (Ivanova and Mamedyarov, 2019). G. Zervas et al. (2017) reported that the development of the phenomenon of the shared economy, the intensification of a use of outsourcing, the changing role of small and medium-sized enterprises in a number of industrial and high-tech sectors of the economy where the non-mining industry occupies an important position.

2. METHODOLOGY

Kazakhstan's economic and investment policy was created from scratch as a bold market and supporting a wide layer of local and foreign subsoil users. Within the framework of the adopted legislation, individual contracts are concluded with them, where the task of increasing production and export of hydrocarbons is solved by creating an investment climate suitable for investors. That will subsequently ensure the emergence of over 200 contracts for oil and gas subsoil use.

Kazakhstan's investment policy is aimed at ensuring that the volume of capital investments attracted to the country grows not only because of super-projects, but also as a result of an increase in the total number of subsoil users and contractors, as evidenced by the following data (Figure 1) (Data of the Committee on Statistics of the Republic of Kazakhstan for 2010-2019).

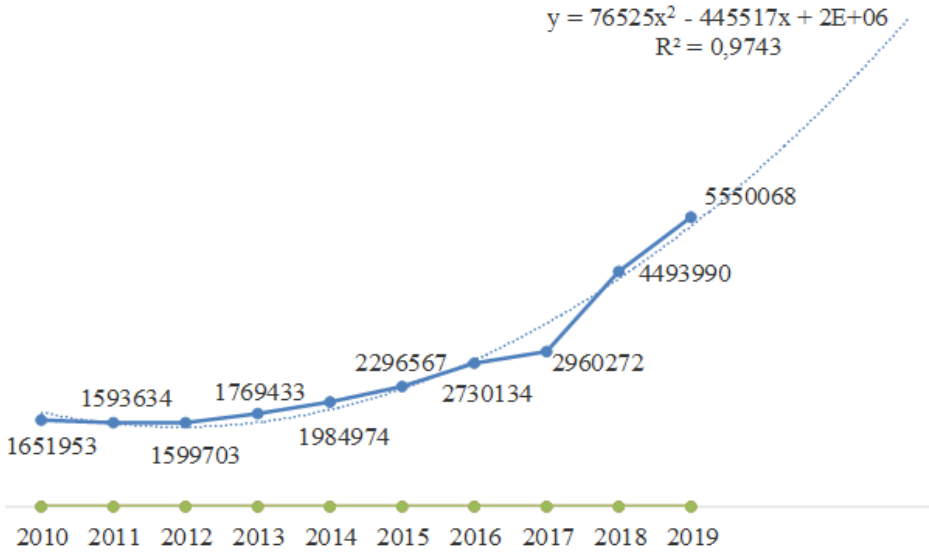

Figure 1. Fixed capital investments in the non-mining industry of the Republic of Kazakhstan for the period of 2010 to 2019, million KZ tenge.

Source*:* Compiled by authors based on the source: Electronic resource: Data of the Committee on Statistics of the Republic of Kazakhstan for 2010-2019 (2019)

There is of great interest to determine the influence of investments in fixed capital in the non-mining industry on the production volume (goods and services) achieved by this industry. It is natural to assume that the benefit on investment does not occur immediately, but after a certain period of time there is likely to attain a profit. Thereby, it is advisable to use a dynamic model with a distributed lag (assuming a lag value of three) for the analysis (Sedelev, 2009):

$$y_t = \alpha + \beta_0 x_t + \beta_1 x_{t-1} + \beta_2 x_{t-2} + \beta_3 x_{t-3}\ , \qquad (1)$$

Where:

- the volume of services rendered by the placements (mln. KZ tenge);
- investments in fixed capital (mln. KZ tenge).

Graphical analysis (Figure 1, Figure 2) suggests that the lag structure has a polynomial form, as a result of this, the Almon method (Data of the Committee on Statistics of the Republic of Kazakhstan for 2010-2019) can be used to estimate the model parameters.

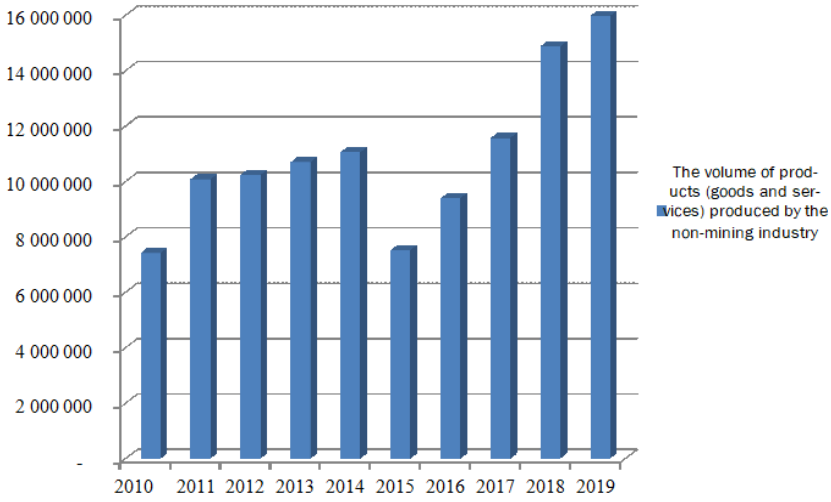

Figure 2. Dynamics of the production volume (goods and services) in the non-mining industry of the Republic of Kazakhstan for 2010-2019.

Source: Compiled by authors based on the source: Electronic resource: Data of the Committee on Statistics of the Republic of Kazakhstan for 2010-2019 (2019)

The statistical data presented in Table 1 were used to build this model.

Table 1. Dynamics of the investments in fixed capital and production volume of the non-mining industry for the period of 2010-2019

Year	The production volume (goods and services) in the non-mining industry	Fixed capital investments in the non-mining industry
2010	7 419 550 330	1 651 953
2011	10 081 254 022	1 593 634
2012	10 242 052 603	1 599 703
2013	10 696 926 187	1 769 433
2014	11 060 179 488	1 984 974
2015	7 521 179 590	2 296 567
2016	9 397 618 601	2 730 134
2017	11 568 784 610	2 960 272
2018	14 877 068 476	4 493 990
2019	15 978 061 372	5 550 068

Source: compiled by authors

The implementation of the Almon method made it possible to obtain the results depicted in Table 2. A model with a distributed lag was built, the relative coefficients and the average lag were determined.

Table 2. Results of constructing a dynamic model with a distributed lag

Distributed lag model: $y_t = -9121201,051 - 0,511x_t - 4,131x_{t-1} + 1,216x_{t-2} + 15,528x_{t-3} + \varepsilon_t$		
Relative ratios, %	current time	-0,042
	within a year	-0,341
	after two years	0,100
	after three years	1,283
Average model lag		3,709

Source: compiled by authors

Analysis of the resulting dynamic model allows us to conclude that investments in fixed capital of the non-mining industry lead to a rise in the production volume of this industry within a three-year period. Thus, for the non-extractive industry, one of the most important aspects is the need to optimize approaches to pricing and implement regulatory reforms which can attract new investment in an extremely competitive environment in the global market, and in order to pave the way to successful integration within the EAEU. Oil companies-subsoil users are important and active agents of economic and social development, as they receive income as a result of the development and use of oil fields in Kazakhstan. According to the contracts concluded with subsoil users, they are obliged not only to use in their activities the goods and services produced by domestic producers, but also to train Kazakhstani specialists at the expense of income from subsoil use.

The economy of Kazakhstan today has a "raw materials orientation" and, in the near future, the situation will not change significantly. Harmless production allows focusing not on maximum production volumes, but also a use of energy and water resources with minimal harm to the environment. This policy is followed by the transition from manual control to automated processes with their self-organization and self-control. Under these conditions, employees are shifting to remote control, and production to flexible management with a focus on demand and sales. According to the National Bank of the Republic of Kazakhstan, at the end of 2019, the net inflow of direct investments in the oil and gas industry of the Republic of Kazakhstan preliminary amounted to USD 5,664.6 million of the total volume of direct investments in Kazakhstan. In the period of 2016–2018, the inflow of investments in the oil and gas industry of the Republic of Kazakhstan increased by 95.9% (by USD 2,012.2 million) (Figure 3) (Data of the National Bank of the Republic of Kazakhstan for 2016-2019, 2019).

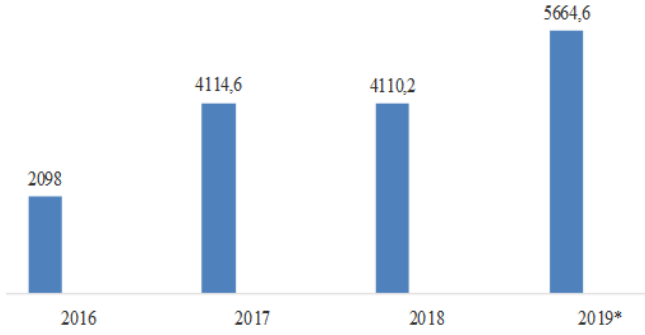

Figure 3. Net inflow of direct investments in the oil and gas industry of Kazakhstan, million US dollars

Source: Created from source: Electronic resource: Data of the National Bank of the Republic of Kazakhstan for 2016-2019, (2019)

According to the Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan as of 2019, 315 companies engaged in the production of crude oil and natural gas were registered in Kazakhstan, of which 187 are operating. Of the total number of companies involved in the production of crude oil and natural gas, they are divided into:

- large enterprises (more than 250 employees) - 22 (including 22 operating);
- medium-sized enterprises (from 101 to 250 employees) - 23 (including 20 operating);
- small businesses (from 5 to 100 employees) - 270 (including 145 operating).

In terms of the geography of the location of companies in the countryas follows:

- Almaty - 89 (of which 52 are operating);
- Mangistau region - 30 (17);
-
- Aktobe region - 27 (9);
- Kyzylorda region - 14 (8);
- Zhambyl region - 13 (9).

At the beginning of 2019, the actual headcount at the enterprises for the production of coke and petroleum products amounted to 8.1 thousand people. Regionally, the largest number (67.9%) is concentrated in Atyrau, Pavlodar regions and Shymkent. This is due to the fact that in these regions there are 3 large domestic oil refineries - «Atyrau refinery» LLP (Atyrau), «Pavlodar oil chemistry refinery» LLP (Pavlodar) and PetroKazakhstan Oil Products LLP (Shymkent). Considering the foreign experience in the development of the non-mining industry, we would like to note that 40 of the largest mining companies are quite successfully overcoming the difficulties that have befallen them due to the COVID-19 pandemic - they certainly coped with the situation better than many other sectors of the economy, as evidenced by the following data (Figure 4) (Mining industry, 2020).

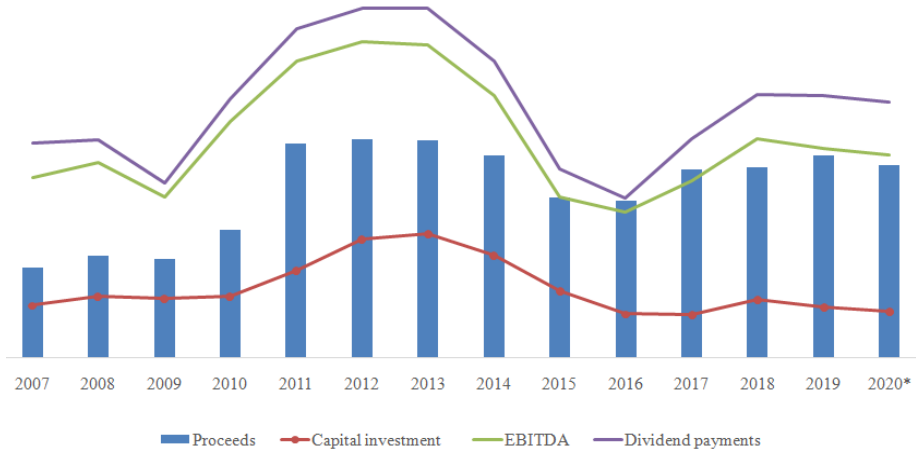

Figure 4. Dynamics of indicators of 40 largest mining companies, billion US dollars

Source*:* Compiled by authors based on the source: Electronic resource: Mining, (2020)

Top 40 companies generated revenues of USD 692 billion in 2019, i.e. increased by 4% compared to last year - mainly as a result of rising commodity prices (Figure 5) (Mining industry, 2020).

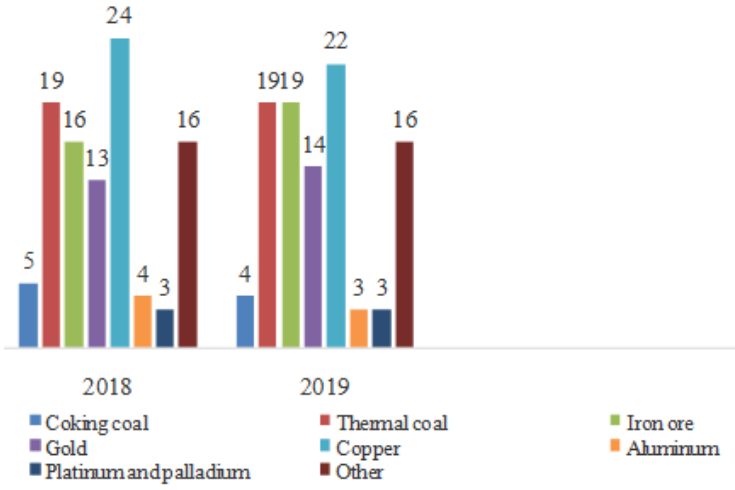

Figure 5. Maintaining the revenue structure of Top 40 companies by commodities for 2018-2019, in %.
Source*:* Compiled by authors based on the source: Electronic resource: Mining, (2020)

The pandemic revealed that the resilience of the industry and the role that mining companies play in supporting local communities and the economy as a whole. Although there is still a long way out of the crisis. Mining companies are already analyzing the lessons they have experienced from the current situa-

tion. The coal sector's contribution to total revenues remained at the level of the previous year, while the share of the iron ore sector increased, mainly due to the price. It reached the peak over the past five years and amounted to almost $ 130 per tonne.

The price of iron ore, which dramatically decreased in production due to the tragic events in Brazil, further reduced due to falling demand and a trade war between the United States and China. As for Kazakhstan, the situation with the volume of production in current prices in the context of the regions of the non-mining industry indicates that among the regions by:

- Karaganda region is the leader in coal and lignite mining;
- Atyrau and Mangystau regions are leading in the production of crude oil and natural gas;
- mining of metal ores - Aktobe, Kostanay, Pavlodar regions;
- mining of iron ore - Kostanay region;
- mining of non-ferrous metal ores - Aktobe, East Kazakhstan regions;
- other branches of the mining industry - Atyrau, Zhambyl, Kostanay regions (Table 3) (Data of the Committee on Statistics of the Republic of Kazakhstan for 2010-2019).

The pandemic has affected the prices of various commodities in different ways: for some it fell, for others it increased. However, some prices remain relatively stable. Non-ferrous metal prices have declined significantly since January 2020 due to weakening demand and uncertainty over the dynamics of economic development. The decline in prices for copper, nickel and zinc since December 2019 has been expressed as a percentage in double digits. Large mining companies expect the demand for non-ferrous metals to weaken in the remainder of the year, and some of them have moderately cut their production forecasts in response to this. Thus, some of Top 40 companies have lowered their forecasts for copper, nickel and zinc mining by an average of 6-7%. Some commodity prices may decline further after COVID-19 restrictions are lifted that affect production. Since the price of gold rises during the crisis, gold mining companies are in an advantageous position - in recent months there has been a recovery in stock prices.

Table 3. Global production and the impact of COVID-19 on the activities of mining companies

A country	Copper	Gold	Iron ore	Coal	Nickel
USA	7	6		9	
Canada	7	5			
Brazil			19		
Peru	12				
Argentina	28				
Congo	7				
South Africa				3	
Russia		9	4	4	10
China	13	8	14	46	
India			8	10	
Philippines					16
Indonesia				7	30
Australia		10	37	6	7
New Caledonia					8

Source: Compiled by authors based on the source: Electronic resource: Mining, (2020)

The price of iron ore has remained above $ 80 per tonne throughout the entire coronavirus outbreak. Some huge iron ore mines reached record production levels in the 1st quarter of 2020 as China began to recover from the crisis and recover business activity. China is expected to increase its budget for infrastructure projects to support a weakened economy. Undoubtedly, mining companies operating in the same geographic region, in the same market and offering a single product are more likely to be affected by an event such as the COVID-19 pandemic than diversified businesses. While some mining companies have simplified their asset portfolios to focus on efficiency gains, it is important to ensure the right balance of unified and diversified operations (Appendix A). In the context of large markets such as

China and India that are driving global economic growth, mining companies should ask themselves how they can diversify their customer base and strengthen demand (Table 3) (Mining industry, 2020).

Table 4. The largest organizations engaged in the extraction of non-fuel minerals in Kazakhstan

Organization	*Main product type*	*Own*
«NMC Tau-Ken Samruk» JSC	Copper, gold, iron ore and so on	State owned
NAC «Kazatomprom» JSC	Uranium, rare metals	State owned
EurasianResourcesGroup (headquarters in Luxembourg)	Ferroalloys, iron ore, aluminum, copper, cobalt, coal	With state participation (40% of shares belong to the Committee for State Property and Privatization of the Ministry of Finance of the Republic of Kazakhstan, 60% are divided between the three founders and members of the board)
ArcelorMittal (headquarters in Luxembourg)	Iron ore, coal	Private enterprise (37.38% of shares are held by HSBC Trustee (C.I) Limited, 62.44% - to other public shareholders)
«Corporation Kazakhmys» LLC (headquarters in Kazakhstan)	Coal	Private enterprise
KAZ Minerals (headquarters in Kazakhstan)	Copper	Private enterprise
LLC «Kazzinc» (headquarters in Kazakhstan)	Zinc and lead	Privately Held (69.61% owned by Glencore International AG headquartered in Switzerland)

Source*:* Compiled by authors based on the source: Electronic resource: Reforming the mining industry in Kazakhstan: investments, sustainable development, competitiveness, (2019)

The mining industry in Kazakhstan is largely represented by a number of large foreign and state-owned enterprises involved in the extraction of non-fuel minerals, and in some cases by their subsidiaries. The dominant position in the industry is occupied by the Samruk Kazyna National Welfare Fund, whose portfolio companies are NAC KazAtomProm JSC and Tau-Ken Samruk NGK JSC - one of the greatest state-owned enterprises. Apart from, the state owns Kazgeology JSC, which is engaged in mineral exploration, and the Ministry of Finance of Kazakhstan owns 40% of Eurasian Resources Group shares. Table 4 represents some of the key enterprises engaged in the extraction of non-fuel minerals in Kazakhstan (Reforming the mining industry in Kazakhstan: investment, sustainable development, competitiveness, 2019).

Currently, Kazakhstan is an attractive country for attracting foreign investment in the oil and gas sector, since the country's position in the overall ratings of the business environment is generally favorable and growing in comparison with other countries. Taking this into account, the use of strategic planning for oil and gas companies will be able to successfully resist new global challenges and threats (National Energy Report Kazenergy, 2019). Kazakhstan is rich in hydrocarbon raw materials, has always strived to develop the deep processing sector in order to reorient its raw material potential towards the production of products with high added value. Over the years, in a country that annually increases oil and gas production, special programs have been developed and adopted to develop the hydrocarbon processing sector and obtain products with high added value.

Kazakhstan has developed a Concept for the Development of the Fuel and Energy Complex (FEC) until 2030, developed in June 2014, which is a key document that defines the strategic goals of the exploration and production sector. According to this concept, in the future until 2030 in the oil industry will be:

- economic incentives have been created to attract investments in geological exploration and effective technological development of oil production;
- the personnel potential of the oil and gas industry is ensured;
- technology transfer in the oil production segment was provided;
- the domestic market of petroleum products was ensured, the capacities for oil refining were expanded;
- developed a competitive market for oil products and oil refining.

The most important factor in the development of the mining industry is the use of innovative technologies to transform core business models and key production processes. Innovations will provide an opportunity to attain a completely new level of efficiency and safety, which are achieved through the integration of processes and the use of artificial intelligence. Another development factor is a new approach to working with staff and partners. This contributes to the formation of new values, more flexible conditions for interaction and personalization of processes. Finally, such changes will make it possible to modernize the business processes of mining companies by switching to remote control (Industry analysis report 2019).

More than 12 key stages of production (from exploration to shipping) can become autonomous from direct human involvement. The correct choice of such stages in each company is based on three criteria including the importance of the business process, its complexity, and the time required for its implementation. Based on the study of the activities of non-mining companies, certain conclusions were drawn:

- An important element of the company's strategic planning is an increase in the volume of capital investments and investments aimed at increasing the level of production, and proven reserves of the company by investing additional funds in the development of new technologies and geological exploration, as well as in improving the financial performance of the company.
- The direction of the energy policy of companies is obvious to stimulate investments in the development of alternative energy.
- Development of international cooperation is one of the priority areas of the oil and gas industry.

In general, the results of the study were achieved, as follows:

- the general trend of development of the modern non-mining industry, both in the Republic of Kazakhstan and taking into account foreign experience;
- provided its characteristics as one of the main sectors of the economy of Kazakhstan;
- it has been proven that the non-mining industry is the driving force behind the ongoing socio-economic reforms in Kazakhstan, and the conductor of modern innovative and management decisions;
- using the construction of a regression model, we analyzed the impact of investments in fixed capital of the sub-mining industry on the production volume (goods and services), its transportation.

CONCLUSION

According to experts, the non-mining industry occupies a strong position in the context of COVID-19 on the global economy and production. Mining companies are financially strong and most of them continue to operate, albeit with increased levels of precaution and preventive control. However, the long-term consequences of the pandemic are still unknown. Top 40 mining companies need to take advantage of current financial stability to rethink their strategy, which will increase business resilience in the future.

In this regard, the non-mining complex of Kazakhstan requires the implementation of the following measures:

- further attraction of investments for the reproduction and development of the mineral resource base;
- renewal of fixed capital in the mineral resources sector using the latest advances in equipment and technology;
- use of the depreciation fund exclusively for the intended purpose;
- increasing the economic efficiency of production and sales activities of non-mining companies, reducing costs in the production, distribution and marketing of hydrocarbons;
- improving the financial condition of the mineral resource complex;
- ensuring full financial transparency of the activities of non-mining enterprises to identify (Sikhimbaeva, 2011).

Considering the risks of COVID-19 in enterprises, companies may outsource some functions. For instance, replace IT functions to the cloud or outsource non-core operational functions to contractors. Such changes can reduce operating costs and eliminate maintenance costs. The main directions of development for industrial companies will be:

- automatic movement of materials (unmanned loaders and cranes);
- automation of repetitive tasks, including assembly (for example, industrial robotics);
- predictive service (using the Web and artificial intelligence).

Most industrial companies are going to strengthen their digital presence in response to the increased demand on the Internet, which will continue after the crisis, so the main challenge for industrial enterprises is structural adaptation to the new market realities, which implies:

- building new supply chains with a greater focus on national contractors (which will minimize problems in the event of quarantine measures and border closures);
- changing working conditions for employees with an emphasis on the transition of some employees (where possible) to the format of remote work;
- a serious revision of the product line and, where it seems appropriate, the reorientation of production to the healthcare and smart industries;
- the widespread introduction of robotics and artificial intelligence in production and management to reduce dependence on quarantine measures and the ability to quickly and painlessly scale production of products depending on the demand situation;
- changing models and channels for selling and promoting products with a shift to the online environment, where an increase in the range of solutions is expected, taking into account the specifics of the sectors;
- continuous monitoring of macroeconomic conditions and demand, changes in consumer behavior using artificial intelligence technologies;
- creating long-term relationships with suppliers of sanitary protection solutions (personal protective equipment, cleaning) (Digest. Impact of the COVID-19 pandemic on industry and the environment, 2020).

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Appendix A. Volume of production (goods and services) in current prices in the context of regions of the non-mining industry

(in thousand tenge)

Region	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
The Republic of Kazakhstan	7 419 550 330	10 081 254022	10 242 052603	10 696 926187	11 060 179488	7 521 179 590	9 397 618 601	11 568 784610	14 877 068476	15 978 061 372
Akmola region	22 146 270	29 567 091	45 973 602	44 333 335	47 677 700	53 470 523	69 221 995	54 957 966	59 372 762	75 897 044
Aktobe region	739 735 712	981 644 944	1 024 466 748	984 788 175	896 515 882	658 564 807	822 406 237	954 056 761	1 149 744 235	1 142 089 899
Almaty region	6 613 429	7 673 712	7 699 183	9 342 098	11 645 147	14 994 903	13 882 861	12 143 386	11 555 000	14 577 293
Atyrau region	2 832 566 513	3 988 163 946	3 852 908 343	4 245 164 480	4 502 527 807	3 052 481 615	3 948 896 927	4 931 030 025	6 411 495 450	7 268 682 061
West-Kazakhstan region	881 695 048	1 344 777 763	1 498 907 720	1 482 062 197	1 657 346 095	1 146 628 333	1 388 588 609	1 690 284 309	2 213 469 221	2 114 621 342
Jambyl region	8 651 131	12 967 286	17 141 431	18 766 577	21 818 878	23 288 140	35 970 914	43 586 663	49 334 091	57 777 122
Karaganda region	88 461 119	134 426 171	134 653 117	193 647 709	281 371 474	159 861 739	209 385 885	287 805 257	355 034 682	400 265 192
Kostanay region	279 935 973	368 070 252	269 745 444	279 580 176	240 313 714	161 269 735	236 453 124	296 037 471	366 149 722	501 961 043
Kyzylorda region	756 951 759	1 000 462 903	1 032 466 324	1 066 725 741	880 763 024	475 356 805	515 061 166	583 804 839	778 607 510	669 337 455
Mangistau region	1 538 594 091	1 927 283 584	2 037 069 437	2 023 476 213	2 150 787 444	1 358 046 905	1 613 869 200	2 037 105 064	2 594 926 768	2 600 970 545
South-Kazakhstan region	72 776 169	81 339 594	140 238 114	146 024 760	149 421 529	193 505 205	216 924 144	152 742 977	..	..
Pavlodar region	75 089 345	89 534 007	100 470 907	104 755 951	113 235 467	119 247 709	202 725 501	340 443 104	376 231 718	420 910 959
North-Kazakhstan region	387 788	799 342	1 540 354	1 785 886	2 001 116	1 558 116	3 170 806	2 063 802	2 760 006	4 594 005
Turkestan region	..	..	..	..	..	..	..	..	188 989 763	224 503 886
East-Kazakhstan region	115 945 983	114 542 579	78 675 657	96 471 817	104 533 875	102 905 055	121 061 232	182 722 986	318 865 490	481 202 689
Nur-Sultan city	-	848	11 217	1 072	-	-	-	-	-	-
Almaty city	-	-	85 005	-	220 336	-	-	-	-	-
Shymkent city	..	..	..	..	..	..	..	..	532 058	670 837
Mining of coal and lignite										
The Republic of Kazakhstan	130 585 989	182 656 456	195 036 869	207 005 546	219 282 250	213 521 406	232 703 098	292 079 360	342 996 228	357 768 139
Akmola region	1 702 456	2 941 713	5 819 492	5 090 849	2 903 137	966 110	448 480	871 228	-	-
Aktobe region	6 830	10 860	10 622	-	-	-	-	-	-	-
Almaty region	39 246	46 345	62 763	75 854	91 037	112 719	127 110	159 264	x	x
Jambyl region	807 889	858 813	222 160	166 240	153 572	45 482	49 365	51 795	x	724 303

Karaganda region	47 869 703	85 659 440	82 269 773	92 156 918	100 891 266	97 796 936	110 556 691	144 981 011	178 305 040	192 442 968
Kostanay region	118 476	74 005	60 236	6 312	-	-	-	34 701	x	-
Mangistau region	-	-	-	-	-	-	-	-	-	-
South-Kazakhstan region	-	-	-	-	-	-	-	-	..	..
Pavlodar region	71 059 425	83 571 776	95 291 976	96 575 375	101 668 173	98 424 906	103 719 540	123 633 583	136 996 313	133 820 361
North-Kazakhstan region	..	..	..	..	..	..	..	..	-	-
East-Kazakhstan region	8 981 964	9 493 504	11 299 847	12 933 998	13 575 065	16 175 253	17 801 912	22 347 778	x	30 561 948
Shymkent city	..	..	..	..	..	..	..	..	-	-
Extraction of crude oil and natural gas										
The Republic of Kazakhstan	6 195 386 180	8 572 794 725	8 720 733 578	9 036 471 043	9 164 094 733	5 880 227 129	7 409 929 215	9 202 732 776	12 060 235116	12 653 589 432
Aktobe region	520 172 503	703 033 529	727 819 069	701 454 417	576 948 877	372 506 011	541 607 513	596 087 223	743 264 885	692 367 888
Atyrau region	2 744 667 107	3 857 404 578	3 744 047 179	4 152 270 397	4 369 105 095	2 921 390 144	3 763 126 907	4 716 819 043	6 140 391 378	7 019 078 796
West-Kazakhstan region	859 317 201	1 326 435 984	1 472 388 876	1 435 908 484	1 605 757 424	1 069 772 118	1 276 176 932	1 614 829 855	2 154 013 998	2 044 536 605
Jambyl region	1 672 720	2 256 289	4 697 304	4 684 419	4 726 032	4 994 985	7 266 339	13 207 931	x	13 090 301
Kyzylorda region	711 330 342	938 557 053	954 870 964	971 722 984	763 244 830	379 165 651	415 600 476	476 431 932	674 522 510	583 241 929
Mangistau region	1 358 226 307	1 745 097 444	1 816 896 606	1 768 177 473	1 839 928 675	1 128 120 255	1 398 580 100	1 776 375 214	2 316 306 859	2 290 522 881
East-Kazakhstan region	-	9 848	13 580	2 252 869	4 383 800	4 277 965	7 570 948	8 981 578	x	10 751 032
Extraction of crude oil										
The Republic of Kazakhstan	6 154 112 810	8 519 705 866	8 639 057 158	8 955 085 020	9 078 512 779	5 757 048 120	7 293 084 725	8 994 914 135	11 819 914670	12 256 876 373
Aktobe region	519 607 254	701 997 219	726 943 528	700 776 267	575 489 139	369 095 348	538 497 171	543 433 221	681 994 984	630 727 896
Atyrau region	2 744 667 107	3 857 404 578	3 744 047 179	4 152 270 397	4 369 105 095	2 921 037 851	3 759 443 391	4 686 866 597	x	6 846 804 320
West-Kazakhstan region	838 737 153	1 296 159 635	1 411 287 948	1 377 618 292	1 541 106 904	974 192 663	1 205 585 527	1 542 977 724	2 071 905 608	1 945 564 999
Jambyl region	132 862	173 413	606 408	622 659	588 540	758 530	1 050 179	1 177 114	x	964 147
Kyzylorda region	708 586 941	936 099 992	952 585 014	966 054 520	759 968 797	378 806 222	415 029 052	475 915 749	674 072 800	582 356 051
Mangistau region	1 342 381 493	1 727 861 181	1 803 573 501	1 757 576 388	1 831 896 328	1 113 040 120	1 373 417 691	1 744 499 017	2 278 158 148	2 250 378 256
East-Kazakhstan region	-	9 848	13 580	166 497	357 976	117 386	61 714	44 713	x	x

Extraction of natural gas										
The Republic of Kazakhstan	41 273 370	53 088 859	81 676 420	81 386 023	85 581 954	123 179 009	116 844 490	207 818 641	240 320 446	396 713 059
Aktobe region	565 249	1 036 310	875 541	678 150	1 459 738	3 410 663	3 110 342	52 654 002	61 269 901	61 639 992
Atyrau region	-	-	-	-	-	352 293	3 683 516	29 952 446	x	172 274 476
West-Kazakhstan region	20 580 048	30 276 349	61 100 928	58 290 192	64650520	95579455	70591405	71 852 131	82 108 390	98 971 606
Jambyl region	1 539 858	2 082 876	4 090 896	4 061 760	4 137 492	4 236 455	6 216 160	12 030 817	x	12 126 154
Kyzylorda region	2 743 401	2 457 061	2 285 950	5 668 464	3 276 033	359 429	571 424	516 183	449 710	885 878
Mangistau region	15 844 814	17 236 263	13 323 105	10 601 085	8 032 347	15 080 135	25 162 409	31 876 197	38 148 711	40 144 625
East-Kazakhstan region	-	-	-	2 086 372	4 025 824	4 160 579	7 509 234	8 936 865	x	x
Mining of metal ores										
The Republic of Kazakhstan	652 602 840	794 453 856	722 893 143	789 832 524	863 139 286	740 258 462	989 193 040	1 188 391 467	1 474 218 362	1 908 282 087
Akmola region	15 372 625	20 896 486	31 604 858	29 633 124	32 428 175	35 628 367	47 166 600	37 210 799	40 584 628	55 130 852
Aktobe region	141 978 850	180 937 534	178 437 612	180 200 372	193 676 382	204 194 438	217 698 581	247 770 151	285 218 274	306 013 492
Almaty region	606 592	190 789	100 842	235 395	509 682	528 253	131 429	103 606	-	-
Jambyl region	107 842	534 308	1 158 986	4 050 066	7 771 559	6 576 636	4 415 876	3 332 874	1 735 942	3 933 627
Karaganda region	35 323 685	40 567 768	40 202 146	84 728 330	160 267 653	42 009 665	78 908 327	111 836 518	129 293 468	157 859 183
Kostanay region	270 180 794	355 854 981	254 820 621	263 450 195	220 475 434	143 241 794	210 224 310	264 697 955	323 116 647	452 540 033
Kyzylorda region	16 215 493	18 307 909	28 310 530	31 290 290	32 786 342	39 065 066	50 950 111	40 079 447	x	35 994 932
South-Kazakhstan region	69 636 605	78 695 280	129 657 384	135 581 543	141 455 925	180 972 042	204 810 745	138 512 755	..	..
Pavlodar region	2 035 096	3 443 231	1 435 473	3 037 647	5 035 437	14 754 645	90 591 230	206 039 153	225 778 616	271 653 273
North-Kazakhstan region	53 264	358 016	794 849	543 481	435 546	187 419	56 735	152 975	x	1 743 771
Turkestan region	..	..	..	..	..	..	..	..	x	212 938 144
East-Kazakhstan region	101 091 994	94 667 554	56 369 842	57 082 081	68 297 151	73 100 137	84 239 096	138 655 234	253 435 133	410 474 780
Iron ore mining										
The Republic of Kazakhstan	257 726 583	338 431 665	235 763 247	254 451 742	223 536 863	136 571 839	194 827 776	244 023 794	291 173 061	415 898 376
Akmola region	2 001 369	3 442 139	2 723 599	2 234 172	2 320 192	1 697 685	2 423 567	3 014 097	x	4 734 187
Aktobe region	164 997	269 555	782 658	1 232 604	1 529 591	102 243	1 195 490	1 420 000	x	x
Almaty region	-	190 789	58 742	235 395	-	-	104 069	-	-	-

Karaganda region	7 266 035	11 402 699	14 023 150	18 734 295	21 384 644	12 312 956	16 649 923	24 761 893	29 998 241	30 723 615
Kostanay region	248 294 182	323 126 483	218 175 098	232 015 276	198 128 350	122 316 571	173 682 496	214 353 567	253 835 825	373 441 658
South-Kazakhstan region	-	-	-	-	-	-	-	44 611	..	..
Turkestan region	..	..	..	..	..	..	..	..	x	47 296
East-Kazakhstan region	-	-	-	-	174 086	142 384	772 231	429 626	-	-
Extraction of non-ferrous metal ores										
The Republic of Kazakhstan	394 876 257	456 022 191	487 129 896	535 380 782	639 602 423	603 686 623	794 365 264	944 367 673	1 183 045 301	1 492 383 711
Akmola region	13 371 256	17 454 347	28 881 259	27 398 952	30 107 983	33 930 682	44 743 033	34 196 702	x	50 396 665
Aktobe region	141 813 853	180 667 979	177 654 954	178 967 768	192 146 791	204 092 195	216 503 091	246 350 151	x	299 061 872
Almaty region	606 592	-	42 100	-	509 682	528 253	27 360	103 606	-	-
Jambyl region	107 842	534 308	1 158 986	4 050 066	7 771 559	6 576 636	4 415 876	3 332 874	1 735 942	3 933 627
Karaganda region	28 057 650	29 165 069	26 178 996	65 994 035	138 883 009	29 696 709	62 258 404	87 074 625	99 295 227	127 135 568
Kostanay region	21 886 612	32 728 498	36 645 523	31 434 919	22 347 084	20 925 223	36 541 814	50 344 388	69 280 822	79 098 375
Kyzylorda region	16 215 493	18 307 909	28 310 530	31 290 290	32 786 342	39 065 066	50 950 111	40 079 447	x	35 994 932
South-Kazakhstan region	69 636 605	78 695 280	129 657 384	135 581 543	141 455 925	180 972 042	204 810 745	138 468 144	..	..
Pavlodar region	2 035 096	3 443 231	1 435 473	3 037 647	5 035 437	14 754 645	90 591 230	206 039 153	225 778 616	271 653 273
North-Kazakhstan region	53 264	358 016	794 849	543 481	435 546	187 419	56 735	152 975	x	1 743 771
Turkestan region	..	..	..	..	..	..	..	..	x	212 890 848
East-Kazakhstan region	101 091 994	94 667 554	56 369 842	57 082 081	68 123 065	72 957 753	83 466 865	138 225 608	253 435 133	410 474 780
Other sectors of the mining industry										
The Republic of Kazakhstan	76 853 226	121 994 308	122 873 130	111 466 217	136 670 954	154 573 107	175 693 575	191 988 321	265 709 458	248 734 573
Akmola region	5 045 705	5 559 466	7 374 617	8 548 700	11 364 739	14 934 386	16 280 562	11 539 918	11 319 682	10 448 926
Aktobe region	7 948 392	9 169 093	10 909 440	11 889 989	16 137 892	13 685 304	15 584 417	24 138 250	25 538 066	28 047 677
Almaty region	5 967 591	7 436 578	7 390 269	8 574 125	9 975 360	12 972 229	12 242 086	10 069 754	9 969 205	12 213 599
Atyrau region	21 374 700	47 534 351	40 468 208	26 791 062	42 650 772	53 475 288	54 438 095	58 865 686	122 229 535	88 015 596
West-Kazakhstan region	189 575	406 200	333 989	567 478	794 322	825 416	921 788	913 439	732 754	1 118 366
Jambyl region	5 165 630	8 161 219	9 967 333	8 095 632	7 731 835	9 968 127	21 860 305	25 605 097	28 407 947	30 750 862
Karaganda region	4 874 009	7 253 423	7 823 567	9 243 936	13 065 267	11 725 051	9 021 135	11 002 914	12 780 139	14 091 666

Kostanay region	9 636 703	11 122 512	13 734 652	13 369 202	14 225 433	14 951 907	20 674 600	22 521 051	x	28 326 816
Kyzylorda region	2 763 638	3 183 656	3 119 773	2 984 050	2 081 623	1 467 861	1 926 593	2 291 490	x	3 208 922
Mangistau region	4 233 189	10 563 862	7 486 036	5 546 089	4 474 856	4 514 320	4 520 622	4 527 218	4 425 790	5 132 723
South-Kazakhstan region	2 343 231	2 644 314	4 249 816	4 870 192	3 423 293	5 047 149	5 221 568	5 288 030	..	..
Pavlodar region	1 994 824	2 492 496	3 480 960	4 360 465	4 727 116	5 274 390	5 758 986	7 977 744	9 537 590	10 650 030
North-Kazakhstan region	334 524	441 326	731 398	1 222 495	1 061 053	969 796	1 108 214	1 414 236	x	2 269 181
Turkestan region	..	..	..	..	..	..	..	..	4 484 816	5 635 895
East-Kazakhstan region	4 981 515	6 024 964	5 791 137	5 401 730	4 737 057	4 761 883	6 134 604	5 833 494	6 696 806	8 153 477
Nur-Sultan city	-	848	11 217	1 072	-	-	-	-	-	-
Almaty city	-	-	718	-	220 336	-	-	-	-	-
Shymkent city	..	..	..	..	..	..	..	..	532 058	670 837

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The Impacts of Changes in the Value Added Tax Rate on the Economy in EU Countries

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ABSTRACT

Any change related to value added tax is perceived very carefully and sensitively, as it is a tax instrument that can ensure a significant increase or decrease in tax revenues in individual countries. To get to the heart of the operation of VAT means to gain more knowledge about the processes in the economy as such. The paper deals with the impact of changes in the VAT rate on the economy in the 28 countries of the European Union using selected macroeconomic determinants, such as VAT revenue, gross domestic product, consumption expenditure, exports and imports, with individual EU countries considered as a separate territorial unit. The monitored period was from 2004 to 2018. The aim of the paper was to evaluate the impact on the economy when changing the standard VAT rate using annual increments from quantified partial econometric models using linear regression analysis. To achieve this goal, the correlation coefficient was used, which determined the relationships between selected macroeconomic determinants and the VAT rate in the EU countries. The analysis showed that an increase in the standard VAT rate by 1 % will cause a decrease in annual increments compared to the real values of annual increments for selected macroeconomic determinants. Ultimately, this will have a negative impact on the economy in the short term, as it will slow down their growth. The most significant slowdown by 2.51 % was achieved in imports and, conversely, the least significant slowdown in consumption expenditure by 1.11 %.

INTRODUCTION

Value added tax (VAT) is the revenue of the state budget in most economies of the world. Their amount depends on several factors and reflects many needs of the state and its goals. It is in the center of attention of both natural and legal persons. Any change related to this tax will be reflected in the change in the economy. The contribution deals with the standard VAT rate, which must not be lower than 15 % in the EU Member States. (Baskaran et al., 2014).

VAT is often used as an instrument of fiscal policy, the aim of which is to influence the revenues and expenditures of the state budget in order to influence the purchasing power demand and thus change the level of GDP, consumer prices, but also employment. (Canova and Cicarelli, 2013). Fiscal policy has an expansionary character, with the government stimulating economic growth through instruments, e.g. by reducing tax rates, and thus wants to get the bell to start the economy. On the other hand, it is restrictive in nature, with the government using tools to dampen economic growth, e.g. by raising tax rates, resulting in a decline in GDP in the short term.

1. LITERATURE REVIEW

Thanks to the long development of optimal tax theory (Ramsey, 1927, Sandmo, 1976, Keen, 2007), the scientific literature provides various analyzes of tax systems, where the main subject of interest of many study authors is the impact of value added tax on the distribution of income or the consequences of the introduction of a uniform or variable rate (Sadka, 1977, Claus, 2013, Hajdúchová et al., 2015). Due to the change in the VAT rate on the economies of countries through changes in macroeconomic indicators, a smaller number of analyzes are devoted. Their authors, whose views are presented in this paper, have arrived at results that differ in some cases. According to Carroll (2010), the impact of a change in the VAT rate on economic growth in developing countries is crucial, as an increase in VAT will cause GDP to fall for several years. A significant impact of VAT on economic growth was observed in Nigeria (Umeora Chinweobo, 2013), which was determined using a linear regression model.

The situation was similar in Ethiopia from 2003 to 2012, where theoretical and empirical evidence revealed a positive impact of VAT on economic growth (Jalata, 2014). On the other hand, in EU countries, an individual analysis of five selected countries using the Bayesian approach showed a positive impact of the VAT rate on the GDP rate for Hungary, while for the remaining countries Bulgaria, the Czech Republic, Poland and Romania showed a slow negative impact of the VAT rate on economic growth. In Hungary, a reduction in the VAT rate would lead to economic growth. The study was also conducted in the form of panel data and a combination of the results of these two approaches found that in the long run an increase in the VAT rate will positively affect economic growth in all Central and Eastern European countries, while in the short term an increase in the VAT rate will reduce GDP (Simionnescu and Albu, 2016).

In 14 developed countries, including EU countries, panel data models of economic growth were used to identify trends as VAT rates changed. Miki (2011) found that before the VAT rate increased, economic growth increased. As soon as the VAT rate rises, GDP suddenly falls. Economic growth is gradually increasing after a dramatic decline. The topic of the VAT rate is becoming an instrument in the election campaign, which will also influence the further political direction of the country. The public is inclined to believe that an increase in VAT may slow economic growth and, conversely, their reduction is argued by a recovery in economic growth during a recession (Ibid.).

According to the IMF (2001), countries where VAT is introduced are less dependent on international trade and have higher levels of GDP per capita. Ramona et al. (2011) concluded that the decline in consumer consumption is influenced by an increase in the VAT rate, which ultimately has a negative impact on the economy as a whole. The same finding was made by Miki (2011), who states that the consumption of the population will decrease after the increase in the rate due to the previously announced increase in this rate, when consumers pre-supply themselves in advance. Later, after the introduction of the rate, consumption expenditure increases due to a decrease in stocks. Alm and El-Ganainy (2013) explain that consumption taxation will lead to increased economic growth, as it is expected to discourage the public from consuming and promote austerity. For this reason, it may be preferred to income tax.

In an effort to promote exports, many countries have decided to introduce VAT (Slemrod, 2011). In countries where the VAT rate is applied, an increase in VAT may lead to a loss of competitiveness, resulting in a decline in exports. Samimi et al. (2012) examined the relationship between exports and VAT. Based on the results, they pointed out that the presence of this VAT rate has a positive effect on exports. They call for the introduction of value added tax in countries where it has not yet been introduced. The change in the VAT rate also significantly affects unemployment in the country. This follows from a survey by Suster (2016), which found that with the difference of one to two quarters, unemployment tends to

develop in the same way as GDP. The aim of employment in relation to VAT is to support sound foreign economic policy. Economic freedom can also have a major impact on unemployment (Salama and Oláh, 2019).

The change in the real wage caused by the change in the VAT rate also affects the supply of labor. An increase in the VAT rate will reduce labor supply and, in addition, may lead to additional labor costs (Metcalf, 1995), where even a low pay system discourages employees from working in a country (Poór et al., 2020). Frederiksen et al. (1995) state that each country is characterized by the specifics that determine the impact of factors affecting employment when changes in the VAT rate. VAT revenue is determined by a number of factors, including the economic situation in the country, which is best characterized by gross domestic product. In addition, the higher the standard of living in a country in terms of GDP per capita, the higher the consumption, the better information on tax payments and the lower the tax fraud.

VAT revenue depends mainly on the level of consumption in the country. In addition, to the above factors, its income is also determined by the level of exports and imports. The export rate is zero, so export growth could have a negative impact on VAT. On the other hand, its growth mostly follows domestic production, which could be significant due to an increase in disposable income or household demand. The change in import VAT has the opposite effect on VAT revenue. The higher the import, the lower the demand for domestic goods, so an increase in imports leads to higher VAT revenues (Hybka, 2009).

The relationship between VAT revenue, VAT and macroeconomic indicators that characterize the economic situation in the country is analyzed: gross domestic product, gross domestic product per capita, consumer costs, household consumer costs, government consumer costs, exports, imports and unemployment (Legeida and Sologoub, 2003).

2. MATERIAL AND METHODS

The aim of the paper was to empirically verify the impact of changes in the standard VAT rate using annual increments of selected macroeconomic determinants on the economies of EU countries. This impact was quantified using partial econometric models using linear regression analysis. All source data used in the paper were annual data for 28 EU countries in the period from 2004 to 2018. Data on standard VAT rates, VAT revenues and selected macroeconomic determinants (gross domestic product, gross domestic product per capita, consumption and household expenditure, expenditure for government consumption, exports, imports and unemployment), which are expressed in EUR million, were used from the databases of the European Commission's statistical office EUROSTAT and the European Commission's Directorate-General AMECO.

The basis for the selection of indicators was the theoretical knowledge of the authors: Legeida and Sologoub (2003), Ramona et al. (2011), Miki (2011), Alm and El-Ganainy (2013), Jalata (2014), Simionnescu and Albu (2016), Sustera (2016), which observed a large number of determinants influencing the change in the standard VAT rate. To determine the estimate of how the selected determinants affect the standard VAT rate, a *Pearson correlation coefficient* was chosen, which determined the amount of dependence between them. Interpretation of correlation coefficients was used according to Ode (2012): correlation + - 0.1 - 0.29 small / practically none, + - 0.3 - 0.69 slightly tight, + - 0.7 - 0.89 medium tight and + - 0.9 - 0.99 very tight.

Within the *linear regression analysis*, an econometric model was compiled, in which selected macroeconomic determinants were inserted on the basis of the correlation coefficient. The values used in the model were the arithmetic average of all 28 EU countries for the observed period from 2004 to 2018 and assuming that it was considered a separate territorial unit. The analysis of the econometric model using regression analysis was performed in the R program, specifically in the R 3.5.0 program version, called R Studio. The commands in the R programming language were used to compile and calculate the equations. The regression analysis determined which of the selected macroeconomic determinants are statistically significant in relation to the dependent variable.

Based on a linearly formulated model with several variables, the econometric model was constructed:

$VAT_t = \beta_0 + \beta_1 * GDP_t + \beta_2 * CE_t + \beta_3 * E_t + \beta_4 * I_t + \beta_5 * RfVAT_t + u_t$,

where the explained (dependent) variable is:

VAT – standard rate of value added tax, and the explanatory (independent) variables are:
GDP – gross domestic product,
CE – consumption expenditure,
E – export,
I – import,
RfVAT – revenue from standard value added tax.

After estimating the parameter vector $\beta = (\beta_{0,\ldots,} \beta_5)$ a model was created:

$$y_t = 17{,}37 - 9{,}197e\text{-}05x_1 + 8{,}520e\text{-}05x_2 + 6{,}309e\text{-}05x_3 - 6{,}836e\text{-}05x_4 + 4{,}951e\text{-}04x_5 + u$$

The linear model showed the correct results in the regression analysis because it met certain assumptions, namely: normality of residues (according to the Shapir-Wilk test, where residues are from the normal distribution if the p-value is greater than the significance level $\alpha = 0.05$), heteroskedasticity (according to the Breusch-Pagan test, where heteroskedasticity is not present, i.e. homoskedasticity is present if the p-value is greater than the significance level $\alpha = 0.05$), autocorrelation (according to the Breusch-Gofrey test, autocorrelation is not present if p- value is greater than the significance level $\alpha = 0.05$), and multicollinearity (according to the Farrar-Glauber test, multicollinearity is not present if the p-value is greater than the significance level $\alpha = 0.05$). Appropriate selection of the model indicates the estimation of regression coefficients, where the p-value is lower than $\alpha = 0.05$, and is therefore statistically significant. Furthermore, the coefficient of determination, which determines how many % of the variability of the dependent variable can be explained by the model (Zelinsky et al. 2010).

Using *sub-models*, the change in selected determinants due to a change in the standard VAT rate of 1 percentage point was calculated. The explained (dependent) variable in the sub-models were individual selected determinants, namely: gross domestic product, consumption expenditures, exports, imports, income from standard value added tax. The explanatory (independent) variable in each model was the standard VAT rate.

Subsequently, the impact on the economy through *annual increments* was determined, namely macroeconomic determinants with an increase in the standard VAT rate and their comparison with real values, which were calculated using the formula: $\frac{(t_1 - t_0)}{t_0}$.

3. RESULTS AND DUSCUSSION

3.1 Correlation coefficient

The relationship and the amount of dependence according to the correlation coefficient between the factors is calculated and summarized in the table (Tab. 1). The color-coded sections in the table show statistically significant values according to the p-value.

Taking into account the EU as a separate unit, the indicators in the table (Tab. 1) represent a medium strong relationship, which means medium tight correlation (correlation coefficient 0.81 and 0.88). The relationship between the indicators standard VAT rate and unemployment represents a slightly tight positive correlation, but according to the p-value is statistically insignificant. All indicators are expressed by plus values, which shows a positive correlation and thus the increase in the indicator of the independent variable (macroeconomic determinants) leads to the increase in the dependent variable (standard VAT rate). Finland has the strongest relationship with a correlation coefficient of 0.93 for VAT and consumption expenditure and a coefficient of 0.92 for household and government consumption. A medium strong relationship, The Czech Republic, Finland, France, Lithuania and Slovakia achieved

a medium tight correlation (coefficient 0.70 - 0.89) for all indicators of the country. If we look at achieving a medium tight correlation according to the indicators, we see that it is reached by 10 countries in GDP, GDP per capita and consumption expenditure by 8 countries, household consumption expenditure by 9 countries, government consumption expenditure by 7 countries, exports by 18 countries and imports 12 countries.

Table 1. Correlation coefficient of dependence between the VAT rate and selected determinants in the EU

Country	Revenue from VAT	GDP	GDP per capita	Consumption expenditure	Household consumption expenditure	Government consumption expenditure	Export	Import	Unemployment rate
Austria	NA	NA	NA	NA	NA	NA	NA	NA	NA
Belgium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bulgaria	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyprus	0,43	0,39	-0,05	0,38	0,48	-0,05	0,88	0,71	0,85
Czech Republic	0,85	0,75	0,74	0,75	0,75	0,72	0,89	0,88	-0,53
Germany	0,78	0,62	0,66	0,62	0,63	0,62	0,66	0,67	-0,81
Denmark	NA	NA	NA	NA	NA	NA	NA	NA	NA
Estonia	0,64	0,65	0,66	0,67	0,63	0,74	0,75	0,64	0,34
Greece	-0,17	-0,64	-0,64	-0,46	-0,45	-0,49	0,74	-0,37	0,84
Spain	0,71	0,50	0,38	0,59	0,60	0,52	0,90	0,53	0,70
Finland	0,93	0,86	0,83	0,93	0,92	0,92	0,41	0,70	0,46
France	0,83	0,78	0,75	0,75	0,74	0,75	0,82	0,77	0,51
Croatia	0,71	0,53	0,59	0,57	0,53	0,66	0,76	0,44	0,46
Hungary	0,63	0,36	0,40	0,21	0,22	0,20	0,43	0,33	-0,09
Ireland	0,01	0,65	0,58	0,45	0,47	0,37	0,75	0,74	0,24
Italy	0,73	0,70	0,57	0,66	0,71	0,41	0,84	0,52	0,89
Lithuania	0,71	0,74	0,77	0,72	0,71	0,72	0,85	0,78	0,44
Luxembourg	0,59	0,80	0,74	0,77	0,79	0,75	0,83	0,83	0,66
Latvia	0,41	0,48	0,55	0,49	0,51	0,43	0,72	0,53	0,55
Malta	NA	NA	NA	NA	NA	NA	NA	NA	NA
Netherlands	0,71	0,75	0,71	0,74	0,78	0,67	0,83	0,82	0,47
Poland	0,69	0,81	0,80	0,80	0,80	0,77	0,84	0,81	-0,54
Portugal	0,71	0,52	0,56	0,45	0,57	-0,35	0,82	0,58	0,53
Romania	0,45	0,13	0,14	0,04	0,07	-0,05	0,28	0,17	0,38
Sweden	NA	NA	NA	NA	NA	NA	NA	NA	NA
Slovenia	0,74	0,70	0,69	0,61	0,63	0,56	0,79	0,71	0,23
Slovakia	0,78	0,80	0,80	0,77	0,76	0,77	0,87	0,85	-0,38
United Kingdom	0,83	0,64	0,51	0,65	0,65	0,61	0,81	0,78	-0,06
EU average	0,85	0,83	0,81	0,88	0,86	0,81	0,87	0,84	0,46

Source: EUROSTAT own processing

On the contrary, the weakest and, according to the p-value, insignificant relationship was achieved in 12 countries with the unemployment rate indicator. In the independent evaluation of countries, we see an insignificant relationship in the case of Cyprus in terms of indicators such as VAT revenue, GDP, GDP per capita, household expenditure, household and government consumption. In Romania, insignificant values were published for all indicators, as well as in Hungary with the exception of VAT revenue.

Greece has a negative relationship with GDP and GDP per capita.

The zero correlation coefficient and thus no correlation is expressed by the relationship between the indicators standard VAT rate and VAT revenue in the countries of Austria, Belgium, Bulgaria, Denmark, Malta and Sweden. The reason for this situation is the constant VAT rate in these countries. The countries of Cyprus, Greece, Ireland, Latvia and Portugal achieved an insignificant value of the p-value correlation. The remaining countries were positively correlated. 12 countries show a medium tight correlation with a coefficient of 0.70 - 0.89 and a very tight correlation with a value of 0.93 is Finland. The EU, as a separate territorial unit, achieved a correlation coefficient of 0.85, which is a medium tight correlation.

Based on the calculated coefficients, selected macroeconomic determinants were selected in the econometric model determining the standard VAT rate, namely GDP, general consumption expenditure, exports, imports and VAT revenue.

3.2 Regression Analysis

An constructed model of linear regression, which expresses the relationship between the rate of the standard VAT rate and the vector of regressors, selected macroeconomic determinants, showed that the coefficient $\beta 0 = 17.37$ is an estimate of the level constant and expresses that if all variables in the model were equal to zero, then the level of the VAT rate would be 17.37 %. Other values in the model are estimates of regression coefficients $\beta 1$, $\beta 2$, $\beta 3$, $\beta 4$ and $\beta 5$, which say that if the variable in the model (x1, .., x5) changes by one unit of measure, the value dependent by such a part of the unit of measure changes, which is the estimated regression coefficient. From the estimated coefficients, it was concluded that the biggest influence on the change in the rate has the income from VAT and with its increase by 1 mil. EUR will cause an increase in the VAT rate by 4.951e-04 %. With an increase in consumption expenditure by 1 mil. EUR, there would be an increase in the VAT rate by 8.520e-05 % and with an increase in exports by 1 mil. EUR, the VAT rate would increase by 6.09e-05 %. On the contrary, with GDP, its increase by 1 mil. EUR caused a decrease in the rate by 9.197e-05 and an increase of 1 mil. EUR, the import rate would fall by 6.839e-05.

By testing the normality of the residues using the Shapes-Wilk test, a p-value of 0.9764> 0.05 was obtained and the residues are from the normal distribution. By testing heteroskedasticity using the Breusch-Pagan test, a p-value of 0.4921> 0.05 was obtained, indicating that the data are not heteroskedastic. An autocorrelation was tested with the Breusch-Godfrey test, where a p-value of 0.8415> 0.05 and the model was considered suitable.

Testing the model as a whole using F-statistics yielded a p-value of 4.846945e-9 <0.05, which is the basis for the assumption that at least one regression coefficient is non-zero and thus significant. By testing the significance of the estimated regression coefficients, the p-value was obtained for all regressors <0.05 and thus all are statistically significant. Lastly, the quality of the model adjustment was evaluated according to the value of the coefficient of determination, which was 0.9915314, which indicates that approximately 99.15 % of the total variability of the dependent variable, i. standard VAT rate is explained by the chosen model and the remaining variability is caused by the element of chance and other factors.

To determine the relationship of the standard VAT rate to selected macroeconomic determinants, it would be possible to use all five selected variables, which explained 99.15 % of its variability. The following graph shows how the constructed model corresponds to the development of the actual amount of the standard VAT rate and calculated (Figure 1).

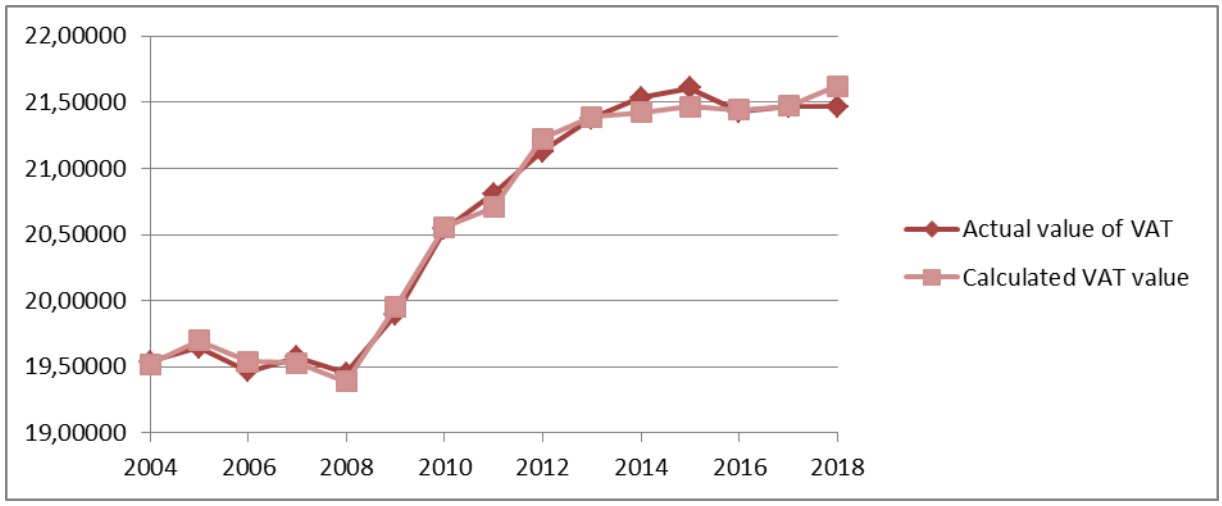

Figure 1. Actual and calculated values of the standard VAT rate for the period 2004-2018

Source: own processing

Based on all macroeconomic determinants from the compiled model, the values of the standard VAT rate were calculated, which with slight deviations faithfully copy the actual value of the VAT rate. Based on the tested model, from a theoretical point of view, it can be said that the given variables, selected determinants, could describe and determine the level of the standard VAT rate.

To prove how the selected macroeconomic determinants would evolve when changing the standard VAT rate, simple partial models of linear regression were created with one dependent - selected determinants and with one variable - the standard VAT rate.

In all sub-models, the residues were from the normal distribution. The data are not heteroskedastic and no autocorrelation is present. In some models, the presence of multicollinearity occurred, which was ignored.

Table 2. Overview of the results of regression analyzes

	1. model GDP ~ VAT	*2. model CE ~ VAT*	*3. model E ~ VAT*	*4. model I ~ VAT*	*5. model RfVAT~ VAT*
Intercept β_0	-471912	-339810	-581425	-450306	-52003,7
Parameter estimation β	46248	34472	37747	30906	4118,8
Estimation of standard deviation - intercept	173830	108775	120944	113824	14318,3
Standard deviation estimation - parameter β	8433	5277	5867	5522	694,6
Estimation of standard deviation for model	28200	17650	19620	18470	2323
p-value - intercept	0,0176880	0,0080700	0,0003420	0,0016400	0,0030400
p-value - parameter β	0,0001050	0,0000190	0,0000222	0,0000867	0,0000499
p-value for the model	0,0001050	0,0000190	0,0000222	0,0000867	0,0000499
Coefficient of determination	0,6982	0,7665	0,761	0,7067	0,7301
Corrected coefficient of determination	0,675	0,7485	0,742	0,6842	0,7093

Source: own processing

Based on the compiled partial regression models, the vector of parameters β = (β0 and β1) was estimated in each model. It is clear from the table that in the 1st model the coefficient Intercept β0 = -471 912 is an estimate of the level constant, and it tells us that if it were a variable, which means that our VAT is equal to zero, the amount of GDP would be - 471 912 mil. EUR. The second value is an estimate of the regression coefficient β1, where an increase in VAT by 1 % would mean an increase in GDP by 46,248 mil. EUR. In the 2nd model, the coefficient β0 describing consumption expenditures would reach the amount at the variable equal to zero - 339 810 mil. In the event of a 1 % increase in VAT, consumption expenditure would increase by 34,472 million. EUR. In the 3rd model, with VAT equal to zero, the amount of exports would be -581,425 mil. EUR and with a 1 % increase in VAT, exports would increase by 37,747 mil. EUR. In the 4th model, with VAT equal to zero, the value of imports would reach -450,306 mil. EUR and a VAT increase of 1 % would increase imports by 30,906 mil. EUR. The last 5th model would reach a revenue from VAT at zero VAT rate - 52 003.7 mil. EUR and a VAT increase of 1 % would increase VAT revenue by 4,118.8 mil. EUR.

By testing the significance of the estimated regression coefficients, a statement was made based on the p-value that was for the explained variable, which means VAT lower than the significance level α = 0.05, that is statistically significant in all sub-models. The table shows that the p-values for the parameter β and the model as a whole are the same due to the use of one explanatory variable in the model. Likewise, the p-values in each of the models are statistically significant.

By evaluating the alignment quality of each model according to the value of the coefficient of determination, it can be seen that the highest value of the coefficient of determination was reached by the 2nd model, which indicates that approximately 76.65 % of the total variability of the dependent variable, consumption expenditure, are explained by the model chosen. The following is the 3rd model, which describes approximately 76.1 % of the total export variability. The lowest value was reached by the 1st model, which explains 69.82 % of the total GDP variability.

3.3 Annual Increments

Based on the calculated values of the estimated β parameters from simple sub-models and the subsequent calculation of the annual increments, the impact on the economy was determined by increasing the standard VAT rate by 1 %. It was found that for the observed period during the crisis (2008-2010), all selected determinants have a positive annual increase compared to real values when increasing the VAT rate by 1 %, which indicates a positive impact on the economy and in recent years have a negative impact. However, from a theoretical point of view, it is not appropriate to increase the VAT rate in times of crisis, because an expansionary policy is used to stimulate economic growth by reducing rates. There is a contradiction with the theory in these years of crisis. Given the crisis known so far, it took place like none before it and could have created a cycle that was very short, which could lead to a deviation that is not standard - so it was considered more appropriate to assess other years outside the crisis, where at the beginning of the period, strong growth can be seen and the use of a restrictive policy using an increase in the rate would dampen economic growth, which would result in a decline in the values of selected macroeconomic determinants and a subsequent negative impact on the economy in the short term.

Table 3. Average annual increments in % with an increase in the standard VAT rate of 1 %

	Annual increment	*Calculated increment when VAT increases by 1 %*	*Difference*
GDP	2,63 %	1,37 %	-1,26 %
Consumption expenditure	2,44 %	1,33 %	-1,11 %
Export	5,16 %	2,89 %	-2,27 %
Import	4,96 %	2,45 %	-2,51 %
Revenue from VAT	3,32 %	1,82 %	-1,50 %

Source: own processing

In the 1st model describing the *relationship between GDP and VAT indicators*, if the value of the VAT indicator were to increase by 1 %, this would mean an increase in GDP by 46,248 mil. EUR. Based on the calculated annual increases in real GDP and GDP affected by the 1 % increase in VAT, it was found that if the VAT rate increases at the time of expansion and the annual GDP increases are positive compared to the previous period, it would cause a further decline in GDP, which should negative impact on economic growth. By evaluating the whole period from the point of view of one whole and calculating the average annual increase in GDP, it was found that in the period when there was a 1 % increase in VAT, the annual increase was 1.37 % and in the real period it was 2.63 %. On this basis, it is considered that the increase in the VAT rate will ultimately have a negative impact on the economy, as it will slow down the GDP growth rate by 1.29 %. This result confirms the findings of Carroll et al. (2010) and Simionnescu and Albu (2016), who found that an increase in VAT would cause a decline in GDP for several years. Also according to Miki (2011), who argues that the public is inclined to believe that increasing VAT may slow economic growth.

In the 2nd model describing the *relationship between the indicators of consumption expenditure and VAT*, with an increase in VAT by 1 %, consumption expenditure would increase by 34,472 mil. EUR. As in the previous model, annual increases in real consumption expenditure were calculated and affected by a one percent increase in VAT. It was found that for the whole period under review, the average annual increase was lower due to the increase in VAT, namely 1.33 % compared to the period in which this increase in VAT did not occur, namely 2.44 %. The same view was reached by Ramona et al. (2011), who argued that the decline in consumer consumption is affected by an increase in the VAT rate, which ultimately has a negative impact on the economy as a whole.

The same result resulted in the indicators export and import, where in the 3rd model describing the *relationship between the indicators export and VAT*, with a 1 % increase in VAT, exports would increase by 37,747 mil. EUR. The annual increase for the whole period, when there was no change in the rate, represented an annual increase in real exports of 5.16 %. With an increase in the VAT rate by 1 %, it would reach 2.89 % for the whole period, which represents a decrease in the annual increase by 2.27 %. The findings of Slemrod (2011) confirm that in countries where the VAT rate is applied, it may lead to a loss of competitiveness as a result of its increase, as a result of which exports are declining.

In the 4th model describing the *relationship between the indicators import and VAT*, an increase in VAT by 1 % would result in an increase in imports by 30,906 mil. EUR. Taking into account the annual increments for the whole period, in the period in which the VAT rate changed, the annual increment would decrease by 2.51 % compared to the period without the increase in the VAT rate.

In the 5th model expressing the *relationship of VAT revenue to the standard VAT rate*, it was found on the basis of estimated parameters β that if the standard VAT rate is equal to zero, the amount of VAT revenue will reach -52,003.7 mil. This, based on this estimated amount, shows how significant part of the revenue to the state budget the EU would have lost as a separate territorial unit if it did not apply the standard VAT rate. On the other hand, an increase in VAT by 1 % would increase VAT revenue by 4,118.8 mil. EUR. This relationship confirms the above-mentioned positive correlation. However, when calculating the average annual increments for the reference period for real VAT revenues affected by the change in the VAT rate, it was found that for VAT revenues affected by a 1 % increase in the VAT rate, the annual average increase was 1.82 % compared to VAT revenues unaffected by the change rate that was 3.32 %. The difference between the values represents a 1.50 % decrease in the increase in VAT revenue due to the increase in the VAT rate. This decrease in VAT revenue is due to a decrease in the value of macroeconomic indicators influenced by the increase in the VAT rate, of which VAT revenue consists. A decrease in the increase in VAT revenue, which was affected by a 1 % increase in the VAT rate, would ultimately have a negative impact on the economy.

CONCLUSION

An important task for the government is to set the standard VAT rate correctly, which will make it possible to create a sufficient financial reserve, especially in times of crisis, when government spending is rising. The change in the standard VAT rate is perceived very sensitively, as it can have a negative or

positive impact on the economy. In the analysis by means of a correlation coefficient, the existence of a positive dependence was found for all selected determinants. The results of the analysis show that the created partial models expressing the relationship of individual determinants to the VAT rate confirmed the positive dependence, especially when increasing the VAT rate. From the resulting values obtained from individual partial regression models, the average annual increments of selected macroeconomic determinants for the entire period were calculated. It was found that in the period when there was an increase in VAT by 1 %, the annual increase was smaller than in the real period, unaffected by the increase in the VAT rate, specifically in expenditure consumption was lower by 1.11 %, in GDP by 1.26 %, for VAT revenues by 1.50 %, for exports by 2.27 % and for imports by 2.51 %. The analysis concludes that an increase in the standard VAT rate of 1 % would have a negative impact on the individual macroeconomic determinants observed and thus on the EU economy as a separate territorial unit, as it would slow down their growth rate.

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The Stimulus of Export and Import Performance on Economic Growth in Oman

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ABSTRACT

Purpose: To investigate the stimulus of export, import, on economic growth in Oman. Methodology: Yearly data for the periods 1974-2018 were used for testing basic statistics, ADF stationary test, co-integration analysis followed by VAR Model, the Granger causality tests, IRF, variance decomposition test followed with basic diagnostic test. Approach: Outcome of ADF analysis shows that economic growth, export, and import become stationary at first difference level. Johansen co-integration analysis indicates short-run affiliation among the three parameters. Findings: Vector auto regressive Model reflects that export has a negative stimulus on economic growth. Though, an import has a positive stimulus on economic growth. Granger causality tests indicate unidirectional causality with both export and import to economic growth. Also, the outcome of the Granger Causality tests indicates that there is unidirectional causality between export and import. Impulse response function revealed a positive shock by both export and import on economic growth in the future. The study emphasizes policymakers' and its reformist role in promoting the stimulus of import, export that influences the level of economic progress of the Sultanate of Oman.

INTRODUCTION

The connection among export and import and its impression on the country's economic progress is the topic of keen interest for economists, policymakers and to some extent for academicians. Economic growth is considered to be the best degree of a country's well-being or economic welfare. Export and import can show a significant role in economic development for both advanced countries and underdeveloped nations. The association among import, export and economic progress is the most occurring theme of the debate, where the economist tries to illuminate the different levels of economic advance-

ment among nations. The economic well-being of any nation can be appraised through its goods and services produced within its territory and this can be termed as Gross Domestic Product (GDP). Hence, the GDP of any nations can be revealed as:

$$GDP = C + I + G + (NX)$$

Where, {*C*} can be denotes consumption, {*I*} can be denotes investment, {*G*} as expenditure, {*NX*} as net exports (i.e. export minus imports). The present study tried to investigate the causation together on export and import and its stimulus on economic progress (i.e. GDP) on the Sultanate of Oman and while, keeping the Consumption, Investment, and Government spending presumed to be constant i.e. *ceteris paribus*.

Economists incline to study the fluctuations in economic development by interpreting the connexion amongst exports and imports on economic growth. Henceforth, the connection among them plays a crucial role in the expansion of economic development. Thus, it's a question of key concern for economists, government planners, and policymakers. The reason behind this is that the foremost aim of virtually every country's economist is to escalate its country's GDP, which ultimately leads to better well-being for its natives. The objective of this study is to create an econometrical model that investigates the link among export, import and economic growth on the Sultanate of Oman. Specifically, we aim to empirically explore a response to the following postulates:

i. To examine export influence on economic growth.
ii. To evaluate the impact of import on economic growth.
iii. To identify that economic growth leads to both export and import.
iv. To assess the causal link among export and import.

1. REVIEW OF THE LITERATURE

Economists, academics, and policymakers have done a deep study on tracking the association among these parameters. There are dual views on the outcome of the relation amid import, export and economic growth as per empirical literature. These thoughts can be categorized as: Firstly, the prevailing pragmatic research tried to individually inspect the significance of export or import on economic growth; next in line, the pragmatic research studies the connection among export and import collectively on economic growth. Concerning approaches familiar with establishing the importance of export or import on economic growth, had duet key methodologies; Basic is simple or multiple regressions, whereas secondary employs the cause and effect method.

Many scholars have tried to scrutinize whether exports and economic development are interconnected and determined the directions of their actions. The pragmatic study, centered on the export-led economic growth hypothesis, has delivered varied results in dual causation by Granger causality. With the help of VAR models, the long and short-run comparisons were also assessed. Ullah et al. (2009) reveal that export extension leads to economic growth. Abu al-Foul (2006) found unidirectional causation from export to output. Demirhan and Akcay (2005) export lead to economic progress in Morocco and Jordan. Awokuse (2005) observed a realistic sign of causation based on duet attitudes which designates that the causative relation amid real exports and real GDP growth is two-way. Further, causes of growth are also established to be noteworthy. Mah (2005) found long-run two-way causality amid real GDP and export growth in China. Vohra (2001) indicate export have a notable and strong influence on economic progress.

Kim and Lin (2009) investigated the influence of export composition on economic progress which displayed that some exports contribute equitably to economic progress. Specifically, underdeveloped nations rely on their primary product exports, tentative to unnecessary price variations. Therefore, this class of exports had an insignificant impression on economic progress, whereas industrial exports had a noteworthy and strong influence on economic progress. Kalaitzi (2013) studied the affiliation between exports and economic growth and firmly embedded the presence of a long-run bond among industrial export, prime export, and economic progress. Also, the Granger causality test exhibited one-way causation among industrial export and economic progress. Therefore, diversification of export from oil to manu-

facturing could quicken economic expansion in the UAE. Hussain (2014) found one-way causation among export and import. Though, the connection amongst both export and import on economic progress were not remarkable. Sachin (2015) probed the affiliation among export, import and economic growth in India. He found a long run co-integrating link among GDP, Export, and Import. Granger causality tests revealed a one-way cause and effect from GDP to export, and no causality relation with GDP and import. Finally, export leads to import but import does not lead to export, hence one-way causation from export leads to import.

Numerous analyses also used causatives for multiple parameters between exports, economic progress, and a third important macroeconomic parameter such as import, external debt, external debt servicing, income, etc. Amoateng and Amoako-adu (1996) inspected the causation among export, external debt and economic progress in African nations, he revealed dual causatives among external debt, economic progress, and export. Baharumshah and Rashid (1999) explored the long-run causality among export, GDP, and imports of the Malaysian economy. Shirazi and Manap (2004) established a strong long-run connection among the three parameters. Eita and Jordaan (2007) evaluated the Granger causality between export, GDP and per capita income in Namibia, and suggested export-led growth hypothesis. Ahmed et al. (2000) scrutinized the cause and effect among export, external debt, and economic growth. They concluded that there is no united response out of them. Awokuse (2007) examined the impression of export and import on economic progress in trio conversion economies and established a dual causative bond among export and economic progress in Bulgaria while causation flows from import and export to economic progress in the Czech Republic and lastly, Poland had one-way causation among import and economic progress.

Al-Sawaee (2008) instituted a positive outcome on productivity of export on economic growth in oil-producing nations and had an adverse effect in the non-oil producing nations. He recommended the embracing strategy of export-oriented in order to take the help of comparative advantage. Elbeydi (2010) showed that the income, export and relative expenses are interconnected and had long run two-way causes and effects amongst the exports and income progression. He also specified that the export elevation strategy pays to the economic development in Libya. Tang et al. (2015) re-investigated the export-led growth postulate for four Asian Tigers. They tested MWALD causation for bivariate model and advocated dual causation among exports and GDP for Hong Kong and Singapore, whereas, one-way causation from GDP to exports for South Korea and Taiwan. However, the trivariate model revealed dual causation occurs for all economies. Additionally, they found that all the four economies are unstable for the export-led growth hypothesis. Afaf (2015) explained that export, import and GDP are found to be integrated of I (1) level, the co-integration test confirmed that GDP, export, and import are co-integrated and the presence of a long-run association among all the parameters. Abugamea (2015) revealed that the co-integration test indicated vector error correction models (VECM) and the presence of a long-run link among imports and economic progress and also found that export and import are the key components of economic progress in the Palestinian. Further, causation tests confirm VECM results that import granger causes economic growth in the long run but not in the short run. El-Alaoui (2015) found both long-run, short-run causes and effects among export, import, and economic growth. Hussain and Saaed (2015) suggested one-way causes and effects among export and import and between export and economic growth. Kalaitzi and Cleeve (2017) explored the causation amid export and economic growth in the UAE. The co-integration test exposed the presence of a long-run bond among parameters. Also, evidence in support shows a dual causal association between export and economic growth in the short-run however, economic growth causes export in the long- run. Bakari (2017) found the co-integration among the parameters in Mauritania. Vector Error Correction Model (VECM) reflected that export had an optimistic outcome on economic growth. Nevertheless, import had an undesirable consequence on economic development. Granger causality test indicated one-way causes and effects among import and economic growth and established no causativeness among export and GDP. Guntukula (2018) revealed that dual causation was running among export and economic progress as well as import and economic progress. And, confirmed that export-led growth and growth-led export hypothesis. Lastly, he suggested that both growth and export promotion strategy are to be followed regularly with pressure on sustainable and inclusive economic growth.

Islam and Zahra (2019) Co-integration test indicated a long-run equilibrium link among export, import, and economic growth. They estimated error correction approach which suggested long-run dual causation between export, import and economic progress in Palestine. They indicated a solid bond among export and economic growth and thus policymakers should motivate Palestinian companies to enter the international markets for economic progress. Contrarily, short-run outcomes provided a sign to support export-led import and import-led export hypotheses. Impulse response function suggested that, an optimistic shock to one variable in the system generated responses in another variable in the same direction.

In conclusive, many of the scholars have addressed co-integration, VAR and VEC model approaches to investigate the stimulus among these parameters. Our review of literature is limited to such studies that focus on causality having a stimulus impact of export, import on the economic growth of the Sultanate of Oman.

2. DATA, METHODOLOGY & MODEL SPECIFICATION

Yearly data from 1974-2018 collected from World Bank, having 45 samples which should be adequate to capture both run (short and long) causation among the parameters in the model. The data file contains monitored for GDP (constant 2010 US$) as economic growth indicator, export (in terms of goods and services i.e. BOP, current US$), and import (in terms of goods and services i.e. BOP, current US$). Initial pragmatic interpretations tried to record the causative link among export, import and economic growth (Balassa, 1988; Din, 2004; Afzal, 2006; Saad, 2012; Abbas, 2012; Güngör, 2014; and Bakari, 2017); our model can be expressed as having ceteris paribus:

$$GDP_t = f(Export, Import) \quad (1)$$

All the parameters are used in a real term and converted into a logarithmic function:

$$LY_t = \log(Y_t).$$

This can also be constituted in a log-linear econometric structure as:

$$\log(GDP)_t = \beta_0 + \beta_1 \log(Exports)_t + \beta_2 \log(Imports)_t + \varepsilon_t \quad (2)$$

where, β_0: constant term, β_1: coefficient of a variable (exports), β_2: coefficient of variables (imports), t: The time trend and ε_t: Presumed that the random error term to be normally, uniformly and autonomously distributed.

The Long-run model can be expressed as:

$$LNG_t = a_0 + a_1 LNE_t + a_2 LNI_t + \varepsilon_t$$

In short run our model can be expressed as:

$$lng_t = a + \sum_{i}^{k} = 1\, \beta_i lng_{t-i} + \sum_{j}^{k} = 1\, \emptyset_j lne_{t-j} + \sum_{m}^{k} = 1\, \partial_m lnim_{t-m} + u_{1t}$$

$$lne_t = \sigma + \sum_{i}^{k} = 1\, \beta_i lng_{t-i} + \sum_{j}^{k} = 1\, \emptyset_j lne_{t-j} + \sum_{m}^{k} = 1\, \partial_m lnim_{t-m} + u_{2t}$$

$$lnim_t = \vartheta + \sum_{i}^{k} = 1\, \beta_i lng_{t-i} + \sum_{j}^{k} = 1\, \emptyset_j lne_{t-j} + \sum_{m}^{k} = 1\, \partial_m lnim_{t-m} + u_{3t}$$

3. EMPIRICAL ANALYSIS

The test of correlation shows a strong association among parameters. It is found that the dependent variable gross domestic product (LNG) and the autonomous variable export (LNE) are strongly corre-

lated with a correlation coefficient equal to (0.91791). Therefore, an increase in export by 1%, gross domestic product (GDP) increases by 0.92%. Another independent variable which is import (LNIM) is also strongly correlated with a correlation coefficient equal to (0.9392). On the other hand, an increase in import by 1% raises the gross domestic product (GDP) by 0.94%.

Table 1. Descriptive and correlation matrix

	Mean	*Median*	*Max.*	*Min.*	*Std. Dev.*	*Skewness*	*Kurtosis*	*Jarque-Bera*	*Prob*	*LNG*	*LNE*	*LNI*
LNG	24.16	24.33	25.06	22.68	0.66	-0.61	2.33	3.6	0.17	1		
LNE	22.9	22.53	24.81	20.92	1.14	0.17	1.93	2.35	0.31	0.92	1	
LNI	22.59	22.44	24.46	20.3	1.14	0.12	2.04	1.83	0.4	0.94	0.99	1

Source Author's Computation

Table 2. Unit Root Test

		ADF		*Phillips-Perron*	
		t-statistic	*Prob.*	*Adj. t-stat.*	*Prob.*
LNG	Level	-3.636	0.0088*	-3.4197	0.0155**
	1st Difference	-4.5996	0.0006*	-4.5851	0.0000*
LNE	Level	-1.0218	0.7373	-0.9994	0.7454
	1st Difference	-6.474	0.0000*	6.5132	0.0000*
LNI	Level	-1.5147	0.517	-1.4687	0.5399
	1st Difference	-5.7993	0.0000*	-5.8018	0.0000*

*,** represents 1% and 5% significance level

Source; Authors computation on E-views

Table 2 indicates that some time series become stationary at level and first-order difference means that by accepting the alternate hypothesis i.e. the series has no unit root, so now we can proceed further for the other relevant tests. Before estimating our model, we have to estimate the VAR lag order selection criteria by using symmetric lags; the same lag length is used for all parameters in the model. This lag length is frequently selected using a clear statistical criterion such as the AIC, SC, HQ, LR, and FPE.

Table 3. VAR Lag order selection criterion

Lag	*Log L*	*LR*	*FPE*	*AIC*	*SC*	*HQ*
0	-43.7995	NA	0.00177	2.1767	2.299	2.222
1	121.6098	300.0447*	1.23e-06*	-5.098*	-4.607*	-4.917*
2	127.3244	9.569	1.44E-06	-4.945	-4.085	-4.628
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final predicted error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan- Quinn information criterion						

Source; Authors computation on E-views 10

Table 3 reveals that the VAR lag 1 criterion must be chosen as LR, FPE, AIC, SC, HQ and HQ statistics. Therefore, the lag of 1 is used further for estimation purposes.

Table 4a. Johansen Co-integration Test for GDP as a dependent variable

	Eigenvalue	*Trace Statistics*	*0.05 Critical Value*	*Prob.**	*Max-Eigen Statistics*	*0.05 Critical Value*	*Prob.**	*Inference*
None	0.313693	23.15116	29.79707	0.2387	16.1865	21.13162	0.2142	VAR Model
At most 1	0.123381	6.964663	15.49471	0.5818	5.662341	14.2646	0.6568	
At most 2	0.029833	1.302322	3.841466	0.2538	1.302322	3.841466	2538	
LNGDP			LNEX			LNIM		
1			11.2516			-11.826		
			(2.687)			(2.74682)		

Source; Authors Own Calculations, Eviews 10

Co-integration test result indicates no co-integrating equation at the 0.05 level, and provides the presence of short-run equality between GDP, export and import, which can be expressed as:

lngdp = -11.25157(lnex) + 11.8262 (lnim)

Source; Author's calculations, Eviews 10

According to the above short- run equation, an increase of 1% in exports leads to a decrease of 11.25157% of GDP ceteris paribus. On the other hand, a 1% increase in imports leads to an increase of 11.8262% of GDP in the short-run ceteris paribus.

Table 4b. Johansen Co-integration Test for LNEX as a dependent variable

	Eigenvalue	*Trace Statistics*	*0.05 Critical Value*	*Prob.**	*Max-Eigen Statistics*	*0.05 Critical Value*	*Prob.**	*Inference*
None	0.313693	23.15116	29.79707	0.2387	16.1865	21.13162	0.2142	VAR Model
At most 1	0.123381	6.964663	15.49471	0.5818	5.662341	14.2646	0.6568	
At most 2	0.029833	1.302322	3.841466	0.2538	1.302322	3.841466	2538	
LNEX			LNIM			LNGDP		
1			-1.051071			0.088877		
			(0.07757)			(0.14284)		

Source; Authors Own Calculations, Eviews 10

Co-integration test result indicates no co-integrating equation at the 0.05 level, and provides the existence of short-run equation between import, export and GDP, which can be expressed as:

lnex = -1.051071(lnim) + 0.088877(lngdp)

Source: Authors own calculations, Eviews 10

According to the above short- run equation, a 1% increase in imports leads to a decrease of 1.051071% of export ceteris paribus. On the other hand, a 1% increases in GDP leads to an increase of 0.088877% of GDP in the short-run ceteris paribus.

Table 4c. Johansen Co-integration Test for LNIM as a dependent variable

	Eigenvalue	*Trace Statistics*	*0.05 Critical Value*	*Prob.**	*Max-Eigen Statistics*	*0.05 Critical Value*	*Prob.**	*Inference*
None	0.313693	23.15116	29.79707	0.2387	16.1865	21.13162	0.2142	VAR Model
At most 1	0.123381	6.964663	15.49471	0.5818	5.662341	14.2646	0.6568	
At most 2	0.029833	1.302322	3.841466	0.2538	1.302322	3.841466	2538	
LNIM			LNGDP			LNEX		
1			-0.084558			-0.951410		
			(0.12596)			(0.06692)		

Source; Authors Own Calculations, Eviews 10

Co-integration test result indicates no co-integrating equation at the 0.05 level, and provides the existence of short-run equation between import, GDP and export, which can be expressed as:

lnim = -0.084558(lngdp) - 0.951410(lnex)

According to the above short- run equation, a 1% increase in GDP leads to a decrease of 0.084558% of Import ceteris paribus. On the other hand, a 1% increases in export leads to a decrease of .95141% of GDP in short-run ceteris paribus. Based on the Johansen co-integration test reveals that the three variables are not co-integrated, which indulges us to use the VAR model for a further test of significance.

Table 5. Vector Auto Regression Estimates

standard errors in () & T-statistics in[]			
	LNGDP	LNEX	LNIM
LNGDP(-1)	0.89079	-0.0054	0.01378
	(0.03184)	(0.14891)	(0.08849)
	[27.9813]	[-0.036]	[0.15575]
LNEX (-1)	0.06313	0.79391	0.51008
	(0.04098)	(0.19167)	(0.1139)
	[1.5407]	[4.14205]	[4.47841]

LNIM (-1)	-0.0208	0.18134	0.45654
	(0.04737)	(0.22159)	(0.13168)
	[-0.4385]	[0.81835]	[3.4671]
	1.71535	0.83542	0.34958
	(0.4106)	(1.92063)	(1.1413)
	[4.17764]	[0.43497]	[0.3063]
R-squared	0.99478	0.96391	0.98696
Adj. R-squared	0.99439	0.96121	0.98598
Sum sq.rsids	0.08726	1.90925	0.67418
S.E equation	0.04671	0.21848	0.12983
F-statistic	2540.31	356.158	1009.33
Log-likelihood	74.4737	6.59126	29.4926
Akaike AIC	-3.2033	-0.1178	-1.1588
Schwarz SC	-3.0411	0.04441	-0.9966
Mean dependent	24.1958	22.9477	22.6397
S.D. dependent	0.62343	1.10925	1.0966
Determinant reside covariance (dof adj.)			1.02E-06
Determinant reside covariance (dof adj.)			7.67E-07
Log-likelihood			122.473
Akaike Information Criterion			-5.0215
Schwarz Criterion			-4.5349
Number of coefficients			12

Source: Authors Own calculations: Eviews10

Table 6a. VAR Granger Causality/Block Exogeneity Wald Test for GDP as dependent

Exclude	Chi-sq	Df	Prob.	Decision
Export	2.373803	1	0.1234	Insignificant
Import	0.192291	1	0.661	Insignificant

Source: Authors Own calculations: Eviews10

Table 6b. VAR Granger Causality/Block Exogeneity Wald Test for Export as dependent

Exclude	Chi-sq	Df	Prob.	Decision
GDP	0.001297	1	0.9713	Insignificant
Import	0.6697	1	0.4132	Insignificant

Source: Authors Own calculations: Eviews10

Table 6c. VAR Granger Causality/Block Exogeneity Wald Test for Import as dependent

Exclude	Chi-sq	Df	Prob.	Decision
GDP	0.02426	1	0.8762	Insignificant
Export	20.05619	1	0.000	Significant

Source: Authors Own calculations: Eviews10

$$LNGDP = C(1)*LNGDP(-1) + C(2)*LNEX(-1) + C(3)*LNIM(-1) + C(4)$$

$$lngdp_t = 0.890793*lngdp_{t-1} + 0.063133*lnex_{t-1} - 0.020773*lnim_{t-1} + 1.715349$$

$$LNEX = C(5)*LNGDP(-1) + C(6)*LNEX(-1) + C(7)*LNIM(-1) + C(8)$$

$$lnex_t = -0.005363**lngdp_{t-1} + 0.793910*lnex_{t-1} + 0.181339*lnim_{t-1} + 0.835424$$

$$LNIM = C(9)*LNGDP(-1) + C(10)*LNEX(-1) + C(11)*LNIM(-1) + C(12)$$

$$lnim = 0.013783*lngdp_{t-1} + 0.510078*lnex_{t-1} + 0.456535*lnim_{t-1} + 0.346535$$

Since we know that some coefficients (C) are not statistically significant for that we have to apply the Wald Coefficient Test. After applying Wald Coefficient test we have to delete C (2), C (3), C (5), C (7), C (8), C (9), and C (12) from our model, hence our new estimated equation can be expressed as:

$$LNGDP = C(1)*LNGDP(-1) + C(4)$$

$$lngdp_t = 0.890793*lngdp_{t-1} + 1.715349$$

It means that GDP in the short run depends 89 % upon its previous value ceteris paribus, hence, GDP does not have any casualty with export and import.

$$LNEX = C(6)*LNEX(-1)$$

$$lnex_t = 0.793910*lnex_{t-1}$$

Impression can be drawn for export that it depends on 79.39 % on its previous value ceteris paribus.

$$LNIM = C(10)*LNEX(-1) + C(11)*LNIM(-1)$$

$$lnim = 0.510078*lnex_{t-1} + 0.456535*lnim_{t-1}$$

Impression can be drawn from import in the short run that it depends 51% on previous year export as well as 45.65 % on its previous year ceteris paribus.

Table 7. Pairwise Granger Causality Test

Null Hypothesis	Observations	F-Statistic	Prob.*	Decision
LNG does nor Granger Cause LNE	44	0.21912	0.6422	Rejected
LNE does not Granger Cause LNG		9.01907	0.0045	Accepted
LNI does not Granger Cause LNE	44	0.90787	0.3463	Rejected
LNE does not Granger Cause LNI		21.0436	0.00004	Accepted
LNI does not Granger Cause LNG	44	6.44396	0.015	Accepted
LNG does nor Granger Cause LNI		0.34878	0.558	Rejected

Source: Own tions: Authors calcula- Eviews10

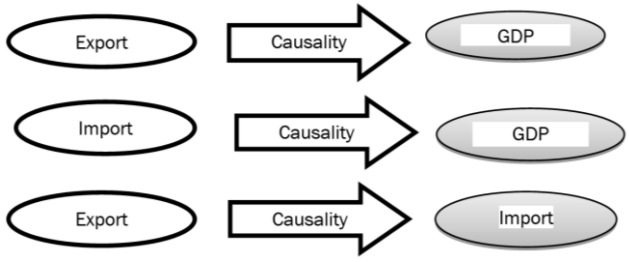

Figure 1. Causal directional flow diagram,

Authors own calculations

Table 8. Summary of VAR Outcomes

Dependent	VAR Granger Causality Test	Wald Coefficient Test	Pairwise Granger Causality Test
GDP	Insignificant	Insignificant	Insignificant
Export	Insignificant	Insignificant	Export Granger Cause GDP, Export Granger Cause Import
Import	Export significant	Export Significant	Import Granger Cause GDP

Source: Authors own calculations, Eviews 10

Table 9. Diagnostic tests for VAR Model for LNG as Dependent

VAR Residual Serial Correlation LM Tests				
Lag	LRE*stat	Df	Prob.	Decision
1	12.4711	9	0.188	No Serial Correlation
	Rao F-stat	Df	Prob	
	1.42904	9,85.3	0.1886	
VAR Residual Normality Tests				
Jarque-Bera	Df	Prob.		Significant
7.38819	6	0.2864		
VAR Residual Heteroskedasticity Tests				
Chi-sq	Df	Prob.		Homoskedasticity
43.422	36	0.1845		

Source; Authors own calculations, Eviews 10

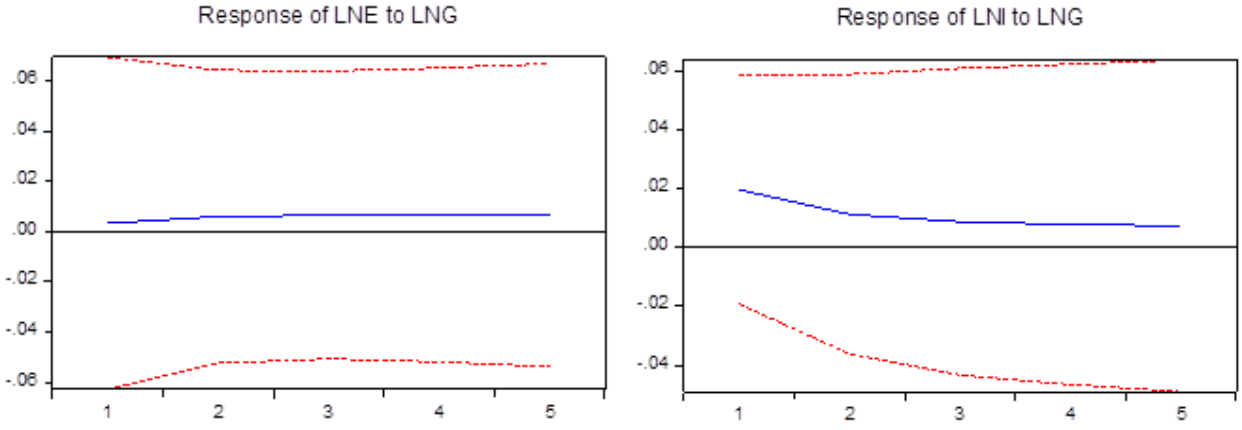

Figure 2. Depicts the Impulse Response Function

Figure 2 indicates the response of LNE to one standard deviation shock to LNG the blue line in the figure represents the Impulse Response Function (IRF) which rested under a 95% confidence interval. IRF graph revealed that for the short-run i.e. for periods 1 and 2 the graph is increasing whereas, for the long-run, the graph revealed stability in the curve. Hence, the shock in the LNE will have a positive stimulus on LNG for both periods.

IRF graph for the response of LNI to one standard deviation shock to LNG revealed that for the short-run i.e. for periods 1 and 2 the graph is decreasing whereas, for the long-run, the graph revealed stability in the curve. Hence, the shock in the LNI will have a positive stimulus on LNG for both periods.

Table 10. Variance Decomposition of LNG

Period	S.E.	LNG	LNE	LNI
1	0.04671	100	0	0
2	0.06361	96.28	3.62	0.11
3	0.07618	90.76	9.12	0.12
4	0.08683	84.49	14.41	0.097
5	0.0965	77.98	21.95	0.08

Source: Authors Computation on E-views 10

The results of Variance Decomposition (VDC) are presented in the above table 10. The results were reported for a 5-years horizon. The ordering of the variables is based on the Cholesky decomposition method which suggests the following order of the variables: Log of GDP as (LNG), Log of export as (LNE) and Log of import as (LNI).

In the short-run, 100% of the forecast error variance in GDP is explained by itself in a period of 1. The contribution of LNE and LNI is having a very weak influence or zero in predicting the GDP i.e. (LNG) in the future. Whereas in long-run 78% of the forecast error variance in GDP is explained by itself for the period of 5, the contribution of LNE is 22% of the forecast error variance in GDP and less than 1% is the contribution of the forecast error variance in GDP for the period of 5. Hence, period 1 denotes the short-run where GDP is 100% forecasted, and period 5 is denoted as long-run where GDP is 78% forecasted by itself.

Table 11. Diagnostic tests for VAR Model for LNE as Dependent

VAR Residual Serial Correlation LM Tests				
Lag	LRE*stat	Df	Prob.	Decision
1	12.4711	9	0.188	No Serial Correlation
	Rao F-stat	Df	Prob	
	1.42904	9,85.3	0.1886	
VAR Residual Normality Tests				
Jarque-Bera	Df	Prob.		Significant
8.55985	6	0.1999		
VAR Residual Heteroskedasticity Tests				
Chi-sq	Df	Prob.		Homoskedasticity
43.422	36	0.1845		

Source; Authors own calculations, Eviews 10

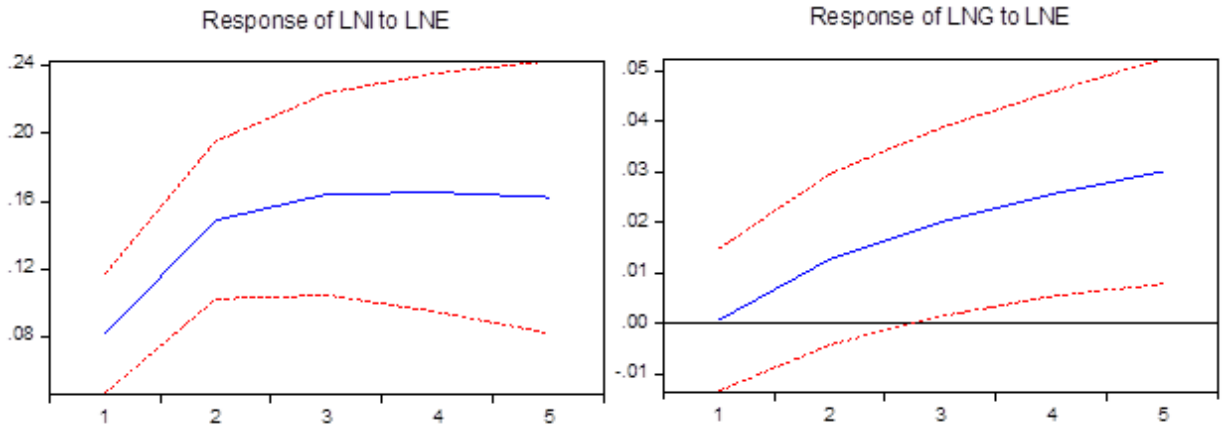

Figure 3. Depicts the Impulse Response Function

Figure 3 indicates the response of LNI to one standard deviation shock to LNE the blue line in the figure represents the Impulse Response Function (IRF) which rested under a 95% confidence interval. IRF graph revealed that for the short-run i.e. for periods 1 and 2 the graph is sharply increasing and for the period 3 it buildup whereas, for the long-run, the graph revealed stability in the curve. Hence, the shock in the LNI will have a positive stimulus on LNE for both periods.

IRF graph for the response of LNG to one standard deviation shock to LNE revealed that for the short-run i.e. for periods 1 and 2 the graph is sharply increasing whereas, for the long-run, the graph revealed increasing but not at that pace as in short-run. Hence, the shock in the LNG will have a positive stimulus on LNE for both periods.

Table 12. Variance Decomposition of LNE

Period	S.E.	LNE	LNI	LNG
1	0.2185	100	0	0
2	0.289	99.6	0.397	7.26E-05
3	0.339	99.26	0.74	0.0001
4	0.38	99.03	0.97	0.0002
5	0.415	98.87	1.13	0.0002

Source: Authors Computation on E-views 10

The results of Variance Decomposition (VDC) are presented in the above table 12. The results were reported for a 5-years horizon. The ordering of the variables is based on the Cholesky decomposition method which suggests the following order of the variables: Log of GDP as (LNG), Log of export as (LNE) and Log of import as (LNI).

In the short-run, 100% of the forecast error variance in LNE is explained by itself in a period of 1. The contribution of LNI and LNG is having a very weak influence or zero in predicting the export i.e. (LNE) in the future. Whereas in long-run approximate 99% of the forecast error variance in export is explained by itself for the period of 5, the contribution of LNI is approximate 1% of the forecast error variance in LNE and about 0.0002% is the contribution of LNI in the forecast error variance in LNE for the period of 5. Hence, period 1 denotes the short-run where LNE is 100% forecasted, and period 5 is denoted as long-run where LNE is 99% forecasted by itself.

Table 13. Diagnostic tests for VAR Model for LNI as Dependent

VAR Residual Serial Correlation LM Tests				
Lag	LRE*stat	Df	Prob.	Decision
1	12.4711	9	0.188	No Serial Correlation
	Rao F-stat	Df	Prob	
	1.42904	9,85.3	0.1886	
VAR Residual Normality Tests				
Jarque-Bera	Df	Prob.		Significant
5.774218	6	0.449		
VAR Residual Heteroskedasticity Tests				
Chi-sq	Df	Prob.		Homoskedasticity
43.422	36	0.1845		
Source; Authors own calculations, Eviews 10				

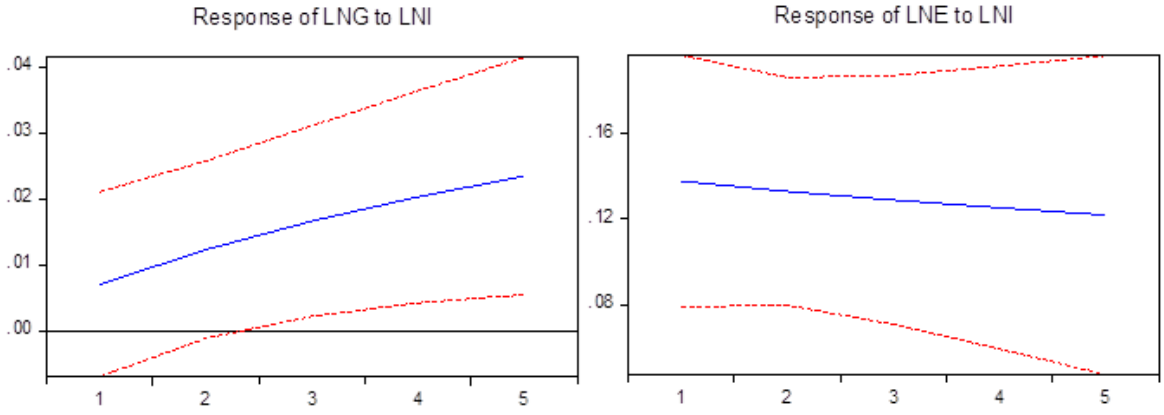

Figure 4. Depicts the Impulse Response Function

Figure 4 indicates the response of LNG to one standard deviation shock to LNI the blue line in the figure represents the Impulse Response Function (IRF) which rested under a 95% confidence interval. IRF graph revealed that for the short-run i.e. for periods 1 and 2 the graph is sharply increasing whereas, for the long-run, the graph upsurges. Hence, the shock in the LNI will have a positive stimulus on LNI for both periods.

IRF graph for the response of LNE to one standard deviation shock to LNI revealed progressive decline for both run. Hence, the shock in the LNG will have a positive stimulus on LNI for both periods.

Table 14. Variance Decomposition of LNI

Period	S.E.	LNI	LNG	LNE
1	0.129	100	0	0
2	0.203	81.85	0.172	17.976
3	0.263	72.22	0.265	27.51
4	0.311	67.28	0.314	32.4
5	0.352	64.45	0.344	35.2

Source: Authors Computation on E-views 10

The results of Variance Decomposition (VDC) are presented in the above table 12. The results were reported for a 5-years horizon. The ordering of the variables is based on the Cholesky decomposition method which suggests the following order of the variables: Log of GDP as (LNG), Log of export as (LNE) and Log of import as (LNI).

In the short-run, 100% of the forecast error variance in LNI is explained by itself in a period of 1. The contribution of LNE and LNG is having a very weak influence or zero in predicting the import i.e. (LNI) in the future. Whereas in long-run approximate 65% of the forecast error variance in import is explained by itself for the period of 5, the contribution of LNG is less than 1% of the forecast error variance in LNI and about 35% is the contribution of LNE in the forecast error variance in LNI for the period of 5. Hence, period 1 denotes the short-run where LNI is 100% forecasted, and period 5 is denoted as long-run where LNI is approximately 65% forecasted by itself.

CONCLUSION

The present study is based on a twofold inspection technique. Initially, it scrutinizes the connection among export, import, and GDP for the Sultanate of Oman. Last but not least, if such a connection arises, it tries to scrutinize the causativeness amongst the models. To achieve our purpose, time-series yearly data were taken from the World Bank for the periods 1974 to 2018. Then correlation test is used to develop a relationship, followed by Augmented Dickey-Fuller (ADF) and Phillips-Perron unit root test to check whether the series is stationary at what degree, further Johansen co-integration analysis was done, which leads to predict the nature of Vector Auto-Regressive (VAR) model and its causal effects. As per our investigation, the test of correlation shows the connexion among the parameters to be strongly correlated. While the ADF and PP unit root test signifies that when the zero level and first difference is considered the parameters become stationary, also, it was determined by Johansen co-integration analysis that there is no co-integration among the parameters which means in the short run there is a connection among the three parameters in Oman. Although, export has an adverse influence on economic growth in the short run while import has a positive influence on economic growth for the short-run with the assumption of ceteris paribus.

Vector Auto-Regressive Model is used to identify the connection among the parameters and Granger Causality Test to indicate the direction of their causal effect among variables. The results of our analysis indicate that there is a one-way causal effect from import to GDP, as well as unidirectional causative stimulus flowing from export to GDP. Hence, GDP does not have any causal influence on both of these variables in the short run ceteris paribus. Fascinating fact is that it was export who promotes the import and unidirectional causation flows from export to import hence export leads to import. The IRF firstly indicates that response in the form of one deviation shock provided by both LNE, LNI will have a positive stimulus on LNG followed by the response in the form of one deviation shock provided by both LNG; LNI will have a positive stimulus on LNE. Lastly, the IRF also directs that response in the form of one deviation shock provided by both LNE, LNG will have a positive stimulus on LNI.

Variance decomposition for economic growth reveals that in short-run GDP is forecasted to 100% by itself whereas, in the long-run, its share is reduced to about 78% by itself, 22% by LNE and less than 1% by LNI. The variance decomposition of export also discloses that in short-run export is forecasted to 100% by itself whereas, in the long-run, its share reduces marginally i.e. 99% by itself, 1% by LNI and 0% by LNG. Eventually, variance decomposition of import tells that in short-run import is forecasted to 100% by itself whereas, in the long-run, its share reduces to about 65% by itself, 35% by LNE and less than 0.4% by LNG.

To end with, we can clinch that our model proves the postulate (i) as supported by Al-Sawaee (2008), Güngör and Bernard 2014, Hussain and Saaed (2015), postulate (ii) as supported by Abugamea (2015), Bakari (2017) and last but not least postulate (iv) supported by Hussain and Saaed (2015), Masoud and Suleiman (2016), El-Alaoui (2015) to be true as well as statistically significant for the short run. In a nut shell this study emphasizes policymakers' and its reformist role in promoting the stimulus of import, export that influences the level of economic progress of the Sultanate of Oman.

IMPLICATION AND LIMITATION

Future research is to expand this research work by adding other factors that can influence economic growth as a covariate in research. By adding covariate into the research model, robust and unbiased results can be achieved. Factors that can be included in the macro-economic model include consumption, Investment, Government spending, export, import etc. Finally, the scope of this research is to evaluate the controlled macro-economic parameters and their impact on economic growth. Therefore, future researchers who want to conduct similar research can include more macro-economic factors and explore their impact.

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The Links between Economic Reform and Corruption: Evidence from Selected Asian Countries

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ABSTRACT

This paper aims to explore the links between the economic reform and the corruption. Because of the conducive economic reforms have attracted the interest of academicians and scholars, it's predicted to reduce corruption, as well as being a subject of academic discussion and policy debate. This view is supported by international institutions which also have interests and justifications for reform programs in many countries, both successful and unsuccessful. The article discusses the methods and empirical aspects of using the panel data approach. The paper applies the pooled model, the fixed effects model, and the random effects model. This method helps us to see the link between economic reform and corruption, by involving other variables such as the growth rates of real gross domestic product per capita, the government effectiveness index, and the dummy variables. For dummy variable, we used the political freedom, the freedom of civil society, and the Human Development Index. The data is obtained from the publication of the World Bank, Asian Development Bank, and UNICEF website. The observation period from 1996 to 2017 for selected Asian countries. The study found that the economic reform has a positive effect on corruption, it reinforces the argument that the economic reform will increase welfare, eventhough it's not guarantee reducing the desire to behave in corruption for every economic agent. In addition, the government efficiency plays an important role because it's become a driving force for strengthening the government services, thereby reducing the intensity of corruption.

INTRODUCTION

Some researchers saw the corruption has become a universal phenomenon, not only experienced by a country, but also has reached public institutions and also private institutions, where corruption become more widespread, not only in developing countries but also in transition countries and in developed countries. The crisis experienced by several countries, at first the country has been able to achieve high economic growth for several decades, but this country is also not free from the latent potential for corruption so that this country cannot become hostage to the problem of corruption (Yu, 2008). So it is not surprising, the majority opinion stated that the war on corruption, of course this has broad support from the international community. Many negative effects of corruption, including corruption inhibits investment, the allocation of resources is distorted due to corruption, and the economic system becomes inefficient. In addition, the decrease in the intensity of corruption does not always occur in some countries, because corruption has become increasingly adaptive and able to transform with political changes and socio-economic conditions (Kamal et al., 2018).

Many academicians have paid attention to the determinant, reason, and consequences of corruption, as well as trying to find ways to reduce corruption. Existing studies have given identification of two groups of variables as determinants of corruption, namely socio-cultural variables (such as party fragmentation and general elections in a country) and variables related to the economy (Monte and Papagni, 2007). The previous literatures have seen the relation between corruption and some economic outcomes, such as gross domestic bruto, gross domestic bruto per capita, growth, quality of life, and unemployment (Moiseev, 2020). However, from existing studies, there are not many studies that use instruments of economic reform as determinants of corruption prevention (Kamal et al, 2018). Although, there have been several study initiatives that have tried to look at the link between corruption and economic freedom (Pieroni and D'Gostino, 2013; Saha et al., 2009; Goel and Nelson, 2005; Graeff and Mehlkop, 2003).

The literature have identified key proxy variables (such as economic reform variables) and these studies are important, such as Kamal et al. (2018), Olofsgard and Zahran (2008), and Goel and Nelson (2005). Olofsgard and Zahran (2008) use economic reform instruments and shape them into binary variables that are defined as trade openness and equity market liberalization. Goel and Nelson (Ibid.), using the corruption data although this data cannot be compared between time; as for the research of Kamal et al. (2018) using a proxy for economic reform variables in the form of an index of economic reform that has been introduced and also calculated by the Heritage Foundation.

Based on previous studies, it still seems to provide evidence that tends to be ambiguous so this has prompted some researchers to conduct a number of empirical studies involving many countries. While some previous studies have not been able to provide clear conclusions on the relationship between the two variables, not necessarily mean that the previous study failed but due to a number of reasons and assumptions from each study. Studies with this theme are still being conducted, such as, Goel and Nelson (2005) using the Corruption Perception Index (CPI). Kamal et al. (Ibid.) state that there is a change in the measurement methodology, so it's suspected a mismatch of scores that might become incompatible if the research involves a range of certain periods. So, there are still an opportunities to conduct research on this topic, namely the link between economic reforms and corruption, especially if it related to the relationship between the economic reform, as well as its success or failure to reduce the intensity of corruption.

The paper is structured as follows. The next section provides a brief overview of the literature review that discusses economic reform and corruption. Then, the section for the data and analysis techniques used to empirically demonstrate the link between economic reform and corruption. After that, the section for the empirical findings and the empirical results are discussed. The last section summarizes the key points of this study's research findings, the recommendations for the future research, limitations, and the suggestions.

1. LITERATURE REVIEW

The link between economic reform and corruption is claimed by various studies and should even have a positive relationship. This claim is believed and understood by most scholars both directly and indirectly. According to Kahn (2011), says that economic reform is expected to produce a society that is not corrupt, where this argument can be found for smaller countries. But this does not always apply, where some experts argue that "*there is a tendency for government authorities to get out of control because they are too big and progressively corrupt*".

The state generally creates an agency in the form of a working group to tackle corruption in order to promote this. It was also stressed that in different countries , economic policy reform must become one of the key pillars of anti-corruption strategies (Estache et al., 2009). The potential for failure, however, exists as economic reform goes hand in hand with corruption reduction efforts. If it is possible for economic reform policies to fail to eliminate corruption, there would be a range of explanations and arguments to justify the failure (Graeff and Mehlkop, 2003; Goel and Budak, 2006). First, as part of a certain class which profits from the reforms, the reform agenda is often promoted, because it tends to lead to higher compensation. It is also noticed that, facing crucial concerns about the viability of change, there is a change program carried out by domestic opponents with the motive of "ensuring the support" of an foreign audience. Sometimes, these domestic opponents often have a corrupted mindset and often do not have the capacity necessary. Second, the reform does not have to tackle corruption, because policies can be poorly formulated and executed (Graeff and Mehlkop, 2003; Goel and Budak, 2006; Olofsgard and Zahran, 2008; Saha et al., 2009; Pieroni and D'Agostino, 2013).

Based on the explanation above, there are still main issues, not only the concern of researchers and academics, but also several international institutions. The issue of corruption and its relation to economic reform, on the other hand, has become the main issue domain for several international institutions, including the World Bank. According to Kamal et al. (2018), the basic idea is how to make economic reform as a tool to reduce the interest of corruption for economic actors. Where this corrupt behavior often appears in every reform program that is being carried out by a country. Initially, corruption was often used as an excuse to carry out the reform agenda, and then, as an excuse when failures of the reform program that had been implemented.

Some studies seem not to have succeeded in producing findings that can be mutually agreed upon, in other words the findings produced tend to be ambiguous. Of course, this encourages research involving this issue to be more interesting especially from the empirical side by involving the experience of countries that have carried out economic reforms. One study that has been carried out has sought to pay attention to the individual side of corruption and economic reform. The research of Olofsgard and Zahran (2008) has looked at the relationship between corruption and economic reform. However, to assess this, trade openness and stock market liberalization, the study uses two distinct binary metrics. Therefore, it suggests that the different ways in which the government controls the economy have not been able to understand it and therefore may not have the ability to grasp the multidimensional essence of this phenomenon. The trade openness index has also been criticized because two components, namely the black market premium and the state monopoly on key exports, are pushing it too much. As Koyuncu et al (2010) have done with regard to the economic transition conditions that occur in a country, where the economic transition often presents the idea of privatization as a protest effort and a solution to the form of inefficiency caused by corrupt behavior. Similar studies in their development, not only use measures of perception of corruption, but also involve other measures such as the Economic Freedom Index, the Governance Index, and other relevant measures. Although, existing studies seem still not enough to be able to explain the link between economic reforms and corruption, then how the influence between them.

Some academics try to see the relationship between these two main variables by collecting data from various relevant sources. Where the proxy measurement of economic freedom often has several additional components such as the existence of labor market rules that differ in each country. But there are also researchers who refer to relatively similar data sources such as Pieroni and d'Agostino (2013),

Saha et al. (2009), Graeff and Mehlkop (2003), and Goel and Nelson (2005); in their efforts to see the link between economic reform and corruption.

From the review literature above, the authors see that there is still a gap to conduct studies related to the relationship between economic reform and corruption, with a focus on selected Asian countries, particularly countries that are simultaneously experiencing economic and political pressure. Of course, in order to prove whether economic reform will minimize corruption or vice versa, this is a question for a separate discussion. The scope of the analysis is therefore very open and wider for studies that use economic reform measures that are in line with the actual reform measures, especially they have been carried out in different countries.

2. DATA, EMPIRICAL MODEL AND PANEL DATA APPROACH

2.1 Data

The data for this paper uses annual data, where some countries involved such as Indonesia, Malaysia, Thailand until South Korea; during the 1996-2017 period. This paper model consists of the main dependent variable (corruption) as measured by the aggregate indicator 'Corruption Control obtained from World Governance Indicators published by the World Bank. This indicator represents the public perception of public authority. The value is higher, the corruption tend to lower, besides the value of this indicator can also be used to identify cross-country differences to see whether there is a tendency for changes in corruption between countries and between time.

The main independent variable is the economic reform variable (econref) which was built from IEF (Economic Freedom Index) data was published by the Heritage Foundation. This index was formed from 10 specific components of economic freedom that have four main aspects in which the government has policy power, such as rights to housing and land, effective justice, and government integrity, tax and fiscal rules, government expenditure, labor costs, business procedures, monetary instruments, trade policies, investment regulations, until financial markets. This variable built from the total value that has been calculated and provided by the Heritage Foundation, where this value has a range from 0 to 100.

In addition, this study also involves control variables consisting of growth rates of real gross domestic product per capita (grpdbkapita), government effectiveness index (goveff), dummy variables, namely representation of political freedom (dpolright) and freedom of civil society (dcivlib), and variables Human Development Index (HDI). In this study, the authors argue that if the salaries of government officials increase, there is a tendency for corruption to decrease, so that the potential revenue of the population may increases. Then, the growth rate of real GDP per capita could be reduce corruption in other words the expected magnitude from regression results are negative. Some of the data, namely the GDP data and the government effectiveness index, we got from the publication of the World Bank and Asian Development Bank website. Data on political freedom and freedom of civil society are obtained from the Freedom House website, while human development index data is obtained from the UNICEF website.

2.2 Empirical Model

The empirical model refers to the study of Kamal et al (2018). The author made a few modifications because it adjusts the availability of data and there may be other limitations in this paper. The empirical model is presented in equation (1), as follows

$$\text{corruption}_{it} = \alpha_o + \beta_1 \text{econref}_{it} + \beta_2 \text{goveff}_{it} + \beta_3 \text{dpolright}_{it} + \beta_4 \text{dcivlib}_{it} + \beta_5 \text{grpdbkapita}_{it} + \beta_6 \text{hdi}_{it} + v_{it} \quad (1)$$

From equation (1), the subscript sign i is country and t is year. The dependent variable is corruption, represents the value of the level of corruption, while econref as the main independent variable is eco-

nomic reform. Control variables involved in the empirical model, namely goveff is an indicator of government effectiveness, dpolright and dcivlib are dummy variables where dpolright will be worth one for a country that at time t belongs to the category of countries that have freedom of political rights and the dcivlib variable will be worth one when countries which at the time were included in the category of freedom of civil rights. The grpdbkapita variable defined by the real per capita growth rate variable and the hdi represents the human development index. The hdi variable can also be an indication that when the value is low, there is a tendency for political freedom and civil society rights to decrease, in other words, reduced freedom of political rights and civil society rights.

2.3 Panel Data Approach

This paper uses panel data estimation techniques, with the literature stating that the pooling is defined through the process of pooling data between time (time series) and between individuals (cross section). The resulting data is called pooled data or longitudinal data or panel data. There are many benefits of using panel data, first, panel data can capture a limited number of observations, so the researchers can obtain larger observations for the advantage of estimating population parameters, which offers the advantage of a wide degree of freedom and reduces the potential for collinearity between independent variables. Second, for variables that are not included in the model (unobserved individual heterogeneity), panel data is able to accommodate the level of heterogeneity. Third, panel data enables individual characteristics to be calculated independently, whether for intertemporal data or inter-individual data. The researcher can estimates the individual features that represent the inter-time dynamics of each independent variable by applying both. Therefore, the analysis of the estimation results would be more detailed and involve aspects that could be closer to fact (Baltagi, 2005).

Owing to the presence of some disturbances, this can create problems when conducting analysis with panel data consisting of many individuals and involving multiple time periods. There are intertemporal disturbances, inter-individual disturbances (disturbances of the cross section) and disturbances from both of them. In a model involving inter-time disturbance and inter-individual disturbance, the general form of the econometric model is as follows (Judge et.al, 1988).

$$y_{it} = \beta_{1it} + \sum_{k=2}^{k} \beta_{kit} x_{kit} + u_{it} \quad \text{i=1,..N;t=1,...,T} \qquad (2)$$

Where i represents the unit cross section, t is time, y_{it} is the dependent variable, x_{kit} is a non-stochastic explanatory variable, and u_{it} is a disturbance term for each individual i and time t. The stochastic form u_{it} is assumed to have a mean of zero, $E[u_{it}] = 0$, and a constant variance of $E[{u_{it}}^2] = {\sigma_{it}}^2$. Thus, the analysis of panel data seeks to accommodate the variations (heterogeneity) that arise as a consequence of each individual or the time difference. Researchers may use models that have different intercepts to reflect a condition of heterogeneity between individuals and over time. It assumes that the different intercept values derive from the influence of variables since they are not included in the regression equation's explanatory variables (it's defined as the omitted variable). The omitted variable is expressed in the equation above in the form of a disturbance term.

In panel data analysis, the concept of disturbance can be divided into two categories: first, the regression model with a component of one-way disturbance (The One-Way Error Component Regression Model), with a structure of disturbance forming (u_{it}), $u_{it} = \mu_i + v_{it}$. Where μ_i is an individual effect that is not included in the study item, v_{it} represents the disturbance residue that has no association with the independent variable (x_{it}). The error term μ_i varies between individuals but it's constant over time (time invariant). Thus, μ_i reflects the discrepancy between individuals but it's not used as the independent variable in the regression estimation. While v_{it} is a disturbance that varies between individuals or between times in the regression outcomes.

Second, the regression model with a component of two-way disturbance (The Two-Way Error Component Regression Model), with a structure of disturbance forming (u_{it}), $u_{it} = \mu_i + \lambda_i + v_{it}$. Where μ_i represents the individual effect which is not included in the study item, it varies between individuals and constant over time. Then, λ_i is the unexplored time effect and v_{it} represents the residual effect of the disturbance that has no relationship with the independent variable (x_{it}). Therefore, λ_i does not vary be-

tween individuals (individual invariant) and takes into account the time effect not included in the regression.

This paper uses a static panel data approach with a general model as described in the previous paragraph. In this paper, the static panel data method is chosen because it does not have the lag of the dependent variable, where in the empirical model these variables are typically explanatory variables. In addition, the selection of the panel data model has three fundamental assumptions, first, individual time-invariant, the model with omitted variables that are different between cross-section units but constant over time, such as gender. Second, the individual-invariant period, the model between the observed periods with various omitted variables but does not see the difference between each unit cross-section, such as the interest rate. Third, the model with an omitted variable that varies between units of the cross section and time, for example the amount of sales (Wooldridge, 2013).

There are two hypotheses about the individual effect that will be confirmed, first, the random effect model, where u_{it} is not associated with x_{it}. Second, the model of the fixed effect, where u_{it} relates to x_{it}. In other words, the relevant difference between the two models does not lie in the fixed effect or not, but the basis of the difference between the two models emphasize to whether or not the effect is associated with the explanatory variable. Further details will be explained later.

Random Effect (Error Component Model). This model is applied when the unit cross section tends appears to have more population since it has many parameters, which would decrease the degrees of freedom when all parameters are used in the empirical estimation. However, this can be solved by assuming randomly on the individual effect (μ_i) and time effect (λ_i) were not studied. These two effects in this model have no relationship with v it, and all components of the disturbance term (μ_i, λ_i, v_{it}) have no relationship with the independent variable. This model is usually estimated using the Generalized Least Square (GLS) technique. Moreover, this model is also called the Estimation of Variance Variable Models in some literature. The model has the same slope but different intercept both between individuals and time and it has the same mean of each intercept.

Fixed Effect Model. This model is also called the Least Squares Dummy Variable (LSDV). To explain the impact of omitted variables that have a particular relationship with the individual effect, this model uses dummy variables. This model have a fixed time effect (time-invariant), and the fixed individual effects (individual-invariant) are possible. The individual effect (μ_i) or time effect (λ_i) is considered to be a fixed parameter in the fixed effects model, while v it has no relationship with the independent variable. The fixed effect model estimator may have a BLUE estimator during the disturbance satisfies the standard classical regression assumptions. The literature notes that if it's presumed that u_{it} is associated with independent variables, the best and unbiased estimation results will be obtained by estimating with a fixed effects model. While it's evaluated using a model of random effects, the outcomes of the estimation would be biased. Therefore, to support the use of fixed-effect models, the Hausman test can applied.

The Hausman test is intended to demonstrate that the covariance differential of the effective and inefficient estimators are exist or not. The test would be asymptotically distributed as X^2 at a certain degree of freedom, with the null hypothesis indicating that the estimator of random effects is correct. If the value of H is greater than X^2, then Ho is rejected so that the model of fixed effects is selected, i.e. the model of fixed effects is more suitable.

3. RESULTS AND DISCUSSION

This paper will start with descriptive statistics for each variable, presented in Table 1. Corruption variable as the dependent variable has a negative value compared to other variables. If this value tends to be low, it shows that the authority of the public has not been optimally fulfilled, in other words the higher the behavior of corruption in a country. The economic reform variable indicated by the econref variable, the higher the value indicates the better the economic reforms that have been carried out by a country.

Table 1. Descriptive Statistics

Variable	*Mean*	*Std. Dev.*	*Min*	*Max*
corruption	-0.092	0.502	-1.176	0.624
econref	64.213	5.823	51.900	74.300
goveff	0.497	0.576	-0.705	1.267
dpolright	0.579	0.497	0.000	1.000
dcivlib	0.461	0.502	0.000	1.000
grpdbkapita	3.059	3.613	-14.347	8.017
hdi	0.742	0.087	0.577	0.903

From the variation for all variables involved in the model, there are four variables that have a lower mean value than the value of the variation, the four variables are government effectiveness (goveff), dummy variables for political freedom (dpolright), dummy variables for civil freedom (dcivlib), and growth in gross domestic product per capita (grpdbkapita). The higher variation of these four variables can be caused because there is a value in one country better than the other. In addition, the variable that gets a negative value as a result of the poor achievement of the country concerned with the aspect being assessed. For the growth in GDP per capita variable, the higher of the growth in GDP per capita shows an increase in people's income in a country, this condition is expected to reduce the corrupt behavior of each economic agent involved. The human development index variable (HDI) shows good achievements because there are efforts to increase the achievement of HDI indicators by each country.

Based on Table 2, the appropriate panel data method approach in this study is the fixed effect model. The test procedure related to collecting the least squares model and the fixed effects model, shown by the Redundant Test, concludes that rejecting the null hypothesis or not rejecting the alternative hypothesis, in other words the chosen model is the fixed effect model. Furthermore, the Hausman test provides conclusions that reject Ho or do not reject alternative hypotheses, in other words the model chosen has a fixed effect model. The authors also present the empirical findings for each model in this section by using numerous control variables, the purpose of which is to see consistency and robustness between the main variables in this study.

Tabel 2. The Regression Results

Dependent / *Corruption*	*Pooled*			*Fixed*			*Random*		
Independent	*Coef.*	*St.Error*	*Sign*	*Coef.*	*St.Error*	*Sign*	*Coef.*	*St.Error*	*Sign*
econref	0.019	0.007	***	0.011	0.006	*	0.019	0.005	***
goveff	0.662	0.073	***	0.376	0.142	***	0.662	0.070	***
dpolright	0.125	0.067	*	0.115	0.089		0.125	0.074	*
dcivlib	0.040	0.061		0.024	0.068		0.040	0.070	
drpdbkapita	-0.002	0.009		0.002	0.005		-0.002	0.005	
ddi	0.241	0.524		-0.273	0.706		0.241	0.465	
cons.	-1.894	0.369	*	-0.883	0.539	*	-1.894	0.353	***
Num of Obs	76			76			76		
F – Stat	153.320			3.860			664.290		
Prob F - Stat	0.000			0.002			0.000		
R – Squared	0.906			0.895			0.906		
Redundant Test : F-test (6.50); Prob (0.000)				Hausman Test : Chi-sq (34.93); Prob. (0.000)					
Notes: ***p<0.01; **p<0.05; *p<0.10									

Regression results on empirical models provide findings that economic reforms have a positive sign and have a significant effect on corruption. This does not only occur in the common model (the pooled model), but also in the fixed effects model and the random effects model. The findings of this paper support the argument built by several literatures where economic development should reduce corruption, this argument is based on an increase in wages making rent seeking costs higher, this causes the desire to behave in corruption tends to be reduced (Dzumashev, 2014). On the other hand, this empirical finding supports the opinion that there is a link between democracy and economic reforms that can increase the level of democratization of a country to strengthen economic reform efforts so that this causes corruption to be reduced (Kamal et al, 2018).

The findings of this paper do not support supporting mainstream claims, because economic reforms should be able to encourage people and state entities not to commit corruption, even though this argument only applies to a small extent. From the results of empirical testing, the countries involved include large countries and most have a diversity of both ethnicity, culture, ethnicity, language, and religion (Serra, 2006). Of course, this argument becomes irrelevant, as conveyed by Khan (2011) argues that economic reforms encourage the emergence of the division of government authority, in this case the division of authority of the central and regional governments, where the division of authority has the potential to become more and more so it tends to become uncontrolled for longer will enlarge so that it has the potential to cause corruption.

Here, there are other opinions related to diversity as mentioned above, Easterly and Levine (1997) state that diversity has the potential and tendency for interest group polarization because there are indications of the behavior of each group to seek profits through a "kick back" resulting in a tendency to decrease the quality of the supply of goods public as a consequence of inter-group agreement, as a result the achievement of long-term high growth and maintained becomes difficult to achieve. In other words, we can state that there is potential for increased corruption as a result of the emergence of diversity because it is not easy to control the interests of groups that tend to be different and heterogeneous.

Table 3. The Regression Result for Pooled Model

Dependent	*Pooled Model*								
Corruption	*Model 1*			*Model 2*			*Model 3*		
Independent	*Coef.*	*Std.Err*	*Sign*	*Coef.*	*Std.Err*	*Sign*	*Coef.*	*Std.Err*	*Sign*
econref	0.067	0.006	***	0.020	0.005	***	0.030	0.007	***
goveff				0.685	0.046	***			
dpolright				0.134	0.070	*			
dcivlib				0.040	0.069				
grpdbkapita							0.005	0.008	
hdi							3.433	0.472	***
cons.	-4.369	0.411	***	-1.817	0.280	***	-4.578	0.315	***
Num of Obs	76			76			76		
F - Stat	108.980			169.870			83.470		
Prob F - Stat	0.000			0.000			0.000		
R - Squared	0.596			0.905			0.777		
Notes: ***p<0.01; **p<0.05; *p<0.10									

The control variable provides consistent findings in terms of the direction of their relationship to corruption based on the pooled model (Table 3), fixed effect model (Table 4), and random effect model (Table 5). These variables are the index of government efficiency, the political freedom dummy, and the civil freedom dummy. Both of these variables support the hypothesis of the effectiveness of government and the increasing authority of the community to be able to use political rights and the rights of civil society to

become important policy instruments in fighting corruption (La Porta et al., 1999). The government efficiency index as a representation of each effective strategy for the active role of the public sector can reduce the opportunity for corruption by limiting the authority of discretion by the government as the power of policy (Best and Burke, 2017). Some several policies often succeeded in inhibiting the potential for corruption such as limiting the authority of foreign trade activities, reducing to eliminate potential barriers to entry for industry players, and privatizing companies owned by the state so as to create competition. In addition, the government's desire to reduce intervention and limit the role of both direct and indirect can also be done by making regulations that support and play an active role to reduce the opportunity for renters to emerge (Estache et al, 2009; Kamal et al, 2018). It was supported by Emerson (2006), who tries to see the relationship between corruption and competition. The findings show a negative relationship between the two variables, where the higher the corruption, the lower the competition.

Table 4. The Regression Result for Fixed Effect Model

Dependent	*Fixed Effect Model*								
Corruption	*Model 1*			*Model 2*			*Model 3*		
Independent	*Coef.*	*Std.Err*	*Sign*	*Coef.*	*Std.Err*	*Sign*	*Coef.*	*Std.Err*	*Sign*
econref	0.004	0.006		0.010	0.006	*	0.005	0.006	
goveff				0.343	0.099	**			
dpolright				0.130	0.082				
dcivlib				0.025	0.067				
grpdbkapita							0.006	0.005	
hdi							0.520	0.542	
cons.	-0.330	0.399		-1.817	0.280	***	-0.827	0.559	
Num of Obs	76			76			76		
F - Stat	0.360			5.900			1.020		
Prob F - Stat	0.553			0.000			0.389		
R - Squared	0.596			0.889			0.727		
Notes: ***p<0.01; **p<0.05; *p<0.10									

Table 5. The Regression Result for Random Effect Model

Dependent	*Random Effect Model*								
Corruption	*Model 1*			*Model 2*			*Model 3*		
Independent	*Coef.*	*Std.Err*	*Sign*	*Coef.*	*Std.Err*	*Sign*	*Coef.*	*Std.Err*	*Sign*
econref	0.009	0.006		0.020	0.005	***	0.030	0.007	***
goveff				0.685	0.046	***			
dpolright				0.134	0.070	*			
dcivlib				0.040	0.069				
grpdbkapita							0.005	0.008	
hdi							3.433	0.472	***
cons.	-0.673	0.433		-1.817	0.280	***	-4.578	0.315	***
Num of Obs	76			76			76		
F - Stat	1.970			679.470			250.400		
Prob F - Stat	0.160			0.000			0.000		
R - Squared	0.956			0.905			0.777		
Notes: ***p<0.01; **p<0.05; *p<0.10									

The human development index variable which is negative in the fixed model cannot be separated from the characteristics of the countries that are the object of study, especially Indonesia and Malaysia as well as Thailand and South Korea, where the first two countries have high diversity in terms of culture, language and ethnicity (Haggard, 2000). Of course, this sets a precedent for policy holders that diversity has the potential for corruption when government authorities do not have enough power to control and regulate the interests of existing groups.

Next, based on arguments built from previous empirical studies, the findings of this study provide evidence that the more mature level of democracy in a country tends to reduce opportunities for corruption, although the maturity of democracy requires time because it is not easy for a country undergoing a democratic transition to carry out economic reforms at the same time. But this condition can also occur in certain countries, such as when the country has already established its democracy (De Haan and Sturm, 2003). In addition, some previous studies also argued that economic liberalization in the initial period of economic reform has the potential to increase corruption, because of a democratic tradition that is better and more stable it will take time to see the effectiveness of democracy will have an impact on reducing corruption (Fisman and Gatti, 2002).

CONCLUSION

The paper findings give the result that the need for government effectiveness such as improving the performance of government services, policy making, firmness in implementing regulations, and the trust of the community. In addition, there is a serious commitment from the government to provide good public services, a commitment to tackle corruption, and guarantee corruption reduction. Second, improving democratic practices, such as political freedom and civil rights so as to ensure an increase in public rights so that they can become instruments to fight corruption.

Finally, the economic reforms are expected to be able to have a significant influence and to have an impact reducing corruption, so it needs the full support of the community and stakeholders. Overall, success in reducing corruption requires multidimensional channels such as the involvement of social, cultural, religious, institutional and legal aspects; not only economic aspects. The future studies need to recognize it, in this paper, some of these have become the limitations. Last, another crucial thing such as the efforts of each country's government and those in power to enforce good governance can be regularly practiced so that it becomes a driving force to eradicate corruption.

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Business Risk Management in Times of Crises and Pandemics

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ABSTRACT

The purpose of the article is to identify approaches and tools for business risk management in times of crises and pandemics for 3 risk groups. The goal was achieved through the following methods: content analysis (for summarizing the views on business risk management, grouping the main types of risks into three groups, which allowed to develop models and management systems), inductive reasoning (for the formation of subgroups of business risk, systematization of the slogans of companies), expert survey (for identifying trends in the development of corporate culture as a tool for managing business risks). The formation of competitive systems requires effective mechanisms for managing business risks, especially in periods of crises and pandemics, which in modern conditions have become more frequent and deepened. The authors suggested that crises and pandemics trigger a mechanism of negative expectations, which further worsens the business and narrows its competitive advantages. Choosing the right model of behaviour allows businesses to make profits due to the expansion of the market niche, the exit of competitors from the market, increasing demand for goods and services due to limited market supply. The authors proposed to divide all business risks into three groups (internal, strategic, external) with a division into 12 subgroups according to the criteria of developing systems and management models. The results of the study show that a corporate culture is a key tool in managing internal business risks, improving the management system is a tool to minimize strategic risks, but business can only mitigate external risks

INTRODUCTION

Global development lays the foundations for business competitiveness. The world system is characterized by a significant strengthening of the positions of Asian countries. Thus, China is a contender for global influence in the political dimension, and in financial and economic terms, China, Japan and South Korea are powerful global players (Samofalov, 2013). The ASEAN community can also claim some weight in the world, as it is surrounded by a large number of associations and forums, both of a purely Asian nature and with the involvement of the United States, Australia and New Zealand (Shergin, 2010). However, relations between East and Southeast Asia are characterized by conflicts, the implementation of which destabilizes the economic, environmental, social components of development of both the region and the world. Therefore, in terms of security, East Asia is to some extent a source of political, economic and socio-environmental instability. Besides, most of the world's pandemics began in Asian countries. In particular, several pandemics spread from China, namely the Black Death (1340–1350), the Asian Flu (1957–1958), the Hong Kong Flu (1968–1970), the SARS epidemic (2002–2003), and Bird Flu (2003–2005), the COVID-19 (2020), as well as cholera (1817–1923, 1961) from India and Indonesia. It should be noted that some pandemics have caused crises in the world economy. In particular, the Asian flu was accompanied by the crisis in the United States, the Netherlands, Great Britain, Canada, Belgium and other countries in 1957-1958. This crisis became the world's first economic crisis since the end of World War II. There was also an epidemic of cholera during 11 crises in the periods of 1825, 1836-1838, 1847, 1857, 1873, 1882, 1890-1893, 1900-1903, 1907, 1914, 1920–1921. However, during the Hong Kong flu, the SARS epidemic, and Bird Flu, global crises were not observed. As business risks arose during crises and pandemics, risk management is a priority for business and government in forming public-private partnerships for sustainable development.

1. LITERATURE REVIEW

Understanding the nature and types of business risks, setting up the process of identifying risks and managing risks help managers make more conscious and well-informed decisions. R. Kaplan and A. Mikes (2012) proposed a new risk categorization that allows managers to determine which risks can be managed using a rule-based model and which require alternative approaches. Risks that can be managed using a rule-based model include preventable (internal) risks (risks of unauthorized, illegal, unethical, incorrect or inappropriate actions of employees and managers, as well as operational risks). Risks that can be managed through management systems include strategic risks that are desirable for the business, as companies consciously agree to the presence of these risks to achieve the strategy. External risks cannot be managed by businesses because they are outside the company's sphere of influence. The sources of these risks are natural and political disasters, macroeconomic shifts. The main thing here is to identify risks in time and mitigate them. Scientists have paid considerable attention to identifying and preparing companies for unforeseen risks that arise externally for their strategy and activities.

S. Kot and P. Dragon (2015) proposed an analysis of business risk management models in international energy companies. The authors identified that the main risks are strategic, operational and financial, which allowed proposing a hypothesis about the effectiveness of risk through a three-level assessment: level (the risk strategy has not been defined and implemented), improvable (the risk management strategy is defined but not fully implemented) та hight (defined strategy, measures adapted). The article Top Risks Facing Businesses (Cbiz, 2017) states that the main risks faced by companies are cyberattacks, rapid technological change, talent management, the Trump administration, a proactive approach as a basis for success. V. Lopatovsky (2006) revealed the expediency of applying control to increase the effectiveness of the risk management system and the use of clusters in the fight against external risks. I. Fadyeyeva and O. Gryniuk (2017) formed a cascading fuzzy model with Mamdani-type assessment and prediction of the probability of risks of operating activities of enterprises.

K. Kozhukhina and K. Costin (2019) proved the impact of emergence and entropy of entrepreneurial risks, proposed a system of principles for building risk management, identified stages of business risk management, including identification, profiling, evaluation and definition of risk minimization methods.

According to scientists, the methods of risk reduction are compensation, methods of risk aversion, risk transfer, distribution, localization. Also, ranked risks were divided into high (negatively affect the brand, which can stop the business), medium (some services are not provided, which can create a negative image in the media), insignificant (additional work for employees, which can cause gossip). S. Kaplan and A. Mikes (2012) noted that communication skills, mathematical models, experience are important in risk management, besides, the experience of risk management in Koch Industries is useful, where the working group includes engineers, accountants, financial specialists and other specialists. The authors proved that the financial sector has the best model of risk management, which is associated with the development of innovations in financial engineering, transport development, telecommunications and computing, motivation in production to grow sales, market share and stock prices. Risks have become the rule, not the exception, because of the scale of the world's crises. Accordingly, the main element in risk management is rationalization, the belief that a particular behavior is economically and morally justified.

Business risk ultimately translates into a threat to financial security. Also, financial risk and business risk are important determinants of firm value. An approach to assessing the change in business risk is associated with different industries and sizes of companies. V. Trynchuk et al. (2019) identified the features of socialization of the organization of sustainable development based on the principles of corporate social responsibility, which is a tool to minimize the negative consequences of external business risks. O. Polinkevych and R. Kamiński (2018) outlined the impact of corporate image on behavioral marketing, noted the peculiarities of the formation of marketing risks and the feasibility of maintaining a corporate image to minimize these risks.

2. HYPOTHESES

Managers sometimes overestimate the ability to influence a variety of events and phenomena. The main hypothesis of the study is the assumption that crises and pandemics trigger a mechanism of negative expectations, which further worsens the business and narrows its competitive advantages. Accordingly, there is a synergistic effect of increasing the impact of all types of risk on business. Choosing the right model of behaviour allows businesses to make profits due to the expansion of the market niche, the exit of competitors from the market, increasing demand for goods and services due to limited market supply.

3. METHODOLOGY AND DATA

The hypothesis was confirmed using several methods, namely content analysis (for summarizing the views of the scientists on business risk management, grouping the main types of risks into three groups, which allowed to develop models and management systems), inductive reasoning (for the formation of subgroups of business risk within the main groups, systematization of the mottos of companies), expert survey (for identifying trends in the development of corporate culture as a tool for managing business risks). In general, entrepreneurial risk means the dependence of business on factors that reduce profitability and lead to bankruptcy, as well as do not contribute to the achievement of socio-environmental and economic goals.

Business risk management is the ability to make non-standard decisions in conditions of uncertainty, which are common sense doomed to failure, but in contrast, due to psychological expectations, provide a high level of income or create conditions for development and implementation of strategic goals, improve corporate culture, security and the state of the environment. The Top 50 Business Risks (2019) provides an exhaustive list of business risks, including 50 risks with management measures. Analysis of examples of risks allowed to divide all business risks into three groups (internal, strategic, external) with a division into 12 subgroups according to the criteria of developing systems and management models (table 1).

Table 1. Groups and subgroups of business risks and features of risk management in times of crises and pandemics

Types of risks	*Risk management*	*Examples of risks according to the top 50 business risks*
	Internal risks	
Operational risks	Insurance, compliance with technical and technological norms and standards, development of early warning and response system, market pricing monitoring, inventory management, flexible work schedule, concluding contracts with emergency services, spare parts formation, improving human management, investing in infrastructure, investing in training managers	Risk of assess loss, Risk of displaying the incorrect cost of components, Lack of office space, Machinery failure, Risk to day-to-day operations, Poor management, Technology risks, Technology breakdown
Risks of monetary and financial losses	Use of credit checks, credit limits, collector services, improvement of cash flow management, inventory, software change, careful use of long-term and short-term financing, an increase of sales quotas, reduction of expenses, establishment of various forecast options (probability of fulfilment 30%, 50%, 70 %), monthly forecast updates, outsourcing, contracting, use of Amazon warehousing system	Bad debt Low cashflow Loss of profit Revenue forecast missed Under-resourcing
Marketing and sales risks	Use of Google Analytics, strengthening of creative entertaining content, product re-profiling, assortment changes, marketing research, diversification, security system, process automation, integration of innovations into business	Brand fatigue, Difficult-to-sell product, Supply chain failure/delays, Theft of product, Time-to-market, Transportation delay or damage
Customer risks	Strengthening business reputation, using the services of business analysts, diversification, reviewing approaches to working with clients, updating the customer base, forming a philosophy of customer value, investing in employees, product quality control, tracking the mood of stakeholders	Bankruptcy of suppliers or clients Client attrition Low customer satisfaction Loss of reputation
Risk of loss of health and safety of employees	Development of safety policy in the field of health, staff training, provision of personal protective equipment, outsourcing, process automation, health insurance	Health and safety of employees, Lack of skills/expertise, Loss of key skills, Staff sickness/absence
	Strategic risks	
Risk of ineffective business strategy	Setting clear goals and objectives, regular review of strategy	Poor or becoming a less effective business strategy
The risk of the inconsistency of goals and objectives of the market situation	Investment risk models, Monte Carlo modelling, sensitivity analysis and risk scenarios, investing in beta testing, shadow-test, investing in consultants, risk assessment	Market changes, Market acceptance, Opportunities and limitations of new markets, Regulatory compliance
	External risks	
Competitive risks	Collection of information and risk assessment, development of defence strategy, cooperation with research and consulting firms, monitoring of social networks, the involvement of outsourcing consultants, insurance against court costs, the introduction of a full-time lawyer or concluding contracts with a law firm for service, implementation of initiatives, choice of priorities, review of decisions, an adaptation of services and products to seasonal changes	Competition: aggressive marketing Competition: better intelligence Competition: legal action Recession Seasonal risk Unexpected demand
Political and legal risks	Staff training and refresher courses, legal advice, quality and safety inspections, registration of copyrights, patents, use of stock images and footage, decentralization of foreign investment, insurance of political risks	Compliance with regulations, Copyright / Patent theft, Loss of political support, Political instability, War, military conflicts
Socio-environmental risks	Ensuring safe temperatures, access to water, support with travel and accommodation for workers, insurance of buildings against accidents, back up generators and autonomous stations, reduction of dependence on utility	Environment (natural or business environment), Failure of utilities e.g. water, electricity, Natural disaster
Information and security risks	Network and data encryption, security audit, efficient data access policy, training of employees in security methods, verification of biographical data, monitoring employee activity	Data security Espionage (commercial)
Currency risks	Exchange operations, Fix rate via a forward exchange contract, currency risk insurance, use of a Forex structured product	Exchange rates e.g. forex

Source: compiled by the authors in accordance with (Stakeholdermap, 2019)

Thus, the authors divided 50 business risks into three groups and 12 subgroups according to the methodology of R. Kaplan and A. Mikes (2012). In particular, internal risks include operational risks, risk of monetary and financial losses, marketing and sales risks, customer risks, risk of loss of health and safety of employees. Active prevention is the best method of managing this group of risks through monitoring of operational processes, adjusting the behaviour of employees in accordance with the rules. Moreover, the main tool should be a strong corporate culture as an effective means of controlling actions. Companies whose corporate culture is aimed at an aggressive competition, carry out riskier activities, suffering greater losses. So, the corporate culture encourages ethical behaviour in business that helps address risky situations. The application of the K. Cameron and R. Quinn (2011) methodology helped to identify the type of corporate culture in Ukraine.

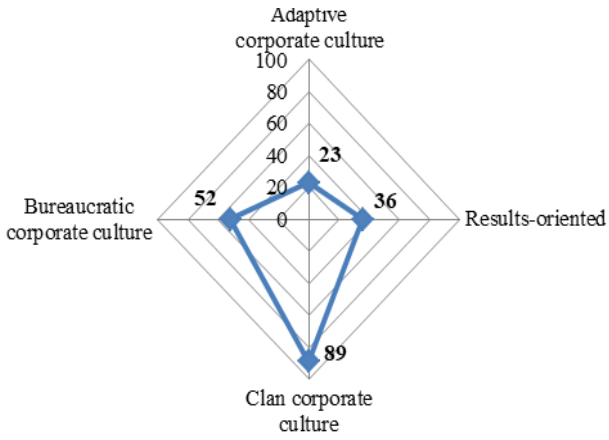

Figure 1. Types of the corporate culture at enterprises in Ukraine in conditions of crises and pandemics

Source: Prepared by authors

The authors conducted a survey of 200 respondents in May-June 2020, including 95 men and 105 women (25% of management staff and 75% of working staff). Respondents were asked about the most important characteristics of the organization, leadership style in the organization, the model of employee management, availability and awareness of strategic goals, criteria for business success, the unifying essence of the organization. Most respondents noted that Ukraine has a clan-based corporate culture that characterizes family-type organizations through such characteristics as commitment, a sense of community, organization of teamwork, corporate obligations to employees, and the perception of consumers and suppliers as partners (Figure 1).

Corporate culture should begin with the formation of the slogan. In particular, T. Deal and A. Kennedy (2000) identified the following slogans: table 2. Scientists have developed profiles for almost eighty organizations (both "profitable" and "non-profit"). As a result, the researchers found that only 30% of the sample companies had clearly articulated missions and values; only 2/3 of this 30% of enterprises unambiguously focused on qualitative indicators, others were dominated by financial goals with quantitative indicators.

Table 2. Examples of the slogans of selected companies

Company	*Slogan*	*Sales volume, number of employees*
IBM	IBM Means Service.	$ 79.59 billion (2018), 355 thousand people (2006)
Nike	Feel the spirit of competition, victory and defeat competitors.	$ 20.86 billion (2011), 38 thousand people (2011)
Walt Disney Company	Making People Happy.	$ 59.434 billion (2018), 201 thousand people (2018)
General Electric	Progress is our Most Important Product.	$ 150.21 billion (2013), 323 thousand people (2008)
DuPont	Give the world the best with innovations for prosperity.	$ 32.733 billion (2010),

		70 thousand people (2012)
Hewlett-Packard	Make a technical contribution to the development and well-being of society.	$ 111.454 billion (2014), 302 thousand people (2015)
3M	Solving problems that have no solutions is innovation.	$ 32.8 million (2018), 94 thousand people (2018)
Roshen Confectionery Corp.	The main goal is our clients. To remain a leader, a company needs not only to move forward but also to set the pace for the entire industry. The main principles of activity are quality and innovation.	$ 800 million (2019), 10 thousand people (2019)
Modern Expo	We implement the client's vision: from a small idea of new equipment to a turnkey innovative project through rapid changes, innovations that transform the customer experience and an atmosphere of trust and involvement.	$ 585.9 million (2016), 2.5 thousand people (2016)
Naftogaz Group	To become the driving force for modernization and professionalism in the Ukrainian energy sector integrated with the European market, ensuring the security of energy supplies at competitive prices while maximizing the value of national resources	$ 7533.08 million (2018), 75 thousand people (2018)
ATB market	To provide the population of Ukraine with quality food and non-food essentials at minimum prices. Guarantee the quality of goods through the use of highly efficient technologies and ethical conduct of retail business.	$ 113 million (2018), 55 thousand people (2018)

Source: compiled by the authors in accordance with (Vinnichuk and Golovnyov, 2019)

The results of the study show that both Ukrainian and foreign companies have their slogans that correspond to a high level of corporate culture. However, sales volumes and the number of employees in Ukrainian companies are much lower than in global ones. The most important cha-racteristics of the organization and leadership styles inherent in Ukrainian business were determi-ned using the method of D. Goleman, R. Boyatzis and A. McKee (2004). Among the most important characteristics of the organization, respondents identified safe working conditions, which is especially important in ti-mes of growing epidemics and crises (Figure 2). The development of corporate culture is facilita-ted by the sociable and democratic leadership styles that received the greatest support from res-pondents. The results of the survey show that 75 respondents believe that the unifying essen-ce of the organization is a smooth approach to change, 61 respondents say that the desire to win the market is an important strategic goal, 75 respondents believe that the socio-psychological component is the main criterion for success (Figure 2-4). Thus, Ukrainian companies have formed an understanding of the importance of a strong corporate culture that can overcome business risks.

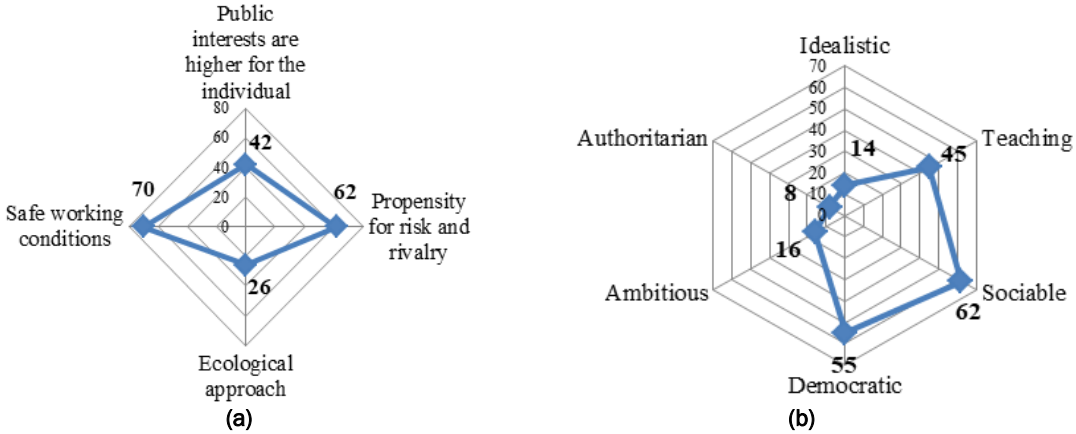

Figure 2. The most important characteristics of the organization (a) and leadership styles inherent in Ukrainian business (b)

Source: Prepared by authors

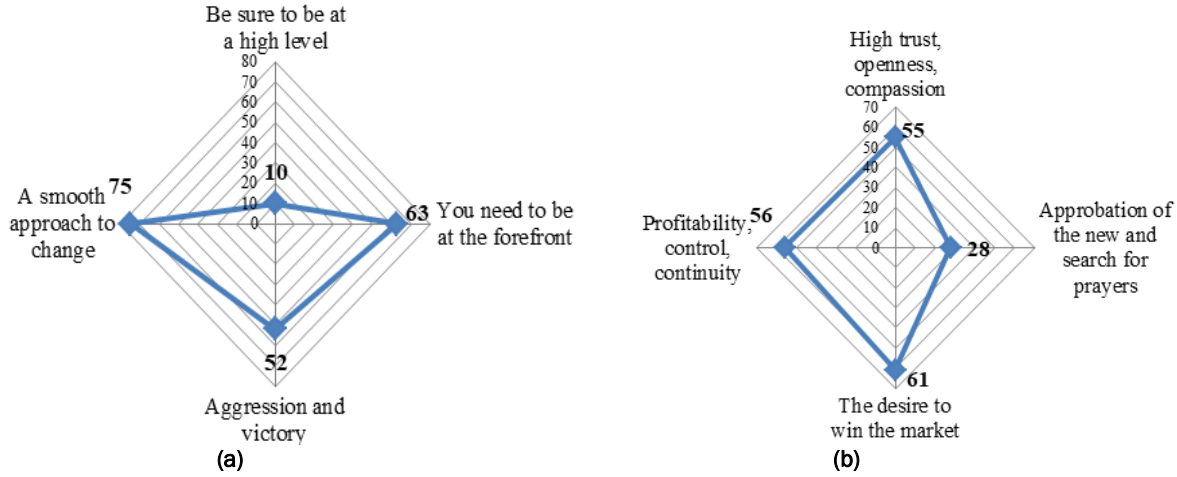

Figure 3. The unifying essence of the organization (a) and strategic goals (b) of business in Ukraine in times of crises and pandemics

Source: Prepared by authors

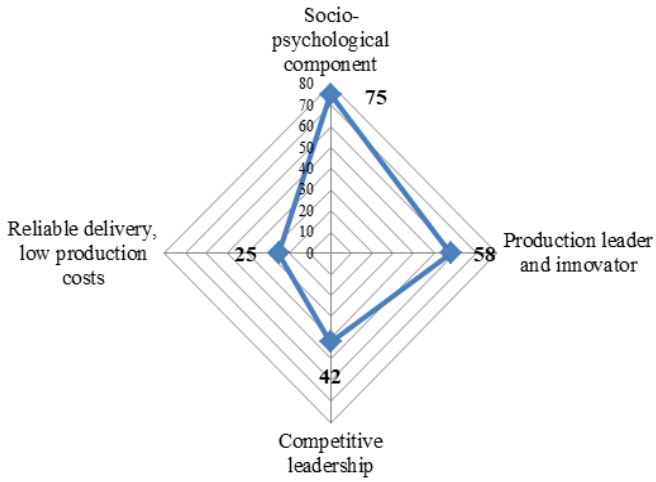

Figure 4. Criteria for business success in Ukraine in times of crises and pandemics

Source: Prepared by authors

It should be noted that strategic risks (the risk of ineffective business strategy, the risk of the inconsistency of goals and objectives of the market situation) can not be managed using a rule-based model. Strategic risk management should use a risk management system that promotes reasonable risk, which will allow you to discuss risk scenarios and make decisions to overcome them. Moreover, the risk is a tool that contributes to the achievement of strategic goals and ensu-res the development of the company, which in the future may bring the company extra profits. The main stages of managing strategic business risks during pandemics and crises are modelling and identification of risks, their analysis and assessment, selection of management tools, creation and implementation of risk minimization strategy, monitoring of strategic risk minimization processes. External risks, which are always present in the business process, are divided into competitive, poli-tical and legal, socio-environmental, information security and currency risks. Because they cannot be prevented, they should be mitigated by insuring risks, involving stakeholders to neutralize risks. External risks need to be assessed, the business impact identified, and mitigation measures deve-loped. At the same time, external risks change depending on the situation in the world. Thus, in 2019, The Economist experts named the main business risks, among which are (RBC, 2019):

– sharp fluctuations in oil prices due to supply shortages;

- the beginning of hostilities on the affiliation of the islands in the South China Sea - Spratly archipelago (claims China, Vietnam, Taiwan, Malaysia, Philippines, Brunei), Paracel Islands (claims China, Taiwan, Vietnam), Scarborough reef (claims China, Taiwan, Philippines);
- harming a large segment of the Internet through cyberattacks;
- the beginning of hostilities on the Korean Peninsula;
- withdrawal of the UK from the European Union without a withdrawal agreement (no-deal Brexit);
- the beginning of the banking crisis in Italy due to political and financial instability in the country.

Analysts at Bloomberg (Vedomosti, 2019) named among the risks world wars (between the US and China), Brexit and fluctuations in oil prices, the situation in Italy. The list of proposed risks should be expanded by the risk of pandemics. In Ukraine, external business risks will increase in 2020 due to the forecast of GDP decline in 2020 by 4.4% (according to the IMF forecast by 7.7%), inflation growth to 7.1% (according to the IMF forecast to 4.5%), raising the dollar exchange rate to UAH 30 (LB, 2019). Dynamics of Ukraine's international ratings confirm the growth of external business risks (Table 3).

Table 3. Ukraine in the global world rankings in 2014–2019, position in the ranking

Year	*Doing Business*	*Global Innovation Index*	*The Global Competitiveness Index*	*Intra-structure Index*	*The Index of Economic Freedom*	*Global Peace Index*	*Bloomberg's Misery Index*	*World Happiness Rating*	*Human Development Index*	*Global Firepower Index*
2014	112	63	76	68	155	141	4	87	81	20
2015	96	64	79	69	162	150	5	111	84	25
2016	83	56	85	75	162	156	6	123	88	30
2017	80	50	81	78	166	154	5	132	90	30
2018	76	43	83	57	150	152	7	138	88	29
2019	71	47	85	57	147	150	9	133	88	27
+/-	-41	-16	9	-11	-8	9	5	46	7	7

Surce: according to the (Globalfirepower, 2020), (Vedomosti, 2019), (UNDP, 2019), (UEFF, 2020), (Slovoidilo, 2019).

In particular, the Doing Business rating is made by the World Bank and is an important factor for investors when deciding to invest in the country's economy. It dropped to 41st place for Ukraine, which is a negative trend, as it indicates a decrease in investment by investors in Ukraine's economy. The Global Innovation Index has a similar trend, in which Ukraine has lost 16 positions. This rating analyzes 80 indicators to assess innovative development, including the level of education, the political situation, the level of infrastructure development. In the Infrastructure Index of the World Economic Forum, Ukraine lost 11 positions, in the index of economic freedom 8 positions. The Index of Economic Freedom takes into account 12 freedoms - from property rights to financial freedom. Ukraine is in the group of countries with the mostly unfree economy (the fourth category in the gradation of groups). In addition to countries with mostly unfree economies, there are countries with free economies, mostly free economies, moderately free economies and repressed economies. Ukraine's position is weakening according to the Global Peace Index, in which Ukraine is among the last ten countries, moving from 141st place in 2014 to 150th in 2019. This index is compiled by the Institute of Economics and Peace, the evaluation criteria are respected for human rights, war, terrorism, police violence, arms exports.

The World Economic Forum's Global Competitiveness Index assesses 12 indicators, including the state of infrastructure, the labour market, the level of education, macroeconomic stability, and the ability to innovate. Ukraine strengthened its position on the competitiveness index by 9 places in 2019 against 2014. The Armed Forces of Ukraine in the ranking of the strongest armies in the world according to Global Firepower Index. Ukraine strengthened its position by 7 places.

The ranking of the most miserable economies in the world (Bloomberg's Misery Index) takes into account inflation and unemployment forecasts for 66 countries. Ukraine is among the ten most miserable countries. The positive dynamics is the movement of Ukraine from 4th position in 2014 to 9th position in 2019. However, according to the World Happiness Rating, Ukraine worsened its position and moved from 87th place in 2014 to 133rd place in 2019. In particular, Ukrainians are dissatisfied with the level of social support in the country and the level of GDP per capita. According to the Human Development Index, Ukraine ranks 81-88 in 2014-2019. This index is used for interstate comparison and measurement of living standards, literacy, education and longevity.

The main external business risks for Ukraine in 2020 in the context of pandemics and crises are such as corruption, raiding, fraud within companies, unfounded and illegal claims of law enforcement agencies to business, loss of information and data, military conflict in Eastern Ukraine, the COVID-19 pandemic, reduction of foreign investment in a business, lack of free information space, violation of socio-environmental and economic security.

4. RESULTS AND DISCUSSION

The processes taking place in the world economy affect the development of the business system not only in the world but also in the region. The concept of development is associated with business risks, which are a key tool for slowing down or growing economic systems. Effective business risk management in Ukraine during pandemics and crises depends on the following main factors: the presence of corporate culture, professional legal support, the right selection of security firms and PR firms with experience in crisis conditions, communication with various stakeholders, the position of advisor on corporate security. Professional legal support has a positive effect on internal and strategic risks. In particular, the system of efficient production on the principles of agile, kaizen, kanban, scrum requires specialized legal support, which can be provided only by a professional law firm. At the same time, there are not only operational risks but also the risk of monetary and financial losses, marketing and sales risks, customer risks, the risk of loss of health and safety of employees. Accordingly, internal and strategic risks are interrelated. In the process of developing risk management mechanisms should take into account such aspects as:

- risks function as a holistic system, and one risk causes another;
- risks in business during crises and pandemics have a socio-psychological aspect. The mechanism of expectations is capable of strengthening of separate risks can cause the emergence of absolutely atypical risks for the sphere of activity;
- risks in business cannot be considered only as losses. This is an opportunity to deviate from the goal to achieve strategic goals;
- Considering the relationship between the system and the mechanism, it should be noted, that this relationship between two interrelated categories, when the first of them is general and the second - specific, designed to achieve the purpose of the first. It is necessary to distinguish between the concepts of „system“ and „mechanism“, namely the stages of transformation of elements with the actions through which it is carried out. The term „system“ can be defined as a set of interconnected elements that perform certain functions. The way to implement these functions is defined through the term „mechanism“, which combines a set of actions, operations to achieve the ultimate goal of the system. The mechanism is formed by the interaction of sub-systems of a particular system and at the same time is its attribute.

Table 4 presents the main approaches and tools for risk management in times of crisis and pandemics.

Table 4. Basic approaches and tools for business risk management in times of crises and pandemics

Risk group	*Management tool*	*Approach in management*
Internal	Corporate culture	Rules-based control models
Strategic	Corporate strategies	The control mechanism, which is based on the socio-psychological aspect
External	Insurance and hedging	The control system that includes a control mechanism and model

Source: Prepared by authors

As shown in Table 4, internal risks can be managed through control models that are built according to certain rules and have a logical basis. The main tool is the corporate culture, which is the basis of the management system. Strategic risks can be managed through the creation of corporate strategies, which are based on four concepts according to M. Porter: portfolio management, restructuring strategy, dissemination of certain skills throughout the enterprise, combining activities. It is necessary to develop a control mechanism, which is built taking into account the socio-psychological aspect. This is where atypical decisions and unexpected results are laid, which are difficult to predict. External risks can only be managed through hedging and insurance. Here it is necessary to develop a control system that includes a mechanism and a model.

The main stages of business risk management during pandemics and crises are modelling and identification of risks, their analysis and assessment, selection of management tools, creation and implementation of risk minimization strategy separately in terms of three risk groups (internal, strategic and external). Moreover, it is important to note that long waits in risk management decisions harm business. The prompt response of business to problems contributes to the receipt of profits for individual companies against the background of mass bankruptcy and the general economic downturn. The choice of an effective model of business risk management in the context of pandemics and crises will increase the profitability of both individual business units and the entire economic system. Therefore, it is important to further identify appropriate measures to mitigate external business risks, neutralize strategic and internal risks. The use of economic and mathematical modelling will establish the effectiveness of various measures.

CONCLUSION

This study describes the approaches and tools of business risk management in times of crisis and pandemics for 3 risk groups. The results of the study proved that it is not possible to apply the same approaches and tools to the management of different types of risks. The authors proved that the main tool in internal risk management is corporate culture, in strategic risk management is corporate strategy, and in external risk management is insurance and hedging. The study also showed that the main approaches in risk management are: model, mechanism and control system. The irrational nature of the behaviour of economic entities can be traced in the management of internal, strategic and external risks. This study offered a theoretical and empirical contribution to the scientific literature. In particular, the authors confirmed the hypothesis that managers overestimate the ability to influence processes and that in times of crises and pandemics, a mechanism of negative expectations is launched, which further worsens the business and narrows the competitive advantages of the business. At the same time, choosing the right model of behaviour, businesses can make profits by expanding the market niche, the exit of competitors from the market, increasing demand for goods and services due to limited market supply.

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Fiscal Policy Cyclicality, Governance, and Quality of Institutions Nexus in Ireland

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Governance

ABSTRACT

Purpose: The relationship between income and government consumption expenditure would reflect the nature of any country's fiscal cyclicality. This study aims to pragmatically evaluate the cyclicality of the fiscal dogma in Ireland and test the role of political institutions, economic institutions, and governance on the cyclicality of the fiscal policy in Ireland. Methodology and Approach: The 3-Stage Least Square technique is applied due to possible endogeneity in the model. Findings: Ireland's fiscal dogma is found as countercyclical in the presence of effective political and economic institutions with highly-structured and well-functioning governance. A negative relationship is observed between income per capita and government consumption expenditure. Hence, countercyclical fiscal policy is corroborated. Moreover, the lag of government consumption and the real interest rate reduces the present government consumption. Local and foreign investments, economic growth differences, government revenues, imports, and population growth have positive effects on government consumption expenditures. Based on findings, we recommend that the Irish government strengthen the quality of institution and governance to support the phenomena of its fiscal policy's counter cyclicality for a smooth fiscal policy in the country.

INTRODUCTION

Setting up vigorous targets in fiscal doctrines can be potentially countercyclical, and it is challenging to maintain an optimal output level at all times. The cyclicality of fiscal strategies is affected by institutional activities under strict governance mechanisms. The advanced countries adopt a countercyclical

fiscal policy mechanism in the presence of well-functioning institutions with *good* governance. The consequences of fiscal policy are usually closely related to institutional backgrounds. The impact that economic variables have on the fiscal strategy's performance and the role institutions play in an economy have widespread importance and consideration in evaluating growth policy. Political institutions' role is essential to European countries like many other economies as these economies are facing a fiscal deficit (Venes, 2010). It is argued that instability and lesser economic growth are caused by weak institutions (Acemoglu et al*.,* 2003; Easterly, 2004).

Cyclicality is significant due to economic growth and fiscal policy's motives as it could have a vital role in business cycles (Akiboty et al., 2004). A procyclical fiscal policy is when the government tends to increase spending and cuts down on taxes during an economic boom. In contrast, when there is a recession, the government goes in the opposite direction, reduces spending, and increases taxes. Conversely, a countercyclical fiscal policy works the other way around. In times of an economic boom, the government cuts down on spending and increases taxes and the other way around in a recession. An acyclical fiscal policy is when the government adopts neither of the two approaches and keeps the spending and taxes constant no matter how the business environment changes.

The developed economies mostly adopt the countercyclical and acyclical fiscal policies (Gali, 1994; Lane, 2003). Some international institutions try to implant the countercyclical fiscal policy in Europe (Melitz, 2000). Similarly, the intensity of the countercyclical nature of fiscal dogma is accelerating during the Maastricht Treaty and the Stability and Growth Pact of European Union followers (Gali and Perotti, 2003). On the other hand, the procyclical type of fiscal dogma is adopted for two main reasons that are poor access to International Financial Institutions (IFI) and substandard performance of institutions, and poor governance (Slimane et al*.,* 2010). Procyclical kind of fiscal dogma is found among Latin American economies, primarily due to the non-availability of funds in the time of financial constraints (Gavin and Perotti, 1997). Procyclicality is considered in the developing world like Latin American economies due to the fragile performance of political institutions and corrupt political leaders that failed to use the finances in the most optimal ways (Tornell and Lane, 1999). Pragmatic studies elaborate that procyclical fiscal policy becomes an essential part of developing economies (Braun, 2001; Kaminski et al*.,* 2004; Frankel *et al.,* 2013). These fiscal policies indicate how the government controls major macroeconomic factors, including the Gross Domestic Product (GDP), spending, taxes, and other variables.

The present study evaluates the cyclicality proposal by using indices of economic and political institutions and governance. Cronin and McQuinn (2018) have been investigated the Irish Ex Ante and Ex Post fiscal strategy cyclicality. Still, the role of institutions and governance has not been covered to the necessary extent in the investigation. Therefore, we emphasize the cyclicality of Ireland's fiscal policy from the perspective of institutions and governance. There is no significant study that elaborates on fiscal policy's cyclical nature purely with economic and political institutions besides governance indicators, especially in Ireland's case. This study focuses on filling that gap and understanding what role these institutions and governance indicators may play in the fiscal policy formation and how that association leads the Irish economy.

1. LITERATURE REVIEW

Macroeconomic policies are considered to help smooth out any business cycle glitches and anomalies. Generally speaking, fiscal strategies in developed countries have been expansionary compared to the emerging world (Calderon and Schmidt-Hebbel, 2008). These policies stabilize the developed economies (Debrun et al., 2008) and a destabilizing role in the developing economies (Suescun, 2007). The cyclical performance of fiscal dogma has been a severe issue for researchers and economists, and several theories circulate in these economies. According to Classical Economists, price mechanisms are self-correcting as they take care of external and behavioral shocks to economic equilibrium. In their view, the government's role is confined to maintaining the law and order in the country. On the other hand, the Neoclassical concept regarding fiscal dogma proposes a minimum of four motives for government expenditure to perform counter-cyclicality:

i) To flatten the levels of government expenditure, inferring that these expenditures should decay throughout booms and rise throughout recessions
ii) To plane out the pathway of output to counterbalance an adverse shudder to demand.
iii) For practical reasons, comprehend the complications in permanent and momentary changes in economic activity.
iv) Lastly, there is a countercyclical community protection constituent of government spending as joblessness assistance (Thornton, 2008).

Neo-Classical Economists elaborated government consumption as exogenous (Blanchard and Fisher, 1989) and not to significantly recommend an acyclical pattern of expenditure (Lane, 2003). However, Baxter and King (1993) favored the countercyclical fiscal policy, and Barro (1979) focused on acyclical fiscal dogma. After the Great Depression, Keynes advocated that countercyclical fiscal dogma needed the hour to stabilize the economy (Morgan, 1978). Tax Smooth Out Theory presented by Barro (1979) is in proportion to the Keynes approach. The unanimity outcome states that fiscal dogma inclines towards acyclical or countercyclical in advanced economies, and procyclical is advocated in developing economies (Fatas and Mihov, 2009).

Literature found that advanced economies adopt the countercyclical fiscal policy (Gali, 1994; Aghion and Marinescu, 2007; Lee and Sung, 2007; Auerbach, 2009; Golinellir and Momiglianos, 2009; Eskesen, 2009; Mesea, 2013; Calderon et al., 2016; Frankel et al., 2013). When their economic condition is good, they can halt their spending and collect revenue from the people in the form of taxes. Nevertheless, all that revenue makes it to the national income no matter if it comes from public spending or taxes collected from the people and eventually contributes to the nations' wellbeing. Gavin and Perotti (1997) highlighted that developing economies adopt a procyclical fiscal policy. Afterward, Schlarek (2007), Kaminski et al. (2004), and Carmignani (2008) also corroborate this ideology. Thus, it pleads why the developing economies adopt a procyclical fiscal policy and consider adjusting their significant macroeconomic variables according to the current business cycles. It is argued that developing economies adopt such policy due to meager access to International Financial Institutions (IFS), especially in recession (Gavin and Perotti, 1997; Calderon et al., 2003; Kaminski et al., 2004).

Political economy has a vital role in fiscal policy. Political antagonism between groups destabilize an economy and causes fluctuations (Buchanan and Wagner, 1977; Akitoby et al., 2004). Another primary reason for adopting a procyclical fiscal policy is corruption in these economies. Public sector size also matters for the procyclicality of fiscal policy (Braun, 2001). Thornton (2008) and Mpatswe et al. (2012) established a positive and robust significant association between foreign aid and procyclicality of fiscal policy. However, Lledo et al. (2009) elaborated that foreign aid minimizes fiscal policy procyclicality. In decentralized economies, the subnational government adopts procyclical policies. Resource-dependent countries adopt a procyclical fiscal policy (Arezki and Bruckner, 2012). For resource-dependent economies, this process practically works well. When there is an economic boom, they can increase their spending to cash out every possible opportunity and relieve its public from paying taxes.

Institutions have an active part in the counter or procyclicality of fiscal policy. A state's institutional structure plays a central role in macroeconomic strategies. Political disintegration inclines to mark the fiscal consultant's policymaking procedure (Velasco, 1998; Perotti and Kontopoulos, 2002). Thus, the incapability to restrain fiscal expenditure in economies is perceived to be due to weak institutions, refutation of agreements, and the occurrence of political organizations that do not confine their political figure (Acemoglu et al., 2003; Braun, 2001). Calderon and Schmidt-Hebbel (2008) have empirically exposed that institutional aspects play a leading part in the procyclical type of fiscal dogma equated to financial marketplace deficiencies. Institutional qualities are applied to appraise the cyclicality of fiscal and monetary dogma.

2. METHODS

The study aims to recognize the nature of the cyclicality of fiscal policy in Ireland by keeping the institutions and governance in an equal span of context. The significant effects of institutions are predomi-

nantly observed in past studies, and robust institutions support the government in executing fiscal growth policy. Though, the variables of institutions and growth may be the foundation of endogeneity. The 2SLS technique is proposed by Theil (1953a,b) and Basmann (1957) and Sargan (1958) have made many additions to the estimation methodology of 2SLS. Ordinary Least Square (OLS) might produce biased results in the presence of endogeneity, and 2SLS should be applied in this case. This method needs to identify the sum of exogenous variables. It substitutes the random endogenous variables with non-random and subsequently autonomous residual (Asteriou, 2006; Creel, 2006).

Zellner and Theil (1962) proposed 3SLS, and this technique is more reliable than the estimations through OLS or 2SLS. Consider 2SLS estimator form:

$$\overline{W} = \hat{Y} \text{ diag} \left[X\left(XX'\right)^{-1} X'Y_{1,\ldots\ldots} X\left(X'X\right)^{-1} X'Y_M \right] = \begin{bmatrix} \hat{Y}_1 & 0 \ldots\ldots\ldots\ldots & 0 \\ 0 & \hat{Y}_2 \ldots\ldots\ldots & 0 \\ 0 & 0 \ldots\ldots\ldots. & \hat{Y}_3 \end{bmatrix} \quad (1)$$

IV estimator:

$$\hat{\delta}_{IV} = \left[\hat{Y}'Y \right]^{-1} \hat{Y}'s \quad (2)$$

2SLS previously established the consistency and while the estimators are less efficient than Generalized Least Square (GLS).
Lets,

$$\hat{\delta}_{3sLs} = \left[\hat{Y}\left(\sum{}^{-1} \otimes I\right)Y \right]^{-1} \hat{Y}' \left(\sum{}^{-1} \otimes I\right)s \quad (3)$$

For estimator, we establish:

$$\rho \lim \frac{1}{T} \hat{Y}\left(\sum{}^{-1} \otimes I\right) \mu = 0 \quad (4)$$

M sets of the equation:

$$\rho \lim \frac{1}{T} \sum_{j=1}^{M} \sigma^{ij} \hat{Y}_j{}' \mu_j = 0 \quad (5)$$

Each is the addition of vectors altogether converge to zero as found in the expansion of the 2SLS estimator. The second inevitability is:

$$\rho \lim \frac{1}{T} \hat{Y}' \left(\sum{}^{-1} \otimes I\right)Y \neq 0 \quad (6)$$

A non-singular matrix can be established as the counterpart for 2SLS. The rank condition is sufficient for identification.

Now using idem-potency of (1-M):

$$\hat{\delta}_{3sLs} = \left[\hat{Y}'\left(\sum{}^{-1} \otimes I\right)\hat{Y} \right]^{-1} \hat{Y}' \left(\sum{}^{-1} \otimes I\right)s \quad (7)$$

The appropriate asymptotic covariance matrix for the estimator:

$$Var\left[\hat{\delta}_{3sls} \right] = \left[\overline{Y}' \left(\sum{}^{-1} \otimes I\right)\overline{Y} \right]^{-1} \quad (8)$$

$\overline{Y} = \text{diag}\left[X\hat{\lambda}_j, X_j \right]$ and Zellner and Theil (1962) establish 3SLS by estimating π by OLS and calculate $\hat{Y}_j$. Then, $\hat{\delta}_j$ $\hat{\delta}_j$ can be computed for every equation of 2SLS:

$$\hat{\sigma}_{ij} = \frac{\left(s_i - s_i \hat{\delta}_j\right)\left(s_i - Y_j \hat{\delta}_j\right)}{T}$$

Finally, estimation is done through GLS estimators consistent with the asymptotic covariance matrix. 3SLS estimator satisfies the requirements for the 2SLS estimator, and 3SLS is also asymptotically efficient. To estimate fiscal policy's cyclicality, the government consumption expenditure as a percentage of GDP is a proxy for fiscal policy. The relationship between government consumption expenditure and GDP per capita would suggest the cyclicality of fiscal policy. Further, the effects of institution and governance quality are also aimed to be tested on fiscal policy's cyclicality. Some other control variables are regressed in the hypothesized model. The following model is used to test the relationship between the cyclicality of fiscal policy and political institutions:

$$D.LogGCP_t = \alpha_0 + \alpha_1 L.LogGCP_t + \alpha_2 LogGDPP + \alpha_3 LogPTYT_t + \alpha_4 LogGFCP_t + \alpha_5 FDI_t + \alpha_6 LogTR_t + \alpha_7 D.GDPG_{tt} + \alpha_8 RINT_t + \alpha_9 LogIMP_t + \alpha_{10} LogPOPG_t + \psi_{1t} \quad (9)$$

Then, we test the relationship between the cyclicality of fiscal policy and economic institutions in the following way:

$$D.LogGCP_t = \beta_0 + \beta_1 L.LogGCP_t + \beta_2 LogGDPP_t + \beta_3 LogPRT_t + \beta_4 LogGFCP_t + \beta_5 FDI_t + \beta_6 LogTR_t + \beta_7 D.GDPG_t + \beta_8 RINT_t + \beta_9 LogIMP_t + \beta_{10} LogPOPG_t + \psi_{2t} \quad (10)$$

Lastly, we test the relationship between the cyclicality of fiscal policy and governance in the following way:

$$D.LogGCP_t = \gamma_0 + \gamma_1 L.LogGCP_t + \gamma_2 LogGDPP + \gamma_3 LogGOV_t + \gamma_4 LogGFCP_t + \gamma_5 FDI_t + \gamma_6 LogTR_t + \gamma_7 D.GDPG_{tt} + \gamma_8 RINT_t + \gamma_9 LogIMP_t + \gamma_{10} LogPOPG_t + \psi_{3t} \quad (11)$$

Where,

$LogGCP_t$ = Logarithm of government consumption expenditure percentage of GDP
$D.LogGCP_t$ = First difference of $LogGCP_t$
$L.LogGCP_t$ = One-year lag of $LogGCP_t$
$LogGDPP_t$ = Logarithm of GDP per capita
$LogPTYT_t$ = Logarithm of Polity2 proxy for political institutions
$LogGFCP_t$ = Logarithm of gross fixed capital formation percentage of GDP
FDI_t = Foreign direct investment percentage of GDP
$LogTR_t$ = Logarithm of total revenue percentage of GDP
$D.GDPG_t$ = First difference of growth rate of GDP
$RINT_t$= Real interest rate
$LogIMP_t$ = Logarithm of total imports
$POPG_t$ = Population growth
$LogPRT_t$ = Logarithm of protection of property rights proxy for economic institutions
$LogGOV_t$ = Logarithm of governance

Data used in the present study is an annual time series ranged from 1981-2016. Most of the series is taken from the World Bank (2019) database. Following Pritchett and Kaufmann (1998), Governance Index is developed through Principal Component Analysis (PCA) using variable Political Rights (PR) and Civil Liberties (CL), sourced from Freedom House (2019). PR and CL values are from one to seven, where one specifies extreme political rights with civil liberty, and seven displays the lowermost values. Polity is a grouping of democracy and dictatorship, sourced from the Freedom House (2019). The data ranges from -10 to +10, where -10 displays intensely autocratic government and +10 indicating a profoundly democratic nation. For Economic institutions, data on the Protection of Property Rights is taken from the Fraser Institute (2019) and is a proxy of economic institutions.

3. RESEARCH RESULTS

Thirteen variables are used in this study collected for the period 1981-2016. The mean and median values of variables are rightly connecting, demonstrating symmetry and balance. These variables are narrowly spread from the mean values, as indicated by the small standard deviations.

Table 1. Descriptive Statistics

Variables	*Mean*	*Std. Dev.*	*Min*	*Max*
FDI_t	1.58	1.61	-1.53	4.27
$LogTR_t$	10.06	0.77	8.53	11.06
$LogGDPP_t$	10.43	0.44	9.75	11.11
$RINT_t$	1.61	0.55	0.48	2.49
$POPG_t$	-0.43	1.21	-4.56	1.06
$LogIMP_t$	25.1	0.92	23.73	26.50
$LogPRT_t$	2.11	0.10	1.82	2.30
$LogPTYT_t$	2.27	0.01	2.25	2.30
$D.LogGCP_t$	-0.02	0.06	-0.27	0.11
$L.LogGCP_t$	2.86	0.13	2.53	3.10
$D.GDPG_t$	0.03	0.74	-1.62	2.04
$LogGOV_t$	0.37	0.09	0.33	0.76
$LogGFCP_t$	3.06	0.19	2.76	3.43

The 3SLS approach is used for estimations due to its superiority over OLS and 2SLS. Political institutions are used to evaluate their role in fiscal policy. Findings are specified in Table 2. To analyze the cyclicality of Fiscal policy in Ireland, $D.LogGCP_t$ is used as a dependent variable. The model's core variables are $L.LogGCP_t$ and $LogGDPP_t$ to capture the cyclicality of fiscal policy in Ireland. The variables $L.LogGCP_t$ and $LogGDPP_t$ have adverse and significant effects on $D.LogGCP_t$. The variable $LogGDPP_t$ has a negative impact on $D.LogGCP_t$. Hence, decreasing government consumption policy is adopted in times of increasing income per capita, and increasing government consumption policy is adopted in times of decreasing income per capita. Therefore, countercyclical fiscal policy is corroborated in Ireland as contractionary fiscal policy. It is adopted to increase income per capita, and expansionary fiscal policy is adopted to decrease income per capita. This result is in line with the findings of Kaminsky et al. (2004).

Further, the effect of $L.LogGCP_t$ is negative, and increasing government consumption in one period is reducing the growth of government consumption in the next period. The significant variable LogPTYTt further supports it. This variable is significant and carries a negative coefficient. So, improving the quality of political institutions is found helpful in reducing government consumption. Therefore, the quality of political institutions matters for the countercyclical fiscal policy in Ireland. This finding corroborates the inferences derived by Slimane *et al*. (2010). $LogGFCP_t$, FDI_t, $LogTR_t$, $LogIMP_t$, $D.GDPG_t$, and $POPG_t$ have positive effects on $D.LogGCP_t$. Hence, increasing domestic and foreign investments, government revenues, differences in growth, imports, and population growth increase government consumption expenditures. However, $RINT_t$ has adverse effects on the $D.LogGCP_t$. Hence, increasing the real interest rate reduces government consumption growth. Therefore, monetary policy in terms of the real interest rate is found countercyclical to fiscal policy.

Table 2. Results of 3SLS

Variables	*Model 1*		*Model 2*		*Model 3*	
	Coefficient	*p-value*	*Coefficient*	*p-value*	*Coefficient*	*p-value*
$L.LogGCP_t$	-1.0390	0.0000	-1.0532	0.0000	-1.0563	0.0000
$LogGDPP_t$	-0.0230	0.0000	-2.0138	0.0000	-2.3373	0.0000
$LogGFCP_t$	0.2316	0.0000	0.2524	0.0000	0.3678	0.0000
FDI_t	0.0345	0.0000	0.0430	0.0000	0 .0517	0.0000
$LogTR_t$	0.5701	0.0000	0.5824	0.0000	0.6108	0.0000
$D.GDPG_t$	0.0068	0.0100	0.0102	0.0000	0.0037	0.0050
$RINT_t$	-0.2410	0.0000	-0.0226	0.0000	-0.0395	0.0000
$LogIMPC_t$	0.2567	0.0000	0.2256	0.0000	0.3069	0.0000
$POPG_t$	0.0271	0.0000	0.0243	0.0000	0.0153	0.0000
$LogPTYT_t$	-0.3809	0.0390				
$LogPRT_t$			-0.0872	0.0000		
$LogGOV_t$					-0.0328	0.0000
Intercept	12.0225	0.0000	11.8652	0.0000	16.6238	0.0000

Table 2 also displays the relationship between fiscal policy and economic institutions. The difference between models 1 and 2 is the political institution variable ($LogPTYT_t$) replaced by the economic institution variable ($LogPRT_t$). All effects are found the same, as shown in model 1. The $LogPRT_t$ variable has a significant and negative effect, which shows that increasing economic institutions' quality has a vital role in reducing government consumption. With improved performance of economic institutions, the growth of government consumption decreases, and vice versa. Hence, the quality of economic institutions supports a countercyclical fiscal policy. The result of this variable is supported by empirical findings of Kaminsky *et al.* (2004), Calderon et al. (2006), and Manasse (2006). In the end, estimates of the relationship between fiscal policy and governance are shown in model 3. The effect of $LogGOV_t$ is negative and significant. Good governance also helps reduce government consumption, indicating that good governance promotes a countercyclical fiscal policy.

CONCLUSIONS

Fiscal policy cyclicality depends on several factors, including governance, economic, and political institutions. This present study investigates the effects of these factors and some classical determinates of fiscal policy cyclicality in Ireland from 1981-2016. The cyclicality of fiscal dogma in the country is assessed. The 3SLS estimation technique is utilized to analyze and care for the possible endogeneity in the hypothesized models. Government consumption expenditure as a percentage of GDP is utilized to assess the cyclicality of fiscal policy. The negative relationship is corroborated between the income per capita and government consumption expenditure. Hence, the Irish fiscal policy is corroborated as countercyclical. The robust political and economic institutions and good governance are significant determinants of fiscal policy's cyclicality. The increasing quality of a political institution, economic institution, and good governance reduces government consumption expenditures. Hence, the quality of institutions and good governance are supporting the countercyclical fiscal policy in Ireland. Moreover, the increasing investments, growth rate, government revenues, imports, and population growth may increase government consumption. However, increasing real interest rates is helping to reduce government expenditures. The lag of government consumption reduces the present government consumption. Based on the results, the Irish government should enhance economic and political institutions' capability and improve governance quality to support its countercyclical fiscal policy.

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Benchmarking of Smart Specialisation in the EU Agri-Food Sector

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ABSTRACT

There are a number of objective factors underlying the territorial specialisation of agriculture, whereas the practices of implementing this approach are extremely diverse. The issue of assessing their effectiveness remains unresolved. The EU experience is an illustrative example of smart agri-food specialisation. The current study aims to clarify the central characteristics of the EU agri-food sector, evaluate the extent to which countries are involved in Smart Specialisation, and analyse best practices. To assess the concentration of agri-food production, we use the Herfindahl-Hirschman index and the Gini index (constructing the Lorenz curve). Trends in the dynamics of concentration indices indicate that there is a problem of optimal placement and specialisation of EU countries/regions by types of agricultural production. Most of the leading regions and regions engaged in Smart Specialisation partnerships are located in Western Europe (Spain, France, and the Netherlands), while the share of Eastern European nations is below 10% of the total number of participants. The research results also show that, in order to successfully implement the strategy of specialisation in developing countries, a number of general economic challenges should be first resolved that caused these states to lag behind. The solution to the problem falls within the domain of innovation and investment support. Findings: The experience of the EU agri-food sector reformation can be useful for formulating and justifying an innovative strategy for the development of agriculture in other countries.

INTRODUCTION

Providing population with foods and achieving a high level of food security are among the top-priorities of any country. The agri-food sector is of strategic, economic and social importance for Europe, and it plays a powerful role in the member countries integration and the development of external relations. People working in agriculture accounted for about 4.2% of total employment in the EU, or 9.7 million persons. Agriculture is a particularly big employer in Romania, accounting for just less than one in every four persons (23.0%) employed in the country, as well as in Bulgaria (17.5% of total employment), Greece (10.7%) and Poland (10.1%) (Eurostat, 2020b). The EU is one of the key players in the global agricultural market and is therefore particularly motivated to seek solutions to the complex problems typical of this sector (EU, 2019).

Currently, among the topical problems are a search for ways to enhance innovative development, introduction of advanced technologies, digitisation and competing with rising global competition (Michalopoulos, 2019; Romanova et al., 2017; Toomsalu et al., 2019). It is noteworthy that each of the EU countries has its own natural and climatic conditions and geographical location; they vary in availability of agricultural production factors, demonstrate different levels of technological and economic development, etc. The indicated issues, therefore, should be tackled selectively and individually. A Smart Agri-Food Specialisation Platform embracing five thematic partnerships was launched to spur innovation in the EU (SSP, 2020). Territorial-sectoral specialisation formed the basis for the implementation of the Smart Specialisation concept in the EU agri-food sector. Such a specialisation made it possible to identify the leading regions in accordance with their bioclimatic potential combined with organizational, economic and innovation advantages.

The issue of assessing the effectiveness of the implemented specialisation approach is still widely debated. The present research focuses on clarifying the main characteristics of the EU agri-food sector, evaluating the participation of countries in Smart Specialisation and analyzing best practices. Studying the experience of agri-food sector reformation in the EU can be of use to design and justify an innovative strategy for the development of agriculture in other regions.

1. LITERATURE REVIEW

The concept of Smart Specialisation was proposed as a basis for the formation of medium-term development strategies (Olaniyi and Reidolf, 2015). The specialisation-based approach implies identification of the most investment attractive areas that can provide an impetus for creating future comparative advantages (Vezzani et al., 2017). The concept generalizes the classical theory of division of labour and trade specialisation of countries, the theory of evolutionary economics, industrial development (McCann and Ortega-Argilés, 2013) and diversification (Crespo et al., 2017). A number of researchers (Stancova and Cavicchi, 2019; Bosch and Vonortas, 2019) examine the practical aspects of Smart Specialisation. According to some scholars, in order to successfully implement the specialisation strategy in developing countries, fundamental problems, which resulted in their economic and technological backwardness, should be resolved in the first place.

A wide range of research publications concentrate on the issue of stimulating economic growth in agriculture. Russell et al. (1989) expanded the list of factors, which exerted a direct effect on technological modernization, by including the industrial sector's ability to produce new technical resources and the agricultural sector's ability to acquire and effectively use these innovations. Ferto and Bojnec (2015) analyze the peculiarities of the development of the EU agri-food sector. In particular, the largest agricultural areas are located in the EU eastern regions (for example, in Romania and Poland), which usually do not have large agricultural farms in their territories. On the contrary, the largest number of enterprises engaged in food and beverages production, wholesale and retail trade, and the provision of services operate in southern Europe (Italy and Spain). A higher concentration of such enterprises is recorded in Germany, the United Kingdom, Finland and the Baltic countries.

Krylatykh (2015) performs a detailed analysis of economic, social, innovative, institutional and informational factors in the development of the EU agri-food sector. The author distinguishes between sev-

eral groups of countries: (a) large, economically developed countries with a highly efficient agrarian sector (Germany, France, the United Kingdom); (b) small in area and population, economically developed countries with a highly efficient agricultural sector and a high level of food security (the Netherlands, Ireland, Denmark, Belgium); (c) countries with a developed agricultural sector, but lagging behind highly developed countries in terms of economic development (Greece, Italy, Spain, Portugal); (d) countries of Central and Eastern Europe undergoing economic transformation due to the integration into the EU (Hungary, the Czech Republic, Poland, Bulgaria, Romania and the Baltic countries). Rakhmatullin et al., (2020) note that the majority of the leading regions and regions participating in Smart Specialisation Partnerships are located in Western Europe, while the share of Eastern European states is below 10% of the total number of participants.

The literature review allows us to conclude that the EU agrarian sector is moving towards technological transformation, which is also characteristic of other sectors (Akberdina et al., 2018). At that, the countries and regions within the EU exhibit an initially high differentiation. These provisions served as the pivot for the analysis of the territorial specialisation of agri-food production and the policy of Smart Specialisation.

2. MATERIALS AND METHODS

To assess the concentration of agricultural and food products, we used the *Herfindahl-Hirschman index (HHI)*, which reflects spatial concentration, and the *Gini index* (including the construction of the *Lorenz curve*, which shows the uneven distribution of production volumes per capita. The indices are calculated using the following formulas

– Gini index

$$G = 1 - 2\sum_{i=1}^{n} X_i \times cumY_i + \sum_{i=1}^{n} X_i Y_i \ , \qquad (1)$$

where X_i is the share of the *i*-th country in the total output of products within the EU; Y_i is the share of the *i*-th country in the volume of production of agri-food products; $cumY_i$ is cumulative volume of production of agri-food products.

– the Herfindahl-Hirschman index

$$HHI = \sum_{i=1}^{n} S_i^2 \ , \qquad (2)$$

where S_i is the share of the agri-food product manufactured by the *i*-th country in the total production volume of this type of products by all the EU nations; *n* is the number of the EU countries manufacturing this type of agri-food products.

The Gini coefficient shows the degree of deviation of the actual distribution of EU production volumes from their equal distribution. If *G*=0, the production of a particular type of agri-food products in the EU is distributed evenly across the countries; if *G*=1, all production in the EU is concentrated in one of the countries. *HHI* can take values from 0 to 1. If *HHI*=0, the production of a particular type of agri-food products is distributed evenly across EU member countries. If *HHI*=1, the production of a particular type of agri-food products is concentrated in one EU country.

The initial data of the current research embrace the statistical indicators of the entire agricultural production and its individual sectors, food production volumes, population size of EU countries, labour productivity and EU foreign trade indicators (Eurostat, n.d.).

3. RESULTS

Due to the unique geographical position and diverse climatic conditions, a wide range of agri-food products can be manufactured in the EU. In 2019, the agriculture sector (EU-27) produced goods worth

412.8 billion euros, or 1.6% of GDP; the food production volume was 954 billion euros (in 2018); and trade in agricultural products amounted to 7% of EU total foreign trade in goods (EU Parliament, 2020). In 2019, the share of the EU in global agri-food exports was 18.2% (CAP, 2020). The need for foodstuffs with respect to healthy nutrition norms can be met through both domestic production and imports. It is worth noting that the European Union ensures the highest level of food security and is 100% self-sufficient in terms of some products. Food security of the EU countries is implemented mainly through interregional exchange (Table 1). Imports within the EU grow at a faster pace in comparison with imports outside the EU (Eurostat, 2020c).

Table 1. EU-27 Agricultural exports and imports by product categories, 2019

Product categories	*Export, %*	*Import, %*
Animal products		
Live animals	8.0	2.0
Meat and edible meal offal	38.0	16.0
Fish and crustaceans, molluscs	13.0	69.0
Dairy produce, eggs, honey	37.0	8.0
Products of animal origin, not included	3.0	5.0
Vegetable products		
Live trees and other plants, bulbs, roots	9.6	3.0
Edible vegetables	14.4	7.0
Edible fruits and nuts	14.8	30.0
Coffee, tea, spices	6.5	15.0
Cereals	16.2	10.0
Products of the milling industry	7.8	1.0
Oil seeds and oleaginous fruits; medicinal plants	9.9	17.0
Vegetable saps, extracts, resins, etc.	3.6	2.0
Vegetable plaiting materials, vegetable products not included	0.1	0.0
Animal or vegetable fats and oils	17.2	16.0
Foodstuffs		
Preparations of meat, of fish or of crustaceans	5.0	10.0
Sugars and sugar confectionary	4.0	4.0
Cocoa	8.0	15.0
Preparations of cereals, flour, starch or milk	17.0	6.0
Preparations of vegetables, fruits, nuts	9.0	12.0
Miscellaneous edible preparations	12.0	9.0
Beverages, spirits and vinegar	33.0	17.0
Residues from the food industries, prepared animal fodder	7.0	21.0
Tobacco and manufactured tobacco substitutes	7.0	6.0

Source: (Eurostat, 2019).

However, EU member states show different levels of food self-sufficiency. The best results are achieved by Ireland, Finland, Sweden, and the Netherlands. The situation is less healthy in Bulgaria, Slovakia, and Romania, where the availability of foodstuffs averages 54.2%, 62.1% and 64.3%, respectively. To compare, in Germany this level reaches 79.1%, in Austria – 78.6%, and in Finland – 78.6% (EIU, 2019). The output of agricultural products differs significantly across the EU nations. For instance, Spain produces 57.5 times more vegetables and fruits per capita than Luxembourg, 15 times more than the Czech Republic, and 14 times more than Slovakia. In terms of cereals, there is 20 times difference in production volumes of the leading countries (Lithuania, Denmark, and Latvia) and those lagging behind (Cyprus, the Netherlands, and Portugal). Denmark produces almost 3 times more milk and dairy products per capita than Italy, and more than 2 times than Latvia and Greece. The gap between the leader in per capita meat production (Ireland) and the EU country with the smallest meat production (Bulgaria) is more than 160 times; the gap between Ireland and Slovakia is 83 times.

Each of the EU countries has its own specificity of agricultural production (Krylatykh, 2015). Territorial division of labour and specialization underlie regional concentration of production, which is due to the differences in natural and climatic conditions. The Netherlands–a country with a small amount of agricultural land and relatively low employment in agriculture–has the highest factor income per labour unit (54.4 thousand euros per year). At the same time, in countries with a large amount of agricultural land and better climatic conditions for the development of agriculture (Italy, Spain), the factor income per unit of labour is 1.6 and 2.7 times lower (32.5 and 19.6 thousand euros per year, respectively). Moreover, in Romania, with a sufficiently large amount of agricultural land and the highest employment in agriculture, the factor income per unit of labour equals only 4.4 thousand euros per year (see Appendix).

There are also substantial differences in labour productivity. In ten EU nations – the Netherlands, Denmark, France, Belgium, Germany, Luxembourg, Spain, Sweden, Italy and Austria – labor productivity in the agricultural sector exceeds the EU average (20,829.5 euros/person hour). In the Netherlands–the nation with the highest labour productivity (72,825 euros/person hour)–it is at least 14 times higher than in Romania (4,956 euros/person hour) and Latvia (5,075 euros/person hour), and 13 times higher than in Poland (5,692 euros/person hour) (EU, 2020).

These peculiarities are reflected in the dynamics of the concentration indices. The Herfindahl-Hirschman index shows a low concentration of agricultural output for aggregated groups of cereals and meat products, as well as for foodstuffs (Figure 1). The output of milk and dairy produce, fresh vegetables and fruits is more concentrated; for the rest of foodstuffs, the concentration is gradually decreasing.

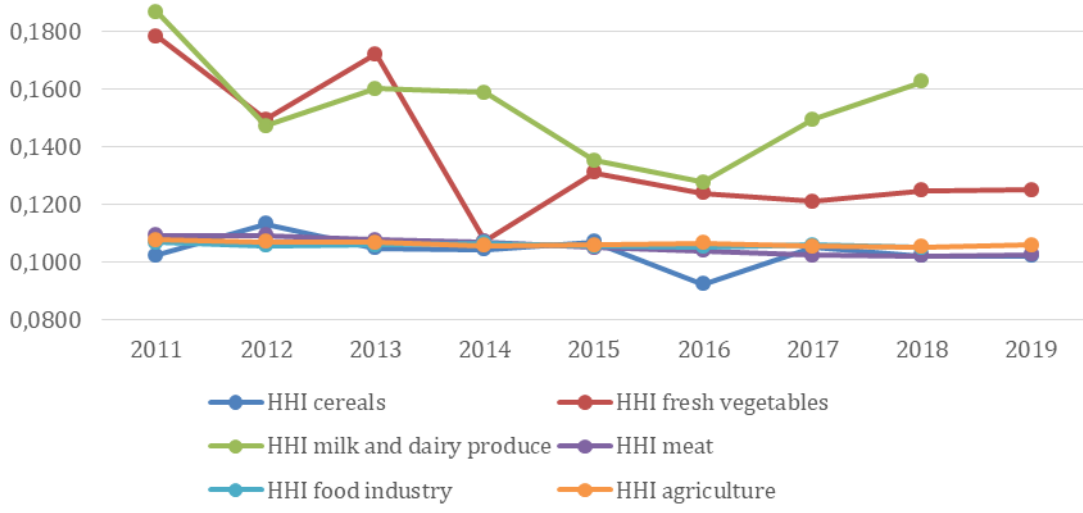

Figure 1. The Herfindahl-Hirschman index for particular EU agricultural products

Source: Eurostat, 2020a.

The Gini index indicates a highly uneven agricultural production by aggregated groups per capita among the EU member states (Figure 2).

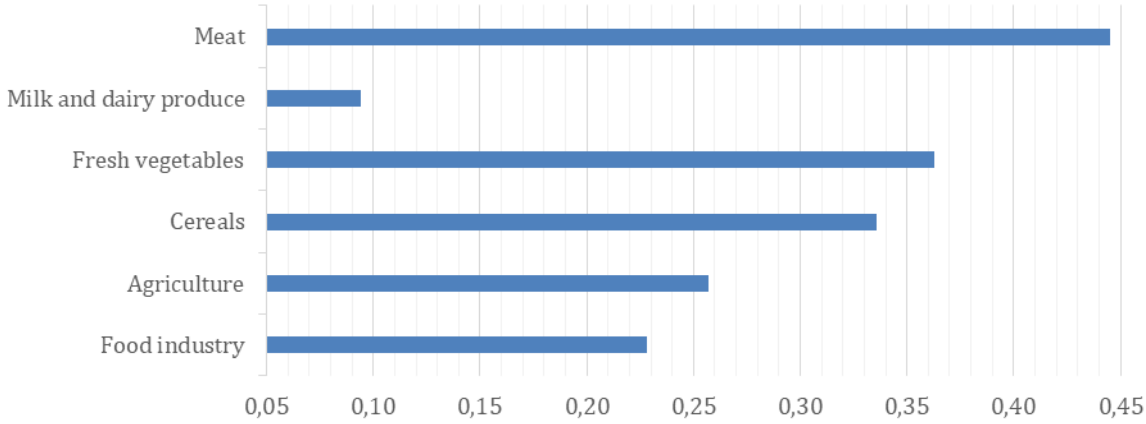

Figure 2. The Gini index for aggregated groups of agricultural products in the EU

Source: Eurostat, 2020a.

The trends in the concentration indices dynamics indicate the problem of optimal positioning and specialization of EU countries/regions by types of agricultural production. The solution to the problem falls within the domain of innovation and investment support. Investment in modern and highly efficient resources should become the key driver of agricultural transformation. The European agrarian sector consists of a large number of small and medium-sized enterprises, which, in contrast to large and super-large agri-food organizations, lag significantly behind in innovative development, in the introduction of advanced technologies and the latest ICT achievements (Litau, 2018). Eliminating these bottlenecks requires investment in intelligent systems and ICT solutions. This underlies the need for new joint research initiatives.

The concept of Smart Specialisation in the agri-food sector covers five thematic areas: high-tech agriculture by type of agricultural activity; food ingredients; consumer participation in innovation; smart sensors of agri-food industry 4.0; and product traceability and Big Data. Most of the organizations participating in the high-tech agriculture partnership are located in Spain, Ireland, Sweden, and Greece; in the field of horticulture – in Spain, Italy, and Greece; and in the field of viticulture and fruit growing – in Italy, the Netherlands, and Greece (Table 2). As for the priority area of smart sensors of agri-food industry 4.0, the leading companies are situated in Spain, France, Belgium, Greece, the Netherlands, Germany, and Finland. Some regions, such as Galicia (Spain), Central Macedonia (Greece), Extremadura (Spain), Flanders and Wallonia (Belgium) or South Ostrobothnia (Finland), are involved in multiple partnerships.

Table 2. Participation of the regions of EU member states in implementing the concept of Smart Specialisation

Leading regions	*Participating regions*
1. High-tech agriculture *Viticulture, fruits*	
Tuscany, Italy Galicia, Extremadura, Spain Gelderland, the Netherlands Central Macedonia, Greece Marche, Italy	West Macedonia, Greece Weser-Ems, Germany South Holland, the Netherlands Limburg, the Netherlands Northeast Romania, Romania
Outdoor and indoor animal husbandry	
Central Macedonia, Greece Extremadura, Spain	Eastern Sweden, Sweden Tuscany, Italy West Macedonia, Greece Auvergne-Rhone-Alpes, France Galicia, Spain Northern Ireland, Ireland

Leading regions	*Participating regions*
Galicia, Spain	Weser-Ems, Germany Eastern Sweden, Sweden Central Macedonia, Greece Northern Ireland, Ireland
Arable crops, cereals, vegetables (outdoors) and crop production in greenhouses	
Tuscany, Italy Galicia, Extremadura, Spain	Galicia, Spain Eastern Sweden, Sweden Weser-Ems, Germany Marche, Italy Central Macedonia, Greece Northeast Romania, Romania Northern Ireland, Ireland
South Holland, the Netherlands	Central Macedonia, Greece Tuscany, Italy
2. Food ingredients	
Wallonia, Flanders, Belgium Galicia, Asturias, Rioja, Spain South Provence, Alps, the French Riviera, France Emilia Romagna, Italy Central Denmark, Denmark Central Transdanubia, Hungary Central Macedonia, Greece	-
3. Consumer participation in innovation	
Sweden, the Netherlands	Denmark, Finland
4. Smart sensors of agri-food industry 4.0	
Asturias, Galicia, Navarra, Spain Attica, Greece Auvergne-Rhône-Alpes, Brittany, France Central Denmark, Denmark Flanders, Wallonia, Belgium Central Transdanubia, Hungary North Brabant, the Netherlands North Rhine Westphalia, Germany Southern Ostrobothnia, Finland	Lower Austria, Austria Lombardy, Italy
5. Product traceability and Big Data	
Andalusia, Spain Italy	Sardinia, Emilia-Romagna, Friulli-Venezia Giullia, Italy Basque Country, Navarra, Extremadura, Spain Limburg, the Netherlands Pays de la Loire, Brittany, France South Savonia, South Ostrobothnia, Finland Alentejo, Portugal Basilicata, Italy Northern Ireland, Ireland

Source: (SSP, 2020).

The development of international cooperation in the Smart Specialisation priority areas enabled the participating countries and regions to enhance access to funding sources. This, in turn, accelerated the introduction of the existing technologies in niche specialization areas. For example, the Tuscany region (Italy) initiated a high-tech agriculture partnership, which united 26 EU regions and one EU country. More than 80 universities and research centers, 163 companies and 160 consumer representatives in different countries are involved in the partnership. Its prime objective is to promote joint activity for easier and

faster introduction of brand-new and high technologies and boosting the efficiency of agriculture and farm management (Cohen, 2019).

Central Macedonia (Greece) is also an active member of Smart Specialisation partnerships. The region aims to cooperate with other territories to realize joint investment in the development of new products and services. For example, the region grounded a pilot project – a farm for growing table grapes, in which technologies provided by developers and suppliers will be tested and updated in the field (Cohen, 2019).

Having summed up the best practices in the Smart Specialization, we identify the following benefits of partnerships:

Firstly, interregional and intraregional cooperation stimulates the participants to pool their efforts in achieving common goals through synergy effect.

Secondly, the regions involved in agri-food Smart Specialisation encourage strategic cooperation within and outside of their territories.

Thirdly, the regions discover new opportunities for financing investment projects at the local and international levels.

Fourthly, the Smart Specialisation strategy contributes to the technological modernization of the agri-food sector and the economic growth of the participating regions (Rakhmatullin et al., 2020; Litau, 2018).

Technological modernization and digitalization of the agricultural sector is of crucial importance for raising labor productivity and promoting the efficiency of enterprises. Nevertheless, as seen from the review of EU participation in Smart Specialisation, the regions with lower labor productivity and factor income are much less likely to participate in partnerships, which can deepen the backwardness of agriculture and, as a result, lower food self-sufficiency.

CONCLUSION

Sustainable economic development is impossible without the introduction of the latest technologies and advanced management practices. The concept of Smart Specialisation has become the central tool in the development of the agri-food sector. It focuses on promoting effective cooperation between participants and eliminating duplicate functions and tasks. The experience of the European Union is a striking example of the practical implementation of the concept. The realization of the Smart Specialisation in the EU agri-food sector has been analyzed through the prism of changes in the concentration of production. The trends in the dynamics of the Herfindahl-Hirschman index and the Gini index indicate the problem of optimal location and specialization of EU countries/regions by types of agricultural production. The solution to the problem falls within the domain of innovation and investment support. The concept of Smart Specialisation has developed a new vision of development for EU regional agricultural policy development. The research results also show that, in order to successfully implement the strategy of specialisation in developing countries, a number of general economic challenges should be first resolved that caused these states to lag behind. Undoubtedly, the experience of European countries is of great value. This will help find optimal solutions and approaches to the innovative transformation of the agricultural sector in other countries.

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APPENDIX

Basic figures relating to agriculture and the food industry in the EU

Region	*Utilised agricultural area (UAA), million ha, 2017*	*No of farms, 2016*	*UAA per farm, ha, 2016*	*Employment in agriculture, 1 000 persons, 2017*	*Total agricultural output, billion EUR, 2019*	*Share of primary sector of GVA/GDP, 2018*	*Factor income per annual work unit, thousands euros, 2017*	*Employment in the food industry, 1 000 persons, 2016*	*Share of food industry in GVA, %, 2012*
Belgium	1.32	36.8	36.7	51.4	8.7	0.8	33.6	119.7	2
Bulgaria	5.03	202.7	22	186.6	4.3	4.2	8.9	109	3.8
Czech Republic	3.52	26.5	130.2	113.3	5.4	2.2	19.8	130.5	2.4
Denmark	2.63	35	74.6	56.7	11.7	1.2	43.5	60.3	1.4
Germany	16.67	276.1	60.5	490.3	57.0	0.8	33.4	913.2	1.7
Estonia	1.00	16.7	59.6	17.1	1.0	2.6	13.4	14	2
Greece	5.15	684.9	6.6	437.8	11.3	4.3	15.1	128.5	3.2
Spain	23.84	945	24.6	749.7	50.6	2.9	32.5	482.4	2.7
France	29.10	456.5	60.9	646.1	75.4	1.8	32.3	648.8	1.9
Ireland	4.47	137.6	35.5	104.3	8.6	1	22.8	56.6	4.7
Italy	12.84	1145.7	11	797.8	56.6	2.1	19.6	493.7	1.9
Cyprus	0.12	34.9	3.2	8.7	0.7	2	16.5	9.5	2
Croatia	1.49	134.5	11.6	92.2	2.3	3.6	6	62.8	–
Latvia	1.93	69.9	27.6	45.7	1.6	3.8	6.3	27.9	2.4
Lithuania	2.94	150.3	19.5	90.9	3.0	3	6.4	38.7	4.6
Luxembourg	0.13	1.9	66.3	3.1	0.4	0.3	23.1	1.3	0.7
Hungary	5.35	430	10.9	197.3	8.7	4.3	8.7	141.5	2.2
Malta	0.11	9.2	1.2	1.5	0.1	1	9.9	4.6	1.7
Netherlands	1.79	55.7	32.3	171.1	28.6	1.8	54.6	141	2.8
Austria	2.66	132.5	20.1	157.2	7.6	1.3	19.6	82.9	1.9
Poland	14.5	1410.7	10.2	1574.2	26.8	2.8	7	542.1	2.9
Portugal	3.60	259	14.1	278.6	7.9	2.3	10.9	103.4	2.2
Romania	13.38	3422.0	3.7	1925.2	19.9	4.8	4.4	216.1	6.1
Slovenia	0.481	69.9	7	49.4	1.3	2.2	5.1	17	1.5
Slovakia	1.91	25.7	73.6	48.5	2.2	3.3	19.2	54.4	1.7
Finland	2.27	49.7	44.9	70.8	4.6	2.8	19.8	36.8	1.6
Sweden	3.01	62.9	47.9	60.8	6.2	1.2	27.8	46.3	1.3
United Kingdom	17.36	185.1	90.1	329.4	–	0.6	36.4	416.2	1.6
EU-28	178.5	10467.7	16.6	8756.0	412.8 (EU-27)	1.6	17.3	5116.6	2.0 (EU-27)

Source: EU Parliament, 2020.

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The Impact of Business Processes on the Efficiency of Small and Medium-Sized Enterprises

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ABSTRACT

Small and medium businesses generate about half of the country's added value and therefore has a significant weight in the economy. At the same time, SMEs have little use in their activities of business process management, which provides flexibility in the enterprise and turns ideas into actions. The purpose of this study is to model effective basic business processes for a company-SME on the basis of a functional approach, taking into account the available human and material resources. The study is based on a SME enterprise. A quantitative and qualitative analysis of financial indicators and current business processes of the enterprise made it possible, on the basis of a functional approach, to model and improve the business process of sales. The implementation of the modernized business process allowed to increase the conversion of leads, the amount and growth of agreements, the size and growth of revenue, labor productivity, growth of revenue, as well as the efficiency of marketing costs.The results and methods of this study can be used by SME top managers to modernize business processes to improve the overall efficiency of the enterprise.

INTRODUCTION

There are 5.979.899 small and medium-sized enterprises registered in the Unified Register of Small and Medium-Sized Business Entities of the Russian Federation. SMEs generate around half of the total value added, therefore their contribution to the national economy can hardly be overestimated (Dumcius and Skersys, 2019). Meanwhile, the lack of finance, time and knowledge, makes the majority of SMEs model and consciously manage their key business processes on rare occasions (Chong, 2014). In this

regard, a case study of business process modeling and management in a particular SME is increasingly relevant. Business process modeling refers to the activity of developing and documenting the core business processes that provide significant value to the business (Panayiotou et al., 2017).

1. LITERATURE REVIEW

The significance of business processes as a link between a company's strategy and outcome cannot be overestimated, as they ensure corporate flexibility and turn ideas into activities (Kirchmer, 2017). A business process (BP) is a coordinated and standardized flow of activities performed by people or machines, which can cross functional or departmental boundaries to achieve a business objective and creates value for internal or external consumers (Chang, 2016). Business process has a key role in company's operations and hence must be properly planned and managed (Paschek et al., 2016). Business process management (BPM) is refers to the modeling, implementation, monitoring and improvement of business processes (Mendling et al., 2018). BPM improves company's organizational productivity, enables joint action of internal and external BP participants, and is a key to mastering digital transformations and innovations in a company's business model (Pradabwong et al., 2017; Vom Brocke and Mendling, 2018; Piątkowsk, 2020).

When effective, BPM ensures accurate alignment between BP and information technology designs, secures and corrects BP in a rapidly changing business environment, manages customer power and is flexible for reengineering (Alotaibi and Liu, 2017). If appropriate, the BPM strategy can effectively support a company's strategy, mitigate or prevent corporate inconsistencies in procurement, marketing, manufacturing, sales and finance (Izmailova et al., 2018). The success of BPM, however, directly depends on how well the information technologies are integrated (Rahimi et al., 2016). A critical place in BPM is occupied by BP performance measurement, since organizations are challenged to achieve effective and efficient results, and the choice of performance indicators is organization-dependent (Van Looy and Shafagatova, 2016; Cazabat et al., 2019).

In BPM, there are two basic approaches. The functional approach divides business processes into functional departments performing specific functions (e.g., sales and accounting). The procedural or process-based approach assigns an executive person with various functional responsibilities to perform the entire process or several process stages (selling, agreement making, invoice rendering, debit balance control, etc.). The vast majority of large and some medium-sized enterprises follow the functional approach, whereas many small and medium-sized enterprises (SMEs) may be short of funds and hence unable to attract a broad range of specialists. Therefore, they often resort to a process-centric approach (Harmon, 2019). Not only the shortage of financial and human resources but also the challenges of knowledge acquisition and scarce awareness of potential advantages keep SMEs from intense BPM processes, and the BPM system itself is often inadequately integrated (Bandara and Opsahl, 2017; Broccardo et al., 2019; Jurczuk, 2017; Kostiukevych et a., 2020).

There is no single internationally recognized concept of small and medium-sized businesses, so the definition of SMEs varies significantly from country to country (Ribau et al., 2018; Haviernikova et al., 2019). In European countries, SMEs include companies employing fewer than 250 people whose annual turnover does not exceed 50 million euros and/or whose an annual balance sheet total does not exceed 43 million euros (Hilmersson and Johanson, 2016; Li, 2019). In the Russian Federation, SMEs are those business entities (legal entities and individual entrepreneurs) classified under the federal law as small- (micro companies included) and medium-sized companies and established in the national register of small and medium-sized organizations.

By the mean number of employees, SMEs are divided into three categories of medium-sized (101 to 250 persons), small (15 to 100 persons), and micro (15 persons and fewer) (Official website of the President of Russia, 2020). The annual limits of business income for each category of SMEs are 2 billion, 800 million, and 120 million rubles, respectively (Official website of the Government of the Russian Federation, 2020). In Russia, there are 5.979.899 small and medium-sized organizations, of which 16.978

are medium-sized businesses, 222.144 are small businesses, and 5.740.777 micro companies (Unified Register of Small and Medium-Sized Business Entities of the Russian Federation, 2020).

Since SMEs generate around half of the total value added, their contribution to the national economy can hardly be overestimated (Dumcius and Skersys, 2019; Du and Wang, 2020). Meanwhile, the lack of finance, time and knowledge, makes the majority of SMEs model and consciously manage their key business processes on rare occasions (Chong, 2014). In this regard, a case study of business process modeling and management in a particular SME is increasingly relevant. Business process modeling refers to the activity of developing and documenting the core business processes that provide significant value to the business (Panayiotou et al., 2017).

This study aims to model the core business processes in the SME organization using the functional approach while taking into account the human and material resources available to it. To achieve this goal, the study sets the following objectives:

- analyze the company's structure including the available human resources;
- analyze the existing business processes, which are related to the major activities of the company;
- based on the analysis, model those business processes allowing for the more efficient use of resources and higher productivity;
- after the integration of new business processes, evaluate their effectiveness by measuring: the total number of agreements; the number of new agreements per month; monthly and total revenue; monthly revenue gain; the incoming lead conversion.

The research hypothesis is that a company integrating a functional process model into a certain area of performance will increase its labor productivity, thereby making more revenue and agreements, improving the lead conversion rates, and reaching cost-effective marketing.

2. MATERIALS AND METHODS

The research object is one of the functional areas of the SME organization (i.e., Sales) operating in Russia. This is a B2B company specializing at intellectual property trade, which customers pay a monthly fee for certain services on a contractual basis. The company agreed to participate in the study and provide all the necessary data including commercial information on condition of anonymity. The company's employees were asked to complete a survey, which contained the following questions:

- What are your daily/weekly/monthly functional responsibilities?
- What responsibilities, in your opinion, do not correspond to your core functionality?
- Are you satisfied with the level of labor automation in your department/company? If not, which processes need automation?
- What functional improvements, in your opinion, would boost the efficiency of your work?
- Describe your sales-related actions.

All participants were also interviewed about the sales process and related aspects such as automation, etc. In general, the following data were collected and transferred to further comparative, descriptive, quantitative and qualitative analyses: the company's organizational structure; manning table; job descriptions; sales-related orders and instructions; monthly revenue figures and new agreement counts for the 12 months prior and subsequently to the BP model integration; employee survey/interview results. The key steps in the current research process are depicted below:

- Review previous studies on business process management,
- Collect and process data about the Company and its sales processes,
- Visualize the working sales process flow,
- Analyze the sales process flow from the functional perspective,
- Assess the business process automation level,

– Identify functional imbalances,
– Optimize the sales process model,
– Implement the new sales process model,
– Analyze consequences,
– Review progress after the new sales process model,
– Draw recommendations.

3. RESULTS

The Company under study belongs to the category of small business, employing 29 persons and earning up to 500 million rubles annually, and can be found in the Unified Register of Small and Medium-Sized Business Entities. At the time of sales process integration, the Company had 4.090 agreements signed with legal entities and sole entrepreneurs. Every month, the Company issues invoices to partners. These are physically printed out of the database along with the service acceptance acts. Both bear the facsimile signature of the CEO and the seal of the Company. These documents are sealed in envelopes with glued stamps and sent by regular mail to each partner.

Twelve months before the new sales process model was integrated, the Company recorded a downward trend in the number of new agreements and, consequently, a drop in the monthly revenue. The comparative study of the total agreement count and the number of new agreements shows that despite the growing total, the monthly rate of growth in the number of new agreements declined by 79 agreements per month or by more than a double (Figure 1).

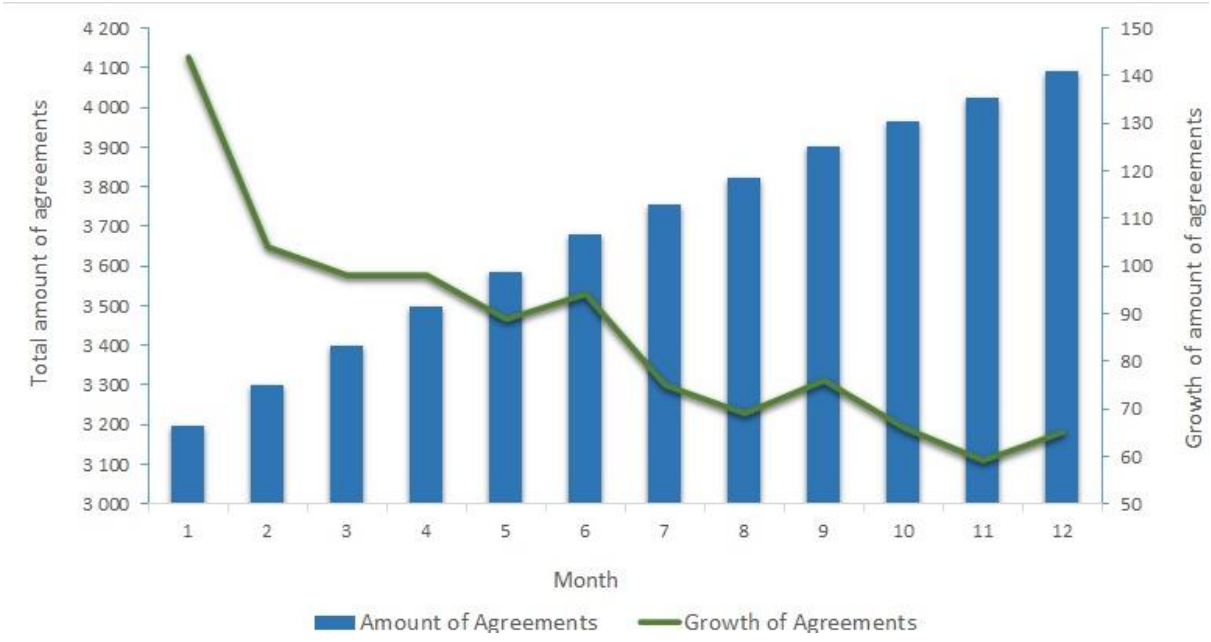

Figure 1. The Comparative View of Changes in the Total Agreement Amount and the Rate of Growth in the Amount of New Agreements per Month, adapted from data provided by the Company

Source: developed by the authors from data provided by the Company

The total agreement count gained 893 agreements during the pre-integration period (27.9%), growing from 3.197 to 4.090. Despite the revenue growth from 32.3 million to 40.1 million rubles (by 7.7 million rubles or 24% over 12 months), its monthly rate dropped 2.4% from 1.2 million to 0.496 million rubles per month during the study period (Figure 2).

Figure 2. The Comparative View of Changes in the Total Revenue and the Monthly Revenue Growth Rate, adapted from data provided by the Company

Source: developed by the authors from data provided by the Company

Note that the following indicator pairs do not correlate directly with one another, since a single contractual sum was negotiated upon with the partner before the conclusion of the agreement and all receipts thus vary: the total agreement count and total revenue; the rate of growth in the number of new agreements and the revenue growth rate.

The comparative study of the incoming leads showed a significant drop in their number during the pre-integration period, with the generation rate of 180 to 160 leads per month. The lead conversion rate has also decreased, from 80 to 40% (Figure 3).

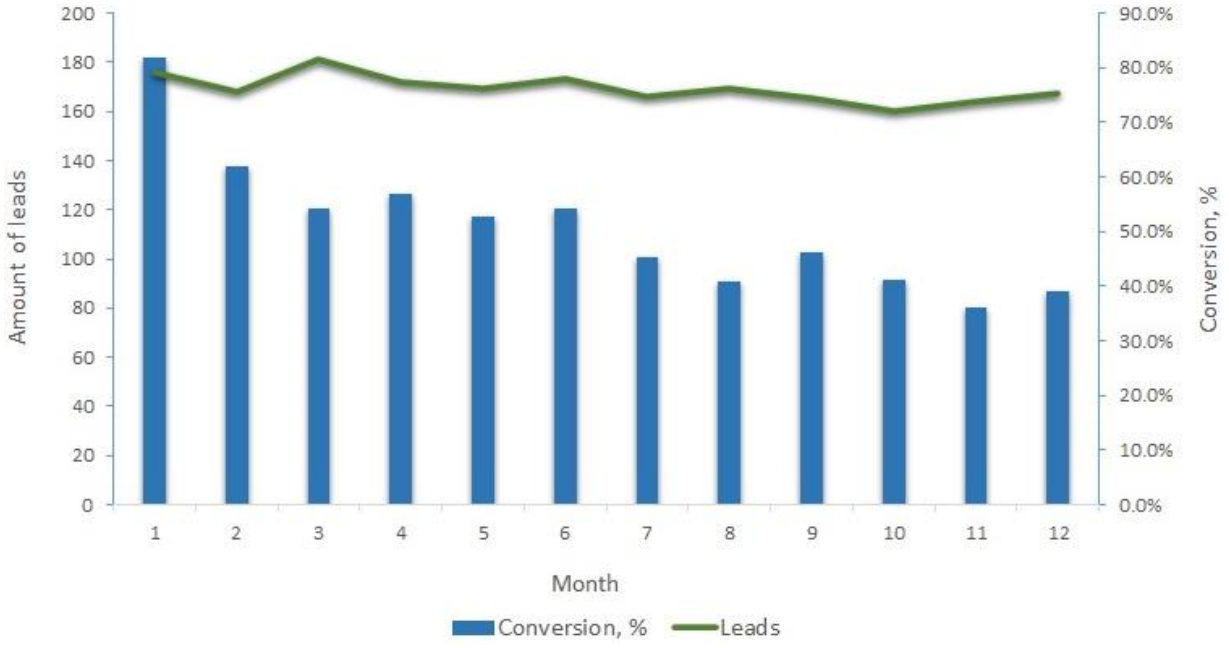

Figure 3. The Comparative View of Changes in Lead Generation and Lead Conversion Rate, adapted from data provided by the Company

Source: developed by the authors from data provided by the Company

Sales managers drew attention to an increased load originating from functions that were time-consuming and not directly related to sales. While spending work hours on performing these functions, managers had little time to manage the incoming leads, which affected their performance in agreement making. The Company is a vertically integrated structure divided into 4 functional departments: Marketing Department, Administrative Department, Sales Department, and Accounting Department (Figure 4).

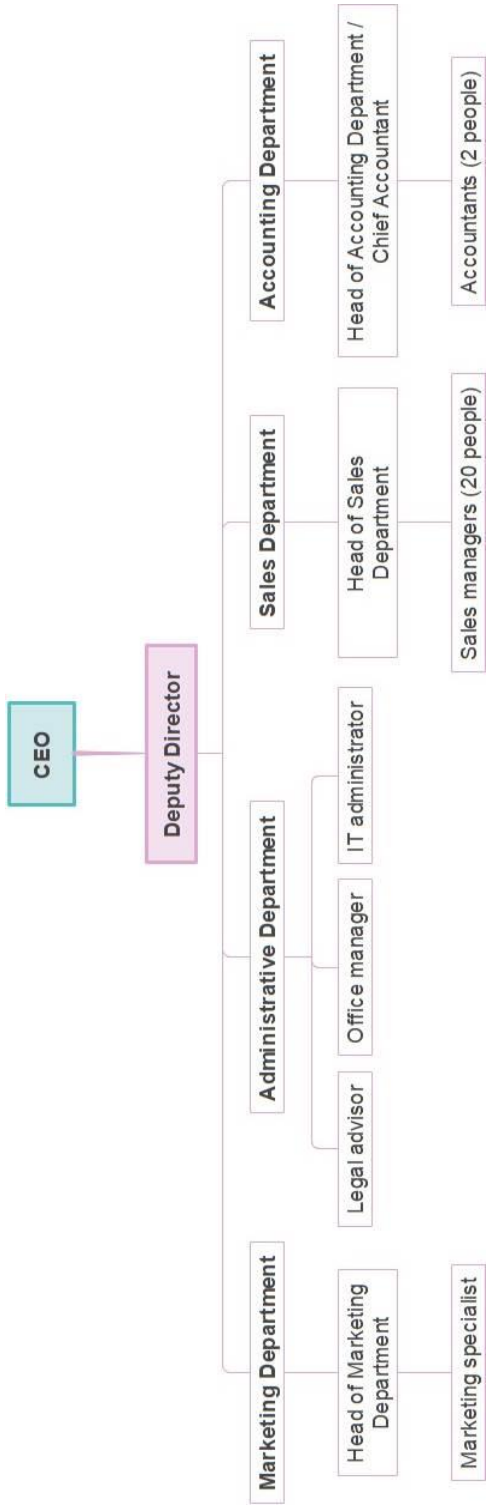

Figure 4. The Organizational Chart of the Company's Structure, adaptd from data provided by the Company

Source: developed by the authors from data provided by the Company

Table 1. The Outline of Company's Departmental Functions, adapted from data provided by the Company

Department	*Employee*	*Functional Responsibilities*
Marketing	Head of department, Marketing specialist	– Marketing process organization; – Lead generation*
Administrative Department	Legal advisor	– Prosecuting or defending lawsuits; – Preparing in-house documents; – Concluding agreements with customers*; – Work with partners on agreements*; – Settlement of claims against debtors
	Office manager	– Answering incoming calls; – Managing document flow between departments; – Registering source documents*; – Purchasing office supplies
	IT administrator	– Managing and maintaining hardware and software; – Managing and maintaining CRM*; – Integrating CRM with necessary document templates*; – Printing invoices and acts from CRM*; – Analytical reporting
Sales Department	Head of department	– Sales process organization; – Sales
	Sales managers	– Sales – Agreement negotiation with potential parties to the agreement (generated leads)*; – Entering details related to the agreement into the CRM database*; – Settlement of agreement-related issues (documentation, receivables, technical issue, etc.) with the partners*
Accounting Department	Head of Accounting Department / Chief Accountant	– Accounting process organization and control
	Accountants	– Collecting and recording financial information of the company; – Invoicing and issuing service acceptance acts*; – Updating payment statuses in CRM*; – Accounts receivable control*; – Submitting appropriate paperwork to regulatory organizations

Source: developed by the authors from data provided by the Company

Note: "" – sales-related functions; knowing what functional responsibilities are sales-related may help business process auditors understand whether departments and employees perform the 'right' functions.*

Table 1 shows a summary of the basic functions of various departments and persons employed there. By nature, these functions are similar to those in other companies. The sales process in the company is not regulated by in-house documents. Based on the employee feedback and documentation analysis, the sales process flow has the following key stages: lead generation; negotiation with a potential partner; agreement conclusion; invoice and acceptance act generation; invoice payment control. The duplication problem with bank payment functions is linked to the presence of two duplicates of CRM, one used by the managers and one used by the Accounting Department staff. Both databases are based on the 1C software, which is popular in Russia and other post-Soviet countries. The top management of the Company explained their decision to duplicate data on a database by saying that it was an attempt to avoid the loss of data, which could affect the accuracy of financial and tax reporting. Both databases are manually synchronized at certain intervals to ensure that there are no mismatches between the two CRMs. The sales process automation assessment showed the integration of standard agreement templates for managers, which could be exported in a Word format with the full details of the partner auto-

matically entered. The CRM also has invoice and acceptance act templates, which makes it possible to print their copies in bulk and thus secure the Company during inspections and/or court proceedings over receivables.

Table 2. The Comparative Functional Study of Initial Sales Process, developed by the authors

Sales Process Model	*Formal Executor*	*Actual Executor*	*Frequency*
Lead generation	Marketing Department	Marketing Department	Daily
Agreement negotiation with potential parties to the agreement (generated leads)	Sales Department	Sales Department	Daily
Entering personal details about the party into the CRM database	Sales Department	Sales Department	Daily
Agreement execution	Legal advisor	Sales Department	Daily
Preparing and sending agreement by mail	Office manager	Sales Department	Daily
Control over the agreement delivery receipt, agreement signing, and return	Sales Department	Sales Department	
Agreement activation in CRM	Sales Department	Sales Department	
Listing invoice candidates	IT administrator	IT administrator	
Printing invoices and acceptance acts	IT administrator	IT administrator	
Printing envelopes with the corresponding addresses	IT administrator	IT administrator	
Placing the facsimile signature and the company's seal, placing the document in the envelope, stamping, and mailing	Office manager	Office manager Sales Department	Once per month, 4 days
Updating payment status in CRM	Accountant	Accountant Sales Department	Daily
Accounts receivable control	Accountant	Sales Department	Daily
Managing receivables	Sales Department	Sales Department	Daily

Source: developed by the authors from data provided by the Company

To identify functional imbalances in the current sales process, a comparative study of the functional departments was conducted (Table 2). Data in Table 2 shows that 5 out of 14 functions are not related to sales and should be performed by other departments. Besides their direct responsibilities, sales managers also act as legal advisers, office managers and accountants. This means that the sales process was managed according to the process approach. The Company's CEO approved and put into action the new BP model (Table 3).

Table 3. The BP Sales 2.0 Framework (Optimized Sales Process Model), developed by the authors

BP Sales 2.0	*Responsible division/employee*
Lead generation	Marketing Department
Agreement negotiation with leads	Sales Department
Entering personal details about the party into the CRM database	Sales Department
Agreement execution	Legal advisor
Preparing and sending agreement by mail	Office manager
Control over the agreement delivery receipt, agreement signing, and return	Sales Department
Agreement activation in CRM	Sales Department
Listing invoice candidates	IT administrator
Printing invoices and acceptance acts	IT administrator
Printing envelopes with the corresponding addresses	IT administrator
Placing the facsimile signature and the company's seal, placing the document in the envelope, stamping, and mailing	Office manager
Updating payment status in CRM	Accounting Department
Accounts receivable control	Accounting Department
Managing receivables	Sales Department

Source: developed by the authors from data provided by the Company

As can be seen from Table 3, the agreement preparation function, mailing operations and payment control duties were transferred to the legal adviser, office manager, and the Accounting Department, respectively. The latter was sentenced to provide the Sales Department with a debtor list on a weekly basis. For BP Sales 2.0, no additional human resources were required. Hence, the Company was not burdened with the excessive bureaucratic procedures, and the business process restructuring was carried out within a week. Based on the BP automation assessment results, recommendations for merging two CRM databases in a single one with different access levels set for Accounting and Sales Departments and with a daily automatic backup feature. Furthermore, it was recommended to integrate CRM with the electronic document management system. Since these improvements were time-consuming and required significant material costs (e.g., programming), actions towards them were still in progress by the end of the study. Twelve months after the BP Sales 2.0 a second interview was conducted. Now when sales managers spent more than 90% of their work hours on their direct functional responsibilities, the top management reported a significant increase in the sales manager productivity. The output of office managers, accountants, and legal advisers, however, somewhat decreased due to the redistribution of functions in a new BP model. The upward trend in sales manager productivity provoked the revenue growth, which allowed the Company to hire temporary labor to cope with the peak workload (mass distribution of invoices and acts).

The study of post-integration data confirmed the positive influence of BP Sales 2.0. For instance, the total number of agreements increased by 1338 (32.7%), from 4090 to 5428 agreements (Figure 5).

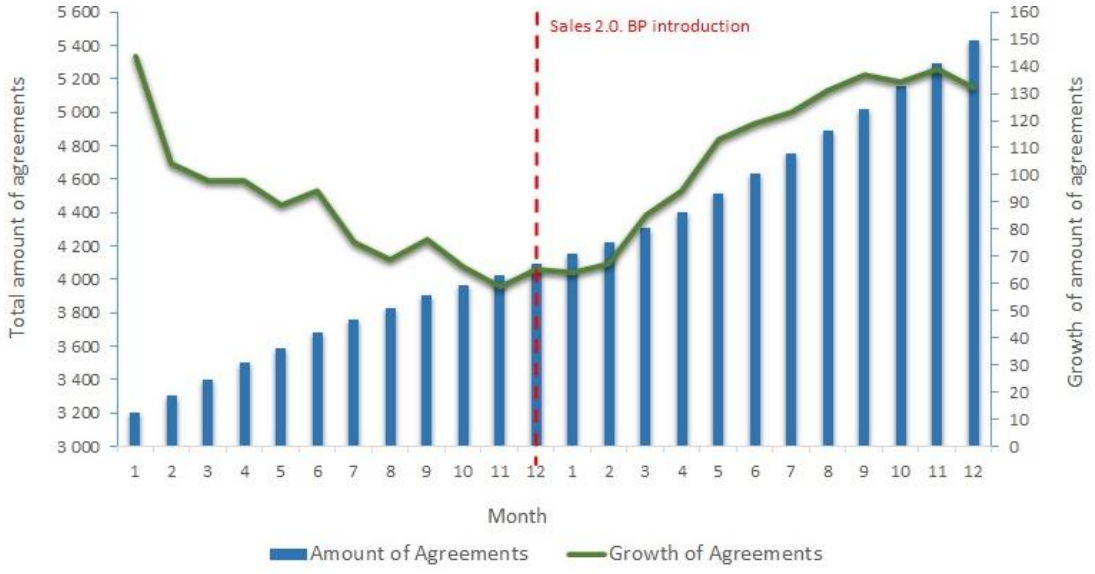

Figure 5. The Comparative View of Changes in the Total Agreement Amount and the Monthly Rate of Growth in the Amount of New Agreements after BP Sales 2.0, adapted from data provided by the Company

Source: developed by the authors from data provided by the Company

The first two months after the integration of BP Sales 2.0 the rate of growth in the number of new agreements remained without change (64 vs 67 agreements per month, respectively), which can be explained by the specificity of the B2B market. Starting with the third month, the number of new agreements showed a steady growth of 106%, reaching 132 agreements per month by the end of the study. The revenue growth chart revealed a curve that was more dynamic as compared to the pre-integration period. The total revenue figure amounted to 557.4 million rubles over the last year of post-integration, assuming an increased growth rate of 53.3 million rubles per month (Figure 6), 13.1 million (32.7%) higher than that in pre-integration period.

Figure 6. The Comparative View of Changes in the Total Revenue and the Monthly Revenue Growth Rate after BP Sales 2.0, adapted from data provided by the Company

Source: developed by the authors from data provided by the Company

Similarly, to the newly concluded agreement count indicator, the monthly growth rate of revenue suggests the presence of certain inertia during the first two months after the integration of BP Sales 2.0., followed by a stable growth from 0.496 million to 1.3 million rubles over a year (161%).

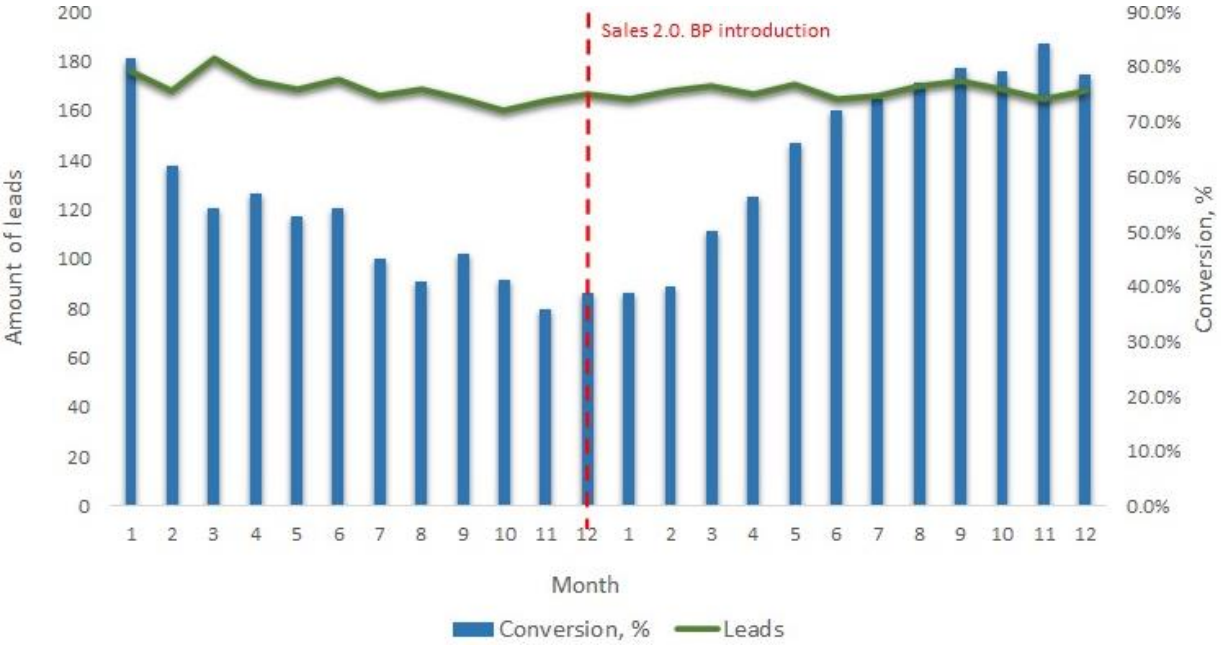

Figure 7. The Comparative View of Changes in Lead Generation and Lead Conversion Rate after BP Sales 2.0, adapted from data provided by the Company

Source: developed by the authors from data provided by the Company

The incoming lead conversion rate increased from 38.9% to 80% over the post-integration period of 12 months. All prior and subsequent data are given in Table 4.

Table 4. The Company's Performance Prior and Subsequently to BP Sales 2.0, developed by the authors based on data from the Company

Indicator	*Before BP Sales 2.0*	*After BP Sales 2.0*	*Difference*
Total agreement count over 12 months, items	893	1 338	445
The number of new agreements over 12 months, items	65	132	67
The number of new agreements per month, items	-79	67	146
Total revenue over 12 months, million RUB	440.4	557.4	117.0
Total revenue growth rate, million RUB	7.8	13.1	5.3
Monthly revenue at the end of the 12th month, million RUB	0.496	1.296	0.800
Change of monthly revenue figure, million RUB	-0.678	0.800	1.478
Lead conversion rate at the end of the 12th month, %	38.9%	78.6%	39.6%
Change of the lead conversion rate, %	-52.4%	101.8%	154.2%

Source: developed by the authors from data provided by the Company

4. DISCUSSION

This study confirms that the SME under study is historically inclined towards a process approach (Harmon, 2019). Its previous sales process was neither purposefully modeled, nor consciously managed (Chong, 2014). Meanwhile, the available human and financial resources allowed the Company to eventually model and implement the BPM system and later attract more labor force. The lack of resources is a typical challenge in BPM (Bandara and Opsahl, 2017; Jurczuk, 2017; Stojanovic et al., 2017). In this case, however, problems with the BPM system integration originated from the lack of BPM competence and the understanding of advantages that such integration could bring (Broccardo et al., 2019, Gagarina et al., 2018; Sanchis-Pedregosa et al., 2020).

In this study, the choice of BP effectiveness indicators (i.e., agreement count, lead conversion and revenue) was determined by the specificity of both the sales process and the Company's activity (Van Looy and Shafagatova, 2016). The sales process model has proven effective (Izmailova et al., 2018), whereas the BPM system had a positive impact on the overall performance of the Company, as evidenced by the rapid revenue growth (Braunnagel et al., 2016; Pejic Bach et al., 2019). Furthermore, the relationship between BPM and non-financial indicators was found to be either direct (productivity and lead conversion) or indirect (revenue, profitability, etc.) depending on the indicator (Glavan and Vukšić, 2017).

CONCLUSIONS

The research objectives were reached and the research hypothesis was confirmed. Based on the Company's performance statistics, the functional model of sales process was created, which was then put to practice in the Sales Department. Integrating this model made sales managers more productive, lead conversion improve by 39.6%, the amount of agreements grow by 106%, monthly revenue and 12-month revenue increase 32.7 and 26.5%, respectively, from the previous period.

This study has one major limitation. The SME entity under study is specific in terms of activity, organizational structure, and business processes. Therefore, similar studies on other organizations, activity, organizational structure, and business processes distinct from those addressed here, may contribute alternative findings.

The methodological framework and findings of this study may be applied by SMEs for business process optimization and modeling in order to increase labor productivity, reach cost-effective marketing, gain more profits, and improve other parameters of performance. These can also be used by other researchers exploring the impact of functional BPM on the corporate activities and outcomes.

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Information and Communication Technologies in the Healthcare tem of the Republic of Kazakhstan: Economic Efficiency and Development Prospects

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ABSTRACT

The article examines the impact of information and communication technologies development in health care on economic growth. The main indicator of the author's economic growth is gross value added. The aim of the study is to identify a quantitative assessment of the impact of ICT costs on the gross value added (GVA) of healthcare in the Republic of Kazakhstan, as well as an analysis of the state of e-health in the Republic of Kazakhstan, a SWOT analysis of the healthcare system in the aspect of a unified information system. The methodology is based on a quantitative assessment of the impact of ICT costs on increasing the GVA of healthcare in the Republic of Kazakhstan. The tools of economic and mathematical modeling were used as the main method for modeling the links between ICT and social services and the growth of gross value added. Research based on data from official statistics for the Republic of Kazakhstan for the period 2010-2018. Based on this model, it was concluded that spending on ICT development has a positive effect on the GVA of health care. Based on the global trends in innovative development, it can be concluded that today Kazakhstan needs to ensure the further development of ICT.

INTRODUCTION

Recent economic studies in the theory of evolutionary and endogenous growth indicate that knowledge and technology play a decisive role in the development of economic systems. The process of

digital transformation of the economy to a large extent determines the effectiveness of economic development. Its competitiveness in the context of globalization and international integration is largely determined by the accumulated and implemented human capital in the country. As you know, the leading countries of the world have achieved success in the field of scientific and technological progress due to the intensive development of education, science and health.

Analysis of the current state and development trends of e-health and the developed SWOT analysis not only explain the existing imbalances, but also predict their further development. This problem is of particular relevance for Kazakhstan, whose economy largely depends on the extraction and sale of minerals, and the share of high technology is low. The urgent task of the transition from a commodity economy to innovative development is to increase competitiveness through the use of advanced technologies, which requires the qualitative development of new types of capital - human and social. At the same time, Kazakhstan has innovative potential, expressed in the high level of the educated population, in a high proportion of highly qualified specialists, as well as resources for the implementation of the Digital Kazakhstan program. However, the insufficient scale of ICT implementation in the regions, as well as the lack of production of ICT equipment, in almost all regions of the Republic, inhibits the effectiveness of innovation policy.

The spread of the main trends of the industry 4.0 global revolution and the increasing competition in world markets in the 21st century have contributed to strengthening the strategic position of any country in the long term. According to the World Economic Forum, digitalization has great potential for business and society and can bring an additional 30 trillion dollars of revenue for the global economy over the next 10 years. From the point of view of applicability to Kazakhstan, models and methods of studying the problems of using ICT and its relationship with economic growth are of greatest interest. Therefore, it is relevant to justify the choice of a common paradigm for modeling the relationship between ICT spending and economic growth. By the mean number of employees, SMEs are divided into three categories of medium-sized (101 to 250 persons), small (15 to 100 persons), and micro (15 persons and fewer) (Official website of the President of Russia, 2020). The annual limits of business income for each category of SMEs are 2 billion, 800 million, and 120 million rubles, respectively (Official website of the Government of the Russian Federation, 2020). In Russia, there are 5.979.899 small and medium-sized organizations, of which 16.978 are medium-sized businesses, 222.144 are small businesses, and 5.740.777 micro companies (Unified Register of Small and Medium-Sized Business Entities of the Russian Federation, 2020).

1. LITERATURE REVIEW

In conduction of this research the study of penetration of information and communication technologies in the sectors, which contribute to the growth of the efficiency and competitiveness of the economy, is of great importance. The mechanism of widespread use of ICTs is based on the process of transferring data, information and knowledge, the exchange of scientific and engineering thoughts, as well as messages on the results obtained in undertaken studies. Economists began to approach the study of the mechanisms of dissemination of innovative processes similar to the physical phenomenon of distribution in various environments in the middle of the last century. The spatial system necessarily evolves along with the distribution processes. This is evidenced by numerous basic research. Innovations are distributed through market and non-market channels, from the place of their first sale to various consumers, countries, territories, industries, markets and enterprises (OECD, 2018). Without the widespread dissemination and implementation of innovations, it makes no economic sense.

Part of the mechanism for spreading and introducing innovations are channels - ways of penetrating innovations. They can be divided into interpersonal (transferring information from person to person directly) and special or remote (iconic and technical means of transmitting information). Nowadays, ICT is the locomotive tool of accelerated development in many areas of the economy. It has become fashionable to talk about new technologies in the digital and electronic economies. These concepts are used interchangeably and mean almost the same thing. In the near future, the digital economy may become a new tool that will open up great opportunities for all spheres of life, so it is very important to understand how to digitalize various structural elements (Satpaeva and Kalymbekova, 2019). Radical changes in

most industries happen under the influence of such global trends as the emergence of breakthrough technologies, digitalization, and acceleration of the product life cycle. Progress toward a greener and more competitive economy is possible only if all components of social security are accounted for by firms, stakeholders, and policymakers. It is well known that sustained economic growth depends on sustained investment in technological, organizational, and new ways of managing production (Veselovsky, Izmailova, Lobacheva, Pilipenko and Rybina 2019).

Digital technologies allow enterprise management and individuals to reduce transaction costs of interaction on an ever-increasing scale and make closer contact with business entities and government agencies (TETIDT, 2019). As a result, an economy based on network services is formed, i.e. digital or electronic (Cardona, Kretschmer and Strobel, 2013;Panshin, 2017). Thus, Negroponte (1995), ab American computer scientist, presented the electronic economy as a transition from the movement of atoms to the movement of bits. This concept is associated with the intensive development of ICT and the beginning of the process of digitalization of society, which is based on the fourth industrial revolution.

In many countries, programs exist to support the adoption and use of ICT. However, there is a growing trend, in both developed and developing countries, to establish barriers to Internet access, which could threaten the fundamental right to freedom of expression and weaken the Information Society, which favors the expansion of capabilities so that people can lead the life they really want. It is therefore essential that public policies in each country and international agreements continue to defend free and secure access to the Internet as the main means of global communication and information provision (de la Hoz-Rosales, Camacho-Ballesta and Tamayo-Torres, 2019). The introduction of ICT allows to develop and raise the economy not only of large cities, but also of small villages, providing them with access to information and expanding the quantity and quality of social services (Zolfani, Sedaghat and Zavadskas, 2012). Formation of the basic model of this study corresponds to the traditional models of catching up endogenous growth. This model was basically formulated back in the 30s of the last century by a Japanese economist K. Akamatsu (1962). In subsequent years, the basic principles of the theory of “goose wedge” were further developed in the scientific concept of "accelerated catching up" development.

One of its ideologists, J. Sachs (2005), defines the process of catching up development as a process in which an economy with a lower level of technology and income reduces the gap with economies with more advanced technologies and a higher level of welfare by using innovation and the flow of capital from a “leader” to a “follower”. Accelerated reindustrialization, modernization, involving the use of information and operational technologies, efficient energy sources, deepening the division of labor, and the development of the commodity and money markets, are the fundamental core of the catch-up development of the economy. This theory has recently received a rigorous mathematical justification thanks to the work of D.L. Anselin, D.Audres and M.F. Feldman (1997, 1996). P. Romer (1986) theoretically substantiated the influence of endogenous factors on economic growth. His calculations contain generalizations of localized effects that positively affect innovation.

A number of Russian scientists study the impact of information and communication technologies on various sectors of the economy, with particular attention being paid to sectors such as health, education and science (Leonov, 2018; Korobkova, 2018). New technologies are the most visible sign of changes in economic systems, and they are often called the driver of economic development. The main idea of such reasoning is that the increased volume of technological innovations in the field of data processing and transferring leads to a reorganization of socio-economic relations, since their impact is quite significant. Many researchers in their works note the importance of the influence of technological innovations. The spread of digital technologies gives rise to discussion about the formation of new socio-economic relations, the digital economy (Semenov, 2017). Each country has its own specific features that determine the general model of the digital economy, the development of information infrastructure, the creation and application of information and communication technologies and the mechanisms for their implementation(Molinari and Torres, 2018). These features are of a different nature, but new economic relations are gradually forming, and the economy is becoming more integrated in the world community, there is an urgent need for structural changes and closer interaction between the state and the private sector.

An effective structure such as public-private partnership (PPPs) has evolved and is playing an increasingly important role. The increased interest in this interaction between the state and business is

explained by the fact that in many countries the pooling of resources from the public and private sectors can effectively solve major social and economic problems and develop their information infrastructures. Most PPPs are focused on basic directions, defining development goals and objectives: a) key institutions within which conditions for the development of the digital economy (statutory regulation, personnel and education, the formation of research competencies and technology departments) are created; b) basic infrastructural elements of the digital economy (information infrastructure, information security). In world practice, there are many successful examples of public-private partnerships that can be seen in the works of such scientists as I.A. Nikonova, I.Z. Yarygina (2018), V.N. Mochalyshkov (2012). This topic is of particular relevance for socially significant areas, in particular for the healthcare sector – medicine. Serious changes are needed in the management of medical institutions, pursuing the goal of developing new approaches, methods and forms of work for organizations, and adjusting the system of relations with a constantly changing external environment. The development of medical technologies significantly increases the ability to really influence the health indicators of the population, as evidenced by the significant successes in the fight against the most life-threatening diseases achieved in developed countries. To improve the health situation of citizens, it is necessary to ensure a qualitative breakthrough in the healthcare system. The industry needs innovative developments in the field of prevention, diagnosis and treatment of diseases (including rehabilitation), an effective system for the training and retraining of medical personnel, and modern high-tech information systems. It is noted that one of the most important tasks is the informatization of the healthcare system, including the introduction of electronic document management in medical organizations and the creation of a medical information and educational resource (Borkova, Napolova and Orlov , 2019).

Since 2009, the International Telecommunication Union (ITU) is annually publishing the “Measuring the Information Society” report, which presents the development of ICT, evaluating country results regarding ICT infrastructure and skills, as well as the ICT price basket index, which tracks and compares the cost and availability of ICT. According to the latest ITU report on the ICT Development Index 2018, Kazakhstan is ranked 52nd (Figure 1). The first three places in the ranking were taken by South Korea, Spain and Denmark. Among the CIS countries, Belarus occupies the leading position (31st place), followed by Russia (42nd place), Kazakhstan (52nd place), Moldova (68th place) (ITU, 2017). Currently, investment in the ICT sector is becoming a priority for many countries. Numerous studies and successful international experience have proved that a developed sector of information technology (IT) contributes to the growth of efficiency and competitiveness of the economy (Burkov, 2013). South Korea is a classic example of such effects, as over the period from 1999 to 2003, the information technology sector grew by 43%. For comparison, we note that over the same period in Singapore the growth rate was 5%, in Malaysia - less than 1%. The success of South Korea is explained by the fact that the development of the ICT sector was put in a national priority, which, in turn, required significant subsidies from the state. These actions led to the fact that the ICT sector has become the largest segment of the national economy, which accounts for 17% of the country's gross national product and 43% of all South Korean exports (Beardsley et al., 2010).

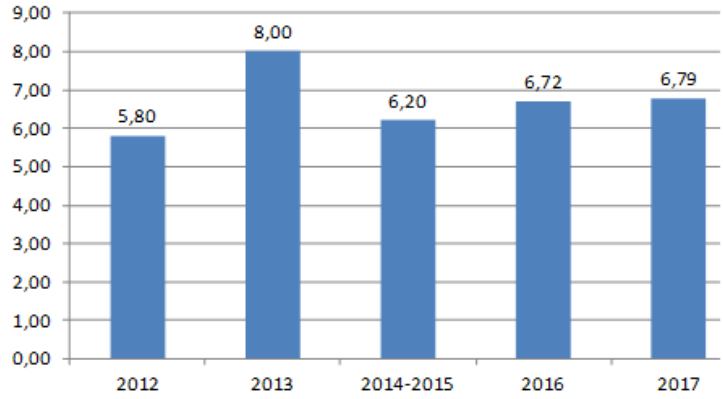

Figure 1. Dynamics of change of indicators of the Republic of Kazakhstan on development of ICT

Source: International Telecommunication union, ICT Development Index 2017

The uniqueness of the current situation is that about 5.5% of world GDP falls on the ICT sector, and according to the forecasts of the McKinsey consulting company, this figure will reach around 9% by 2020 (McKinsey & Company, 2011). This suggests that ICT is becoming a serious factor in the growth of GDP in the global economy. Nowadays, even in countries that have entered the post-industrial period of economic development, information technology continues to be the backbone of the economy. The fact is that in addition to the economic aspect, the ICT sector has the exceptional ability to build more stable relationships. According to the results of recent studies of consumer markets by McKinsey consulting company, it is argued that ICT is one of the four leading areas of economic activity in terms of intensity of influence on modern society, following healthcare, agriculture and utilities. Figure 2 shows the industries that have the greatest impact on social development (Qiang, Rossotto and Kuniko, 2009).

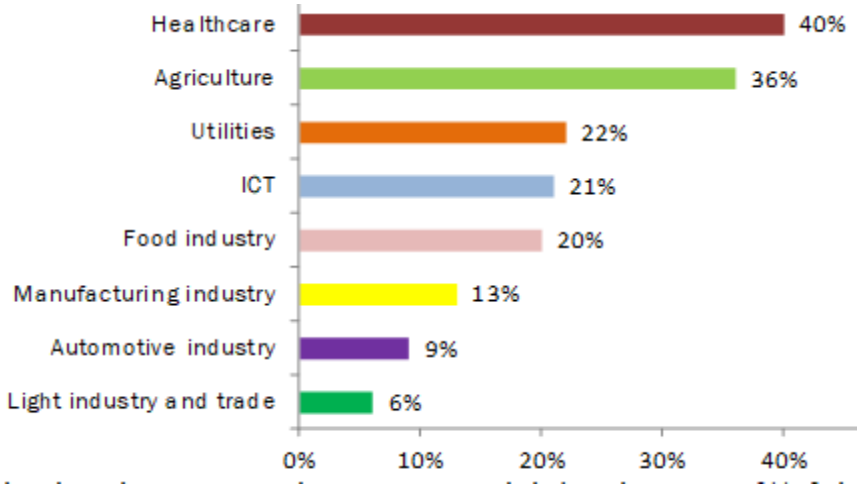

Figure 2. Sectors having the greatest impact on social development, %(of the number of consumers surveyed)

Source*:* Qiang et al., 2009.

The use of modern ICT in healthcare is caused by large volumes of information, methods of its collecting, processing and transferring. The process of informatization of healthcare in the Republic of Kazakhstan is gaining momentum every year. Therefore, the appearance in the speeches of President K. Tokayev that the digital economy will determine the future and, in fact, is the locomotive of the country's development. In this regard, the introduction and widespread use of modern ICT and the development of telemedicine are aimed at rationalizing the work of medical workers, ensuring accessibility and improving the quality of medical care, which determines the relevance of the study.

2. METHODOLOGY

Information technology, which today is a component of fixed capital, allows, on the one hand, to facilitate work by replacing the physical energy of a person and increasing labor productivity. On the other hand, the share of fixed capital in the value of the produced product or service is growing per worker (capital-labor ratio). As the capital-labor ratio of labor grows, so does the qualification of workers, since information technology contributes to the development of the intellectual abilities of specialists. Therefore, in the aggregate, labor and fixed capital will increase the volume of sales of goods and services (hereinafter the volume of production), while improving the quality of the manufactured products or services, in our case, the quality of medical care and saving time, without much stress. As a result, a person has more free time. This result corresponds to the universal economic law of saving time, expressing the source and method of increasing social reproduction.

The Law of time saving was formulated by K. Marx (1959) in connection with the identification of the historically passing significance of money as a cost form of manifestation of society, the nature of production. The essence of this law is to eliminate the contradiction between the need to increase free time

and busy time. Saving of busy time and increasing free time are components of social progress. Today, the countries that have high results of scientific and technological progress, a high level of culture of the population, and a high level of medical care mainly achieve this due to the increase in free time due to the saving of busy time.

For empirical testing of the studied problem, the authors put forward a hypothesis: it is assumed that ICT indicators have a statistically significant and positive effect on economic growth. In accordance with theoretical approaches to the study of innovation, they activate the process of creating gross value added. To calculate the model, the annual data of The Ministry of National Economy of the Republic of Kazakhstan Statistics Committee for 2010 – 2018 time period were used. The economic result of the health sector, like any other sector, is the gross value added indicator, which is measured in the system of national accounts. The gross value added indicator is influenced by many factors, the combined effect of which can be correctly taken into account on the basis of the correlation-regression model.
One of the methods that allows to investigate the dependence of one variable on several explanatory factor variables influencing it is multiple regression analysis. For this, the multiple linear regression equation is constructed

$$y = a + b_1 x_1 + \ldots + b_k x_k \cdot \quad (1)$$

The parameters b_i, $\left(j = \overline{1, k}\right)$ of a quantitative explanatory variable are interpreted as the average change in the resulting variable with a single change in the explanatory variable itself and the constant values of the remaining independent variables. The free term a determines the value y at zero values of all factor variables. The parameters of the multiple regression equation are estimated using the least squares method. When applied, a system of normal equations is constructed, the solution of which allows one to obtain estimates of the regression parameters (Yemelina, 2015). The results of calculations using this model will allow us to characterize the quantitative relationship between gross value added and the costs of digitalization of healthcare. In the applied model, the gross value added of healthcare acts as a dependent variable and the dependence on various factors is estimated. The following indicators were selected for inclusion in the model (Table 1):

Y (dependent variable) - gross value added (healthcare and social services), mln.tenge
X1 - The volume of services rendered in the field of healthcare and the provision of social services in the Republic of Kazakhstan, million tenge
X2 - Costs of ICT in the healthcare sector, million tenge
X3 - Public expenditures on health care, million tenge
X4 - Private health spending, million tenge

To select the factors that should be included in the multiple linear regression equation, we will use the statistical data of these indicators for the period from 2010 to 2018 (Table 1). Due to the fact that while evaluating multiple linear regression, to ensure statistical reliability of the results, it is required that the number of observations is at least 3 times higher than the number estimated by the parameter, only two factors can be included in the desired model.

Table 1. The source data for 2010 - 2018 in the context of the analyzed parameters

Years	*Y*	*X1*	*X2*	*X3*	*X4*
2010	377 936,90	440 284,60	1917,99	402 277,14	198 077,50
2011	482 072,00	573 801,80	2998,5	653 422,92	296 992,90
2012	516 554,10	699 390,00	4027,67	770 226,95	384 354,90
2013	577 127,00	720 519,20	5281,98	825 200,46	447 510,90
2014	666 308,40	816 427,10	4036,1	892 844,87	532 092,90
2015	729 986,80	892 643,80	5066,9	898 512,67	578 957,00
2016	888 829,70	1 082 797,40	22190,9	948 038,39	645 618,10
2017	1 075 543,50	1 165 626,90	9284,5	1 023 872,76	626 874,60
2018	1 172 754,30	1 238 640,32	17963,1	1 085 236,00	679 520,60

Source*:* compiled by the author according to The Ministry of National Economy of the Republic of Kazakhstan Statistics Committee and National Health Accounts

Further, to build the model, the Microsoft Office application package was used, which made it possible to obtain a correlation matrix. Table 2 presents the correlation matrix, which allows to see a list of factors that directly affect Y and exclude those that cannot be used further to build an econometric model of the analyzed set of parameters.

Table 2. Correlation Matrix

	Y	*X1*	*X2*	*X3*	*X4*
Y	1,0000				
X1	0,9830	1,0000			
X2	0,7654	0,6871	1,0000		
X3	0,8894	0,9379	0,6522	1,0000	
X4	0,9090	0,9611	0,7417	0,9654	1,0000

Source*:* Author calculated from research data

Table 3. A qualitative interpretation of the theoretical correlation based on the Cheddock scale

The correlation coefficient by absolute value	0,1 - 0,3	0,3 – 0,5	0,5 – 0,7	0,7 – 0,9	0,9 -0,99
Correlation strength characteristic	Weak	Moderate	Observable	High	Very high

Source*:* (Statistics: textbook and workshop for academic undergraduate 2018)

Tables 2 and 3 show that the analyzed Y- "gross value added, mln. tenge" is influenced by factors such as X1 and X4, in which the correlation coefficient exceeds 90%, factorX3is high being more than 80%. The analysis of the values of the correlation matrix shows that GVA (Y) is most affected by the factor "the volume of rendered services in the field of healthcare and the provision of social services" (X1). Since the factor "costs for ICT in the field of health care" (X2) is important for the study, we use it to further build the model. In addition, there is no multicollinear dependence ($r_{x_4x_8} = 0{,}6871 < 0{,}7$) between these factors. Therefore, the two factors X1 and X2 must be included in the multiple regression model. Thus, the desired two-factor linear regression equation will have the following form:

$$y = a + b_1 x_1 + b_2 x_2 \qquad (2)$$

Since the initial indicator *X2*- costs for ICT in the health sector is a subject to fluctuation, we conducted exponential smoothing of this time series (smoothing parameter $\alpha = 0{,}1$) in advance. Exponential smoothing is one of the most common techniques used for smoothing time series, as well as for forecasting. The smoothing procedure is based on the calculation of exponential moving averages of the smoothed series (Lukashin, 2003). After that, using the "Data Analysis" add-in, calculations of indicators of the future regression model were carried out (Table 4).

Table 4. Regression statistics

Parameter	*Indicator*
Regression statistics	
Multiple R	0,9834
R-suqared	0,9671
Normalized R-squared (reduced coefficient of determination)	0,9561
Standard error	57266,3815
Observations	9,0000
Coefficients	
Y-intersection	-92328,5235
X1 - The volume of rendered services in the field of healthcare and the provision of social services in the Republic of Kazakhstan	0,9241
X2– Costs of ICT in the healthcare sector	4,5744

Source*:* compiled by the authors

As a result of approximating the initial statistical data using the "Regression" tool (Data Analysis in Microsoft Office Excel), the following two-factor linear regression equation was obtained:

$$y = -92328,52 + 0,92x_1 + 4,57x_2, \quad R^2 = 0,98 \qquad (3)$$

After constructing the multiple linear regression equation, it is necessary to evaluate the quality of the model in the following areas:
a) check of the quality of the regression equation (correlation coefficient, determination coefficient);
b) check of the significance of the regression equation (Fisher criterion).

The multiple correlation coefficient is $R = 0,98$, which indicates a close relationship of the resulting attribute with two factor attributes at the same time. In addition, from the data of the protocol for performing the regression analysis, we have that the observed value of the Fisher criterion is equal $F_{obsrvd.} = 88,21$. The critical value of the Fisher criterion at the significance level of $\alpha = 0,05$ and the number of degrees of freedom $k_1 = m = 2$, $k_2 = n - m - 1 = 6$ (where n is the number of observations, m is the number of factors) is $F_{crit.}(0,05; 2; 6) = 5,14$. Since $F_{obsrvd.} > F_{crit.}$ ($88,21 > 5,14$), therefore, the obtained regression equation is statistically significant and reliable.

3. RESULTS AND DISCUSSION

As a result of the obtained two-factor regression equation analysis, the following conclusion was made:

- with an increase in the volume of rendered health services and the provision of social services by 1 million tenge, GVA increases by 0.92 million tenge;
- an increase in ICT costs in healthcare sector by 1 million tenge entails an increase in GVA by 4.57 million tenge.

According to the Ministry of Health of the Republic of Kazakhstan, today thanks to digitalization, savings of about 315.4 million tenge have been achieved on the purchase of paper for medical paper documentation; the cost of purchasing supplies for medical images (fluorography, x-ray, mammography, etc.) has decreased by 224.7 million tenge; visits to the clinic have been reduced by 8%, as well as live queues decreased by 30% due to pre-registration through electronic services, the time spent by patients in the clinic before receiving services decreased by 50%; also, due to electronic services, the time for obtaining laboratory research results was reduced by a factor of 1.7. From the point of view of sustainable and stable growth in the well-being of the population, one of the priorities of the Republic of Kazakhstan is the healthcare industry, which should become a unified, developed, socially oriented system, recognized to ensure the availability, timeliness, quality and continuity of medical care. The main goal of the healthcare sector development of the Republic will be to improve public health and ensure sustainable socio-demographic development.

Today, the rapid development of information and communication services is becoming a key factor that contributes to the inclusion of the Republic of Kazakhstan in global economic processes. In 2013, with the involvement of international experts from the Swiss Institute of Public Health (Swiss Tropical and Public Health Institute), the effectiveness of the e-health introduction in the Republic of Kazakhstan was assessed (The concept of development, 2013). Based on the results of the abovementioned audit, the Concept of e-health development of the Republic of Kazakhstan for 2013-2020 was developed. Table 5 shows the current information systems integrated into the healthcare system, developed and implemented in accordance with the adopted concept.

The aim of the implementation of these information systems was to create an information and technology platform that ensures the rational use of health resources with better delivery of services to the population. A fundamentally new solution is planned to create or modernize records at various levels of

medical care and a separate centralized implementation of the electronic health passport as a tool to provide support for clinical decision-making and continuity of medical care.

Table 5. Current information systems integrated into the healthcare system of the Republic of Kazakhstan

№	Information systems	Code	Comment on the IS content
1	Attached population register	APR	Transfer of data on an individual, information on the attachment of an individual, structure of districts, personnel on and off the site
2	Resource management system	RMS	Transfer of a list of medical organizations, a list of employees of medical organizations, bed capacity
3	Automated information system "Clinic"	Clinic AIS	Sending and receiving data (directions, DAS results, information on a static map, etc.)
4	Register of pregnant women and women of childbearing age	RPWCA	Management of groups of pregnant women and women of childbearing age to monitor indicators of their health status. Users of the system are ambulatory-level medical organizations (obstetrician-gynecologists, general practitioners).
5	The electronic register of inpatients	ERI	Upon the patient's admission to hospital for hospitalization, after the patient's treatment and discharge are completed, personal data is entered into the electronic information system
6	Health Services Quality Management System	HSQMS	Designed for information support of the functions of management, structural divisions and individual specialists of governing bodies and healthcare organizations in planning, accounting, analysis and management (organization), as well as in monitoring the quality of medical services provided.
7	Hospitalization bureau	HB	Designed for the effective management of planned hospitalization, the operational solution of registration issues, accounting, beds booking, free medical care
8	Drug provision management system	DSMS	The register contains complete information on all domestic and foreign medicines, medical devices and medical equipment registered in the Republic of Kazakhstan that are approved for medical use and sale in the Republic of Kazakhstan.
9	Cancer patients electronic register	CPER	Designed to keep track of patients in cancer clinics in the Republic of Kazakhstan, maintaining and processing information on the volume of medical care provided to patients with socially significant diseases.
10	Medical Technology Management System	MTMS	Designed for automated collection, processing and storage of data on medical equipment located in healthcare organizations, as well as for automating the process of generating an application for the purchase of medical equipment, with the decision of the parties involved on the application, as well as further monitoring of its use in the healthcare organization.
11	Provision of medicines	PMIS	A program that allows you to keep a personal record on the free prescriptions for each patient and doctor in the by medical institutions
12	Electronic register of dispensary patients	ERDP	Designed to form a single centralized information database of patients (electronic register) who are on the dispensary records and to determine the need for free medication on an outpatient basis
13	Single payment system	PS APP	Designed to automate the process of payment for a rendered medical care at the stage of primary health care and consultative and diagnostic care. An additional purpose of the System is the implementation of settlements between medical organizations

Source: Compiled by the author based on the materials of the RSE on REO "Republican Electronic Health Center" of the Ministry of Health of the Republic of Kazakhstan, 2019.

Electronic health passport (EHP) is a centralized system for storing, processing and transferring EHP for all patients in the country, which will store basic information about patients throughout their lives. The communication of various systems and the exchange of data on the health status of patients will be carried out only by transmitting data to and receiving data from the EHP. The data in the EHP system will be managed by the local doctor, general practitioner. The EHP system is the main tool for integrating all other systems. Using a system analysis, we prepared an up-to-date SWOT analysis of the implementation of information systems in healthcare (Table 6).

Table 6. Analysis of the implementation of information systems in healthcare of the Republic of Kazakhstan

Strengths	*Weaknesses*
The "Digital Kazakhstan" state program was developed The development of ICT and e-health is a priority in Kazakhstan The presence in the Republic of Kazakhstan of a specialized enterprise established by the Government - Republican Center for Electronic Health A number of IS and web applications have been introduced in the Republic of Kazakhstan The systems are designed to operate in a single database and apply common concepts and standards. The country has gained experience in the development of healthcare IS, there are IT companies specialized in the development of such systems The systems have a fairly rich functionality based on the needs of the Ministry of Health and Social Development The presence of telemedicine points in rural medical organizations and their widespread use	Launch of multiple IS and web applications without proper integration violates the principle of a single database Insufficient level of digital literacy of a certain part of healthcare workers (especially for aged people) Lack of a comprehensive training program for users of information systems
Opportunities	*Threats*
Attraction of investments in healthcare sector and the development of PPP The introduction of CSHI in the Republic of Kazakhstan, as a pillar for the modernization of IS and increased funding Technology transfer in collaboration with international partners	Lack of qualified IT specialists, project managers, staff turnover Insufficient number of players in the ICT market of e-health services (monopolization of system development) Deterioration of the global economic situation and optimization of budget expenditures in Kazakhstan

Source*:* compiled by the authors

The SWOT analysis leads to the need for new and conceptual approaches to improving healthcare IS. At the same time, the development of informatization of the healthcare industry with the involvement of the private sector and the development of public-private partnership is becoming relevant. PPP can significantly offset the threats identified in the SWOT analysis and use the possibilities of this type of partnership. Despite the considerable variety of forms and directions of PPPs, it is possible to identify the preferred forms of implementation of PPPs in the healthcare sector (Figure 3).

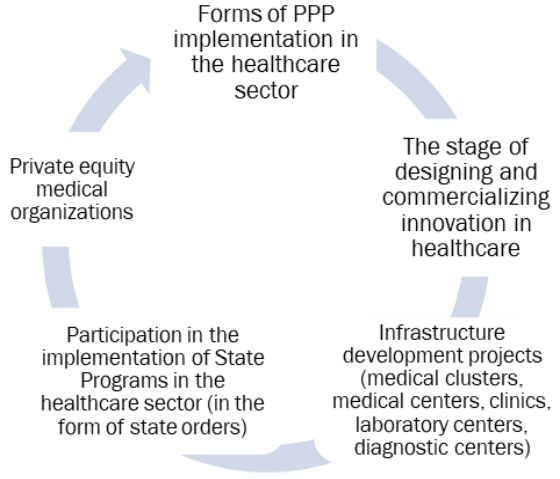

Figure 3. Forms of implementation of PPP depending on the stages of innovation

Source*:* compiled by the authors

The proposed form of PPP in healthcare is indicative for Kazakhstan in that it reflects current trends, such as:

– Use of combined sources of financing for the modernization of healthcare;

– Creation of preferential conditions for investors, including long terms for the transfer of new innovations into operation, grace periods for investing;
– Focus not only on national capital investments, but the creation of favorable conditions for the development of foreign business, attracting a great number of investors from all over the world.

CONCLUSION

Based on global trends in innovative development, we can conclude that today the further development of ICT is required in Kazakhstan. The study confirms the basic theoretical position that the use of ICT is an important factor that can affect the growth of value added in the health system. At the same time, methods for assessing the relationship between the use of ICTs and health care costs expand analytical capabilities and identify ways and reserves to increase the use of ICT.

The development of ICT, including in the health sector, is a priority strategic direction. However, e-health is developing through centralization, where the Ministry of Healthcare of the Republic of Kazakhstan plays a leading role, with insufficient involvement of IS end users in the decision-making process. In this regard, the provision of all types of state support is supposed to be strictly targeted, with the specification of the purpose and principles of state aid for each region.

The emphasis in the implementation of ICT is placed on the collection of analytical information for making managerial and financial decisions that allow healthcare professionals to provide safe, high-quality, timely and affordable medical services. In order to increase the share of GVA in healthcare, the creation of new medical institutions based on PPP is recommended. These steps, together with new approaches in the field of healthcare informatization, implemented in accordance with the development concept and state programs, allow us to modernize e-health in the coming years. Thus, the solution of these problems will be an important factor in improving the quality of life of citizens, economic growth and ultimately the long-term economic security of Kazakhstan.

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The Financial Determinants of Corporate Cash Holdings: Does Sharia-Compliance Matter?

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ABSTRACT

This paper aims to investigate the financial determinants of corporate cash holdings of Sharia-compliant (SC) and Sharia non-compliant (SNC) firms. This study applies the autoregressive distributed lag (ARDL) approach for a sample of 178 Malaysian listed firms over the period 2008-2017. The results show that, in long-run and short-run, various cash holding determinants vary in sign and magnitude between SC and NSC firms. Moreover, we find that SC firms quickly adjust their level of cash holdings toward a target level than NSC firms. These results can be explained by the by the restrictions imposed by Sharia rules on firms to sustain their compliance status. Overall, the findings reveal that the trade-off, the pecking order and the free cash flow theories play an important role in explaining the determinants of cash holdings of both SC and NSC firms. This study concludes that SC firms possess certain financial characteristics that can affect their cash holding decision.

INTRODUCTION

How firms make decision for holding cash is one of the most important research topics in financial economics. The theoretical literature in finance offers three alternative theories to answer the above mentioned prevailing question namely the trade-off theory (Myers 1977), the pecking order theory (Myers and Majluf 1984) and the free-cash flow theory (Jensen, 1986). The trade-off theory states that firms set the optimal level of cash reserves by weighting the marginal costs and marginal benefits of holding cash. Under this theory, holding liquid assets is justified by two motives, namely the transaction cost motives and the precautionary motives.

Contrasting with this view, the pecking order theory considers that there is no optimal level of cash holdings. In order to minimize the costs associated with asymmetric information, firms have a preferred hierarchy for financing decisions. The highest preference is to use internal financing such as retained

earnings, before resorting to any form of external funding. The free-cash flow theory relies on managerial discretion to explain cash holding decision. Managers have an incentive to build up cash to increase the amount of assets under their control and to gain discretionary power over the firm investment decision. Since holding cash provides more flexibility, managers would rather retain cash than increase payouts to shareholders when the firm has poor investment opportunities. There is an extensive empirical research on the determinants of corporate cash holdings. The most of the previous existing studies have explored the issue for conventional firms only. However, when we review the literature for Sharia-compliant firms, we observe that researchers have not paid attention about which factors explain the decision of cash retention.

During the last two decades, the business community had witnessed a drastic growth of Islamic funds all over the world. Islamic finance has attracted a fair amount of attention from stock market participants. The financial market around the world experienced exceptional growth in Islamic finance. In Malaysia, Islamic finance has been witnessed with the robust growth. It is now the fastest growing segment in the global financial industry. Sharia-compliant securities have being the prominent products in Malaysian capital market. The average growth rate of Islamic Capital Market (ICM) in Malaysia is 13.6% per annum over the ten year period between 2000 and 2010. Haron and Ibrahim (2012) report that 80% of Malaysian publicly listed firms are Sharia-compliant.

According to the theory of Islamic finance, SC firms are subject to a variety of restrictions to maintain their compliance status. More specifically, these firms can access fewer financing channels in comparison with non Sharia-compliant firms, and hence are more constrained in their financing choices (Alnori and Alqahtani, 2019).

This study aims to examine the financial determinants of corporate cash holding of SC and SNC Malaysian firms by applying a newly developed autoregressive distributed lagged (ARDL) bound testing approach proposed by Pesaran et al. (2001). It contributes to the current literature in different ways. First, it provides further understanding of the determinants of cash holdings of firms identified as being SC compared to their non-compliant peers. Particularly, this research explores the implication of relevant Islamic principles on corporate cash holdings. We argue that financial constraints faced by SC firms are such that these firms are at a disadvantage relative to their SNC counterparts to access financial markets. In addition, SC firms are constrained to have low cash level to maintain their compliance status. Second, this study focuses on an emerging Malaysian economy where the regulatory and institutional constraints are different from other developed and emerging economies. In particular, a significant proportion of Malaysian firms adopt Islamic business principles as a core element of their articles of association. Third, this study analyses the determinants of corporate cash holding using ARDL method. The use of this method permits to identify the short-run and long-run relationships, as well as the elasticities of the relationship between cash holding and its main determinants. The reason for using this method is that the firm characteristics have a lagged effect on cash holding. For instance, the growth opportunities in future have an effect on today's cash holding. Moreover, the use of this method permits to consider the firm-specific heterogeneity. To the best of our knowledge, this is the first study that uses an ARDL approach to examine the determinants of corporate cash holding. Finally, the findings will contribute significantly to the body of knowledge as well as to practitioners and to firms that would like to operate under Islamic principles.

The remainder of this paper is organized as follows. The following section reviews theoretical and empirical literature. The sample and the methodology are discussed in the next section. The subsequent section analyses the empirical results and the final section presents the conclusion.

1. LITERATURE REVIEW AN HYPOTHESES DEVELOPMENT

Assuming a world without market imperfections, holding large amounts of cash is irrelevant because companies can easily go to capital markets to finance their profitable investment projects at negligible transaction costs (Modigliani and Miller, 1958). By introducing market frictions, scholars developed several theories, which provide rational explanations for the determinant factors of firms' cash level. This resulted in three major theories, namely the trade-off theory, the pecking order theory, and the free cash

flow theory. To empirically test these theories, researchers analyze the impact of several firm characteristics (used as proxy variables) on the level of corporate cash.

1.1 The trade-off theory

The trade-off theory starts with the premise that a company should seek an optimal level of cash holdings by weighting the marginal costs and marginal benefits of holding cash. The advantages of holding cash derive from the transaction cost motive and the precautionary motive (Bates et al., 2009). By holding cash, firms save transaction costs associated with converting a non-cash financial asset into cash and uses cash for payments. Furthermore, Firms hold cash to better cope with adverse shocks when they struggle to obtain funding from external sources (Chireka and Fakoya, 2017). Holding more cash, however, comes with a price as firms incur an opportunity cost of the capital due to the low return on liquid assets. Following prior studies (e.g. Opler et al., 1999; Ferreira and Vilela, 2004; Al-Najjar, 2013; Guizani, 2017), we have taken growth opportunities, asset tangibility, leverage, liquid assets, company size, cash flow , cash flow uncertainty and dividend payout as the possible determinants of corporate cash holding. We discuss the relevant literature for each of these variables below.

When linking the proxy variables to cash holding under the trade-off theory, we expect a positive impact of growth opportunities on cash level since the cost of incurring a cash shortage is higher for firms with larger investment opportunities (Guizani, 2017). Therefore, cash retention enables firms to undertake their profitable investments projects without raising outside funds at high transaction costs. Keeping more cash for firms with better investment opportunities is also justified by financial distress costs because the positive NPV of these investments disappears in case of bankruptcy (Ferreira and Vilela, 2004). The presence of tangible assets should lead to lower cash levels, as they can be sold in the case of a cash shortfall (Drobetz and Gruninger, 2007). Singh and Misra (2019) found that tangible assets are negatively associated with cash holding. Such relationship exerts to enhance the borrowing capacity to make such outlays and undercut the requirement of cash holding. In addition, higher firm leverage coincides with high problems of financial distress. For this reason, firms with higher leverage are expected to hold more cash. On the other hand, in line with the transaction cost motive, highly levered firms face high costs when investing in liquid assets and should hence hold less cash (Ferreira and Vilela, 2004).

For liquid assets, Ozkan and Ozkan (2004) and Al-Najjar (2013) propose a negative impact on cash reserves, because these assets can be seen as substitutes for cash holdings. Here the precaution motive states that it is better to hold non-cash liquid assets than cash (Singh and Misra, 2019). Also, in accordance with transaction cost motive, Bates et al. (2009) suggest that firms with sufficient liquid assets may not have to use the capital markets to raise funds when they have a shortage of cash. Firms can covert liquid assets to cash and in turn are less likely to hoard cash.

As large firms are often more diversified, increasing firm size is commonly associated with lower direct bankruptcy costs (Titman and Wessels, 1988). In addition, larger firms incur smaller cost of external financing owing to the economies of scale resulting from a substantial fixed cost component of security issuance costs. Consequently, larger firms are less likely to accumulate cash reserves. For cash flow uncertainty, the trade-off theory predicts a positive sign for its relation with cash holding. Since cash flow volatility induces higher liquidity constraints and more cash shortage, more volatile firms should hold more precautionary cash (Bates et al., 2009). As for cash flow, it provides a buffer when income from operations unexpectedly falls. The trade-off theory views cash flow as an alternative source of liquidity that can set managers free from the financial constraints that can otherwise be imposed by the capital markets (Chireka and Fakoya, 2017). Therefore, we expect a negative relation between cash flow and cash holdings. Finally, previous literature found that dividend is negatively associated with cash holding. To the extent that dividend-paying firms have more financial flexibility, they can raise funds at low cost by reducing its dividend payments. However, non-dividend paying firms have to use the capital markets to raise funds and bear transactions costs (Opler et al., 1999; Bates et al., 2009). Thus, it is expected that firms that pay dividends hold less cash than firms that do not pay dividends.

1.2 The pecking order theory

Contrary to the trade-off theory, no optimal level of cash exists in the pecking order approach, but instead, cash is used as a buffer between retained earnings and investment needs. Owing to asymmetric information between firms and capital markets, firms finance investments first with internal resources, then with safe debt and risky debt, and with equity as a last resort. Under the pecking order theory, firms with higher growth opportunities need higher cash level to cope with any shortfall in cash and limit company commitment in costly external financing (Guizani, 2017). Tangible assets are assumed to lower the degree of information asymmetry due to ease of valuation by outsiders. At the same time, capital expenditures create assets that can be used as collateral (Bates et al. 2009). Thus, they could increase debt capacity and reduce the demand for cash. In a similar vein, investment expenditure limits firms' capacity to invest in liquid asset reserves, and hence they hold less liquid assets (Opler et al., 1999). Regarding firm leverage, the pecking order theory assumes a negative impact on cash holding. In a financing hierarchy model, debt typically grows when investment exceeds retained earnings and falls when investment is less than retained earnings (Ferreira and Vilela, 2004; Drobetz and Gruninger, 2007). In addition, when firms have better access to the debt markets, they have less need to keep cash reserves. For firm size, the pecking order theory predicts a negative impact on cash holding. As large firms provide better information to outside investors, information asymmetries are lowered, which reduces the costs of external financing (Drobetz and Gruninger, 2007). Moreover, Ozkan and Ozkan (2004) argue that large firms are less likely to experience financial distress. Thus they hold less cash. Moreover, firms with more volatile cash flow hold more cash as increased cash flow volatility raises outsiders' investment uncertainty (Frank and Goyal, 2009). Therefore, due to increased information asymmetry, these firms suffer from more problems of adverse selection. Finally, as retained earnings constitute the favored form of financing under the pecking order model, firms with higher cash flow are expected to retain more cash reserves.

1.3 The free cash flow theory

The theory of free cash flow developed by Jensen (1986) suggests that excess cash holdings exacerbates the risk of the misappropriation of these funds that can be squandered on projects with negative net present value. Thus, firms with agency problems tend to accumulate cash even if they do not have good investment opportunities. Managers of these firms are reticent to return cash to shareholders; however, they are prone to invest in growth projects, even if the NPV of these projects is negative. Previous studies show that firms hold more cash when agency problems between insiders and outside shareholders are greater. Accordingly, it is likely that the relation between investment opportunity set and cash holdings will be negative. In light of the agency theory, an increasing debt derives firms to use the cash efficiently, because cash is used to the repayment of the principal and interest payments.

Debt imposes a certain level of discipline upon corporate executives since it reduces the resources under their control. In contrast, low leverage firms are less subject to monitoring, allowing for superior managerial discretion. Therefore, we expect that less levered firms hold more cash. Furthermore, agency costs increase with the size of the company as the latter becomes more difficult to control (Jensen and Meckling, 1976). Ferreira and Vilela (2004) argue that the larger the company size the larger the proportion of actual resources which is affected by any given managerial decision. Accordingly, we expect that managers of large firms have more discretionary power over the firm financial policies, leading to a greater amount of cash holdings.

Table 1 presents, separately for each of the three theories, the most common proxy variables and the direction of their hypothetical signs.

Table 1. Determinants of corporate cash holding

Variables	*Trade-off theory*	*Pecking order theory*	*Free cash flow theory*
Investment opportunity set	+	+	-
Asset tangibility	-	-	
Leverage	+	-	-
Liquid asset substitute	-		
Firm size	-	-	+
Cash flow uncertainty	+	+	
Cash flow	-	+	
Dividend payments	-		

2. DATA DESCRIPTION AND METHODOLOGY

2.1 Data Sources and Sample

For the purpose of our empirical investigation, we consider Sharia-compliant and Sharia non-compliant firms listed on Bursa Malaysia for which all data were available. We follow the classification adopted by the Malaysian Securities Commission's Sharia Advisory Council to distinguish between Sharia-compliant and Sharia non-compliant firms. The classification used consists of two screening processes. Firstly, the contribution of Sharia non-compliant activities (such as conventional banking and insurance, gambling, pork and pork-related activities) to the total revenue and profit before tax of the company should not exceed 5%. A 20-per cent benchmark is also applicable to the following activities: share trading; stock broking business; rental received from Sharia non-compliant activities; and other activities deemed non-compliant according to Sharia. The second screening process adopted by the Sharia Advisory Council consists of the following financial ratios:

i. Cash over total assets: cash only includes cash placed in conventional accounts and instruments;
ii. Debt over total assets Debt: only includes interest-bearing debt.

Each ratio, which is intended to measure *riba* and *riba-based* elements within a company's statements of financial position, must be less than 33 per cent. This study uses a 10 year period data from 2008 until 2017. The year 2007 serves to calculate some parameters that are variations. We collect firms' stock prices, returns, and firms' financial data, available in Thomson Reuters Datastream. Financial companies are excluded because they are normally considered separately due to differences in their businesses and regulatory environment. We also exclude firms with missing information. The final sample due to data availability for the entire period is 143 Sharia-compliant and 35 Sharia non-compliant firms.

2.2 Empirical Specifications and Estimation Methods

This study employs the Autoregressive Distributed Lag Model (ARDL) to capture both the short run and long-run impact of the model (Pesaran and Shin, 1997 and Pesaran et al., 2001). Because of its flexibility, this technique is used as an alternative to the usual cointegration tests (Engle and Granger, 1987; Johansen, 1991). In the ARDL model, the relation between the variables is tested regardless of whether the variables are I(0), I(1) or mutually integrated. The ARDL model is also an appropriate technique to small samples and which offers the possibility of jointly processing long-run dynamics and short-run adjustments. It involves the formatting of the error correction model or unrestricted error correction model (ECM). Following Pesaran and Shin (1997) and Pesaran et al. (2001), the empirical formulation of ARDL model for this study is specified as follows:

$$\Delta Cash_{i,t} = \alpha_0 + \sum_{j=1}^{p} \beta_1 \Delta Cash_{i,t-j} + \sum_{j=1}^{q1} \beta_2 \Delta Q_{i,t-j} + \sum_{j=1}^{q2} \beta_3 \Delta Tang_{i,t-j} + \sum_{j=1}^{q3} \beta_4 \Delta Lev_{i,t-j} + \sum_{j=1}^{q4} \beta_5 \Delta Liq_{i,t-j} + \sum_{j=1}^{q5} \beta_6 \Delta Size_{i,t-j} + \sum_{j=1}^{q6} \beta_7 \Delta CFvol_{i,t-j} + \sum_{j=1}^{q7} \beta_8 \Delta CF_{i,t-j} + \sum_{j=1}^{q8} \beta_9 \Delta Div_{i,t-j} + \pi_1 Cash_{i,t-1} + \pi_2 Q_{i,t} + \pi_3 Tang_{i,t} + \pi_4 Lev_{i,t} + \pi_5 Liq_{i,t} + \pi_6 Size_{i,t} + \pi_7 CFvol_{i,t} + \pi_8 CF_{i,t} + \pi_9 Div_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where *Cash* is the cash ratio measured by cash and cash equivalents to total assets ratio; *Tang* is the asset tangibility measured by capital expenditures to total assets; *Lev* is the leverage ratio, measured by total debt to total assets; *Liq* is the liquid asset substitute measured by the net working capital; *Size* is the natural logarithm of total assets; *CFvol* is the standard deviation of firm cash flow; *CF* is the ratio of cash flow to total assets. The cash flow is assessed as earnings after interest, dividends and taxes plus depreciation. *Div* is the dividend payout ratio measured by dividend per share divided by earnings per share. Δ is the first difference, p is the optimal lag length of the ARDL model and ε is the error term assumed to be independently and identically distributed.

The null hypothesis of no co-integration in the long-run relationship is defined as H_0: $\pi_1 = \pi_2 = \pi_3 = \ldots = \pi_9 = 0$, against the alternative hypothesis H_1: $\pi_1 \neq \pi_2 \neq \pi_3 \neq \ldots \neq \pi_9 \neq 0$. In the ARDL model, the null hypothesis of no cointegration between two variables is examined via the F-statistic (Pesaran et al. 2001). The estimated F-statistic is usually compared with the two critical values (upper-bound and lower-bound):

- If the F-statistic exceeds the upper-bound, then we reject the null hypothesis of no cointegration and we conclude that there is a long-run association between retained variables;
- If the F-statistic is lower than the lower-bound, then we do not reject the null hypothesis of no cointegration and we conclude that there is no long-run association between the retained variables;
- If the F-statistic is between the two limits, then we cannot conclude.

Once cointegration is established, the conditional long-run ARDL model can be estimated as:

$$Cash_{i,t} = \alpha_0 + \sum_{j=1}^{p} \beta_1 Cash_{i,t-j} + \sum_{j=1}^{q1} \beta_2 Q_{i,t-j} + \sum_{j=1}^{q2} \beta_3 Tang_{i,t-j} + \sum_{j=1}^{q3} \beta_4 Lev_{i,t-j} + \sum_{j=1}^{q4} \beta_5 Liq_{i,t-j} + \sum_{j=1}^{q5} \beta_6 Size_{i,t-j} + \sum_{j=1}^{q6} \beta_7 CFvol_{i,t-j} + \sum_{j=1}^{q7} \beta_8 CF_{i,t-j} + \sum_{j=1}^{q8} \beta_9 Div_{i,t-j} + \varepsilon_{i,t} \quad (2)$$

Finally, a dynamic error correction model (ECM) can be derived from the ARDL bounds test through a simple linear transformation. The short-run dynamic parameters by estimating an unrestricted ECM associated with the long-run estimates are specified as follows:

$$\Delta Cash_{i,t} = \alpha_0 + \sum_{j=1}^{p-1} \beta_1 \Delta Cash_{i,t-j} + \sum_{j=1}^{p-1} \beta_2 \Delta Q_{i,t-j} + \sum_{j=1}^{p-1} \beta_3 \Delta Tang_{i,t-j} + \sum_{j=1}^{p-1} \beta_4 \Delta Lev_{i,t-j} + \sum_{j=1}^{p-1} \beta_5 \Delta Liq_{i,t-j} + \sum_{j=1}^{p-1} \beta_6 \Delta Size_{i,t-j} + \sum_{j=1}^{p-1} \beta_7 \Delta CFvol_{i,t-j} + \sum_{j=1}^{p-1} \beta_8 \Delta CF_{i,t-j} + \sum_{j=1}^{p-1} \beta_9 \Delta Div_{i,t-j} + \varphi ECT_{i,t-1} + \varepsilon_{i,t} \quad (3)$$

Where $ECT_{i,t-1}$ is the error correction term that indicates the speed of adjustment, that is to say, how quickly the cash holdings return to the long-run equilibrium.

3. RESULTS AND DISCUSSION

3.1 Descriptive statistics

Table 2 provides the main summary statistics for the variables used in the empirical analyses. First, we present the descriptive statistics for the whole sample, and then we split the sample based on SC and SNC corporations. The results show that cash holdings for SC firms are significantly less than those for SNC firms. This may be due to the fact that SC firms restrict themselves from using cash to maintain their compliance status. Further, as highlighted by Table 2, SC firms have lower growth opportunities than their NCS peers. This may be attributed to the limited financing channels available to SC firms as indicated by the significantly low leverage. The slower growth of SC firms results in lower capital expenditures and size differences in favor of SNC firms, which enjoy a wider range of financing options. However, SC firms pay higher dividend compared to SNC firms, despite their lower growth.

Table 2. Descriptive statistics

	All firms				*SC firms*				*SNC firms*			
	Mean	*St.dev*	*Min*	*Max*	*Mean*	*St.dev*	*Min*	*Max*	*Mean*	*St. dev*	*Min*	*Max*
Cash	0.13	0.22	0.01	3.71	0.09	0.11	0.01	1.02	0.25	0.42	0.01	3.71
Q	1.52	1.05	0.25	7.54	1.46	1.03	0.25	7.54	1.63	1.15	0.50	6.19
Capex	0.58	0.20	0	0.97	0.56	0.20	0	0.97	0.64	0.20	0.06	0.94
Lev	0.18	0.17	0	1.10	0.14	0.16	0	1.10	0.26	0.18	0	0.62
Liq	0.08	0.16	-0.57	0.87	0.09	0.16	-0.57	0.87	0.04	0.15	-0.38	0.51
Size	9.33	0.71	7.73	11.53	9.27	0.70	7.73	11.53	9.42	0.78	8.08	11.00
CFvol	0.03	0.03	0.01	0.32	0.04	0.03	0.01	0.32	0.03	0.02	0.01	0.15
CF	0.04	0.07	-0.51	1.05	0.04	0.07	-0.31	1.05	0.02	0.07	-0.51	0.18
Div	0.41	0.35	0	1.45	0.44	0.35	0	1.45	0.32	0.37	0	1.11

3.2 Regression analysis results

3.2.1 Unit root tests

Before proceeding to the ARDL approach, we test the stationarity of the different series to ensure that none of the variables is integrated of higher order i.e. I(2) as it will violate the assumption of bound testing procedure. To ascertain the order of the integration, we perform the LLC test (Levin, Lin & Chu, 2002) and Pesaran test (Pesaran, 2003). Table 3 shows unit root test results for SC and SNC firms. As can be observed, for all variables, the null hypothesis of non-stationarity cannot be rejected, except the variables *Lev*, *CFvol* and *Div* for SC firms and *Tang*, *CFvol* and *Div* for SNC firms. Both the LLC and Pesaran test results reveal that *Cash*, *Q*, *Tang*, *Liq*, *Size* and *CF* are not stationary at level but stationary at first difference for SC firms. Concerning SNC firms, the results indicate that *Cash*, *Q*, *Lev*, *Liq*, *Size* and *CF* are not stationary at level but stationary at first difference.

Table 3. Unit-Root Test Results

	Sharia-compliant firms				*Sharia non-compliant firms*			
	LLC		*Pesaran*		*LLC*		*Pesaran*	
Vbles	Level	First Differ.	Level	First Differ.	Level	First Differ.	Level	First Differ.
Cash	1.176	-4.285***	0.315	-3.683***	4.523	-3.447***	2.358	-5.042***
Q	-0.687	-6.367***	-0.423	-4.526***	-0.302	-8.554***	-0.114	-3.747***
Tang	2.154	-3.956***	2.718	-7.589***	-6.553***	-30.452***	-4.125***	-11.745***
Lev	-4.027***	-21.234***	-5.201***	-17.653***	-1.902	-11.232***	-1.137	-8.477***
Liq	5.462	-6.325***	2.452	-8.635***	3.443	-7.358***	1.884	-5.058***
Size	1.956	-5.133***	0.684	-4.568***	5.136	-2.925***	2.552	-8.254***
CFvol	-2.305***	-11.542***	-5.845***	-20.521***	-4.551***	-22.083***	-3.683***	-19.035***
CF	1.845	-4.887***	0.526	-3.995***	6.884	-5.845***	4.632	-9.478***
Div	-3.712***	-15.623***	-5.456***	-27.84***	-6.215***	-18.932***	-4.956***	-25.412***

Δ denotes the first lag level. ***, **, * denote statistical significance at the 1, 5 and 10% levels.

3.2.2 Cointegration tests

This step consists of testing the existence of a possible cointegration relationship between cash holding and its main determinants. Pedroni (2004) is the first who proposed a cointegration test. Seven statistics were performed to establish cointegration test for panel data among which four statistics are based on the *within* dimension and three statistics are based on the *between* dimension. Pedroni (2004) showed that at a fixed threshold, a statistic greater than the tabulated critical value (1.65 at the 5% threshold) will lead to the rejection of the null hypothesis of no cointegration. The results reported in Table 4 show that all statistics are significant rejecting the null hypothesis of no cointegration. Therefore, we can conclude that there is a cointegration relationship between cash holding and its determinants.

Table 4. Pedroni Cointegration Test

	Sharia-compliant firms		*Sharia non-compliant firms*	
	Statistic	*p-value*	*Statistic*	*p-value*
Within dimension				
V-Panel	-6.08	0.00	-8.35	0.00
Rho-Panel	-7.21	0.00	-10.02	0.00
PP-Panel	-12.63	0.00	-15.31	0.00
ADF-Panel	-10.52	0.00	-12.63	0.00
Between dimension				
Rho-Group	-8.24	0.00	-10.22	0.00
PP-Group	-17.54	0.00	-18.98	0.00
ADF-Group	-14.83	0.00	-16.43	0.00

3.2.3 Long-run estimation results

The long-run elasticities among the predetermined, cointegrated variables are analyzed via the dynamic OLS (DOLS) technique as suggested by Stock and Watson (1993).

Table 5. Estimated long-run coefficients for *CASH* using the ARDL approach

	Sharia-compliant firms		*Sharia non-compliant firms*	
	Coefficient	*Std. Error*	*Coefficient*	*Std. Error*
Q	0.011**	(0.004)	-0.037*	(0.023)
Tang	-0.211***	(0.026)	-1.943***	(0.147)
Lev	-0.241***	(0.031)	-0.400**	(0.198)
Liq	-0.127***	(0.034)	-1.819***	(0.181)
Size	-0.014**	(0.007)	0.035	(0.047)
CFvol	0.287**	(0.120)	-0.537	(1.114)
CF	0.015*	(0.059)	-0.474**	(0.348)
Div	-0.018*	(0.013)	-0.097**	(0.062)
Intercept	0.091**	(0.065)	1.451***	(0.451)
Adj. R^2	0.608		0.527	
F statistic	72.80***		23.09***	
N	1430		350	

***, **, * denote statistical significance at the 1, 5 and 10% levels.

The estimated results confirm the existence of the long-run relationship between corporate cash holding and its main determinants for both firm groups. As highlighted in Table 5, the coefficients of the growth variable do show mix results for both SC and SNC firms. Consistent with the trade-off and pecking order theories predictions, we find a positive and significant impact of growth opportunities on cash retention for SC firms. According to the trade-off theory, growth firms accumulate more cash reserves because the opportunity cost of lost investment is larger for these firms. In addition, in a pecking order world, growth firms are characterized by a higher degree of information asymmetry leading to more costly

external financing. This implies that SC firms with better investment opportunities hold more cash because the inability to raise financing is more costly for these firms. This result can be explained by the restrictions imposed by Sharia rules on firms to sustain their compliance status. More specifically, these firms can access fewer financing channels in comparison with SNC firms and hence are more constrained in their financing choices (Alnori and Alqahtani, 2019). The positive relation supports the view that the cost of financial distress of high growth firms is relatively high, thus lead to an increase in cash retention. However, the results show that the growth opportunities are found to be highly significant and negatively related to cash holding in SNC firms. This implies that cash holdings in SNC firms are the outcome of agency conflicts. The negative relationship is consistent with the predictions of the free cash flow theory which posits that managers of firms with poor investment opportunities will hold more cash to ensure the availability of funds to invest in growth projects, eventually with negative NPV.

As for asset tangibility, we document a negative and highly significant coefficient for both SC and SNC firms. However, the magnitude of the asset tangibility effect is stronger in SNC firms. Every 1% increase in the asset tangibility will lead, on average, to a 0.211 % and 1.943% reduction in cash for SC and SNC firms, other things being equal. Overall, this negative relationship is consistent with the predictions of the trade-off and pecking order theories. This result supports the argument that tangible assets can be sold if a cash shortfall occurs and that firms with more collaterals encounter fewer problems issuing debt. The leverage coefficient exhibits a negative and significant result for both SC and SNC firms consistent with the pecking order and the free cash flow theories expectations. This negative relationship supports the previous arguments that debt can increase a firms' access to the capital market and also reduce agency cost which could arise for the free cash flow reason. Leverage also exerts a negative relationship with cash holding as it can be viewed as a substitute for holding cash. We also find a negative significant relationship between liquid assets and corporate cash holding for both SC and SNC firms, supporting the trade-off theory expectation. Firms that face cash shortages can easily convert their liquid assets into cash and thus they can avoid expensive capital market financing.

Firm size is one of those determinants that provide consistent results in its relationship to cash holding. While the results show a negative and significant coefficient for SC firms, a positive and insignificant relationship is found for SNC firms. The negative relationship between firm size and cash holding aligns with trade-off and pecking order arguments that large firms are more able to obtain external funds and, therefore, are less in need of holding cash. Due to the economies of scale enjoyed by large firms, they can lower their transaction costs incurred in external borrowing. This influences large firms rather to borrow than to hold the cash. However, small firms carry more cash as they do not have proper information asymmetry and also to avoid financial distress. This evidence does not support the free cash flow theory that states that managers of large firms are more likely to hoard cash reserves for discretionary purposes.

Regarding cash flow uncertainty, the results show a positive and significant coefficient for SC firms and a negative but insignificant coefficient for SNC firms. The positive effect of cash flow volatility on cash holding documented in SC firms is a sign of a precaution against adverse situations. Since cash shortages have adverse effects, firms can be forced to forfeit positive NPV investment opportunities. Therefore, companies experiencing high cash flow uncertainty will be driven by the precautionary motive to retain more cash. Similar to the growth variable, the sign and coefficient of cash flow show mix results for both SC and SNC firms. Owing to restrictions imposed by Sharia rules on firms to sustain their compliance status, SC firms face more constrained in their financing choices. Thus, they rely more on their internal funds for their financing needs. This supports the notion of the pecking order theory with the rationale that firms with good cash flows will use these internal funds to finance their projects, pay off their debt and accumulate cash reserves. As for SNC firms, the association between cash flow and cash holding is negative and significant in accordance with the prediction of the trade-off theory. Cash flows are viewed as an alternative source of liquidity to set managers free from financial constraints imposed by the capital markets. This leads SNC firms to use these cash flows in times of cash shortages, thus, reducing the need to hold cash.

As predicted by trade-off theory, dividend payout has a negative and significant impact on cash holding for both SC and SNC firms. This suggests that dividend-paying firms can trade-off the high costs of stocking cash by drawing down on dividend payments (Al-Najjar, 2013). In addition, according to the fi-

nancial constraints' theory of Fazzari et al. (1988), firms that distribute dividends are more able to raise funds at lower costs when needed by reducing their dividend payments.

3.2.4 ECM Short Run Dynamic ARDL Estimation

After the investigation of the long-run relation of model specified, we further proceeded towards examining the short-run dynamic following the ECM-ARDL model. The short run estimated coefficients of Eq. (3) are reported in Table 6. The error correction term (ECT) represents the speed of adjustment towards the long-run equilibrium. It should be negative and statistically significant. The more negative and significant this speed of adjustment, the more rapidly firms adjust their cash holdings relative to their levels in (t – 1) and the less possible shocks are sustainable over time.

Table 6. Estimated short-run coefficients for *ΔCASH* using the ARDL approach

	Sharia-compliant firms		*Sharia non-compliant firms*	
	Coefficient	*Std. Error*	*Coefficient*	*Std. Error*
ΔCash	0.142***	(0.039)	0.066*	(0.046)
ΔQ	0.021**	(0.093)	-0.015*	(0.028)
ΔTang	-0.889***	(0.063)	-1.601***	(0.265)
ΔLev	-0.162**	(0.067)	-0.703*	(0.370)
ΔLiq	-0.640***	(0.054)	-1.264***	(0.215)
ΔSize	-0.149**	(0.061)	0.591**	(0.235)
ΔCFvol	-0.018	(0.197)	1.368	(1.543)
ΔCFvol(-1)	0.084**	(0.104)	0.173***	(0.421)
ΔCFvol(-2)	0.023*	(0.043)	0.087**	(0.152)
ΔCF	-0.115*	(0.061)	-0.909*	(0.733)
ΔDiv	-0.033**	(0.017)	-0.051*	(0.090)
ΔDiv(-1)	-0.017*	(0.024)	-0.031*	(0.014)
ECT(-1)	-0.354***	(0.073)	-0.217***	(0.053)
Intercept	-0.002	(0.003)	-0.018*	(0.012)
Adj. R^2	0.528		0.463	
F statistic	62.53***		17.85***	
N	1430		350	

ARDL (1,0,1,0,1,1,0,3,0,2) is selected for SC firms while ARDL (1,1,0,0,0,1,1,3,1,2) is selected for SNC firms based on Schwarz criterion.. ***, **, * denote statistical significance at the 1, 5 and 10% levels.

The estimation results (Table 6) show that the estimated coefficients associated with the error correction term are negative and significant confirming the long-run equilibrium relationship between corporate cash holdings and its main determinants. The error correction term ECT is negative and statistically significant at the 1% level of significance for both SC and SNC firms. The coefficient of ECT is equal to (-0.345) for SC firms and (-0.217) for SNC firms. This implies that any prior period shock in the model is to be adjusted in the long-run equilibrium with speeds of 34.5% and 21.7% for SC and SNC firms respectively. With regard to the magnitude of the ECT coefficients, it is clear that SC firms quickly adjust their level of cash holdings toward a target level than SNC firms. The high adjustment speed of SC firms suggests that the cost of being off target is higher compared to SNC firms. However, the slow speed of adjustment of SNC firms seems consistent with their propensity to hold high levels of cash which is not permitted to SC firms. For instance, among the requirements for a firm to be Sharia-compliant is to have low cash (Dow Jones). As argued by Drobetz and Gruninger (2007), firms with slow adjustment towards their target cash ratio must hold higher cash reserves in order to avoid cash shortfalls that require costly adjustments. Additionally, in the short-run, asset tangibility, leverage, liquid assets, cash flow and dividend payout have negative and significant effects on both SC and SNC firms. The coefficients associated with *ΔCFvol(-1)* and *ΔCFvol(-2)* are positive and significant for both groups. However, we obtain mix results for growth opportunities and firm size. The estimated coefficients reveal a positive relationship be-

tween growth opportunities and cash holding for SC firms. For firm size, we find a negative effect on cash reserves in SC firms. The reverse relationships are found in SNC firms.

CONCLUSION

Given that the literature suffers from a tight focus on cash holdings of conventional firms and often ignores those of SC companies, this study contributes to the literature by moving beyond this boundary and extending the investigation for all prevalent company types in the context under investigation. Therefore, this empirical paper examines whether the most reliable corporate cash holding determinants are related to Sharia-compliance status. To establish the relationship between cash holding and its determinants, this study employs an autoregressive distributed lag (ARDL) econometric framework. It uses the DOLS method to explain the long-run dynamic of corporate cash holding of both SC and SNC firms. We have found results confirming the existence of a long-run relationship between corporate cash holding and its main determinants for both firm groups. However, various explanatory variables on the cash holding do exhibit different effects among SC and SNC firms. The results show that growth opportunities and cash flow differently affect cash holdings. Further, the magnitudes of the effects of capital expenditure and liquidity substitutes are significantly different among both groups. These results can be explained by the restrictions imposed on firms to sustain their compliance status.

Overall, the findings reveal that the trade-off, the pecking order and the free cash flow theories play an important role in explaining the determinants of cash holdings of both SC and SNC firms. The results also show that the short-run coefficient estimates obtained from the ECM version of ARDL model are altered by Sharia-compliance. We find that SC firms quickly adjust their level of cash holdings toward a target level than SNC firms. We argue that financial characteristics of SC firms are such that they have quick speed of adjustment than their SNC counterparts. Subject to the above caveats, we can draw some theoretical and managerial implications of this study. First, the study explores the role of Sharia in corporate cash holdings in terms of its influence on the costs of external funds and financial constraints. Consequently, scholars can draw on this research to further investigate the effect of Sharia on cash management, financing and investment decisions. Second, the study findings may be useful to investors, assisting them in making better informed decisions and aids other interested parties in gaining a better understanding of the role played by Sharia in corporate cash holdings. Third, the study findings may be also useful to managers to efficiently establish the level of cash holdings in order to maximize firm value.

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Tri Hita Karana's Philosophy and Intellectual Capital: Evidence from The Hotel Industry in Indonesia

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ABSTRACT

This study aims to examine the relationship of local culture (represented by the elements of Tri Hita Karana—THK, i.e. parhyangan, pawongan, palemahan) and intellectual capital—(IC, i.e. human capital, customer capital, structural capital) in Indonesian hotel industry. Data were collected from 139 questionnaires sent to the general managers of three-, four- and five-star hotels in Bali Province, Indonesia. The returned questionnaires, amounting to 114 (82% response rate), were used for further analysis. Analysis was conducted by variance-based SEM (SEM PLS) with WarpPLS 5.0 software. The findings show that all elements of THK (parhyangan, pawongan, palemahan) are positively and significantly associated with IC (human capital, customer capital, structural capital). The findings also show a mutual, positive relationship among IC elements. This study contributes to the importance of considering local culture when discussing IC. Another contribution of this study is to enrich the conceptualisation of IC that has been developed by previous researchers, by proposing local culture as an important variable that underlies the practice of IC in an organisation.

INTRODUCTION

Discussions about knowledge in organisations, without reference to cultural contexts, tend to be misleading (Long and Fahey, 2000). The metaphor used in the conceptualisation of knowledge will be different when there are cultural differences. Thus, the conceptualisation of Western knowledge inherent in IC cannot simply be transferred to Asian business without considering the local views of knowledge (Andriessen and Boom, 2007). Individuals learn in the social context and develop cognitive maps that are appropriate to local resources, so individual behaviour will tend to follow the local context's emphasised values (Navarro and Polo, 2010).

It is important to recognise that the connections used to create and improve IC are never context-free, but are always created, shared and utilised in the context of national history, national resources and national attributes (Navarro and Polo, 2010). The findings highlight that importing the IC paradigm, without reference to the surrounding community's value, may be ineffective in some countries. The national culture in which an organisation is located can contribute to the success or failure of its IC management system, because the national culture influences the way IC management manifests itself and how far it is communicated to the outside world (Lynn, 1999). Franc et al. (2013) found that the performance of IC is correlated with national culture. A country's national culture can, in turn, be influenced by local cultural heritage, such as tradition, folklore, legend, indigenous language, oral history, creativity, adaptability and local uniqueness (Galla, 2001).

Indonesia is an Asian country that is characterised by various local cultures, and one of them is *THK*. *THK* is a philosophy, as well as the way of life, of the Balinese people in Indonesia. It covers all aspects of business or life without exception (Peters, 2015), symbolises three aspects that bring prosperity, balance of life and happiness, which are: to maintain harmony and balance between humanity and God (*parhyangan*), between human and human (*pawongan*) and between humans and the environment (*palemahan*) (Wardana and Manrique, 2015). The philosophy is related to the values and wisdom of local culture, so the values contained therein are universal, applicable to all religions and has the spiritual flexibility that makes it suitable for introduction everywhere in the world (Peters, 2015). The application of the *THK* philosophy is very important for tourism organisations in Bali, as Bali is a tourist destination, but, on the other hand, tourism has nourished exploitative, individualistic and materialistic mental attitudes with a tendency to destroy the ecological, socio-cultural and aesthetic subsystems (*THK* Foundation, 2012).

Peters (2015) claimed that since 2000, booming tourism has become mass tourism in Bali and result in the ignorance of *THK* and Balinese culture. The local culture are just a justification for planning, but many investors did what was actually prohibited by law, such as building hotels higher than the coconut trees, without license, within a forbidden distance from a temple or on a cliff, which is sacred in Hindu belief. The government remained passive as long as the numbers of tourists and the revenue kept increasing. Matters are settled between the government and investors (mostly from outside Bali), which is profitable for both the government (income) and investors (profit), but makes no contribution to the welfare of the Balinese. Tourism development 'quantity' was clearly prevailing over 'quality'; business over philosophy. It is a paradox that Bali is facing a bright future as a prime tourism destination, but it is losing its identity. Mass tourism is a major threat to the identity of the Balinese and their culture. The only effective remedy against mass tourism is the implementation of *THK*, the philosophy of life of the Balinese. The investors have to accept beforehand the *THK* as reference for their projects. *THK* is not only implemented in hotels, but also other institutions in Bali such as schools, universities, government offices, etc.

Previous researchers, such as Bontis (1999), emphasised the organisational culture as a driver of IC. Although some researchers (e.g., Navarro and Polo, 2010; Franc et al., 2013; Holmen, 2014) have also examined national cultural differences in the practice of IC, it is not easy to find a study examining the relationship between local culture and IC. Local culture characterizes daily life experiences in certain areas and reflects the feeling of conformity, comfort, and truth of ordinary people-attributes that determine personal preferences and changing tastes. Meanwhile national culture is more concerned with a set of norms, behaviours, beliefs and customs that exist in the population of a sovereign country. In Indonesia, national culture is dominated by Javanese culture (Chariri, 2008). Hofstede's (1982) study concluded that local culture has influenced the behaviour of the Indonesians both in business and government institutions. Therefore, the role of local culture especially *THK* in organizations cannot be ignored.

Based on the above arguments, we are interested in investigating the relationship of the local culture (*THK)* and IC in the hotel industry. Knowledge of how to manage IC effectively is crucial, especially in service-oriented and non-manufacturing industry sectors, since these sectors have more intangible resources than tangible ones (Bontis and Fitz-enz, 2002). Hotels are in the service-sector industry, where IC results from the knowledge and skills of employees, processes and systems and customer relationships (Zeglat and Zigan, 2014). Both the individual knowledge of employees and the overall organisa-

tional knowledge portrayed in routines, systems, customer databases, etc., are considered essential elements to running hotels effectively in a competitive environment (Engstrom et al., 2003).

The results of this study confirm that the local culture, in this case represented by *THK (parhyangan, pawongan, palemahan)* has a significant positive relationship with IC (human capital, customer capital, structural capital). This research contributes to creating awareness of the relevance of local culture when discussing IC. This study also provides an important contribution in enriching the conceptualization of IC developed by previous researchers, demonstrating that IC can not only be influenced by organizational culture and national culture, but also local culture where the organization is located.

1. LITERATURE REVIEW AND HYPOTHESES

1.1 THK philosophy

Epistemologically, the Sanskrit term *THK* is derived from the individual words '*tri*', '*hita*', and '*karana*'. *Tri* means 'three', while *hita* means 'happy/prosperous', and *karana* means 'cause'. Thus, *THK* is defined as three causes of happiness/prosperity and prosperity of human life. The Government of the Republic of Indonesia and the United Nations World Tourism Organisation (UNWATO) have officially recognised the *THK* philosophy as a concept that can lead to sustainability (Peters and Wardana, 2014).

THK teachings emphasise the three human relationships in this life, which are interconnected with one another (Suwetha, 2015), include (1) human relationships with their God (*parhyangan*); (2) human relationships with others (*pawongan*) and (3) human relationships with the natural environment (*palemahan*). In the context of *parhyangan*, human beings are expected to have spiritual closeness with God; each activity is based on the spirit of devotion to God. A person realises his/her true identity as an *atman*, or spiritual being, who must always be associated with the source, that is God (Suwetha, 2015).

Pawongan is a concept of harmonious relationship between human and human, as fellow beings who have the same rights and obligations. It is expected that such connection produces a universal brotherhood—universal bonds between humans, free from racial elements (Suwetha, 2015). A simple way to implement the concept is to do three good things: thinking, talking and doing good things, which, together, are known as *Tri Kaya Parisudha*[1]. *Tri Kaya Parisudha* is a philosophical synergy governing the universe, spirituality, humanity and the natural environment (Peters, 2015).

In the concept of *palemahan*, human beings are expected to responsibly manage nature (Suwetha, 2015). Nature should be utilised by not neglecting sustainability. The Balinese people believe that a good environment will provide them with a better life. Making the three elements harmonise is the foundation for creating a comfortable and peaceful life, both outwardly and inwardly. *THK* not only illustrates cause and effect, but also the process of welfare achievement through dynamic interaction with the three elements, related to harmonisation in and between *parhyangan, pawongan* and *palemahan*. When the balance is achieved, humans will live by avoiding bad actions, and their lives will be balanced, calm, and peaceful. Peters (2015) put forward some of the values contained in *THK,* i.e. respect and togetherness, integrity, self-control, compassion, and harmony.

1.2 IC concept

There is no universally-accepted definition of IC in the literature. IC can be viewed as the intellectual material (knowledge, information, intellectual property, experience) that can be used to create wealth (Stewart, 1997). In essence, all information that can be transformed into something of value is IC (Edvinsson, 2000).

Three elements are widely accepted in the classification of IC: human capital, customer capital and structural capital (Farsani et al., 2012). Human capital is defined as the knowledge, skills and experiences that employees take with them when leaving a company (Starovic and Marr, 2003). Human capital

[1] *Tri* means 'three'; *Kaya* means 'activity'; *Parisudha* means 'good/holy'. So, *Tri Kaya Parisudha* are 'three good/holy activities/behaviours'.

encompasses the individual knowledge of an organisation that exists in its employees (Bontis et al., 2002).

Customer capital represents the current value of the organisation's relationship with its customers and the potential future value of that relationship (Engstrom et al., 2003). The core of customer capital lies in the knowledge embedded in the marketing channels and customer relationships developed by an organisation during its existence (Bontis et al., 2000). Roos et al. (2001) argue that customer capital should include all value relationships, whether they relate to customers, suppliers or other stakeholders.

Structural capital is defined as knowledge that will remain within the company, includes organisational routines, procedures, systems, cultures and databases (Starovic and Marr, 2003). The capital is described as what is left to the company when an employee returns home at night (Roos et al., 1997). Some of the structural capital is legally protected and becomes part of the organisation's intellectual property rights, legally owned by the company.

1.3 Hypotheses Formulation

1.3.1 Parhyangan and IC

Rational thought, in Asian philosophy, is inseparable from the mind's emotional activity (Andriessen and Boom, 2007). Knowledge is gained from examination and inquiry, and it depends on a conscious drive and motivation to know deeper. Knowledge also depends on a disciplined, pure and alert mind. Hence, awareness to keep harmony with God can bring new knowledge. In the context of *parhyangan*, then, all the activities of a company and the individuals in it are a form of offerings to God and always get control from God. In this case the law of *Karma (Karma Phala*[2]*)* is believed to be valid. *Karma Phala* is a law of causality stating that every action will bring results.

Parhyangan is a belief that humankind has an obligation to do something for nature and for fellow human beings, as a manifestation of respect for God (Windia and Dewi, 2011). Individuals should commit to good conduct to create harmony, including within the company. This is because of a strong belief that God always controls their actions. By doing so, then, with God's permission, individuals will be awarded good results. All actions should be done with pleasure because they are solely sacrificed to God. Based on the concept of *parhyangan*, the individuals within a company will respect one another, share with each other and voluntarily give all efforts to the company. The company will strive to provide the best for its customers by paying attention to the customer's wishes so that the customer will be satisfied with the services provided. The concept of *parhyangan* will eventually spur the company to develop a comfortable culture and atmosphere, respond quickly to changes, develop accessible information systems, etc.

Based on this, we formulate the following hypotheses.

H1: *Parhyangan* is positively associated with structural capital.

H2: *Parhyangan* is positively associated with customer capital.

H3: *Parhyangan* is positively associated with human capital.

1.3.2 Pawongan and IC

In the epistemology of Asia, knowledge is dynamic and full of life because it arises in social interaction among individuals, groups, nature and the surrounding social context (Andriessen and Boom, 2007). In Asian philosophy, the notion of knowledge is very symbolic. Asian philosophy considers a unity of knowledge and action and strongly refers to natural and social phenomena because of the unity between humans and being. In this regard, the concept of *pawongan*, which wants harmony between human beings, can encourage knowledge creation in the IC context. Aspects of *pawongan* are directly linked to the

[2] Derived from the word *Karma*, which means 'deed,' and *Phala*, which means 'result'. *Karma Phala* means 'the result of the deed', both what has been done and will be done.

harmony of relationships among human beings through the implementation of activities together (Windia and Dewi, 2011). With the realiation that people are essentially creatures of God, and the awareness of *Tat Twam Asi*[3], individuals within a company will support each other. *Tat Twam Asi* is a concept of love and considers the lives of all living things to be one unified whole. The concept characterises the recognition of empathy, compassion and mutual respect among human beings. Attention given by the company to maintaining harmony with customers can bring customer capital in the form of customer satisfaction and customer loyalty. The concept of *pawongan* can also spur a company to develop structural capital. For example, based on the need to realise internal and external harmony between fellow human beings, companies are encouraged to develop cultures and atmospheres that are comfortable and supportive, not only for individuals working within the company, but also for individuals who engage in transactions with companies.

Based on this, we formulate the following hypotheses.

H4: *Pawongan* is positively associated with structural capital.

H5: *Pawongan* is positively associated with customer capital.

H6: *Pawongan* is positively associated with human capital.

1.3.3 Palemahan and IC

Andriessen and Boom (2007) suggest that, within the context of Asian thought, knowledge arises from the unification of the universe and the human self. Therefore, the concept of *palemahan*, which wants harmony between humans and the surrounding natural environment, can encourage knowledge creation in the IC context.

Based on the *palemahan* philosophy of, companies provide various facilities that support the implementation of employee duties and responsibilities. If a conducive atmosphere is created, accompanied by adequate work facilities, then it will be easier for the employee to initiate new ideas, meaning that, ultimately, the company will receive the best from its employees. A conducive atmosphere created by the beauty and cleanliness of the environment around a hotel, as well as hotel buildings and rooms designed and arranged in such a way, will create a sense of comfort for guests, so guests will be willing to stay again at a later time. In addition, maintaining and taking care of the security and continuity of work as a reflection of *palemahan* implementation will make the company more efficient and make it easier for the company to respond to changes.

Based on this, we formulate the folowing hypotheses.

H7: *Palemahan* is positively associated with structural capital.

H8: *Palemahan* is positively associated with customer capital.

H9: *Palemahan* is positively associated with human capital.

1.3.4 Human capital and structural capital

Bontis et al. (2000) found a non-significant relationship between human and structural capital in the service sector. However, previous research conducted by Engstrom et al. (2003), Kim *et al.*(2012) and Sharabati *et al.*(2013) in hotels and the broader tourism industry identified strong positive impacts and relationships between human capital and structural capital. In the hotel industry, organisational structure, routines and management, as well as employee behaviours, are interrelated (Zeglat and Zigan, 2014). Kim et al. (2012) found that trained employees can, for example, improve operational processes and, therefore, positively influence structural capital creation. Previous research has shown a significant, positive relationship between human capital and structural capital in the Korean hotel industry (Kim et al., 2012) and in the Jordanian hotel industry (Zeglat and Zigan, 2014).

Based on this, we formulate the following hypothesis.

[3] *Tat* means 'it' ('he'), *Twam* means 'you' and *Asi* means 'it is'. *Tat Twam Asi* means 'you are me'.

H10: Human capital is positively associated with structural capital.

1.3.5 Human capital and customer capital

Employees with right skills, knowledge, attitudes and motivation will attract customers (Kooistra and Ziljstra, 2001). Chen et al. (2004) found that employees with high levels of human capital encourage customers and other stakeholders to connect with companies, helping the companies ultimately generate more profit. If employees have the appropriate knowledge and skills, they can serve customers better by, for example, providing more information to them (Hsu and Fang, 2009). Zeglat and Zigan (2014) argue that, specifically in service organisations such as hotels, the relationship between human capital and customer capital is very strong. This is evidenced in their research, which found a significant positive relationship between human capital and customer capital in the Jordanian hotel industry. The findings are further supported by Bontis et al. (2000) and Kim et al. (2012), who also found a significant positive relationship between the two elements of IC.

Based on this, we formulate the following hypothesis.

H11: Human capital is positively associated with customer capital.

1.3.6 Customer capital and structural capital

Companies that can effectively manage customer relationships will be able to generate innovative ideas to respond to customer demand (Kheng et al., 2013). Structural capital arises from the process and value of the organisation, reflecting the company's internal and external focus, coupled with the value of renewal and development for the future (Bontis et al., 2000). Bontis et al. (2000) support this, finding that there is a significant positive relationship between customer capital and structural capital, both in the service industry and in non-services.

Based on this, we formulate the following hypothesis.

H12: Customer capital is positively associated with structural capital.

2. METHODOLOGY

2.1 Research setting and sample

To test the hypotheses, we used sample from three-, four- and five-star hotels in Bali Province, Indonesia. The hotel industry is one of the participating organisational groups in the *THK* Tourism Awards & Accreditations (*THK* Awards) program. This program is an activity as a form of community awareness, which strives to implement *THK* in the real life of development in Bali Province. According to the Bali Government Tourism Office (2016), a total of 181 hotels are classified as three-, four- and five-star hotels operating in Bali Province. Using Slovin's formula, the sample size should be 125, with a 5 percent sampling error.

We expected a high response rate (up to 90%) because the data were collected by a self-administered questionnaire method. Thus, a total of 139 questionnaires were sent in sealed envelopes. The questionnaires were accompanied by a request letter explaining the study's purpose, requesting that the general managers fill out the questionnaire and assuring the participants about confidentiality. We sent questionnaires directly to each member of the research samples. Within two months after the questionnaires were submitted, we began to retrieve the completed questionnaires. Of the 139 questionnaires submitted, 114 were returned (an 82% response rate). The results of the non-response bias test of the respondents who returned the questionnaire answers on time and late, showed that there is no problem of non-response bias[4]. The respondent's demographic analysis showed that most of the re-

[4] We divided the responses into two groups based on the time of arrival. We then did a t-test to test the difference between answers for all research variables. We found no significant differences between the two groups.

spondents who participated in the study were male (63%), had a working life of more than 5 years (94%), had an undergraduate educational background (76%) and came from a five-star hotel (38%).

2.2 Instruments

THK consisting of *parhyangan, pawongan*, and *palemahan*, are measured in our study using a five-point Likert scale, ranging from 'strongly disagree' to 'strongly agree'. The questionnaire contained 12 statements to which respondents indicated the extent of their agreement on the five-point Likert scale. Indicators for measuring *parhyangan* consisted of five items adopted from Suardikha (2013) and the *THK* Foundation (2012). Our research also adopted four items from Suardikha (2013) and the *THK* Foundation (2012) to measure *pawongan*, while *palemahan* was measured by three items adopted from Suardikha (2013). The 12 indicators are adopted from Bontis (1998)—with a five-point Likert scale ranging from 'strongly disagree' to 'strongly agree', to measure IC.

Variance-based SEM (SEM PLS) was used to test the study's hypotheses because variance-based SEM (SEM PLS) is able to test multiple dependent and independent variables simultaneously. In addition, the limited theory of structural relationships among variables is another reason for using variance-based SEM (SEM PLS) here, in combination with WarpPLS 5.0 software.

3. RESULTS AND DISCUSSIONS

When we place all the variables into the model (see Table 1, Figure 1), the results show that hypothesis H1, claiming that *parhyangan* is positively associated with structural capital, was supported (β = 0.487; p <0.001). The findings illustrate that three-, four- and five-star hotels in Bali are encouraged to develop organisational knowledge, such as corporate culture, a conducive working atmosphere and efficient operating procedures. They are also encouraged to respond to change rapidly, based on the belief that what they do is an offering to God to create harmony.

Table 1. PLS results for full model

Variable	Path to		
	Human capital	Customer Capital	Structural capital
Parhyangan	0.364 (p<0.001)*	0.246 (p=0.003)*	0.487 (p<0.001)*
Pawongan	0.509 (p<0.001)*	0.179 (p=0.024)**	0.381 (p<0.001)*
Palemahan	0.159 (p=0.040)**	0.176 (p=0.026)**	0.155 (p=0.044)**
Human capital		0.386 (<0.001)*	0.317 (p<0.001)*
Customer capital			0.213 (p=0.009)*
R-squared	0.784	0.724	0.991

*Significant at p < 0.01; ** Significant at p < 0.05

Other findings showed a significant positive relationship (β = 0.364; p <0.001) between *parhyangan* and human capital as well as a significant positive relationship between *parhyangan* and customer capital (β = 0.246; p = 0.003). Therefore, both H2 (*parhyangan* positively associated with human capital) and H3 (*parhyangan* positively associated with customer capital) were supported. The results revealed that humans in three-, four- and five-star hotels in Bali, as homo-religious creatures, believe that there is a supernatural power of God that controlled their activities. Such strong beliefs encourage individuals in three-, four- and five-star Balinese hotels to create human capital in the form of good attitudes and deeds, such as mutual respect among fellow employees, a willingness to share experiences, knowledge and creativity and the emergence of sincerity in giving all their efforts for the company. This is because, for the people in some Asian countries (such as Indonesia, India, China, Japan and other regions), knowledge is spirit, wisdom and truth (Andriessen and Boom, 2007). So, the knowledge formed results from the values of spirit, wisdom and truth that are believed.

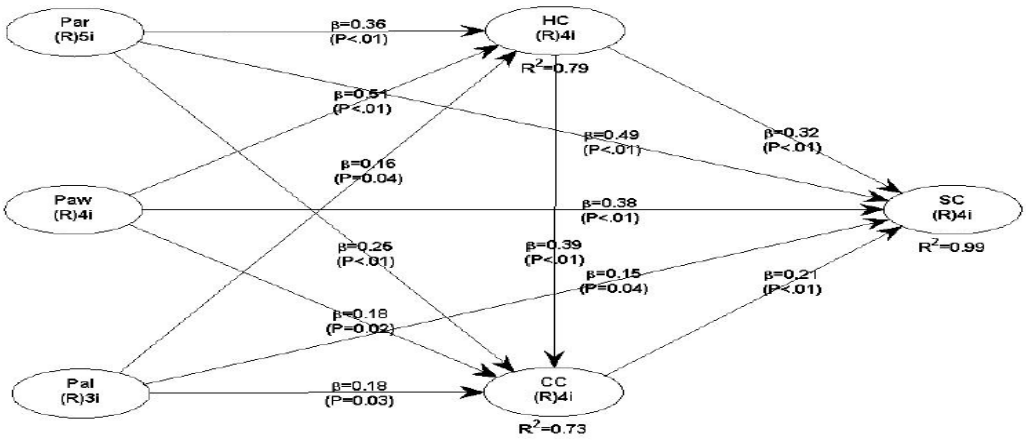

Figure 1: PLS results

The belief that there is God's control over an action has spurred individuals in three-, four- and five-star Balinese hotels to give their best service to customers. The three-, four- and five-star hotel employees in Bali carry out their duties and responsibilities based in *yadnya* (selfless sacrifice) because of the inner awareness that, as God's creatures, they always get control from God. They uphold the values of harmony and togetherness, bringing satisfaction to the customer so that customer loyalty can be maintained. The belief within the individual that the law of cause and effect *(Karma Phala)* will always prevail also spurs the emergence of good values that are IC, because each individual will compete in doing good deeds. These findings are supported by Andriessen and Boom (2007), who claim that Asian thinking is holistic and considers reality as an integral whole where there is interdependence and relationship between objects and events.

Table 1 above shows a significant positive relationship between *pawongan* and structural capital (β = 0.381; p <0.001), *pawongan* and human capital (β = 0.509; p <0.001) and *pawongan* and customer capital (β = 0.179; p = 0.024). Similarly, empirical data supports H4 (*pawongan* positively associated with structural capital), H5 (*pawongan* positively associated with human capital) and H6 (*pawongan* positively associated with customer capital). H4 results illustrate that the creation of harmonisation between individuals in three-, four- and five-star Balinese hotels causes willingness to cooperate with one another, so that efficient processes and systems can be developed. In addition, a comfortable and supportive culture and atmosphere for employees, customers, or related parties can also be built and developed. This shows that the concept of *pawongan* has been transferred into organisational knowledge.

The results of the H5 test indicate that understanding of the concept of *Tat Twam Asi* encourages human capital emergence in three-, four- and five-star Balinese hotels. For example, employees operate with attitudes that do not hurt others and they do not consider other employees as less than themselves. *Tat Twam Asi* teaches unlimited sociality because it means that 'he is you', 'I am you' and all beings are the same as having an *atman* that comes from God. Therefore, full awareness of it encourages individuals to respect other individuals. However, this respect for other individuals is not only in the context of fellow hotel employees, but also of hotel customers, because customers are also creatures of God who must be respected. For example, by understanding *Tat Twam Asi*, a hotel is also encouraged to better appreciate customers who have physical limitations by providing special facilities for them. This will encourage the formation of customer capital, such as the fulfilment of customer desires and the emergence of customer loyalty. Likewise, giving equal opportunities for employees to excel and have their achievements rewarded can further motivate employees in their jobs, so that customer satisfaction increases even more.

This study found a significant, positive relationship between *palemahan* and structural capital (β = 0.155 and p = 0.044), so that H7 (*palemahan* positively associated with structural capital) is supported. H8 (*palemahan* positively associated with human capital) is also supported by a significant, positive relationship (β = 0.159; p = 0.040), as is H9 (palemahan positively associated with customer capital) (β = 0.176; p = 0.026). These findings indicate the efforts of three-, four- and five-star Balinese hotels to

maintain relationships with the environment, such as designing buildings and hotel rooms so as to maintain the beauty and cleanliness of the environment around the hotel, making the hotel's culture and atmosphere supportive and comfortable for both hotel employees and overnight customers.

Table 1 shows that the relationship between human capital and structural capital is positive and significant (β = 0.317; p <0.001). The study also found a significant, positive relationship between human capital and customer capital (β = 0.386; p <0.001). Therefore, H10 (human capital positively associated with structural capital) and H11 (human capital positively associated with customer capital) are empirically supported. The hotel industry is a labour-intensive industry, so employees, along with their knowledge, motivation, and attitudes, become the fulcrum of structural capital development and customer capital. Finding strong relationships between human capital and structural capital indicates that three-, four- and five-star hotels in Bali are well able to transform individual knowledge into non-human knowledge. Hotels can transform individual, unarticulated knowledge into something more concrete—for example, into a written or electronic document.

The results of the H10 test provide an overview of the ways three-, four- and five-star hotels in Bali explore existing knowledge in employees to develop effective processes, such as responding to any changes that occur quickly, developing efficient operating procedures and developing easily accessible information systems. The findings supported the opinions of Yeung and Leung (2007), which suggest that the knowledge and skills of hotel staff should be effectively utilised to improve operation and service quality. The findings also support previous research from Zeglat and Zigan (2014) and Kim et al. (2012).

The significant positive relationship between human capital and customer capital in this study indicates that human capital in the three-, four- and five-star hotels in Bali and its tacit knowledge create company value. With their tacit knowledge, employees give all their efforts to make an individual hotel different from other hotels. A hotel's investment to improve employee competency by constantly improving the employees' skills and education enables the hotel to maintain its value-added services and meet customer needs, thus creating its own loyalty to customers. These findings provide a good management of human capital, making the three-, four- and five-star hotels in Bali capable of transforming the tacit knowledge—which is personal and difficult to formulate, communicate and share with others—into the knowledge embedded in the company's external relationships. These findings support the research of Zeglat and Zigan (2014), Bontis et al. (2000) and Kim et al. (2012).

This study found a significant positive relationship between customer capital and structural capital (β = 0.213; p = 0.009), and, based on these results, H12 (customer capital as being positively associated with structural capital) is supported. Customer loyalty has spurred three-, four- and five-star hotels in Bali to always develop a culture and atmosphere of comfort for guests. In addition, three-, four- and five-star hotels are also encouraged to develop information systems that are easily accessible, by both guests who stay and prospective guests who will stay. The findings indicate that three-, four- and five-star hotels have been able to transform external knowledge, obtained from the relationship with their customers, into the company's knowledge well. The results of this H12 test support the findings of Bontis et al. (2000), who found that customer capital and structural capital relations were positive and significant in the service industry. The high value of R-squared (see Table 1) shows that the model tested in this research is a good model. The roles of human capital and customer capital as the mediating variables in the relationship are also shown in Table 2, which evidences significant p value.

Table 2. The indirect effects of *THK*'s philosophy on IC

Path	Indirect effects	P value
Par-HC-CC	0.141	0.015**
Par-HC-CC-SC	0.168	0.032**
Paw-HC-CC	0.197	0.001*
Paw-HC-CC-SC	0.200	0.013**
Pal-HC-CC	0.061	0.174
Pal-HC-CC-SC	0.088	0.170
HC-CC-SC	0.082	0.103

*Significant at p < 0.01; ** Significant at p < 0.05

To test the practical significance of this study and to estimate the extent to which statistical findings in this study are also present in the population, we performed effect size tests.

Table 3. Effect size test results

	Par	Paw	Pal	HC	CC
HC	0.279	0.421	0.090		
CC	0.179	0.135	0.101	0.318	
SC	0.341	0.252	0.071	0.187	0.140

The effect size can be grouped into three categories, which are weak (0.02), medium (0.15) and large (0.35) (Kock, 2014). The largest effect size belongs to the relationship between *pawongan* to human capital, which is 0.421 (see Table 3). This value belongs to a large group, indicating that *pawongan* has an important role from a practical perspective in driving human capital.

This study provides us with an important implication. Local contexts provide the environment for learning, which in turn enables adequate practices of IC in an organization. Social learning theory suggests that individuals can learn vicariously, and future behaviors are guided by vicarious learning (Bandura, 1977). According to the value theory of culture, the impact of cultural values on individual's beliefs and behaviors depend on how the cultural values are exposed (Hofstede, 1980). Similar to findings of previous studies (Lynn 1999 and Franc et al. 2013) on how national culture and organizational culture determine the successful implementation of the IC management, this study includes more specifically the importance of local culture underlying the practice of IC in manifesting itself. Culture can influences knowledge-related behaviors with shapes assumptions about which knowledge is important; mediates the relationship between levels of knowledge; and creates a context for social interaction (Long and Fahey, 2000). The findings infer that the practice of IC is not value-free, but is created, shared and used in accordance with the underlying cultural context, whether national culture, organizational culture, or local culture.

CONCLUSIONS, LIMITATIONS AND FUTURE RESEARCH

This study found a significant, positive relationship between the elements in the *THK* philosophy *(parhyangan, pawongan, palemahan)* with elements in IC (human capital, customer capital, structural capital). The findings indicate that local culture can play an important role in the practice of IC in an organisation. Local culture that fits the context of the environment in which the organisation is located, such as *THK*, become one of the basic motivation of individuals in the practice of IC in an organisation. This study provides us with new insights in IC areas. When we discuss IC, we cannot give up the role of local culture. This research also contributes to the development of the existing IC conceptualisation by proposing local culture as a variable that underlies the practice of IC in an organisation.

This study has several limitations. We only examine one service sector, the hotel industry, and we have only taken samples from top-class hotels (three-, four- and five-star). This will reduce the generalisability of the findings. Due to the research focus on upscale hotels, items in the survey instrument may be irrelevant when used to research hotels with lower scales.

Further academic research is needed to verify the research instruments' rationality when applied to different types of hotel organisations, as well as their suitability to the research's country context. To test the extent to which the research findings can be generalised to other industries and countries, we recommend that this research model be replicated in other service industries and in other countries by replacing *THK* constructs with other local cultures, according to the country of research. Expansion of the IC element, especially customer capital, must be done in further research to better fit the hotel industry's needs. Future research should test customer capital broken down into end-customer-relationship capital and non-end-customer-relationship capital. End-customer-relationship capital refers to the company's relationship with the end-customer only concerning a hotel product, while non-end-customer-relationship capital refers to the company's relationships with partners who are not the final customers for hotel products. Non-end-customer-relationships can be divided into two sub-categories, namely relationships

with commercial partners in the private sector, and relationships with other partners, such as governments, associations, non-governmental organisations and the media. Taking these other aspects into consideration will allow future research to expand upon and verify this study while continuing to contribute to the present literature on IC.

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Challenges of Approaching Climate Neutral Society in V4 Countries

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ABSTRACT

The paper deals with challenges of transition to carbon neutral carbon transition of Visegrad countries (V4), namely Poland, Hungary, Slovakia and Czech Republic. The paper provides analysis of the main problems for these countries in implementing targets set by energy and climate package. The analysis of energy vulnerability and poverty issues in V4 countries is also delivered in the paper. Comparative assessment of progress towards climate neutral society is carried for his group of countries to highlight the best practices and problems encountered. The paper also provides policy recommendations based on study conducted for implementing transition towards climate neutral, inclusive society for Visegrad countries.

INTRODUCTION

European Union (EU) has set ambitious targets in European Green Deal (EGD) policy document for transition to carbon neutral society by 2050. However, Covid 19 crisis had negative influence on advancement of penetration of renewable energy sources (RES) and energy efficiency improvements necessary to implement 100% RES scenario by 2050 (EC, 2019). The best results in low carbon energy transition were achieved in power sector however, in other sectors such as transport and buildings transition is just started by providing different outcomes on energy savings and penetration of renewable energy sources for specific EU Member States (MS). Though, RES have reached 18% in overall final energy consumption of EU in 2018, progress achieved in transport and buildings sectors is very low, especially for some EU MS. Though, EGD initiated a review of the CO2 standards for road vehicles to deliver towards zero-emission mobility since 2025, however, it is necessary to note that RES have very low share in final energy consumption in transport (8%). Though, the share of RES in heating and cooling sector was just 20% in 2018, it is far bellow of expectations risen in EU energy policy documents (IRENA, 2020).

The buildings sector requires more attention, especially in central Europe countries which inherited energy inefficient buildings stock from their socialist past (EC, 2010). Overall buildings in EU account for about 40% of the overall final consumption and provide many options for deployment of RES and GHG emission reduction (EC, 2018). The EU developed new Renovation Wave initiative presented in EGD to promote the large scale energy retrofitting of present building stock by addressing the most important obstacles of energy renovation and putting main focus on old multi-flat buildings, social housing, public buildings etc. The Visegrád Four countries (V4 group) – the Czech Republic, Hungary, Poland and Slovakia – is an influential political group of Central Europe countries in EU sharing a number of important features which provides that working together allows to achieve mutual benefits. These common features cover geographical proximity, shared socialist legacies linked to Soviet rule, similar transition experiences from socialistic past having also impact on institutions and social capital of these countries.

In 2017 during the first discussions of on EC Clean Energy Package, Visegrád Group countries have jointly issued a short statement about serious concerns regarding the very short timeframe of the negotiations, and the significance of Member States' right to freely determine their own low carbon energy transition paths. Visegrád Group countries with regards of energy and climate issues, prefer to relay on nuclear energy and coal without concerning energy security issues. There is also some resistance in these countries linked to high initial costs of the low-carbon transition without taking into account the long-term benefits of such transition for social and economic development of countries. In addition, the GHG emissions decline in these countries since 1990 was the result of the economic recession following the collapse of the Soviet Union. Therefore, there is a lack a robust policy framework to ensure a low-carbon energy transition in place in V4 group countries.

There are some important differences and nuances in their paths towards carbon neutral society, such as the high share of renewables in Slovakia, higher GHG per capita rate in Czech Republic than in Poland. For example, Hungary has low the lowest energy intensity in V4 group. The main fuels used by households also differ substantially in countries of Visegrad group (Renewable Networking platform, 2020). There are also many different national policy approaches on transitions towards climate neutral society to 2050 (Liao et al., 2019; Savitz, Gavriletea, 2019). Though there are several studies dealing with challenges of transition (Diesendorf & Elison, 2018; Breyer & Lund, 2017; Virglerova et al., 2020), however the situation of V4 group countries requires special attention in terms of progress achieved in low carbon energy transition and related energy vulnerability and poverty challenges. The V4 countries have many similarities and important differences therefore it is important to compare them in terms of their success towards climate neutral society and define the main reasons of lagging or leading in this low carbon transition.

The paper aims to overcome this gap and provides comparative assessment of progress achieved by V4 countries in terms of transition to carbon neutral society by applying robust indicators framework to track and compare results and achievements and the main drivers of these. The rest of the paper is structured in the following way: section 1 presents literature review, section 2 introduces methods and data; section 3 provides results of comparative assessment; section 4 discusses findings of study conducted and section 5 concludes.

1. LITERATURE REVIEW

Carbon neutral society means having a balance between emitting GHG and absorbing them from the atmosphere in carbon sinks (Dahal & Niemela, 2019; Laine et al., 2020). Removing carbon from the atmosphere and then storing it is called as carbon sequestration. In order to achieve net zero emissions, overall GHG emissions have to be counterbalanced by carbon sequestration. Under the Green Deal EU aims to become the first continent that removes as many GHG emissions as it produces by 2050 (Jacobson et al, 2019). This goal will be set binding then new Climate Law will be adopted. On 7 October 2020, the European Parliament supported climate neutrality by 2050 and a 60% GHG emission reduction target was set for 2030 compared to 1990 levels. It is more ambitious than proposed 55% target by EC. In addition, all EU MS need individually to become climate neutral by 2050, and afterwards more carbon should be removed from atmosphere than it is emitted (EU, 2018; 2019). However, the economy affects

society, and this becomes exceedingly important in this dynamic, i.e. when moving towards the desired change and transformation of energy systems (Brown et al., 2018; Cherr et al., 2018). Therefore, society also has to significantly change and invest efforts towards building sustainable communities, which means that today's cities and settlements should transform towards becoming carbon neutral cities and settlements (Disendorf & Elliston, 2018; Jetoo, 2019). The independence of external sources of energy and drinking water will strongly affect the form and structure of future cities as well as interpersonal relations living with particular emphasis on their relationships in terms of energy production, and consumption (Sepulveda et al., 2018; Grubb et al., 2020). Several cities in Europe has established carbon neutral development strategies and aims upon 2050 (City of Berlin, 2020; City of London, 2020; City of Copenhagen, 2020). For example, Copenhagen decided to be carbon neutral until 2025 and can be considered as the first carbon neutral capital in the world. To achieve carbon neutral transition goals it is necessary to transform energy supply, renovation of building, waste management and public infrastructure including mobility and for this new climate change mitigation policies and measures are necessary.

Majority of studies on climate neutral society development and achievement of 100% RES scenarios were performed in US (Afhahosseini et al., 2019), Japan (Esteban et al., 2018); Australia and New Zeland (Blakers et al., 2017), however there are several studies conducted in developing countries like China (Liu et al., 2018), Pakistan (Sadiqa et al., 2018; Buthan (Yangka et al., 2019), Colombia (Zapata et al., 2018). There are also several studies conducted in Europe to assess feasibility of moving towards climate neutral society by 2050 (Wood et al., 2020; Moran et al., 2020; Pollitt et al., 2020; Breyer & Lund, 2019; Child et al, 2018; Tantau & Santa, 2019; Eber et al., 2017. The studies found that one of the most important technical issues are storage technologies necessary for wide penetration of renewables (Mathiesen et al, 2020; Chil et al., 2018) and carbon capture and storage technologies (Haszeldine et al., 2018). The public perception is also crucial in moving towards carbon neutral society (Cherry et al, 2018; Laine et al., 2020). The implications of transition to carbon neutral society on energy poverty are also very important and these issues were stressed in several studies (Scott et al., 2019; Weber & Cabras, 2017).

This paper aims to compare low carbon energy transition paths in Visegard countries by applying comparative assessment approach to grasp the differences between countries in achievement of the main energy and climate targets and addressing together energy vulnerability issues.

2. DATA AND METHODOLOGY

The main approach applied in this paper – comparative assessment. The quantitative indicators of tracking transition towards climate neutral society were selected based on EU energy and climate legislation. As one can notice the main ways to reduce GHG emission is energy sector are: increase in the share of renewables in overall final energy consumption as well as in other sectors: electricity, transport, heating and cooling; increase of energy efficiency which can be expressed by energy intensity of GDP indicator as well as energy consumption per capita, showing overall energy consumption level in the country and number of GHG emission indicators like GHG emission reduction from base year (1990), GHG intensity of energy supply, GHG intensity of GDP and total GHG per capita. These GHG emission indicators also indicates the drivers of GHG emission trends, as reduction of GHG intensity of energy supply indicates GHG emission reduction due to increase of the share of RES in energy consumption and reduction of GHG intensity of GDP indicates reduction of GHG emissions due to increase in energy efficiency. Three main headline indicators for assessing progress towards zero carbon energy are based on 2020 and 2030 climate and energy package goals: cutting in GHG emissions (from 1990 levels); The share of enewables in final energy consumption and improvement in energy efficiency or reduction of energy intensity of GDP.

EUROSTAT and Energy Poverty observatory data was applied for comparative assessment of results of low carbon energy transition in Visegrad countries. As in some years, data is unavailable, the 2005 and 2018 data was applied for assessment of progressing of V 4 countries to carbon neutral society and it's implications to energy poverty. In Table 1 the main energy and climate indicators for Visegrad countries in 2005 and 2018 are given for tracking they transition towards climate neutral society.

Table 1. Main energy and climate indicators for Visegrad countries in 2005 and 2018

EU Member States	*EU28*	*CZ*	*HU*	*PL*	*SK*
2005					
Renewable energy indicators					
Overall Renewable share, %	9,1%	7,1%	6,9%	6,9%	6,4%
RE-T - Renewable energy in Transport, %	1,8%	1,0%	0,9%	1,6%	1,6%
RES-E - Renewable Electricity Generation, %	14,8%	3,8%	4,4%	2,7%	15,7%
RES-H&C - Renewable Heating and Cooling, %	11,1%	10,8%	9,9%	10,2%	5,0%
Energy efficiency indicators					
Energy Intensity [gross inland energy consumption/GDP2015]- toe/M€'15	141,0	331,4	278,3	316,3	338,1
Energy per Capita [gross inland energy consumption/ pop] - kgoe/cap	3 717	4 465	2 823	2 425	3 480
GHG emission indicators					
GHG national total emissions / index 1990	93,9%	75,1%	80,7%	85,2%	69,9%
Total GHG per capita - t CO2 eq./cap	10,9	14,7	7,5	10,6	9,6
GHG Intensity of Energy - kg CO2 eq./toe	2 246,5	2 648,5	1 961,0	3 584,2	1 978,6
Total GHG - GDP Intensity - ton CO2 eq./M€'15	401,5	1 091,3	744,1	1 380,3	929,6
2018					
Renewable energy indicators					
Overall Renewable share, %	17,88	15,15	12,49	11,28	11,9
RE-T - Renewable energy in Transport, %	8,03	6,52	7,68	5,63	6,96
RES-E - Renewable Electricity Generation, %	32,06	13,71	8,29	13,03	21,50
RES-H&C - Renewable Heating and Cooling, %	19,67	20,65	18,12	14,80	10,60
Energy efficiency indicators					
Energy Intensity [gross inland energy consumption/GDP2015]- toe/M€'15	107,84	235,11	212,45	218,79	195,22
Energy per Capita [gross inland energy consumption/ pop] - kgoe/cap	3248,43	4104,76	2731,77	2811,83	3131,59
GHG emission indicators					
GHG national total emissions / index 1990	76,76	64,83	67,82	87,42	59,16
Total GHG per capita - t CO2 eq./cap	8,57	12,19	6,55	10,95	8,00
GHG Intensity of Energy - kg CO2 eq./toe	1970,19	2224,38	1704,04	3203,55	1719,46
Total GHG - GDP Intensity - ton CO2 eq./M€'15-	276,95	698,49	509,55	849,92	498,60
Change during 2005-2018, %					
Renewable energy indicators					
Overall Renewable share, %	96,48	113,38	81,01	63,48	85,94
RE-T - Renewable energy in Transport, %	346,11	552,00	753,33	251,88	335,00
RES-E - Renewable Electricity Generation, %	116,62	260,79	88,41	382,59	36,94
RES-H&C - Renewable Heating and Cooling, %	77,21	91,20	83,03	45,10	112,00
Energy efficiency indicators					
Energy Intensity [gross inland energy consumption/GDP2015]- toe/M€'15	-23,53	-29,05	-23,67	-30,84	-42,26
Energy per Capita [gross inland energy consumption/ pop] - kgoe/cap	-12,60	-8,06	-3,25	15,94	-10,02
GHG emission indicators					
GHG national total emissions / index 1990-	-12,60	-8,06	-3,25	15,94	-10,02
Total GHG per capita - t CO2 eq./cap	-18,25	-13,68	-15,96	2,61	-15,36
GHG Intensity of Energy - kg CO2 eq./toe	-21,11	-17,06	-13,20	3,12	-16,42
Total GHG - GDP Intensity - ton CO2 eq./M€'15	-12,30	-16,01	-13,10	-10,62	-13,10

In Table 2 the main energy poverty indicators for Visegrad countries in 2005 and 2018 are given for assessing the influence of transition towards climate neutral society on energy poverty.

Table 2. Energy poverty indicators for Visegrad countries in 2005 and 2019

Energy poverty indicators	*EU*	*CZ*	*HU*	*PL*	*SK*
2005					
Areas on utility bills, %	7.3	7.2	15.9	24.2	8.5
Inability to keep home warm, %	10.9	9.3	17.7	33.6	13.6
2018					
Areas on utility bills, %	6.6	2.1	11.1	6.3	7.9
Inability to keep home warm, %	7.3	2.7	6.1	5.1	4.8
Change during 2005-2018, %					
Areas on utility bills, %	-9.5	-70.0	-30.1	-74.0	-7.1
Inability to keep home warm, %	-33.0	-71.0	-65.5	-84.8	-64.7

The results of comparative assessment of Visegrad 4 countries is presented in the next section of paper.

3. RESULTS

Results of comparative analysis show that in 2005 Czech Republic distinguished with the highest share of RES in overall final energy consumption as well in the share of RES in heating and cooling however, this level was lower than EU average in the same year. The highest share of RES in electricity generation and transport in 2005 was in Slovakia however it was bellow EU average level. In 2005 energy intensity was the lowest in Hungary and highest one in Slovakia exceeding EU average more than twice. In all other V4 group countries energy intensity of GDP was also twice higher than EU average.

With regards of GHG emission indicators the highest GHG emission reduction since 1990 in 2005 was in Slovakia, following by Czech Republic. The modest reduction was achieved by Poland following by Hungary. In term of drivers of GHG emission the lowest carbon intensity of GDP in 2005 was in Hungary and Slovakia and it was bellow even EU average level. The lowest carbon intensity of GDP in the same year was also in Hungary and Slovakia however it was almost twice EU average level in the same year. Total GHG per capita is distributed in the same way like GHG intensity of GDP among Visegrad countries.

The changes in the main energy and climate indicators of Visegrad countries indicates the leading countries in term of low carbon energy transition. In increase of the share of RES in final energy consumption the best results during 2005-2018 period were achieved by Czech Republic as the share of RES more than doubled during this period, the share of in electricity generation increased more than 3 times and in transport almost 6 times. In other Visegrad countries the increase of the share of RES was also very significant. Poland showed the most modest results as the overall share of RES in final energy consumption has increased by more than 60% and the share in heating and cooling by 45%.

Energy consumption per capita has increased just in Poland during investigated period while in other V4 group countries it has reduced however energy intensity of GDP have declined in all Visegrad countries during 2005-2018 leading by Slovakia in all indicators of energy efficiency. In terms of total GHG emission reduction during 2005-2018 the most advanced country was Slovakia. GHG per capita have declined by 15, GHG intensity of energy by 16% and GHG intensity of GDP by 13% in Slovakia. In Poland even some increase in GHG emission comparing with year 2005 can be observed. Total GHG per capita

increased by 2.6% and GHG intensity of energy has increased by 3% in Poland during investigated period showing alarming trends. In all other V4 group countries GHG emission indicators have declined showing positive trends. In Table 3 the ranking of Visegrad countries based on comparative assessment are provided, the first rank is allocated for the best performing country according specific indicator and in the end all ranks are summed up giving final ranking of V4 group countries based on all indicators showing results in progress towards low carbon energy future.

Table 3. The ranking of Visegrad countries based on the changes of energy and climate indicators during 2005-2018

Visegrad countries	*CZ*	*HU*	*PL*	*SK*
Overall Renewable share, %	1	3	4	2
RE-T - Renewable energy in Transport, %	2	1	4	3
RES-E - Renewable Electricity Generation, %	2	3	1	4
RES-H&C - Renewable Heating and Cooling, %	2	3	4	1
The sum of ranks on renewable energy indicators	7	10	13	10
Energy Intensity [gross inland energy consumption/GDP2015]- toe/M€'15	3	4	2	1
Energy per Capita [gross inland energy consumption/ pop] - kgoe/cap	2	3	4	1
The sum of ranks on energy efficiency indicators	5	7	6	2
GHG national total emissions / index 1990-	2	3	4	1
Total GHG per capita - t CO2 eq./cap	3	1	4	2
GHG Intensity of Energy - kg CO2 eq./toe	1	3	4	2
Total GHG - GDP Intensity - ton CO2 eq./M€'15	1	2	4	2
The sum of ranks on GHG emission indicators	7	9	12	7
The sum of total ranks on progress towards low carbon energy transition	19	26	31	19

As one can see from table 3, the best performing countries in terms of progression towards low carbon energy and economy in V4 group are Czech Republic and Slovakia, both received the same sum of ranks however Czech Republic was the leading country in penetration of renewables and Slovakia was the most advanced country in terms of energy efficiency improvements while in term of GHG emission reduction countries have achieved similar results and obtained the same sum of ranks. Poland distinguishes with the lowest results in penetration of RES providing for the lowest results in all GHG emission reduction indicators. Hungary can be assessed like country somewhere in between of the best and worst performing countries.

In Table 4 the ranking of Visegrad countries based on comparative assessment of energy poverty indicators are provided, the first rank is allocated for the best performing countries like in the case of energy and climate indicators (Table 3).

Table 4. The ranking of Visegrad countries based on progress in energy poverty reduction during 2005-2018

Visegrad countries	*CZ*	*HU*	*PL*	*SK*
Areas on utility bills, %	2	3	1	4
Inability to keep home warm, %	2	3	1	4
The sum of total ranks on progress towards energy poverty reduction	4	6	2	8

As one can see from Table 4 the best results in energy poverty reduction during 2005-2018 were achieved by Poland and the worst results were achieved by Slovakia following Hungary. The trends in energy poverty alleviation during investigated period are opposite to energy and climate indicators progression among Visegrad countries.

4. DISCUSSIONS

The Visegrad Group was founded in 1991 as a cultural and political alliance between Czech Republic, Hungary, Poland and Slovakia. The specific political situation and inherited nuclear energy capacities from their past created situation that transition from fossil fuels to renewables has been quite slow in these countries compared to others EU Member States. This is obvious from National Energy and Climate Plans (NECP) submitted by Visegrad countries in 2019. The low ambitions in fostering penetration of renewables can be treated even as a lost opportunity for these countries to innovate, to phase out dirty industries and to build a basis for future economic growth and prosperity provided by transition to climate neutral society. Analysis of NECPs of V4 countries show, that the share of RES in final energy consumption and targeted sectors in recent years is stagnating in all countries of V4 group.

One can suppose that Visegrad countries will implement their targets set in NECPs, but V4 group members certainly are not between overachievers in the share of RES. Also, lower than average EU targets are determined in these countries because decision makers in these countries often perceive renewables as a measure of last resort and focus more on the nuclear path.

EU average target for RES is 32% of renewables in final energy consumption by 2030. Poland has established 21-23% RES in final energy by 2030 (Ministry of Foreign Assets, 2019), Czech Republic (2019)- 22%, Hungary - 21% (Ministry of Innovation and Technology, 2019) and Slovakia 19.2% (Slovak Ministry of Economy, 2019). All Visegrad countries fail in meeting the recommendations of the European Commission to the draft NECPs from June 2019 to increase their renewable energy targets.

Though, the Visegrad countries are lacking ambition to set RES targets, they are no longer a unified block opposing RERS and strict climate policies (EC, 2020). The views of policy makers on RES penetration are changing, especially in Czech Republic and Slovakia. Some RES technologies attracted high interest from private business and households even in the situation of modest climate change governance policies. It is necessary to highlight, that the implementation of the revised in 2018 Renewable Energy Directive creates a new opportunities to support the low carbon energy transition of V4 countries even in the case of set low targets for RES. The Renewable Energy Directive propose new public support schemes; promote energy prosumers and renewable energy communities; and European and national funding will continue financing the low carbon energy transition in EU Member States (Renewable Networking Platform, 2020). Nonetheless, results in RES penetration achieved during transition to climate neutral society in Visegrad countries depend on policies and measures and extend of public funding for RES. Some very successful programs were implemented in Czech Republic and Slovakia such as the Green Savings Programme in Czechia and the Green Savings Programme for households in Slovakia however the successful implementation of these programmes would not be possible without favorable regulatory framework.

Conducted ranking of V4 countries indicated, that Czech Republic and Slovakia are the best performing countries in low carbon energy transition. Czech Republic is superior in penetration of RES among V4 group members. The increase in the share of RES in power generation in country is based on the fact that the power generation capacities are expected to decrease in the next decade due to the closure of coal-fired power stations (Czech Republic, 2019). Therefore, Czech Republic could take full advantage of the positive synergy effects of using RES inside buildings and increasing energy efficiency to include the energy produced by renewables into the energy efficiency target. Although the amended Directive 2012/27/EU on energy efficiency limits the inclusion of from RES by set conditions, it is possible to negotiate with the European Commission. Therefore, the development and utilisation of RES potential available to the Czech Republic should be a strategic priority for the country in future as well. Renewables are the most economically efficient energy sources providing public service, reducing greenhouse gas emissions and air pollution, improving public health and creating opportunities for industrial modern-

isation. They also enable the citizens and municipalities to participate in the energy system and implement energy justice principles necessary to just low carbon energy transition of the country.

The ranking of V4 countries showed that Slovakia is superior in implementation of energy efficiency targets. High share of nuclear in power generation and very high level of gasification makes the Slovakia less eager to develop an ambitious RES targets by 2030 (Slovak Ministry of Economy, 2019). The Slovak Republic has set target in NECP to increase installed power in solar photovoltaic and wind power plants. A high degree of centralization of heat supply should constitute good technical conditions for the use of biomass, biomethane and geothermal energy in the country (Renewable Networking Platform, 2020). Important challenge is high necessary investment costs for modernization and reconstruction of district heating systems, therefore Slovak Republic show low ambition for RES development in heating and cooling sector. Besides that, the advantage of Slovakia's relatively low-emission energy caused low targets in plans of decarbonization of transport sector as well.

The ranking provided that Poland has lowest position in low carbon energy transition progress. Poland's electricity consumption has been constantly growing within the last decade and reached 175 TWh in 2019. 73,6% of power in country was produced in coal and lignite power plants. Though, the RES position in the Polish energy mix is becoming stronger, however it is still not good enough to meet the set 15% target in the gross final energy consumption by 2020. GHG emission reduction trend has stopped in 2017 and in 2018 and 2019 greenhouse gases emission were stagnating (Ministry of Foreign assets, 2019). A significant part of the energy transition cost may be borne by Polish industry which is fast growing in recent years. There are many advantages that RES can bring to industries in Poland. Onshore wind is currently the cheapest new energy generation source in Poland and PV costs are also decreasing and becoming more and more attractive. Another factor is the high carbon footprint of goods produced in Poland which makes them less competitive in world markets (Renewable Networking Platform, 2020).

The ranking of V4 group of countries putted Hungary in better position than Poland however there are serious problems in moving towards carbon neutral society in this country as well. It is necessary to highlight that Hungary is the only EU Member State where the share of RES in gross final energy consumption was declining in recent years and the target set by 2030 is significantly below the EU average (32%) and lower than the recommended 23% for Hungary by the EC. Such a low ambition can be explained by a Hungarian government plan to rely on nuclear energy - dependent on Russian technology and fuel - as a means to achieve "energy sovereignty". NECP also assumes that the domestic energy consumption will increase by 15% between 2017 and 2030 (Ministry of. Innovation and Technology, 2019). Serious concerns arise due to low interest in RES deployment and weak policies to promote investments in RES technologies and energy efficiency improvements which can provide for prosperous carbon neutral society development by 2050.

CONCLUSIONS

Climate neutral society is not simply a goal for climate change mitigation, it is the way to deal with the man challenges of development and to address the major environmental, economic and social problems under the broad sustainability agenda. Climate neutrality is presumed to provide also individual benefits, such as reduced expenditures, increased quality of life and improved public health.

The comparative assessment of Visegrad countries based on energy and climate indicators changes during 205-2018 period indicated that the best performing countries in terms of progression towards low carbon energy and economy in V4 group are Czech Republic and Slovakia, as both received the same sum of ranks. Czech Republic was the leading country in penetration of renewables and Slovakia was the most advanced country in terms of energy efficiency improvements while in term of GHG emission reduction countries have achieved similar results and obtained the same sum of ranks.

Poland distinguishes with the lowest results in penetration of RES providing for the lowest results in all GHG emission reduction indicators. Hungary can be assessed like country somewhere in between of the best and worst performing countries.

The ranking of Visegrad countries based on the energy poverty indicators changes during 2005-2018 period indicated that the best results in energy poverty reduction during investigated period were achieved by Poland and the worst results were achieved by Slovakia following Hungary. The trends in energy poverty alleviation during investigated period are opposite to energy and climate indicators progression among Visegrad countries.

The main policy recommendations for V4 group countries would be to promote investments in RES technologies by developing policies and measures targeting specific consumer groups from households to business entities and energy suppliers. Though high share of nuclear in power generation balance provides low GHG emission intensity of energy supply however increase of the share of renewables in final energy generation can provide additional benefits linked with economic growth, and new jobs creation as well as reduction of energy poverty. Energy efficiency improvement through large scale energy renovation of buildings can provide for extra benefits like costs savings and improved living conditions, quality of life including energy poverty reduction as well as positively influence public health.

The study has limitations as just period 2005-2018 of transition towards carbon neutral society was addressed. The future research is necessary to address issues of dynamics as well as provide policy assessments by identifying their influence on carbon neutral society transition. The policy analysis and more in depth policy discussion can provide better understanding of results and explain the progress achieved by countries towards low carbon transition.

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Development of Logistics Routes of Intermodal Transport in the Eastern Adriatic

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ABSTRACT

The subject of this paper is the assessment of the development of logistics routes in intermodal transport in the Eastern Adriatic, measured through container throughput in the seaports of Koper, Rijeka and Bar (as dependents variables in our hypothetical model). The aim of this paper is to show how certain significant economic and logistical factors (marked as independent variables) affect the stated dependent variable. The paper investigates the impact assessment of three independent variables: a) seaport connectivity measured by the LSCI (Liner Shipping Connectivity Index), b) seaport development and c) seaport connectivity with dry ports (intermodal terminals, i.e. economic centers) in the hinterland. The starting point is the hypothesis that the development of logistics routes of intermodal transport is proportionally influenced by all three mentioned factors (independent variables). The paper uses data collected on the basis of assessments of 180 surveyed experts from the subject area from Southeast Europe, which are given on the basis of official statistics on container traffic throughput the observed seaports and the Liner Shipping Connectivity Index in the period 2006-2020, as well as the second and third independent variables. All data were processed by the method of multiple linear regression analysis, which showed predictions of the movement of the dependent variable depending on the projected values of the independent variables. The results have confirmed the validity of the hypothesis and, consequently, the selected factors have the high influence to the development of logistics routes of intermodal transport in the analyzed ports.

INTRODUCTION

Maritime transport experienced a revolution in the mid-1960s with the invention of the container unit for the transport of goods. Since then, intermodal transport of all types of cargo has been continuously growing, namely, container transport of goods by land and sea has risen exponentially (De Langen and Sharypova, 2013). Modern logistics systems in seaports integrate the organizational functions of

marketing and management, through which the process of cargo handling in primary and accompanying logistics flows is carried out (Bichou and Gray, 2004; Draskovic, 2019). In the situation when there is a heavy international competition, quality performance and low costs of all logistics activities are essential for the business success of seaports (González and Trujillo, 2009). B. Beskovnik (2010) points out to the need for cooperation of all entities and factors of within the intermodal chain, which refers to the ports of the Eastern Adriatic. Underdeveloped intermodal infrastructure (Baran and Górecka, 2019) and lack of investment are the main limiting factors for the development of the considered seaports. The former relates primarily to railway and road infrastructure (Vlahinic-Lenz et al., 2018), which connects intermodal hubs, as well as the deficit of intermodal terminals, which operate using limited equipment and space. Also, specialized staff and management skills are in short supply.

One of the basic conditions for the development of a logistics route in intermodal transport is the existence of dry ports in the hinterland of seaports (Roso, 2013). The increase in freight transport by sea generates an almost proportional increase in the land flow of goods. It has to be accompanied by the development of dry ports (Bask et al., 2014). The concept of a dry port (which can be more or less remote) is based on the fact that it is connected to the seaport by rail.

In this paper, the economic modeling was applied to the three selected the Eastern Adriatic seaports (Koper, Rijeka and Bar), in which we conducted a field survey (the samples of 50 respondents in each of these seaports). The aim of the survey was to obtain valid responses, based on the perception of 180 respondents about the level of development of logistical routes of intermodal transport in the three mentioned seaports, as well as about the possible positive impacts of the selected factors. In this sense, we have obtained the responses to the following research questions:

- What is the level of development of logistical routes of intermodal transport in the three mentioned seaports? (the dependent variable in the model);
- What is the positive impact of LSCI on the development of logistical routes of intermodal transport in the three mentioned seaports? (the first independent variable in the model);
- What is the positive impact of the development of the seaport on the development of logistical routes of intermodal transport in the three mentioned seaport? (the second independent variable in the model), and
- What is the positive impact of connection of the seaport with the network of intermodal terminals in the hinterland (the third independent variable in the model).

In addition to theoretical considerations, and in order to verify the initial and auxiliary hypotheses, we have used numerical tables, graphical and statistical analysis and regression multiple linear analyses applied to the data obtained in the course of surveying 180 respondents.

1. THEORETICAL APPROACH

Before explaining our hypothetical model, we will point out an interesting theoretical idea (Draskovic, 2019), which with a good political will, economic logic and institutional elaboration (harmonization) could be applied in the future to increase the level of development of intermodal transport logistics routes in selected seaports of Eastern Adriatic (Bar, Rijeka and Koper). It is about the implementation of the partial business integration, with a certain redistribution of transport, port and logistics services in the region, which would strengthen the key competencies of the considered sea-ports. The implementation of this idea also considers a significant degree of partnership and the associated long-term forms of partial business integration between these ports (Ibid.). It should enable a synergistic strengthening of the competitiveness and key competencies the ports of Koper, Bar and Rijeka by increasing cargo throughput and their participation in the global flows of integrated marketing logistics keeping in mind their geographical position for the cargo from/to Asia compared to the Western European ports. Development and implementation of discussed ideas has to be seen at the practical regional level (political, economic, and institutional), with the wider participation and cooperation of all /regional stakeholders (govenrmental entities, mentioned Adriatic ports, and the selected global logistics provider). It is also necessary to bear in mind the theoretical model (Figure 1), proposed by A. Montwiłł (2014, p. 260) in accordance with

UNCTAD recommendations (2004). Our adaptation refers to the inclusion of independent variables from the hypothetical model in the stated theoretical model, which unequivocally indicates a certain degree of their complimentarily.

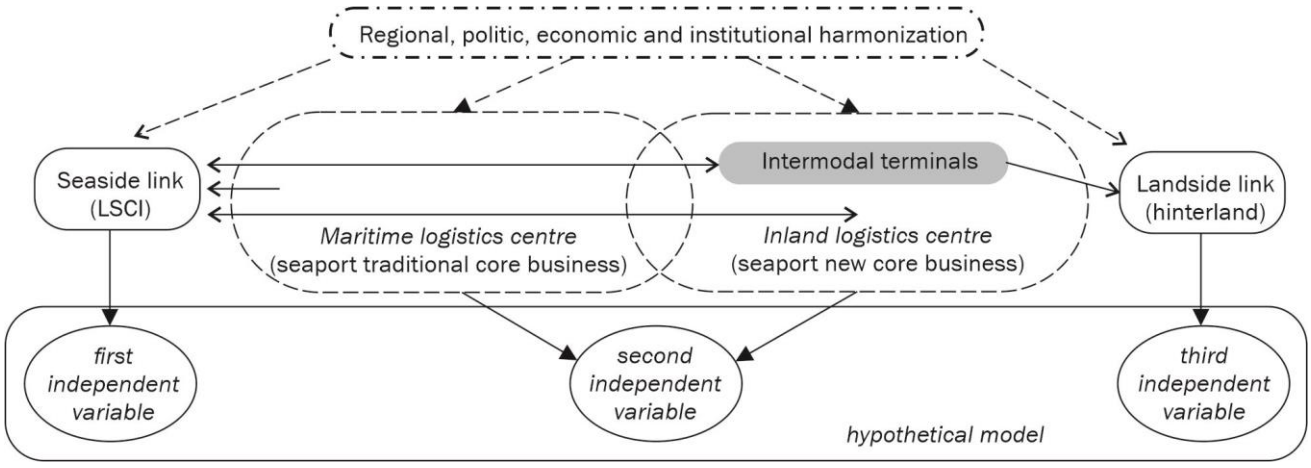


Figure 1. Possibilities of developing logistics routes

Source: adapted from UNCTAD, 2004; Montwiłł, 2014.

In accordance with the subject and goal of the research, in defining a hypothetical economic model, the following variables were selected for evaluation by the surveyed experts: The level of development of intermodal transport logistics routes in the Eastern Adriatic in the period 2006-2020. in the seaports of Koper, Rijeka and Bar (Figure 2).

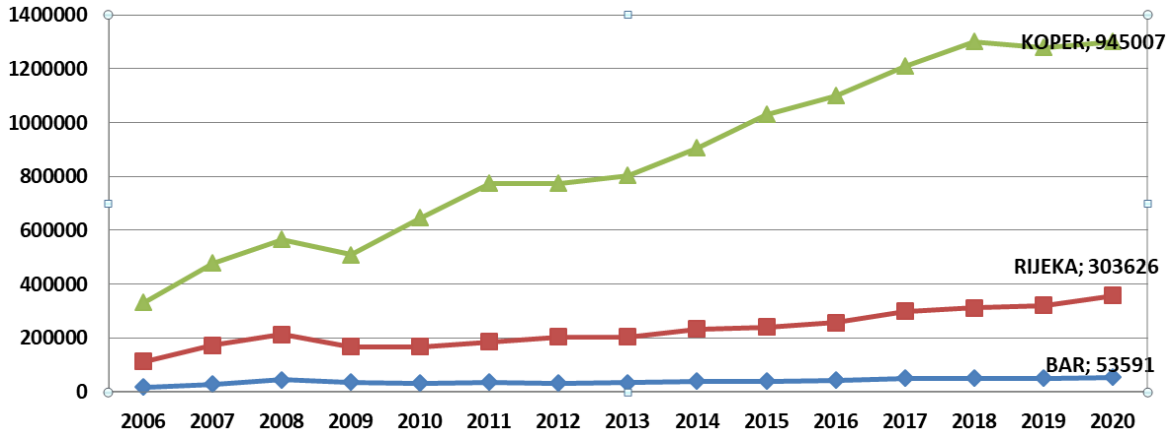


Figure 2. Container throughput 2006-2020 / TEU.

Sources: Container statistics by lines, Port of Bar and Port of Adria Bar, 2021; Container statistics by lines, Port of Rijeka and Adriatic Gate Container Terminal, 2021; Port of Koper, 2021,

The influence of the real data for *Liner Shipping Connectivity Inde*x (LSCI)[1] on the specified dependent variable (Table 1) was chosen as the first independent variable.

[1] LSCI aims at capturing the level of integration into the existing liner shipping network by measuring liner shipping connectivity. It can be calculated at the country and the port level. LSCI can be considered a proxy of the accessibility to global trade through to proxy of its shipping network. The higher the index, the easier it is to access a high capacity and frequency global maritime

Table 1. Liner Shipping Connectivity Index 2006-2020

Port	2006	2007	2008	2009	2010	2011	2012	2013	1014	2015	2016	2017	2018	2019	2020
Bar	1,51	1,51	2,51	3,82	3,50	3,37	4,40	3,65	3,88	3,65	4,55	3,92	3,11	4,27	5,25
Rijeka	10,36	11,43	13,80	10,82	16,89	17,35	17,87	18,72	19,97	23,17	26,99	29,80	29,32	32,34	33,35
Koper	13,23	13,85	16,67	17,83	19,28	19,91	20,12	21,05	22,61	26,78	29,96	32,44	31,37	34,26	35,32

Source: *Country and Port Level Liner Shipping Connectivity Index*, 2020

The second independent variable in the model is the development of the seaport, measured through the development of port infrastructure, superstructure and logistics, as well as the amount of total costs in the observed ports.

The third independent variable is the connection of the seaport with the network of intermodal terminals in the hinterland.

The initial research model connects three independent variables with one dependent variable. For the realization of multiple linear regression analysis, we used Modules Solver and SPSS (Coakes, 2013; Pallant, 2011; Teles and Schachtebeck, 2019, Bayraktar, 2019). In addition, for simple mathematical statistical modeling, we used the works of N. Balakrishnan et al. (2007); D. Bertskas and J. Tsitsiklis (2008). The constructs used in this study were measured on a Likert scale from 1 to 5, where 1 means the least impact and 5 the greatest impact. Multiple regression analysis was applied to the results of the respondents & # 39; perceptions obtained through the survey, for cases of specified ports.

2. DATE AND RESEARCH METHODOLOGY

2.1 Model

For this research, we have conceived questionnaires in accordance to the previously presented theoretical framework. In total 180 surveyed experts from the subject area from Southeast Europe have been interviewed. They were asked to evaluate, based on their best knowledge, experience and(or) intuition, the dependent variable in the model, defined as the *levels of development of logistics routes of intermodal transport in the Eastern Adriatic (Zp)* (each respondent for the corresponding in his/her own country). Also, they were asked to evaluate the values of the positive influence of the three independent variables in the model (listed above) on the dependent variable.

The constructs from the research framework were measured with point 1; 1,5; 2; 2,5; 3; 3,5; 4; 4,5; 5 Likert-type multi-item scale. In fact, the respondents used linguistic qualifications: very strong (5), strong (4), medium (3), weak (2) and very weak (1) to answer the questions. These qualifications were later coded into Likert's scale as it is noted in the brackets next to each of the linguistics qualification. In the next section is described shortly multiple linear regression model which we used for the responds quantitative analysis.

2.2 Linear multiple regression model

The idea is to determine functional relationship between the dependent variable: *levels of development of logistics routes of intermodal transport in the Eastern Adriatic (Zp);* and independent ones: a) seaport connectivity measured by the LSCI (Liner Shipping Connectivity Index) *(Np_1)*, b) seaport develop-

freight transport system and effectively participate in international trade. Therefore, LSCI can be jointly considered as a measure of connectivity to maritime shipping and as a measure of trade facilitation. It reflects the strategies of container shipping lines seeking to maximize revenue through market coverage (https://porteconomicsmanagement.org/pemp/contents/part1/ports-and-container-shipping/country-port-level-liner-shipping-connectivity-index). The LSCI is calculated based on six major components (Ibid.): a) *Scheduled ship calls*; b) *Deployed capacity*; c) *Number of shipping companies and liner services;* d) *Average and vessel size*; e) *Directly connected ports; and* f) A number of destination ports that can be reached without the need for transshipment.

ment *(Np2)* and c) seaport connectivity with dry ports (intermodal terminals, i.e. economic centers) in the hinterland *(Np3)*. Our goal was to estimate the realistically expected mean value of the dependent variable ($\overline{Zp}$), based on individual estimation of the respondents. Since the respondents have estimated the dependent variable *Zp* and independent variables (*NP1, Np2* and *Np3)* on their own discretion, our task was, in line with the requirements of multiple linear regression, to determine the coefficients: B_0, B_1, and B_3, and to calculate $\overline{Zv}$, using Eg. (1):

$$\overline{Zp} = B_0 + B_1 Np_1 + B_2 Np_2 + B_3 Np_3 \qquad (1)$$

Where,

$\overline{Zp}$ - is the mean expected value of the dependent variable;
B_0 - is the intercept, determined on the basis of an appropriate sample;
B_1, B_2, and B_3 – are coefficients of independent variables Np_1, Np_2, and Np_3, or slopes of the correspondent lines. This practically means that for any new value of each independent variable from a predefined interval, we can estimate the value of the dependent variable. It should be said that $\overline{Zp}$ is an average estimated value, since it is a mean value of Np_1, Np_2, and Np_3. To determine $\overline{Zp}$ it is used the last square method (Bertskas et al., 2008). In fact, our goal was to determine the coefficients: B_0, B_1, B_2, and B_3, so as to minimize the sum of squared errors (SSE), which is represented by Eq. (2):

$$SSE = \sum_{k=1}^{n} \left(Zp_k - \overline{Zp}_k \right)^2 = \qquad (2)$$

$$= \sum_{k=1}^{n} \left(Zp_k - \left(B_0 + B_1 Np1 + B_2 Np_2 + B_3 Np_3 \right) \right)^2$$

Where,

Zpk - is actual value of the dependent variable, given by the k respondents ($k = \overline{1,n}$);

$\overline{Zpk}$ - is the estimated value of the dependent variable on the basis of the model, in the case of k respondents ($k = \overline{1,n}$);

n – is the total number of respondents (180), $k = \overline{1,n}$.

Using the least-squares method, here is actually determined a straight line, which minimizes the sum of vertical differences for each pair of points (Balakrishnan et al., 2007). In other words, identified is a straight line that best fits the given set of points, by determining the optimal value of intercept (B0), as well as coefficients (B_1, B_2, and B_3), in order to obtain a more accurate value of $\overline{Zp}$ for the given (estimated) values of Np_1, Np_2, and Np_3, and *Zp* (for $\forall k$, $k = \overline{1,n}$).

2.3 Results and discussion

The obtained results are shown in Table 1. In addition to the coefficients: B_0, B_1, *and* B_3, the following statistical indicators were also determined: mean absolute deviation (MAD), correlation coefficient r, coefficient of determination (r^2), mean square error (MSE), mean absolute percent error (MAPE), and standard error of regression estimate (SE). These indicators show high model correspondence and respondents' estimates.

In accordance with the data shown in Table 1, the lines representing the functional dependency between the dependent *(Zp)* and the independent variables ($Np_{1\text{-}3}$) are below.

- *Port Bar:*

$$\overline{Zp} = B_0 + B_1Np_1 + B_2Np_2 + B_3Np_3$$

$$\overline{Zp}_1 = 1{,}178 + 0{,}740 \times Np_1 + 0{,}284 \times Np_2 + 0{,}007 \times Np_3 \quad (3)$$

- *Port Rijeka:*

$$\overline{Zp} = B_0 + B_1Np_1 + B_2Np_2 + B_3Np_3$$

$$\overline{Zp_2} = 0{,}914 + 0{,}238 \times Np_1 + 0{,}038 \times Np_2 + 0{,}395 \times Np_3 \quad (4)$$

- *Port Koper.*

$$\overline{Zp} = B_0 + B_1Np_1 + B_2Np_2 + B_3Np_3$$

$$\overline{Zp_3} = -0{,}336 + 0{,}615 \times Np1_1 + 0{,}342 \times Np_2 + 0{,}173 \times Np_3 \quad (5)$$

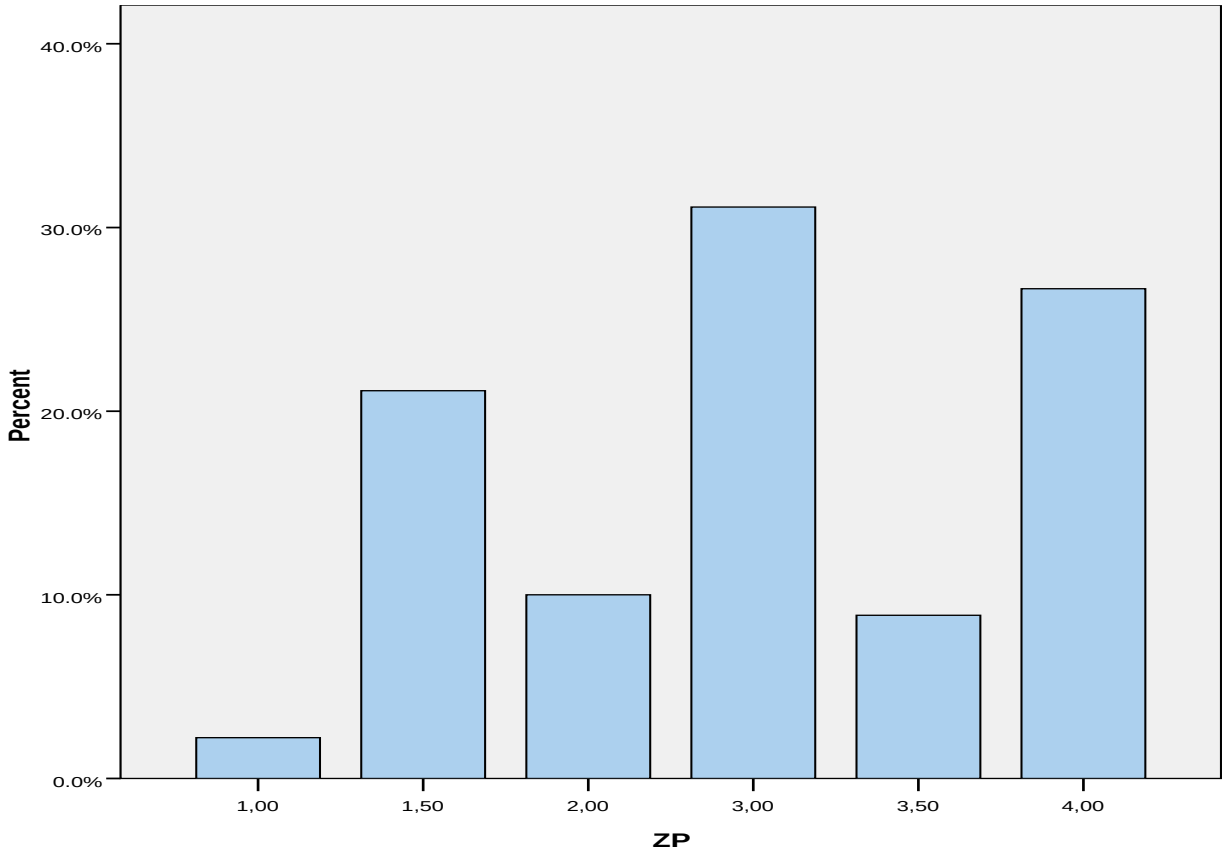
Table 1. Key parameters and statistics in a multiple linear regression model (Source: own)

Param.	*Port Bar:*	*Port Rijeka:*	*Port Kopar:*
B_0	1,178	0,9143	-0,336
B_1	0,74	0,238	0,615
B_2	0,284	0,0383	0,342
B_3	0,007	0,395	0,173
R	9,761	0,725	0,953
r^2	0,579	0,526	0,909
MAD	0,109	0,133	0,084
MSE	0,033	0,038	0,015
MAPE	7,37%	0,041%	2,22%
SE	0,18	0,20	0,12

The mean value of the dependent variable was calculated and the following results were obtained:

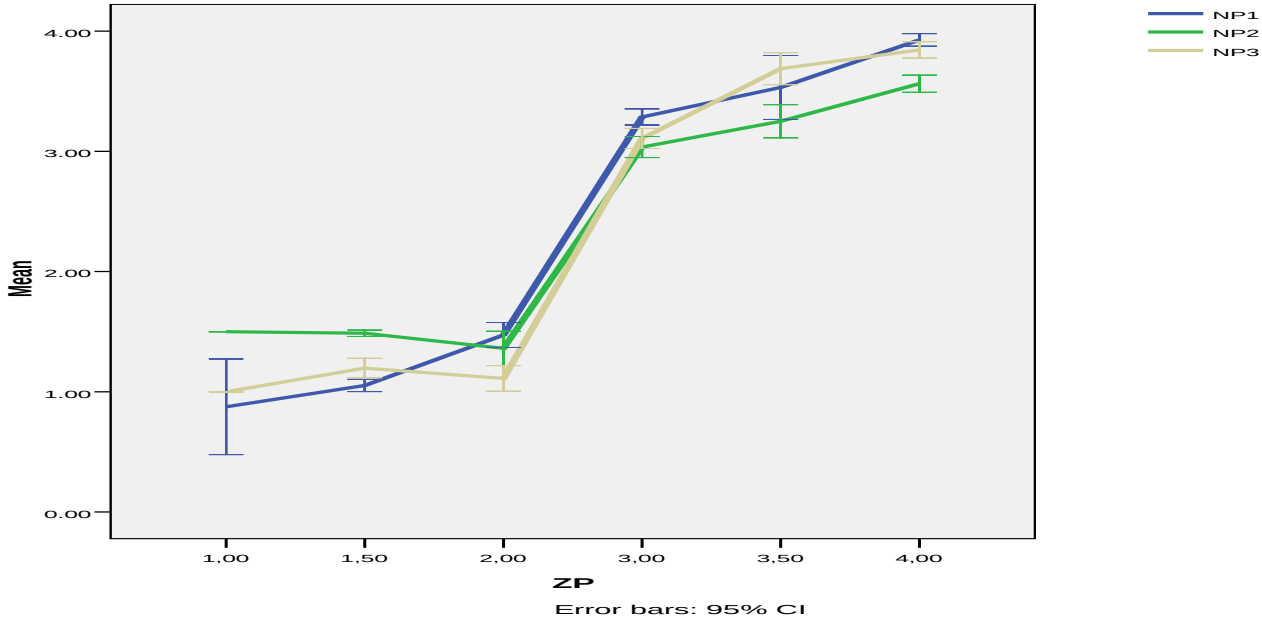
Port Bar	*Port Rijeka*	*Port Koper*
1,51	3,15	3,76

According to the analysis of the linear dependence between the dependent variable and the mean values of the independent variables at the level of all respondents (Graph 2), it is clear that variable Np_1 has the most pronounced influence on the dependent variable. These analyses (Gaph (2) were done over the entire sample. Based on the analysis of the individual sample, the rank of the influence of the independent on the dependent variable given in Table 2 was obtained.



Graph 1. Percentage of estimates 1 to 5 in the set of dependent variable (Zp)

Source: own



Graph 2. The dependent variable (Zp) vs independent variables ($Np_{1\text{-}4}$) in the model

Source: own

In accordance with the mean values of the independent variables (Table 5), the largest impact of the independent variable is the Liner Shipping Connectivity Index LSCI (Np_1), in all Ports. The impacts of this variable is low at the Port of Bar, and significant at the Port of Rijeka and Koper. Also, the dependent variable (Zp_1) is proportionally influenced by all three independent variables (Np_1, Np_2, and Np_3).

Table 2. Mean values of independent variables (Np_{1-3}) and rank of their influence on the dependent variable (Zp)

Rang	*Port Bar:*	*Port Rijeka:*	*Port Kopar:*
1	Np_1 [1,616]	Np_1 [3,433]	Np_1 [3,716]
2	Np_2 [1,450]	Np_3 [3,308]	Np_3 [3,650]
3	Np_3[1,158]	Np_2 [3,075]	Np_2 [3,475]

Source: own

CONCLUSION

The research showed that the seaport of Bar is noticeably behind the seaports of Rijeka and Koper in terms of the development of logistics routes for intermodal transport. This was ascertained and corroborated by through real data and hypothetical assessments of 180 respondents. The reasons are numerous, and they are dominated by the low level of infrastructural, superstructural and logistical development of the Port of Bar, high costs of its port and logistics services, deteriorating political relations between Montenegro and Serbia, the poor infrastructural transport connections of the Port of Bar with Serbia, development investment deficit, orientation of Serbia to other seaports, a percentage of idling of engaged containers in the return direction, etc.

The functional dependencies between the dependent variable the levels of development of logistics routes of intermodal transport, and the above mentioned the independent variables, were established. Based on the conducted analysis, it was found that the prevailing influence on achieved levels of development of logistics routes of intermodal transport are factors: Liner Shipping Connectivity Index LSCI, seaport development, and seaport connectivity. On the basis of statistical modelling it has been shown that mean values of the dependent variable are: Port Bar is 1.51, in Port Rijeka is 3.15, and Port Koper is 3.76. Also, the rank of independent variables influence to the dependent variable has been established. Testing impact of independent factors shows that ports with the higher level of these factors, have achieved the greater levels of development of logistics routes of intermodal transport. According to the above stated, the starting hypothesis in the paper has been fully verified.

From the perspective of enhancing the levels of development of logistics routes of intermodal transport, the findings of this research give support for deciding on the directions, that when setting up a good strategy of the development, the given factors and their influence should be considered as the most important. These factors are, on the basis of regression analysis, significant elements in the influence the level of the levels of development of logistics routes of inter-modal transport. The selected independent variables in the model explains over 65% of the variation of the level of the levels of development of logistics routes of intermodal transport. If the observed countries strive to develop the levels of development of logistics routes of intermodal transport and create a competitive the levels of development of logistics routes of intermodal transport, understanding the selected factors in this model is invaluable.

Despite some limitations, this research provides the notable contributions. First, it fills up deficit of research in this field. Second, the analysis of the impact factors is given, with certain extensions compared to the previous studies. Thirdly, the theoretical framework for the research of the achieved level of the levels of development of logistics routes of intermodal transport, can be generalized.

Further research should be carried out in the direction of the possible inclusion of additional independent variables, or the establishment of different, more complex aspects of functional dependence among the variables. There are significant internal reserves for the improvement of all independent factors in order to achieve the highest level of the levels of development of logistics routes of intermodal transport in observed ports.

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