INVESTMENT DETERMINANTS OF ECONOMIC GROWTH: WORLD EXPERIENCE AND UKRAINE

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Abstract. *Welfare of the population and investment are known to be drivers of economic growth. The paper explores the concept of economic growth and the development of determinants of this economic phenomenon. Since the beginning of the 20th century, economic models based on the premise that investment factors lead to the growth of a nation have been widely used. Since GDP is a quantitative indicator that allows making conclusions about a country's economic growth, this paper studies GDP dynamics in Ukraine, compared to other regions, and identifies its link with the FDI. The article analyzes the dynamics of direct foreign investments on regional and global scales, and compares them with trends in world gross product changes, which is a direct expression of a region's growth status. To test our hypothesis on the interrelation between GDP and macroeconomic indicators such as FDI, inflation index, and discount rate, we conducted panel studies using data from Ukraine, Georgia, Serbia, and Romania. The findings suggest that foreign direct investments constitute one of the sources of a country's GDP*

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growth and, therefore, it can be considered an important determinant of a country's economic development.

1. Introduction

The most important goal of the economic policy of any nation is to maintain long-term economic growth. Therefore, the detection of the rules of its achievement and the substantiation of factors determining and stimulating it are important scientific research areas. For Ukraine, investments are considered as important factors of economic growth today and even more than ever. Each country is characterized by its unique system of factors, which, accordingly, must be based on measures to build up an effective national economic policy. In modern conditions, investment plays an important role, as it promotes technological progress, increases economic activity, and positively influences the development of human capital. In the crisis period and in the period of macroeconomic instability, the nation's economy, as a rule, shows a decline in investment inflows.

This study aims to reveal new processes in the economic growth of various nations, including Ukraine, that no longer can be explained by the previously used economic variables and to analyze new determinants based on existing theories and hypotheses. Current theories account for a number of determinants of economic growth including GDP growth, inflation rate and growth rate, development of infrastructure, income level, income surplus, price level, and investment share and type of investment. Under an increasing number of countries and time periods that are being studied, economic growth is characterized not by the bulk of factors, but rather by identifying the high quality determinants and their impact on it.

On the basis of theoretical and logical, mathematical and statistical analysis of economic growth in the global and regional dimension, panel data analysis was performed to confirm the hypothesis that there is a close correlation between GDP and FDI in the country.

Recommendations and proposals for economic growth in correlation with investment determinants for Ukraine and other countries were formed on the research results.

2. Literature Review

For the methodological foundations of economic growth and development, their intrinsic features remain in the focus of many scholarly studies. Economists from different countries use both theory and empirical research to explain the cause of economic growth. P. Samuelson (2010), R. Solow and D. Romer (1956) highlight its theoretical

foundations that have become the basis for many further studies. Later, R.Barro and X.Sala-i-Martin (2004) carry out a thorough research on the growth theory, and R. Harrod, E. Domar, R. Lucas (2002), and D. Ademoglu (2012) conduct empirical studies to test established hypotheses.

The issues of the interconnectedness of investment and economic growth is revealed in the studies of R. Alvarado (2017), D. Burns, A. Jones, T. Gao (2005), Y. Goryakin, A. Kumar Tiwari (2011), T. Kunieda (2016), M Suhrcke (2017), G. Kharlamova (2014), Z. Varnalii (2018), D. Nikytenko (2018), etc. Numerous studies of well-known economists from all over the world are devoted to the problem of building a system of economic growth factors.

Although a considerable number of studies explore investment, this topic remains relevant, as the relationship between economic growth and direct foreign investment inflows to the country and the region is not sufficiently analysed.

Economic development was once a topic of great interest and political debate. Nowadays, the subject of economic growth is seen as rather controversial. The world economy consists of corporate and market institutions that rotate around the planet as a certain mass. When one of these subjects collapses, the simultaneous effects are noticeable everywhere. These effects manifest themselves in the form of deep crises, the most disastrous of them being the sharp waves of repetitive cycles of the financial system downturn and irreversible intensification of global warming. Both effects represent the most extreme dangers humankind encounters when trying to reach the next level of development, which in turn is associated with the stages of economic growth of any nation (Maguson, 2016; Błażejowski et al., 2016).

The problems of economic development were first outlined by the economist of the Physiocratic school F. Quesnay, but only in the 20th century did they start gaining broad scholarly interest. Undoubtedly, one of the most important goals of any economic policy is to achieve long-term economic growth, which can only be reached by clear understanding of its stimulating or restraining factors (Barro and Sala-i-Martin, 2004). The theory of three factors of production introduced by J-B. Say claims that land, labor and capital contribute to the creation of product value. Hence, these three factors determine a country's economic growth. J. Schumpeter complemented the factors of economic growth via the roles of entrepreneurship and innovation (Żelazny, 2017; Peretto, 2015, C.Chu at al, 2017, He, 2018) and the American economist B. Seligman (2012) suggested that when studying economic growth, one should consider not only the basic factors, but also the political and regulatory institutions, as well as the psychological and social aspects. However, according to the author, it is almost impossible to embrace economic growth in these broader terms. Therefore, well-known economists, authors of economic growth theories, tried to create their own unique theory or model of economic growth, which allows study and distinguishment of its most significant determinants.

For the purpose of this study, we conducted a minimal empirical research, which specifically addresses the factors determining the growth of developing economies within recent years. Since economic growth is a very dynamic process, studies based on hun-

dred-year-old cases may no longer be relevant. It is also important to highlight that the analysis of economic growth can only be effective when the study period is sufficiently long. Not considering cyclical and seasonal fluctuations, economic growth is regarded as a complex and long-term process.

Presently, GDP, its rate per capita and its dynamics represent important quantitative indicators of the nation's economic growth. This indicator is the basic one used for ranking countries by level of development. In order to assess economic growth in qualitative terms, international organizations are increasingly using a human development index that takes into account the following factors: demographic situation, labor market development, material well-being, health and education, and environmental status (Bilan et al., 2020; Korauš et al., 2017; Lucas, 2002; Mendy & Widodo, 2018; Mishchuk et al., 2018 Papadaskalopoulos at al., 2003).

In the middle of the 20th century, R. Harrod introduced his new model of economic growth, which was subsequently developed by E. Domar. This model is based on a tendency to save and build on a condition of long-term perspective. In addition, these scholars became the first to determine that investment is one of the factors of economic growth. Their model of economic growth is further elaborated on through the basis of scholarly research by R. Solow, which leads to his neoclassical model of economic growth (Solow, 1956). These models introduce the notion of investment efficiency into the academic circle and allow analysis of the dependence of national economic growth using a number of determinants, including the share of direct foreign investments.

Solow's model becomes fundamental in the theory of economic growth. Many established scholars in their further studies use it: F. Ramsey (1928) to substantiate his dynamic optimization model, D. Cass (1965) in his attempt to modify Ramsey's model, and P. Diamond (1965) in his studies devoted to capital accumulation.

Moreover, the neoclassical model of economic growth gives birth to a hypothesis of conditional convergence formulated by R. Barro (1991) in an attempt to shed light on one of the central questions of the theory of economic growth, i.e. whether the countries tend to converge over time.

P. Samuelson and V. Nordhaus (2010) were the first to formulate the mechanism of interaction between economic growth and investment based on the principle of acceleration. This interaction implies the growth of real gross domestic product (GDP) due to the growth of real investment, as well as further increase in real investment due to the corresponding GDP growth.

Hence, there is a large number of economic growth factors that can be analyzed from the perspective of qualitative content and focus of action. It should be noted, that investment determinants constitute a practical interest in terms of their impact on economic growth and the possibility to use them as part of economic policy aimed to promote a nation's economic growth.

3. Methodology

This paper presents an analysis of the determinants of economic growth such as GDP and FDI on global and regional scales. The methodology includes theoretical and empirical analysis using statistical methods, panel studies, correlation and regression analysis, the Pearson correlation coefficient to test the hypothesis of the significance of the interconnectedness of determinants, and methods of system and comparative analyses.

Since the social phenomena are shaped under the influence of multiple factors that are in turn interconnected, their influence will be complex and cannot be regarded as a simple sum of isolated interactions.

Multi-factor models or phenomena require the use of methods of multiple correlation and regression analysis that allow study and quantification of internal and external cause-and-result relationships between the factors that create the model and establish the functioning patterns and development trends of the attribute being studied.

The main task of correlation and regression analysis methods is to analyse statistical data, in order to identify the mathematical relationship between attributes under study and establish the correlation coefficients using density comparative assessment of the relationship that has a numeric expression.

Even though GDP growth is seen as an important determinant in our study, when analysing the macroeconomic model of development, one could argue that GDP indicators are influenced by such determinants as FDI, inflation rate, discount rate, and so on. Therefore, when carrying out a correlation and regression analysis, we will consider the volume of GDP as the resulting attribute (dependent variable), and all other factors (inflation rate, foreign direct investment, discount rate) will be considered as explanatory attributes (independent variables).

The study of panel data is based on a correlation-regression analysis, which consists in evaluation of paired correlation coefficients between the dependent and independent variables. These coefficients will show the density of the relationship between the economic indicators. Thus, the computation of the correlation coefficients will determine the degree of influence of key macroeconomic factors on GDP.

To study panel data, one needs to create a sample of statistical data. For the purpose of this study, besides Ukraine, we included data for Georgia, Serbia, and Romania, as comparable to Ukraine-like developing countries. Data used consisted of official statistics datasets of the World Bank on a yearly basis.

For the analysis, we took a sample of data for ten years, for the period from 2008 to 2017. We assume, that the investments made in 2018 will bring effects to the economy only in the following, therefore we allowed for a shift of one year.

It is clear that the more distant in time the statistical data is, the lower is their impact on the current state of the economic system. However, the accuracy of the correlation and regression analysis increases with an increase in the sample size.

Having formed a statistical sample using STATISTICA software package for statistical analysis, we constructed a corresponding correlation matrix. The grouped data will be displayed in the table. The main purpose of correlation analysis is to determine the

connection between random variables and to assess its intensity and direction. Pearson's coefficient of correlation is used to perform this assessment. Hence, the corresponding coefficients of Pearson's correlation show the density of the relationship between the attributes. The value of coefficient correlation may vary from −1 to +1. The values −1 and +1 correspond to a clear linear functional dependence, which in the first case is decreasing, while in the second it is increasing.

The closer the value of the correlation coefficient to -1 or +1, the more reasonable is the assumption of the presence of a linear connection. The approximation of its value to zero indicates a lack of linear communication, but it is not a proof of the absence of a statistical connection in general.

Having determined the factor with greatest impact on national GDP, we carry out a regression analysis. The methods of regression analysis allow estimating the density of the relationship between the attributes and seeing the type of this connection in the form of an equation describing the relationship between the mean values of one dependent attribute and the values of independent factors; the impact of which on the dependent attribute is being evaluated.

Using the STATISTICA program, we built a simple linear regression, where the volume of GDP is a dependent variable and a share of FDI in Ukraine is an independent variable.

As a result of this analysis, we obtain the empirical equation of simple linear regression.

The quality of this model can be checked by determining the determination coefficient.

The reliability of the analysis will be verified by constructing a model for analysing the residues.
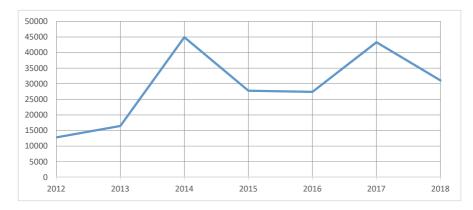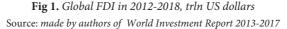
4. Results and Discussion

1. The investment component of economic growth

In current research, the role of investment in economic growth is not subject to challenge, but the question is whether the attraction of foreign capital affects the economic growth of national economies.

The redistribution of capital markets in connection with the attraction of foreign direct investments is a typical trend in recent years. There is a noticeable decline in the share of capital operations on a national scale in favour of international, in national and regional scales (Sayaria at al, 2018).

The changes in the total share of foreign direct investments (FDI) in the world are characterised by instability. However, under the influence of recent attempts to improve the mechanisms of intergovernmental management of global investment flows, recently there is an increasing and gradual trend of the world economy towards economic growth. (Fig. 1)

Fig 1. *Global FDI in 2012-2018, trln US dollars*
Source: *made by authors of World Investment Report 2013-2017*

In 2012, the world has seen moderate growth of 28% in foreign direct investment (FDI). While other macroeconomic indicators such as GDP, employment, and volumes of international trade showed a more considerable increase; the investment component has demonstrated a weaker overall trend. In 2013, global FDI has increased dramatically (by 173%), which gave impetus to more intensive economic growth in the developing countries, whose share in global FDI constituted 39%. In 2014, global FDI flows decreased by 38%, largely due to the volatility of the world economy, the unpredictability of investment policies, and the increased level of geopolitical risks. In 2015, the level of FDI remained almost unchanged, and 2015 saw a considerable recovery in FDI when its flows jumped by 58%. The main reason behind this global recovery was a boom in international mergers and acquisitions. Levels of greenfield investments remained high too. A decline of FDI by 28% in 2017 proved the fact that the global investment process is not uniform and hardly predictable. Today, we can only foresee that 2018-2019 will see an increase in world investment volume, which will help accelerate economic growth (World Investment Report 2013-2017).

Considering breakdown of FDI by regions, one can see that it varies considerably. Global FDI flows started growing significantly in 2013, and then continued to demonstrate an upward trend in 2015. A similar trend is observed in the regional context, although with some peculiarities. (Fig. 2)
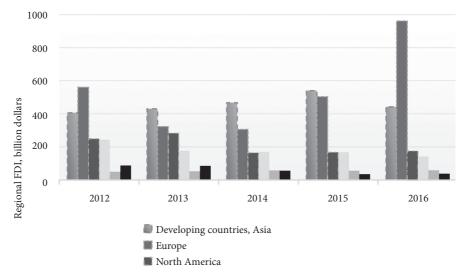
Fig 2. *Distribution of global FDI by region, 2012-2016, bln US dollars*
Source: *made by authors of World Investment Report 2013-2017*

In most regions, the prospects of FDI look moderately optimistic, with the exception of Latin America and the Caribbean, where FDI is demonstrating a steady downward trend, albeit at a low pace. Recently, one of the apparent trends is a tangible growth of about 10 % on investment inflows to developing countries, and to Asia due to larger cooperation with the advanced economies based on strengthened investor confidence. In the context of regional integration and changes in fuel prices, there is also a gradual increase in FDI in the countries of the African region and similar trending is expected in 2018. However, flows of investment in the least developed countries are constantly declining, where, for instance, in 2016 they dropped by 13%.

In the European region, 2012 brought a decline in investment of 32%. This situation was typical for most European Union countries. Over the next two years, European countries did not manage to recover their previous volumes of investments with the yearly decline of 28-30%. In 2015, after three years of recession, FDI inflows to the countries of the European region rose sharply and reached almost 55%. In the following year, the growth rate of investment was not so significant (just 5%), but an overall upward trend was sustained. In 2018, a continuous increase of FDI flows to the EU countries is forecasted. Moreover, in 2015, Europe became the largest regional investor in the world.

Ukraine belongs to a group of countries with transition economies. According to the World Economic Situation and Prospects (2017), this region is made up of Albania, Montenegro, Serbia, Kazakhstan, Russia, Belarus, Georgia, Moldova, etc. Over the period of 2012-2015, these countries and Ukraine in particular, saw a gradual outflow of FDI, reaching decade-long lows. The reasons for this downward trend included low prices

for raw materials, a decline in domestic markets, and geopolitical tensions. (Egger & Larch, 2011, Feils & Rahman, 2008, Fitzová & Žídek, 2015, Simionescu, 2018). In 2016, this region saw a significant recovery in investments that nearly doubled and reached 68 billion US dollars. This growth was facilitated by large privatization deals and growing investment in mining projects.

2. GDP as an indicator of economic growth

Another indicator of economic growth is GDP, which is quite significant and enables us to conclude about the positive or negative changes in the economic system of any region and any nation. According to the international report on World Economic Situation and Prospects (2018), in 2018 and 2019, the growth of gross world product (GWP) will amount to 3 %.

The analysis of the GWP dynamics as an indicator of economic growth and the dynamics of FDI on a global scale show that both demonstrate similar growth dynamics, common trends, and prospects, which confirm the deterministic nature of investment in relation to the national economic growth. (Fig. 3)
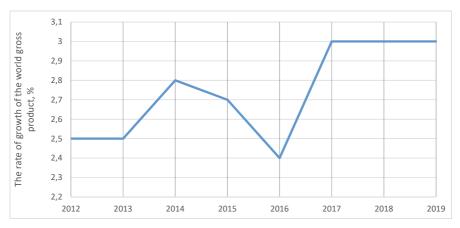

Fig 3. *The growth rate of GWP, 2012-2019, bln US dollars*
Source: *made by authors of World Economic Situation and Prospects (2018)*

Having taken the same sample region and same periods, we analyzed the annual growth rate of GDP. (Fig.4)
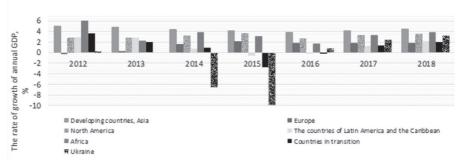
Fig 4. *Annual growth rate of GDP, %, bln US dollars*
Source: *made by authors of World Economic Situation and Prospects (2017)*

The annual GDP growth rates across regions within 2012-2018 have similar trends to those of the distribution of global FDI. Although Ukraine belongs to a group of countries with economies in transition, it shows somewhat distinct development features within the group. In 2014 and 2015, Ukraine had a negative GDP growth rate and only in 2016, the country managed to reverse the trend and demonstrate positive growth. This was due to the growth of output in almost all economic activities and low statistical base. In 2017, real GDP growth reached 2.5% according to the analytical report to the Annual Address of the President of Ukraine (2017).

The economic crisis caused a significant decrease in the share of FDI in the Ukrainian economy. This trend changed in 2016 due to the rollout of reforms and general macro-economic stabilization when the negative impact of external factors on the Ukraine's investment attractiveness was noticeably offset. Over 2015-2018, the dynamics of FDI inflows in the economy of Ukraine was characterized by the following trends:

- Recovering volumes of foreign investments after a two-year decline. In 2016, the growth of FDI in Ukraine amounted to 1.5 bln US dollars FDI, in 2017 – 2.54 bln US dollars, in 2018 – 2.87 bln US dollars.
- Declining FDI from the EU countries (Germany, France, the Netherlands, and Sweden), the USA, and the UK by 28-43%.
- Dramatic decrease in investment attractiveness of Ukraine resulting from unsatisfactory business environment in the country. According to the World Bank, the nature and volumes of investment in Ukraine are in line with its business conditions, where improvement by one cent determines the corresponding index of annual growth of FDI by 250-500 million US dollars. Although Ukraine is gradually improving its position in the Doing Business ranking (80th place in 2017 versus 83rd in 2016), its FDI per capita is still inadequate among the countries of the Eastern Partnership. Thus, at the beginning of 2017, Ukraine was 6 times behind Azerbaijan, 5 times behind Georgia, 2 times behind Belarus and by 50% behind Armenia (Doing Business 2017).

However, in this study, our objective is not only to assert the interrelationship be-tween macroeconomic indicators of GDP, FDI, and, accordingly, the economic growth of the nation, but also to attest such a connection with relevant mathematical models.

First, we carried out a correlation analysis of key macroeconomic indicators that have an impact on GDP (Table 1). For the reliability of the analysis, we added other macroeco-nomic indicators to the analysis, other than FDI, which, in our opinion, have a significant impact on the GDP of any country such as inflation index and discount rate.

Table 1. *Macroeconomic factors affecting GDP*

Period	FDI, billion dollars	GDP, billion dollars	Inflation Index%	Discount rate,%
2008	5.95	179.82	122.3	10
2009	3.07	117.11	112.3	11.5
2010	4.74	136.01	109.1	8.5
2011	5.42	163.16	104.6	7.75
2012	4.65	175.78	99.8	7.5
2013	2.46	183.31	100.5	7
2014	0.63	133.5	124.9	12
2015	3.35	91.03	143.3	22.5
2016	3.32	93.36	112.4	17
2017	2.52	112.15	113.7	13.25

Source: *World Bank Open Data [On-line]: Access mode: https://data.worldbank.org*

We determined the Pearson correlation coefficient that shows the connection be-tween the densities characteristics are given in Table 2.

Table 2. *Correlation matrix of dependence of volumes of GDP and FDI, Inflation index, Discount rate*

	FDI	Inflation index	Discount rate
GDP	0.63	-0.57	-0.85

Source: *made by authors*

The absolute values of Pearson's correlation coefficient given in Table 2 exceeding 0.3 suggest a moderate direct relationship between GDP and the selected macroeconomic determinants. One can argue that a dense dependence exists only between the GPD and FDI. Pearson's correlation coefficient between GDP and FDI in Ukraine amounts to 0.63, which suggests that the share of FDI in Ukraine is high, and shall lead to sustainable growth in GDP the following year.

Persons' correlation coefficients for such indicators as GDP and the inflation index and GDP and the discount rate are negative which suggests a reverse relationship meaning that the higher the inflation rate, the lower is GDP.

In addition, in the framework of our analysis, we have constructed a simple linear regression, where the dependent variable is the volume of GDP and the independent variable is a part of FDI in Ukraine.

We received the following empirical equation of a simple linear regression.

$$GDP = 9{,}3393FDI + 74963 \qquad (1)$$

The quality of this model will be verified by the definition of the determination coefficient.

The determination coefficient ($R2 = 0.59$) indicates that 59% of the value of the resulting attribute (GDP) is determined by the values of the explanatory variable (PPI), and 41% determined by other indicators. Given the large number of factors that influence GDP, we consider the result quite significant. In general, the calculated value of the determination coefficient indicates that one of the main factors influencing the volume of GDP in Ukraine has been identified.

The reliability of the analysis can be verified by constructing residual analysis model (Fig. 5).
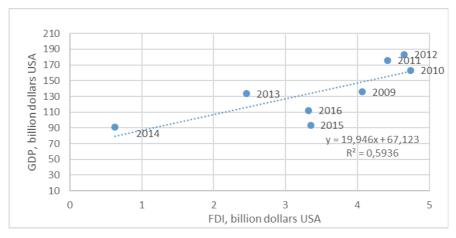

Fig 5. *Residual variables analysis, Ukraine, 2008-2017*
Source: *made by authors of World Bank Open Data*

It can be seen in Fig. 5 that the scattering of values is relatively small and it suggests accuracy of the model.

To confirm the hypothesis about the linearity of the dependence of GDP on FDI, we analysed these processes in other developing countries, namely Georgia, Serbia and Romania. Based on panel studies, we performed the required analytical and statistical

observations and they allowed us to draw a conclusion in favour of the direct linear relationship of GDP and FDI. (Fig. 6-8)
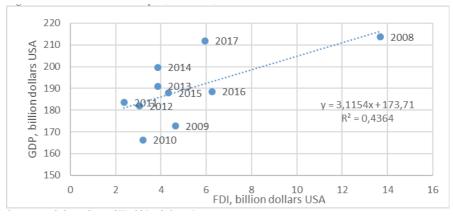

Fig. 6. *Residual variables analysis, Romania, 2008-2017*
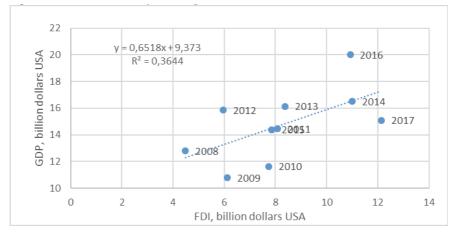Source: *made by authors of World Bank Open Data*

Fig.7. *Residual variables analysis, Georgia, 2008-2017*
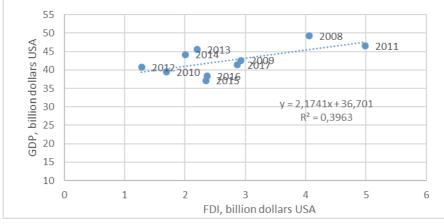Source: *made by authors of World Bank Open Data*

Fig.8. *Residual variables analysis, Serbia, 2008-2017*
Source: *made by authors of World Bank Open Data*

Finally, we compute Pearson's correlation coefficients between the GDP value and the share of FDI for each of the countries, which shows the density of the relationship and present the obtained values in a correlation matrix.

Table 3. *Correlation matrix (Pearson correlation coefficient)*

	Romania	Georgia	Serbia
Pearson correlation coefficient	0.66	0.60	0.63

Source: *made by authors*

The Pearson correlation coefficient for all countries suggests an average correlation. Obviously, the density of interrelation will not always be equally large, which is conditioned by the economic development and growth of the country, its welfare, its economic system, the attractiveness of its investment environment and overall competitiveness of the country, etc.

Hence, GDP will increase if FDI grows, and consequently the economic well-being of the nation will grow. Our economic and mathematical analysis has demonstrated that the relationship between the determinants of economic development such as FDI and GDP exists and it is quite dense. However, this growth is facilitated by creating an economic environment favourable for economic growth in general, and not just for the growth of individual macroeconomic indicators.

In particular, creating favourable business climate depends on coordinated and rapid advancement of reforms and the implementation of relevant initiatives aimed to stimulate the investment activity, to promote macroeconomic stabilization, to strengthen de-

regulation, and to foster the development of domestic market and the diversification of Ukraine's international economic cooperation.

5. Conclusions

The analysis of GDP growth rate for Ukraine and the country's investment climate allows the making of a conclusion that the gradual restoration of the positive dynamics in economic growth takes place. A revival in investment activity also provided a certain impetus for the development of the real sector of the economy. This serves as a confirmation of the fact that investment factors are significant for the economic growth of a country, while the deficiency or insufficient amount of investment leads not only to a decline in gross output and industrial and social infrastructure, but also to a recession in social sphere.

Evidently, investment ensures sustainability and long-term orientation of economic growth, making it resistant to competition. However, current levels of macroeconomic uncertainty and high internal and external security risks in Ukraine today do not help secure a steady growth of FDI and improve business expectations.

In this study, we used panel studies and Pearson correlation coefficient to prove the density of the interrelation of GDP and FDI, unlike other macroeconomic indicators. The correlation coefficient between the volume of direct foreign investments in Ukraine for 2008-2017 and the share of gross domestic product is 0.63, which indicates a dense correlation between the data. Panel studies prove that direct foreign investment in Ukraine is currently the main source of GDP growth of the country, as it is also associated with hopes for the development of new technologies and reorganisation of the existing structure of the economy. Therefore, it can be argued that FDI is an important determinant of economic growth within the studied group of countries.

A practical implication of the study is that in Ukraine, where the density of the link between the GDP and FDI is so strong, it will highlight the need for institutional changes necessary to create the climate promoting the free flow of foreign capital to the domestic capital market and, on the other hand, to prepare the industries for the absorption of foreign investment. The required conditions should include freedom and equality for FDI in priority areas of economic development of the country, transparent rules of interaction, and effective mechanisms for investment protection. To make sure that Ukraine does not miss out on the excessive supply of foreign capital in the world due to lack of areas ready for its absorption, it is important to find effective mechanisms of interaction between the producers of intellectual high-tech products, the government, that creates conditions for their development, and businesses ready to implement this product in the real economy.

A further study into the main factors of economic growth of national economies in the conditions of globalization, namely, the dependence of the processes of economic growth of a country on the inflow and outflow of investment resources by geographical principle in the medium and long-term is required. This will allow to draw important conclusions not only with regard to economic growth, but also on the geo-economic and geopolitical dependence of the country and to prevent possible economic crises in the region in the absence of investment determinants.

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