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Impact of foreign direct investment on economic growth in the world during 1975–2015

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The study is concentrated on examination the impact of FDI on economic growth in the World during 1975–2015. The study consists of four consecutive parts, including introduction, literature review, model and methodology, data, empirical results and conclusion. Each part of the study is focused on its own goals. According to the results of the literature review, there is positive influence of FDI on economic growth in various countries. Economic growth is one of the most important goals of any country. The country image on the international level is dependent on its economic power. Economic growth provides an opportunity to improve the living standards in the country. Most researchers conclude that there is a positive influence of FDI on the countries' economic growth. However, the impact of FDI is strong in developing countries. Moreover, this relationship is stronger in countries with higher educational and technological level, trade openness and development of the countries' stock markets. Economists often build regression models to estimate the relationship between the variables. In order to find the impact of FDI on economic growth, we are going to apply linear regression models. We take two variables as indicators of the countries' economic growth, including current GDP expressed in U.S dollars, and annual GDP growth rate. Taking into account that the World's GDP in current U.S dollar is a factor variable with the mentioned resulting variables, the regression equation looks as follows:

$$\log Y = -187.79 + 0.000883 FDI - 0.02412 C + 35.19 GS + 1.009407 NS + 0.0668 Exp - 0.00245 TVST + 0.005572 MC - 13.0019 T$$

The R-squared of the built model is 0.99, indicating that roughly 100% of changes in the World's GDP is caused by the chosen factors. As it is seen from the SAS output, the residuals of dependent variable and factors variables are distributed normally among its average value. Thus, non-normality is not observed in the model. Taking into account the coefficients of the factor variables, the log GDP is most sensitive to the changes in trade as a percent of GDP. The log GDP is not quite sensitive to the changes in FDI, since the coefficient of 0.000128 means that increasing of FDI by one unit increase the logarithmic value of GDP by $ 0.000128.

Key words: FDI, economic growth, GDP.

Introduction

Economic growth is one of the most important goals of any country. The country image on the international level is dependent on its economic power. Economic growth provides an opportunity to improve the living standards in the country. The country's government may stimulate the education level, improve infrastructure and solve other vital issues by increasing the rates of economic growth. Economic growth encourages constant efforts to improve the quality of life.

As it is known, a country's GDP consists of expenditures of four main economic subjects, including consumer expenditures, investment spending, government purchasing and net export. GDP may be computed as a sum of expenditures or incomes. Thus, investment spending is one of the most important parts of a county's GDP. Some parts of aggregate expenditures are relatively stable, for example, consumer expenditures, while investment spending is quite vulnerable. Vulnerability of investment spending may leads to changing the level of a country's GDP and national output. Many economics consider investment as the major source of technical improvements, capital rising, and productivity growth. As it is known, Robert Solow considered investments as the source of increasing the capital per worker in national economy. In addition, in recent years the discussion regarding the impact of foreign direct investments on

economic growth in different countries has become more actual. The current paper analyzes the impact of FDI on economic growth.

Literature Review. According to Solow's economic growth model, the national output per worker depends on capitalization, i.e. level of capital per worker. In addition, the level of capital per worker depends on investment and amortization rate, rate of population growth and rate of technological progress. Investments increase the level of capital per worker in any country, while amortization, increasing of a country's population and quantity of new technological workers decreases the level of economy's capitalization. Thus, Solow considers investment as a single source of increasing the level of capital per worker and, thus, the long-term economic growth. According to Solow's model, investment depends on the saving rate in a country's national economy.

Many economists research the impact of FDI on economic growth in various countries worldwide. Anna Ek investigated the influence of FDI on economic growth in China during 1993–2004. According to the authors' conclusion, the FDI has a positive influence on economic growth, since "it serves as a channel through which new technology is transferred from one country to another and thereby it increases output and GDP in the recipient country" (Ek, 2007). It means that FDI encourages the transferring of new technologies between the countries. In such a case, FDI stimulates economic growth and national output in the recipient country. According to the author's findings, there is a positive impact of FDI on economic growth in all 30 regions of China, but this connection is insignificant.

Abdul Khaliq and Ilan Noy researched the relationship between the FDI and economic growth in different sectors of Indonesia. The authors conclude that there is a positive influence of FDI on economic growth in Indonesia during 1997–2006. However, taking into account the sector data, the authors conclude that the mentioned positive impact is not so strong, since the positive impact was observed only in few sectors (Khalid and Noy, 2007).

Benedict Nyaga (2013) researched the connection between the foreign direct investment and economic growth in Kenya during 1982–2012. According to the author's findings, the FDI encourages technical and educational development in emerging markets. Due to FDI, the countries' integration in the international trade improves, as well as business environment. Thus, the FDI leads to higher rates of economic growth. The author concludes that there is a strong positive correlation between the FDI and GDP in Kenya during the analyzed period. Thus, the author recommends to stimulate the FDI into Kenyan economy in order to promote the economic growth (Nyaga, 2013).

Panagiotis Pegkas analyzed the impact of direct investment on economic growth in the Euro zone countries during 2002–2012. The author uses panel data estimation to test the connection between the FDI and economic growth. According to the results of empirical analysis, the author concluded that there is a long-run positive connection between FDI and economic growth (Pegkas, 2015).

Philip Gunby, Yinghua Jin, W. Robert Reeda investigated the role of FDI in Chinese economic growth. The authors conducted a meta-analysis of 37 studies with totally 280 estimations. The authors indicated that productivity spillovers can be identified as the key element of FDI stimulating process on economic growth. According to the authors' conclusion "the effect of FDI on Chinese economic growth is much smaller than one would expect from a naïve aggregation of existing estimates" (Gunby et al., 2017).

Rafael Alvarado, María Iñiguez, Pablo Ponce investigated the relationship between FDI and economic growth in 19 Latin countries, using panel data econometrics. The authors concluded that the effect of FDI on economic growth is statistically insignificant. The authors analyzed the mentioned relationship incorporating the level of development of the countries included. Thus, according to the authors' conclusion FDI positively affects economic product in high-income countries, while FDI's impact on economic growth in upper-middle-income countries is uneven and insignificant (Alvarado et al., 2017).

It can be concluded that many economists conducted an examination of relationship between the foreign direct investments and economic growth in many countries during long-run period. Most researchers conclude that there is a positive influence of FDI on the countries' economic growth. However, the impact of FDI is strong in developing countries. Moreover, this relationship is stronger in countries with higher educational and technological level, trade openness and development of the countries' stock markets.

Model and Methodology

Methodology is considered as the sum of methods applied by the scientists to examine the connection between various variables. Economists often apply models to research the relationship between the variables. An important area of scientific abstraction is modeling. Macroeconomic model is a simplified reflection of economic reality, summarizing of the relevant evidences.

Macroeconomic models may be in the mathematical, tabular, and graphical forms. It is not so important what type of model is used: equation, graph or table. The most important thing is to represent and display a real connection between facts.

All models are classified according to the period of time for which they are used and referred to three time groups – short-term, long-term and very long term.

Short-term is a period in which prices are inflexible, and, as a result, resources can not be fully used in production. In this period the amounts of capital and labor are constant, as well as the level of technology that is used to convert resources into finished products. The duration of this period is few months or a year or two. The long-term is a period in which prices are flexible and resources are fully used in production. The duration of the long term period is few years or even ten years.

Economists often build regression models to estimate the relationship between the variables. In order to find the impact of FDI on economic growth, we are going to apply

linear regression models. We take two variables as indicators of the countries' economic growth, including current GDP expressed in U.S dollars, and annual GDP growth rate. As it is known, GDP measures the market value of products and services produced in a country during one year. Thus, we have built a linear regression model, with GDP expressed in current U.S dollar as an indicators of economic growth. This variable is endogenous variables in our model.

We also take several variables as exogenous variables in our model. First of all, the most important variable is FDI net inflows in current U.S dollar. The other factor variables include final consumption expenditure in current U.S dollar, government expenditure as a % of GDP, gross national expenditures in current U.S dollar, exports of goods and services in current U.S dollar, total value of traded stocks in current U.S dollar, market capitalization of listed domestic companies in current U.S dollars, and trade as percent of GDP.

Thus, our level-level model look like:

$$Y = \beta_0 + \beta_1 FDI + \beta_2 C + \beta_3 GS + \beta_4 NS + \\ + \beta_5 Exp + \beta_6 TVST + \beta_7 MC + \beta_8 T$$

where:

Y – is GDP expressed in U.S dollars in the first model, and annual GDP growth rate in the second one;

FDI – is the net inflows of FDI in current U.S dollar;

C – is consumer expenditures in current U.S dollar;

GS – is government expenditures as a % of GDP;

NS – is gross national expenditures in current U.S dollar;

Exp – is exports of goods and services in current U.S dollar;

TVST – is total value of traded stocks in current U.S dollar;

MC – is market capitalization of listed domestic companies in current U.S dollars;

T – is the total value of export and import as a % of GDP.

All variables are taken for the World's economy at the World Bank's database. The model is built for the period from 1975 to 2015 and, that is why, the number of observations is 41. We expect that there is a positive connection between the factor variables and the resulting variable. Consumer expenditures, government purchasing, national expenditures, and export of goods and services are the parts of GDP. Thus, increasing of these variables should lead to increasing of the GDP. We also take such variables as total value of stocks traded and market price of stocks of the listed companies as indicators of the stock market development. Many economists believe that development of the stock market significantly affects the rate of economic growth in many countries. Finally, value of trade is an indicator of the World's economy integration.

Data

During the analyzed period the World's economy GDP significantly increased from $5.88 trillion in 1975 to its maximal value of $80.7 trillion in 2017. The dynamics of the World's GDP is presented in the figure below. Due to the global financial crisis, the World's GDP dropped from $63.4 trillion in 2008 to $60.1 trillion in 2009

World's GDP (current trillion US $)
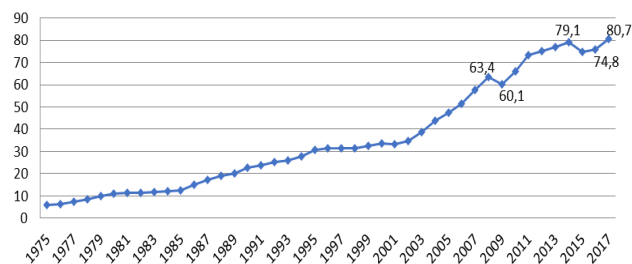
The dynamics of annual GDP growth are during the analyzed period is quite unstable, and the periods of fast economic growth were combined with periods of low economic growth and even recession. During the considered timeframe, the fastest GDP growth rate of 5.36% was observed in 1976, while the minimal value of GDP growth rate was during the global financial crisis. The World's GDP dropped by 1.7% in 2009 as compared to the previous year. Thus, the negative value of the World's economy growth rate was observed only in 2009. The average rate of GDP growth rate was 2.97% during 1975–2017.


World's GDP growth rate (annual %)
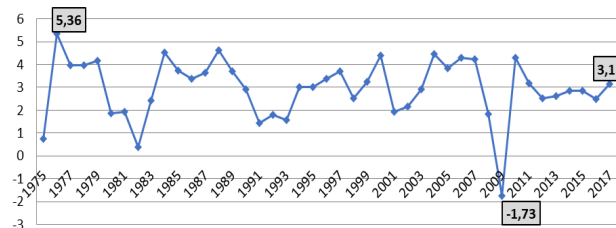
During the analyzed period, the FDI increased from its minimal value of $23.1 billion in 1975 to its maximal value of $3099 billion in 2007. During the global financial crisis, amount of the FDI dropped to $1365 billion in 2009. The 2017 FDI value of $1863 billion indicates that the global economy have not reached its pre-crisis level.

World's FDI, net inflows (current billion US $)
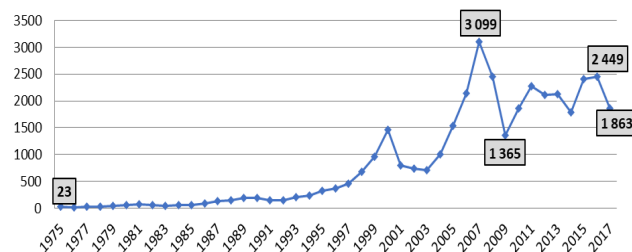
As one of the major parts of GDP, final consumption expenditures had a similar dynamics to the World's economy GDP. The consumption expenditures increased from its minimal value of $4481 billion in 1975 to its maximal value of $56186 billion in 2014. In 2016, the global final consumption expenditures dropped to $56248 billion.

Final Consumption Expenditure (current billion US $)
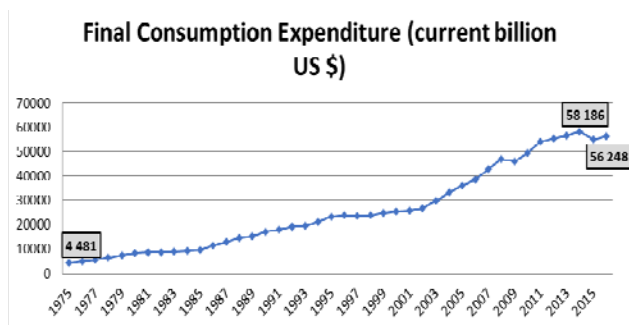
Despite significant increasing of the World's economy GDP, the percent of final consumption expenditures in GDP was practically stable during the analyzed period. The share government spending in GDP increased from $16.18% in 1975 to 17.15% in 2015.

The minimal value of the government spending of 15.74% was observed in 1979, while its maximal value of 17.86% was in 2009. Such high share of government spending to the World's GDP may be explained by the governments' efforts to encourage economic growth by increasing the aggregate demand.

Dynamics of indicators of the stock market development are also positive. The total value of the stocks traded increased from $299 billion in 1975, reaching its maximal value of $99759 billion in 2007. It means that the global stock market was significantly developed during the analyzed timeframe. The market capitalization of the listed stocks increased from $1218 billion in 1975 to its maximal value of $61781 billion in 2015. In general, it can be concluded that the World's stock market was increased a lot during the considered period.
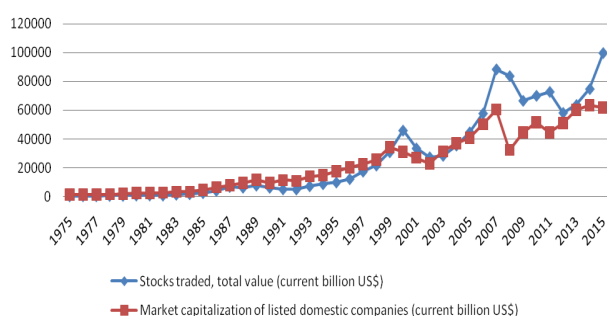
The last indicator taken into account is the total value of trade as percent of the World's GDP. The total sum of export and import as percent of the global GDP increased from 33.4% in 1975 to its maximal value of 61.1% in 2008. The latest value of trade was 58.2% of the World's GDP in 2015. To conclude, the World's economy became more integrated during the analyzed timeframe, and the economical relationship between the countries became stronger.

Empirical Results

Taking into account that the World's GDP in current U.S dollar is a factor variable with the mentioned resulting variables, the log-level regression equation looks as follows:

$$\log Y = -187.79 + 0.000883 FDI - 0.02412C + 35.19GS + 1.009407NS + 0.0668Exp - 0.00245TVST + 0.005572MC - 13.0019T$$

Where:

logY – is logarithmic GDP expressed in U.S billion dollars;

FDI – is the net inflows of FDI in current U.S dollar;

C – is consumer expenditures in current U.S dollar;

GS – is government expenditures as a % of GDP;

NS – is gross national expenditures in current U.S dollar;

Exp – is exports of goods and services in current U.S dollar;

TVST – is total value of traded stocks in current U.S dollar;

MC – is market capitalization of listed domestic companies in current U.S dollars;

T – is the total value of export and import as a % of GDP.

According to the regression coefficients, there is negative impact of final consumption expenditures, total value of traded stocks and total share of trade on the World's GDP. It is quite strange results, since consumption expenditures is one of the major parts of GDP, while trade integration and stock market development should leads to higher rates of GDP growth. The R-squared of the built model is 0.99, indicating that roughly 100% of changes in the World's GDP is caused by the chosen factors.

Table 1

Factor	Equation	R-squared
Eight factors	$\log Y = 3.4145 + 0.000128 FDI - 0.0000423C - 0.01095GS + 0.00008343NS - 0.000125Exp - 0.00000282TVST - 0.00000372MC + 0.012979T$	0,999
FDI net inflows (current billion $)	$Y = 14970 + 23.42 FDI$	0,834
Final consumption expenditure, etc. (current billion US$)	$Y = -548.78 + 1.35C$	0,999
General government final consumption expenditure (% of GDP)	$Y = -550144 + 35484GS$	0,58
Gross national expenditure (current billion US$)	$Y = -208.99 + 1.010NS$	0,999
Exports of goods and services (current billion US$)	$Y = 7355.16 + 3.05Exp$	0,984
Stocks traded, total value (current billion US$)	$Y = 14342 + 0.7034TVST$	0,879
Market capitalization of listed domestic companies (current billion US$)	$Y = 8514.11 + 1.0732MC$	0,917
Trade (% of GDP)	$Y = -72752.5 + 2308.132T$	0,909

Analyzing the provided table, it is worth emphasizing that the entire range of factors are positively affect the GDP expressed in U.S billion dollars in a case of considering the simple linear regression models, while the general equation shows that some factors negatively affect the GDP. In any case, there is a strong positive connection between the FDI and the World's GDP.

The log-level model is characterized by low p-values. The p-value exceeds the t only for such factor variables as consumption expenditures and government spending. It means that the model is statistically correct in general.

Sometimes, the preconditions of the model's estimation based on least-squares method may be wrong. One of such condition is the immutability of residual variance for all observations of the original. This phenomenon is called Homoscedasticity. In practical trials, it is often violated. For example, econometric models describing the dependence of consumption expenditure on income variance of residues may vary for observations that relate to different groups by size of income. If the variance of residues in econometric modeling changes for each observation or groups of observations, this phenomenon is called heteroscedasticity. Taking into account that there is no connection between the residuals and the factor variable FDI, there is homoscedanticity in the model.

As it is seen from the SAS output, the residuals of dependent variable and factors variables are distributed normally among its average value. Thus, non-normality is not observed in the model.

Taking into account the coefficients of the factor variables, the log GDP is most sensitive to the changes in trade as a percent of GDP. The log GDP is not quite sensitive to the changes in FDI, since the coefficient of 0.000128 means that increasing of FDI by one unit increase the logarithmic value of GDP by $0.000128.

Conclusion

To conclude, it is worth emphasizing that the current paper is focused on examination the impact of FDI on economic growth. Analyzing the impact of various factor variables on economic growth during 1975–2015, it can be concluded that FDI is positively connected with the World's GDP.

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