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# Energy Consumption, Trade Openness and Exchange Rate Impact on Foreign Direct Investment in Union State of Russia and Belarus

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## ABSTRACT

In this paper we investigate the casual relationship between energy consumption, trade openness, exchange rate and foreign direct investment in Union State of Russia and Belarus for the period from 1997 to 2017. To test the hypothesis and explain the possible casual relations we use the error correction approach. Result of the conducted research show that in the short run trade openness and exchange rate affect foreign direct investment in positive and significant manner. In the long run, energy consumption, trade openness and exchange rate positively affect foreign direct investment.

**Keywords:** Foreign Direct Investment, Energy Consumption, Trade Openness, Exchange Rate, Error Correction Model

**JEL Classifications:** F21, F31, Q43

## 1. INTRODUCTION

Foreign direct investment has a significant impact on the economic growth of the national economy. The role of foreign direct investment is difficult to overestimate. Given the fact that investment plays a key role in gross domestic product (GDP), the inflow of foreign capital can have an important positive impact on the development of the national economy. At the same time, it is important to note that foreign direct investment can have both positive and negative effects on the national economy. In case, if investments are long-term nature, they can have a significant positive impact on the national GDP. If the capital inflow is speculative, consequences of its dramatic power can have a detrimental effect on the national economy. The history of economic and financial relations knows many examples of the negative impact of speculative capital inflows. The inflow of speculative capital leads to the formation and development of bubbles on the securities markets, asset markets, including the real estate market.

Thus, the experience of the great recession of 2007–2009 showed that there is a direct linear relationship between the inflow of investments into the country and the rate of growth of real estate prices. In the case

of uncontrolled capital flows, the impact on the national economy may even be devastating. At the same time, foreign direct investment, which is an investment aimed at long-term control by the investor over the economic operations of the recipient’s company in another country, can have a positive impact not only on the development of the national economy, but also contributes to the welfare of the population.

The positive role of foreign direct investment is that, in the case of control over the economic activities of the company by the investor, the productivity of these investments, as well as the productivity of the enterprise significantly increases. For example, the Russian experience shows that companies with foreign direct investments in Russia have higher productivity than a company without foreign participation. Foreign companies with a share of more than 90% of foreign investors are more productive than joint ventures, where the share of foreign participation is lower.

## 2. LITERATURE REVIEW

It may be noted that there are many factors that can affect the volume and speed of foreign direct investment. These include the

level of energy consumption in the national economy, as well as the energy consumption of production in the national economy, trade openness, as an indicator of how open the economy is to the global markets and the exchange rate. Each of these factors can have a significant impact on the volume of foreign investments attracted. For example, on the one hand, the reduction of energy intensity of production, the reduction of total electricity consumption can serve as a signal or indicator of the effectiveness of the national economy, which, in turn, can lead to the inflow of foreign direct investment. On the other hand, the inflow of foreign investments can lead to a decrease in energy consumption, as well as to an increase in energy efficiency.

A number of studies have examined the causal relationship between electricity consumption and a number of independent variables, such as price level, employment, economic growth, and foreign direct investment. For example, in studies devoted to the analysis of the relationship between consumption and the variables indicated above, the results are ambivalent. The most significant studies in this area include papers by Elliott et al. (2013), Rafindadi and Ozturk (2016), Sbia et al. (2014), Jebli et al. (2015), Rafindadi and Ozturk (2017), Zaman et al. (2012). For example, the negative impact of foreign direct investment on energy consumption was found. In a number of studies, the authors concluded that changes in foreign direct investment could not be explained by excessive electricity consumption (Lee, 2013; Sbia et al., 2014). On the other hand, in a number of studies using econometric models for testing hypotheses, the authors found a positive relationship between foreign direct investment and energy consumption, which is reflected in high energy consumption (Omri and Kahouli, 2014; Zaman et al., 2012). In a number of studies, empirical results of testing this hypothesis have shown the existence of a statistically significant relationship between energy consumption and foreign direct investment (Tang, 2009; Sadorsky, 2009; Chandran et al., 2010). In the paper by Bekhet and Othman (2001), the long-term impact of energy consumption on foreign direct investment was found, while in the short term this relationship was absent.

In addition to electricity consumption and energy efficiency levels, or the energy consumption of the national economy, trade openness and the exchange rate are generally pointed out among the significant factors that have the potential to affect foreign direct investment, and it is believed that the higher the openness of the economy, the more foreign direct investment it can attract. Thus, the degree of openness of the economy can have a significant impact on the behavior of investors. The key link between economic openness and foreign direct investment is investor expectations. The higher the degree of openness of the economy, the more positive are the expectations of investors in terms of economic turnover in the country-recipient of investments, and, accordingly, the higher expectations regarding income (Liargovas and Skandalis, 2012). The degree of economic openness may also have a significant impact on export-import operations. For example, the higher the openness of the exporting country's economy, the higher is the likelihood of successful realization of export products, and, in turn, the higher is the probability of importing countries to meet the demand for the necessary resources and goods. The benefits of opening up a national economy through

trade include access to a global market on the one hand. This, in turn, leads to the need to maintain a highly efficient level of production, in order to survive in face of severe international competition. Several studies found a positive relationship between trade openness and foreign direct investment (FDI) flow (Biglaiser et al., 2006; Chakrabarti, 2001).

International labor mobility is also an important factor in the impact of trade openness on investors' expectations. Maintaining a high level of productivity on the international arena is forcing commercial organizations to reduce costs by improving labor productivity. The increase in labor productivity in turn reduces costs and frees up more of the profits, which can, in addition to energy consumption and trade openness, be another important factor with a potential impact on the inflow of foreign direct investment.

Another important variable is the exchange rate of the national currency. For example, the study on the case of Morocco and Nigeria, found that the exchange rate can have a substantial and statistically significant negative impact on foreign direct investment (Bouoiyour, 2007; Udoh and Egwaikhide, 2008). On the other hand, studies on the example of the same countries showed that the exchange rate may not affect the inflow of foreign investment (Ahmed and Mayowa, 2012). The ambivalence of the findings is due to differences in economic instruments for measuring the variables sampled and econometric tools used in the studies.

Given this ambivalence, it is important to note that the exchange rate can have a significant impact on investments through various channels, as well as taking into account the mood and expectations of investors. If the investor's target is the local market, the strengthening of the national currency may increase the inflow of foreign direct investment due to an increase in the purchasing power of the national currency, and, consequently, the expansion of the budget restriction of households in the country. If the goal of the investor are export industries, the strengthening of the national currency can lead to a decrease in foreign direct investment in the country due to the decrease in competitiveness of national goods and services in international markets. This decrease may be due to an increase in labor costs (Bénassy-Quéré et al., 2001). For example, a negative statistically significant relationship between exchange rate and foreign direct investment was found among the countries members of the European Union (EU) in Central and Eastern Europe (Arratibel et al., 2009). Thus, exchange rate volatility can have both a positive and a negative impact on foreign direct investment.

The willingness of foreign investors to invest in a particular national economy can be assessed in terms of the prospects for international trade and capacity, as well as the ability of the industrial sector to support and accept foreign direct investment, which can be expressed through the energy consumption in the national economy. Studies, examining the relationship between foreign direct investments and energy consumption in the national economy, are scarce. This is because the effect of energy consumption as an economic variable with the potential

to affect foreign direct investment is rarely studied. In particular, the relationship between these variables is rarely considered for the purpose of identifying short-and long-term aspects of causal relationship. The most frequently studied variables in determining foreign direct investment in the national economy include trade openness, market size, labor productivity and labor force, infrastructure development, as well as the level of return on investment. For example, the experience of South Asian countries provides a good example of the importance of trade openness for attracting foreign direct investment. The results of the study showed the existence of a positive and statistically significant causal relationship between trade openness and foreign direct investment (Sahoo, 2006). Trade openness increases export-oriented FDI inflows, while trade barriers lead to growth of tariffs on foreign direct investment. Trade openness significantly increases with an increase in the volume of capital flows from export-oriented countries. Beyond trade liberalization, foreign investment essentially depends on political stability, exchange rate stability, and the size of the market. Thus, the study of foreign direct investment in developing countries need to consider the degree of stability of their currency and political situation in the national economies (Liargovas and Skandalis, 2012).

In addition to these key factors, essential for attracting foreign direct investment are costs of investment, political stability, human capital, trade deficit, external debt, inflation and others (Blonigen, 2005). In addition, the quality of institutions, import tariffs, macroeconomic stability and other factors are also considered to be of great importance (Trevino et al., 2002).

In contrast to previous studies on the factors affecting the inflow of foreign direct investment into the national economy, we focus on the study of the importance of energy consumption of the national economy as the main factor affecting the inflow of foreign direct investment into the export-oriented country. Unlike previous studies, our research is based not on the example of Russia, but on the example of the Union state of Russia and Belarus, which will be considered not separately but as a whole, in an attempt to determine the attractiveness of the Union market.

### 3. MATERIALS AND METHODS

In this paper, we investigate the hypothesis of the causal relationship between energy consumption, trade openness, the exchange rate of the national currency, as well as the inflow of foreign direct investment. The study is based on the example of the Union State of the Russian Federation and the Republic of Belarus for the period from 1997 to 2017. Taking into account the fact that each economy has its own specific trading space, production structure and export-import specifics, the data on sampled variables is averaged with the use of weights in the total volume for the purposes of the study. This will allow us to smooth out the above mentioned differences while maintaining statistically significant patterns. Energy consumption is defined as the use of primary energy, which is equal to production plus imports and changes in balances minus exports. Trade openness is defined as the sum of exports and imports of goods and services, as a percentage of GDP. The exchange rate of national currencies

against the US dollar is determined by the national financial authorities. In case of Russia, we are talking about the Bank of Russia, in case of Belarus - the data of the Bank of Belarus. Foreign direct investment is nominated in United States dollars to eliminate exchange rate fluctuations. Data for the variables in the sample is obtained from the statistical databases of the World Bank, the Bank of Russia, the Bank of Belarus as well as from the statistical databases of the official statistical agencies of the countries under investigation.

To test the stated hypotheses, we use error correction model to identify the relationship between energy consumption, trade openness, exchange rate and foreign direct investment in the short and long term. The following specification model is used to study the long-term effects:

$$FDI = a_0 + a_1 EC + a_2 TO + a_3 ER + \xi \quad (1)$$

Following Djulius (2017) we transform the equations into error correction models to measure short-term and long-term effects.

$$\Delta FDI = \beta_0 + \beta_1 \Delta EC + \beta_2 \Delta TO + \beta_3 \Delta ER + \beta_4 EC_{-1} + \beta_5 TO_{-1} + \beta_6 ER_{-1} + \beta_7 ECT_{-1} \quad (2)$$

Where  $\Delta FDI$  present changes in foreign direct investment,  $\Delta EC$  - changes in energy consumption,  $\Delta TO$  - changes in trade openness,  $\Delta ER$  - changes in exchange rate,  $N_{-1}$  - variable meaning in previous period,  $ECT_{-1}$  - Changes in error correction term. Error correction term is the residual value of the static equation or the long-term model in Equation (1).

$$\hat{\varepsilon} = FDI - \delta_0 - \delta_1 EC - \delta_2 TO - \delta_3 ER \quad (3)$$

### 4. RESULTS AND DISCUSSION

To test the hypothesis stated in this study, we use econometric tools. The use of econometric research methods allows to consider the behavior of each independent sampled variable on the one hand separately, and on the other hand to study its impact on dependent variables. The first step in the research algorithm is to conduct tests for the stationarity of the sampled time series. In the case of nonstationary sampled variables, their differentiation is necessary to continue the study. The second step in the research algorithm is to conduct a cointegration test using all explanatory variables. In case of cointegration detection, as well as statistical significance, it is possible to build a long-term and short-term model for testing the hypothesis.

Table 1 presents the results of the sampled variables test for the presence of unit root. As can be seen from Table 1, the sampled variables are characterized by non-stationarity. In case of their differentiation to the first and second order, the variables become stationary.

Therefore, the use of first-order differentiated variables makes it possible to conduct further research. In order to identify causation links between explanatory and resulting variables in the short and long run, it is necessary to determine whether there is cointegration

**Table 1: Augmented Dickey–Fuller test results**

Variable	Level		First difference		Second difference	
	ADF statistics	P-value	ADF statistics	P-value	ADF statistics	P-value
FDI	-0.5907	0.3507	-6.7823	0.0015*	-8.9532	0.0001*
EC	-0.9431	0.6043	-4.0975	0.0056*	-7.8451	0.0000*
TO	-0.1209	0.1095	-6.1322	0.0253*	-9.5485	0.0001*
ER	-1.1042	0.7804	-5.5291	0.0051*	-7.3208	0.0000*

\*Denotes statistical significance. Source: Authors' calculations

between them. The results of the cointegration test are presented in Table 2.

A main feature of cointegration tests is an indispensable condition of stationarity of the regression residuals. In the case of nonstationary regression residuals, we can accept that regression model is spurious. As can be seen from the data in Table 2, error correction term is stationary, negative in sign and statistically significant. Thus, the use of the error correction term is possible to determine short-term relationships between variables. Also, the results of the cointegration test indicate the existence of a long-term relationship between variables.

Table 3 presents the results of building a long-term model of the relationship between energy consumption, trade openness, exchange rate and foreign direct investment. As can be seen from the data of Table 3, all variables have a statistically significant impact on the resulting variable at 95% level.

The results of the model, reflecting the short-term relationship between the variables of the sample are presented in Table 4.

As can be seen from Table 4, the error correction term is significant, which means that the error correction model is valid and can be used to study the sampled variables.

Regression coefficients for determination of causal relationships between energy consumption, trade openness, exchange rate and foreign direct investment are calculated based on the following algorithm. After obtaining error correction term, we estimate the error correction model for the short term by the ordinary least square method. Subsequently the short-run regression coefficient is attained from Equation 2, long-term regression coefficient, given in Equation 4 is obtained through:

$$a_0 = \beta_0 / \beta_9$$

$$a_1 = (\beta_5 + \beta_9) / \beta_9$$

$$a_2 = (\beta_6 + \beta_9) / \beta_9$$

$$a_3 = (\beta_7 + \beta_9) / \beta_9$$

$$a_4 = (\beta_8 + \beta_9) / \beta_9$$

Based on the results of calculations, the equation of long-term relationship between variables can be written as follows:

$$FDI = -3.8724 + 0.8415EC + 2.5401TO + 5.6153ER \quad (4)$$

The equation describing the long-term relationship between variables shows that in the long-run, energy consumption, trade openness and exchange rate have a statistically significant impact on the movement of foreign direct investment in the Union state of Russia and Belarus. The equation shows that each variable has a positive and statistically significant impact on foreign direct investment. This result suggests that energy consumption, trade openness and exchange rates should be taken into account in the formulation of policies for the management of foreign direct investment in national economies.

In the short term, the relationship between these sampling variables is more uncertain. For example, energy consumption in the short term has a positive but not significant impact on foreign direct investment. At the same time, in the long term, energy consumption has a positive statistically significant impact on foreign direct investment. In developing economies, the growth of production, development of manufacturing and processing industries, the transport sector and other industries can be represented through energy consumption. Thus, foreign investors can and do view electricity consumption as an indicator of the development of a particular industry in conjunction with the potential investment attractiveness. Foreign investors expect that the growing needs of the national economy will be provided with an appropriate supply of resources, which in turn ensure continuity of the reproduction process and the possibility of gaining profit.

Thus, in some previous studies, a positive statistically significant relationship between electricity consumption and the inflow of foreign direct investment was found (Omriand and Kahouli, 2014; Zaman et al., 2012). The existence of this relationship may not be considered by foreign investors in the short term, but is taken into account as sectors develop and is reflected in the long-term growth of the rate of return on a particular market, which leads to the possibility of obtaining additional return for foreign investors, and, accordingly, their inflow in the national economy. Thus, long-term decisions on investing in a particular national economy are related to energy consumption, energy intensity and energy efficiency of national economies. Moreover, problems with energy resources can discourage foreign investors from investing in high-risk industries.

As can be seen from Table 4, trade openness both in the short and in the long term has a positive statistically significant effect on foreign direct investment. The results of the short-term effects evaluation show that increased trade openness and increased presence on the international markets of the national economy lead to increased investment inflow. Trade openness provides certain advantages to exporting countries by removing barriers,

**Table 2: Co-integration test results**

Variable	ADF statistics	MacKinnon statistics			P-value
		1%	5%	10%	
ECT	-6.2398	-4.1207	-2.9754	-2.1108	0.0000*

\*Denotes statistical significance. Source: authors' calculations

**Table 3: Long-term equation estimation**

Variable	Regression coefficient	P-value
Intercept	-0.1562	0.0000
EC	0.0704	0.0312*
TO	0.4679	0.0135*
ER	0.2319	0.0145*
R square	0.8212	
F-statistics	23.1208	
P-value	0.0000	

\*Denotes statistical significance. Source: Authors' calculations

**Table 4: Short-term equation estimation**

Variable	Regression coefficient	P-value
C	-2.5401	0.6801
$\Delta EC$	0.0507	0.9753
$\Delta TO$	3.1053	0.0192*
$\Delta ER$	5.0637	0.0054*
$EC(-1)$	0.0062	0.8763
$TO(-1)$	12.4596	0.0459*
$ER(-1)$	24.5602	0.0031*
$ECT(-1)$	0.8851	0.0268*
R square	0.8323	
F-statistics	5.6719	
P-value	0.0000	

\*Denotes statistical significance. Source: Authors' calculations

tariffs, and increasing cross-country mobility not only of capital but also of labor. For foreign investors trade openness means the possibility of importing the necessary raw materials and goods, as well as the possibility for foreign investors to export their products to a given country (Agiomirgianakis et al., 2003; Anyanwu, 2011; Asiedu, 2002; Demirhan and Masca, 2008).

It is curious to note the following. Taking into account geopolitical tensions, as well as sanctions' pressure on the national economies of Russia and Belarus, including the embargo response by Russia, it was logical to expect a decrease in the impact of trade openness factor, as well as energy consumption on the inflow of foreign direct investment. Before increased geopolitical tensions, a large part of foreign direct investment was received by the national economies of Russia and the Republic of Belarus from the countries of the EU. Within the framework of the sanctions regime, a decrease in the inflow of foreign direct investment into the above-mentioned national economies could be expected. However, the inflow of foreign direct investment remains positive due to changes in sources. Investment flows shifted and the main sources of foreign direct investment changes from the EU to Asia and the Middle East. This result once again confirms the high level of competition on the capital markets in the world.

Another important factor with the potential to affect foreign direct investment flows is the exchange rate of the national currency for the Union State, which has a positive impact on the flow of foreign direct investment, both long-term and short-term. This result

shows that the depreciation of the national currency is one of the main reasons for foreign investors to invest capital. In the case of developing countries, whose national currencies are cheaper, the exchange rate increases allow foreign investors to conduct sales transactions in those countries on more favorable terms. If the purpose of investors is re-export, the exchange rate may be a significant factor in decision-making. A strong national currency also attracts investors if their target is the domestic local market of the national economy (Ahmed and Mayowa, 2012; Bouoiyour, 2007; Udoh and Egwaikhide, 2008).

The purpose of re-export and presence on the domestic markets of the national economy are observed both in the case of Russia and in the case of the Republic of Belarus. Our study confirms both above mentioned hypotheses. On the one hand, the inflow of investments in the energy sector of Russia is associated with domestic local markets, on the other hand, the investment in the export sector associated with further re-exports, for example, in the case of Belarus also takes place.

## 5. CONCLUSION

This study aims to test the hypothesis of the relationship between energy consumption, trade openness, exchange rate and foreign direct investment. The study was conducted on the example of the Union state of Russia and Belarus for the period 1997–2017. To test the hypothesis, we used econometric methods of analysis. An error correction model was used to assess the causation linkages between sampled variables in the short and long term.

The results of the study show the existence of a causal relationship between sampled variables in the long run. The assessment of short-term effects showed a positive and statistically significant relationship between trade openness, exchange rate and foreign direct investment. Based on the results obtained, energy consumption, trade openness and exchange rates can be assumed to have a statistically significant impact on foreign direct investment and must be taken into account in the formulation of appropriate public policies.

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