# Does foreign direct investment lead or lag economic growth ? evidence from Russia

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# Does foreign direct investment lead or lag economic growth ? evidence from Russia

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## Abstract

It is generally believed by many economists that particularly in the developing countries, foreign direct investment (FDI) plays a very important role. The FDI is even considered as the engine of economic growth and development. However, various empirical studies show contradictory results where the impact of FDI on economic growth is not definitive. In this paper we attempt to examine whether a long-run theoretical relationship does indeed exist between the foreign direct investment and economic growth and whether FDI has any significant causal impact on driving economic growth. The standard time series techniques are used to address our research objectives. Russia is used as a case study. Our results tend to indicate that there is a long-run theoretical relationship between the FDI inflow and economic growth as evidenced by cointegration test. However, based on the generalized variance decomposition test, the FDI does not lead but lag economic growth at least in the context of Russia.

**Keywords:** FDI, economic growth, lead-lag, VECM, VDC, Russia

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## 1.0 Introduction

Economic growth is an important means to raise people's income and reduce poverty in emerging countries as it facilitates in creating jobs and opportunities for poorer population to support their families and build stable future. There are particular challenges that many emerging countries encounter in stimulating and sustaining economic growth. It is believed by some economists that foreign direct investment is highly linked with economic growth especially of developing countries. Trofimenko (2011) concluded that FDI, which possesses an important place at both micro and macro levels, is among the principal sources of the development of the Russian economy. It is said that resources generated by FDI are particularly important for the Russian Federation in cases where allocations from the state budget are inadequate (Vasilyevskaya, 2010).

Regardless of many challenges, Russia has been a reliable business partner for foreign investors in the past few decades. There was a solid FDI regime created in Russia with the purpose of improving its economy. There is 1999 Federal Law No. 160 on foreign investment and the 1991 Investment Code that guarantee foreign investors have equal rights with Russian investors. The Russian constitution has stated restricted condition under which nationalization can take place. Besides that, there are 54 bilateral investment treaties that are in act. Russia is a member of the International Centre for Settlement of Investment Disputes (ICSID). This means that foreign firms are not dependent on Russian courts before turning to ICSID. However it is worth noting that restrictions on foreign ownership in areas with strategic importance for state defense and security, Russia's withdrawal from the Energy Charter Treaty together with the slow privatization process, prevented higher FDI from foreign firms in the past. The investments in Russia decreased in 2008 due to financial crisis, and by the year 2012 FDI still did not surpass 2008 levels. In 2010 it was seen that more than a half of FDI was absorbed in finance and insurance sectors together with wholesale and retail trade areas. The economic development evidenced in the 2000s produced a strong urban middle class with Western-style consumer behavior. This could be the reason to explain that high volume of FDI was injected in finance and commerce areas. The consumeristic behavior led to the boom in banking, retail and construction areas. However, the portion of high-tech industries in the total amount of FDI to the country was still low and did not exceed 4–5% (Mutanga & Simelane, 2016). In 2013 Russia witnessed intense increase of 57% in FDI inflows. With this Russia was able for the first time to become the world's fourth largest recipient of FDI.

The main reason of this drastic increase in FDI was the fact that British Petroleum (BP) acquired 18.5% of Russia's state oil company Rosneft. However, in second half of 2014, the economic situation of Russia got worse due to Ukrainian crisis. Sanctions imposed on Russia by Western countries caused a currency crisis that led to an acceleration of the ruble's depreciation. Sanctions inevitably worsened the FDI prospects. The results of a survey conducted with 300 German companies operating in Russia, only 12% of the firms answered that they were planning to divest in Russia if the situation does not improve (Jost, 2015).

It is still not clear whether level of FDI has any significant impact on economic growth of Russia. Should the government take into consideration the situation with sanctions that have effect on FDI which in turn might have an effect on long term economic growth of the country? Or is the FDI not a significant determinant of economic development of a country.

So in this paper we have two main research objectives, namely:

I. To establish whether a long-run theoretical relationship exists between the FDI and economic growth in Russia;

II. To determine the direction of causality between FDI and economic growth in Russia.

### *1.1 Theoretical support*

In terms of theoretical basis, extensive studied have found positive relationship between FDI and economic growth. FDI with positive impact (Moran, 1998) is the model relevant for the theoretical, especially models with endogenous economic growth belonging to Romer (1986), Borensztein, De Gregorio and Lee (1998), Graham & Wada (2001), or Aitken and Harrison (1999).

First to develop a model theoretically examining the relationship between host's country's net FDI position and its economic development were Dunning and Narula (1996). Host country's economic growth is sustained by the new inflow of capital and new technologies transferred by FDI. They referred to the theory as "Investment Development Path". Positive role of FDI in economic growth was explained through the existence of positive externalities, otherwise referred to as "FDI spillovers" (Jones, 1998).

Diminishing returns on capital formation is one of the most important features of neoclassical growth theory. Therefore, investments often stimulate economic development on

short term basis while the economy is switching from one short term equilibrium to another. The only source of economic development in long run is technological advances, which is autonomous of investment activities. However, there is a way to avoid the diminishing returns on investment in endogenous growth theory. This is when there are positive externalities linked with investments. For instance, if we look at technological spillovers, it occurs when an investment produces technological knowledge and it causes technological development in other companies. Thus, considering the spillovers, overall return on investment will be greater (Oxelheim, 1996). Consequently, when investment produces enough new technological knowledge, it will result in long term economic development. Since FDI brings about new technological advances, it is viewed as main source of economic growth according to endogenous growth theory.

### *1.2 Empirical support*

There was a study conducted by Nabila, Samia and Hafeez (2011) to examine the impact of FDI on economic output of selected Asian countries for the period from 1983 to 2008. Their results showed that the FDI and economic growth are cointegrated. Moreover, the findings suggested that FDI has positive significant impact on economic growth.

Ledyayeva and Linden (2006) found that in Russia FDI is hardly impacts economic growth on the regional level. Their study was conducted Russian regions in the transition period from 1996 to 2003 to examine the significance of FDI in short tern economic growth. But their finding may be explained by the low level of FDI in Russian economy and its industrial structure which is deemed ineffective.

The crisis in the August of 1998 exposed many pitfalls in Russian economic policies and proved to be critical event that pushed Russian economy to transition to market economy.

Amritkant and Agarwal (2017) found no significant positive relationship between net FDI position and GDP growth rate as far as Russian economy is concerned. Similarly, FDI was found to have no relationship with change in employment in the case of Russia. However, the same study found that FDI inflow is in fact positively related to GDP growth rate in Brazil.

The results of our study support the point that FDI and economic growth has long run relationship in Russia, however, there is no evidence that FDI has any causal significant impact on economic growth of the country.

The structure of this paper is as follows. Section 2 describes the data and methodology used to conduct the study. Section 3 will show the empirical findings of the research. Section 4 will give concluding remarks and policy implication. Section 5 will tell about the limitations of the study.

## 2.0 Data and methodology

The data required for this research are secondary data on FDI and economic growth. The growth of any economy can be substituted by Gross Domestic Product (GDP), Unemployment level (UNMPLT) and Industrial Production Index (IPI). Hence, this study employs GDP, IPI and UNMPLT as the measure of growth in the analysis using available annual data covering 25 years starting from 1992 for Russia. FDI measured by FDI inflows are also used for the above matching period for Russia. The annual data set is obtained from Thomson Reuters Datastream.

In this study we use the standard time series techniques in order to achieve our research objectives, which as mentioned earlier is to find out whether there is a long-run theoretical relationship between FDI and economic growth and also whether there is any granger-causality between them in the context of Russia. The time series methodology is preferred over traditional regression analysis for a few reasons.

Firstly, most of economic time series variables in reality incline to be non-stationary in their original 'level' form. Therefore, it is not correct to carry out any conventional statistical tests on such variables, because the variances of these variables are not constant and changing over time and hence the relationship estimated will be 'spurious'. On the other hand, if the variables taken are turned 'stationary' by 'first-differencing', the long-term information contained in the trend element in each variable would have been, by definition, removed and the relationship estimated would only give only the short-run relationship between the variables. Thus, the regression analysis would only capture short-term, cyclical or seasonal effects, and would not be testing any long-term theoretical relationships (Masih *et al*, 2009). Hence, in this study we will conduct unit-root tests to test the stationarity of the variables. Next we will proceed to determine the optimum order (or lags) of the vector autoregressive model or VAR. Using the lag order found in the previous step, we would conduct Johansen cointegration tests. The test of cointegration is designed to examine the long-run theoretical or equilibrium relationship and to rule out any spurious

relationship among the variables. Afterwards, the cointegrating estimated vectors will then be subjected to exactly identifying and over-identifying restrictions based on theoretical and a priori information of the economy.

Using the traditional regression analysis, researcher assumes which variable are endogenous and which are exogenous based on prevailing or a prior theories. With application of cointegration techniques we get rid of assumptions regarding the endogeneity and exogeneity of variables, and instead test and determine which variables are in fact exogenous, and which are endogenous. In other words, in traditional regression analysis, causality is assumed, whereas in cointegration techniques, it is empirically proven by data. To achieved that we will the 'Long-run Structural Modelling' (LRSM) technique to estimate theoretically meaningful long-run relations by imposing on those long-run relations (and then testing) both identifying and over-identifying restrictions, based on theories and a priori information of the economies (Masih et al, 2009).

However, the evidence of cointegration will not necessarily mean that there is causality of variables. The causality can be checked by conducting Vector Error Correction Model (VECM), which is able to indicate the direction of Granger causality both in the short- and long-run. Since VECM will shows which variable is leading and which is lagging, we would still be unable to determine which variable is relatively more exogenous or endogenous. To help us in this we use Variance Decomposition (VDC) technique. This technique will test and determine the relative exogeneity or endogeneity of a variable by the way of decomposing the variance of variable's forecast error into proportions attributable to shocks in each variable in the system, including its own. The variable that has highest proportion will mean that it is explained mostly by its own shocks and, hence, is the most exogenous of all and vice versa.

To map out the dynamic response path of a variable due to a one-period variable-specific shock to another variable we apply the Impulse Response Function (IRF). The IRF is similar to VECM but it is a graphical way of expressing the relative exogeneity or endogeneity of a variable. At the end we apply the Persistence Profiles (PP) technique. Similarly to IRF it is in graphical form as well. PP is designed to estimate the speed at which the variables would return to equilibrium, assuming that there was a *system-wide shock*. This is different from Impulse Response Function (IRF) which maps out the effects of only a *variable-specific* shock on the long-run relationship (Masih *et al*, 2009).

## 3.0 Empirical Results

### *3.1 Unit root test*

We start the analysis by testing the data series for unit root with ADF test. The null hypothesis for the ADF test is that the variable is non-stationary. Preferably, our variables should all be I(1), implying that in their original 'level' form, they are non-stationary, and in their 'first differenced' form, they are stationary. In all cases of the variables in level form, the test statistic is lower than the critical value and hence, we cannot reject the null. On the other hand, in all cases of the variable in differenced form, the test statistic is higher than the critical value and thus, we can reject the null and conclude that the variables are stationary in differenced form .

***Table 1: ADF Test – Variables in Level Form***

| | **Test Statistics** | | **Critical Value** | **Results** |
|---|---|---|---|---|
| | **AIC** | **SBC** | | |
| **LFDI** | -2.9652 | -2.9652 | -3.6746 | Non Stationary |
| **LGDP** | -1. 6726 | -0.85869 | -3.6746 | Non Stationary |
| **LIPI** | -2.9807 | -2.9807 | -3.6746 | Non Stationary |
| **LUNMPLT** | -3. 3692 | -3. 3692 | -3.6746 | Non Stationary |

***Table 2: ADF Test – Variables in Differenced Form***

| | **Test Statistics** | | **Critical Value** | **Results** |
|---|---|---|---|---|
| | **AIC** | **SBC** | | |
| **DFDI** | -4.7083 | -4.7083 | -3.0401 | Stationary |
| **DGDP** | -3.0910 | -3.0910 | -3.0401 | Stationary |
| **DIPI** | -4.3108 | -4.3108 | -3.0401 | Stationary |
| **DUNMPLT** | -3.7895 | -3. 6461 | -3.0401 | Stationary |

### *3.2 Determining the order of the VAR model*

Before we can proceed with cointegration tests, we need to first test and determine the optimum number of lags to be used (VAR). In testing AIC and SBC will recommend the lag length. As per the Table 3 below, the results show that AIC recommends an order of 3, while SBC suggests order of 1 lag. This mismatch can be explained by the fact that AIC normally recommends the highest order of VAR and SBC recommends the minimum lag of VAR. From our results we choose

order 3 considering if we adopt too low order (in our case 1), we may encounter the effects of serial correlation.

***Table 3: Order of the VAR***

| | Criteria | |
|---|---|---|
| | **AIC** | **SBC** |
| **Optimal Order of the VAR** | **3** | **1** |

Since the tests showed that our variables are I(1) and the optimal VAR order is 3, we are ready to test for cointegration.

*3.3 Testing cointegration: Johansen test*

We have performed Johansen method to identify cointegration between the variables. The Johansen method uses the maximum likelihood approach (i.e. Eigenvalue and Trace) and is able to identify more than one cointegrating vector. The null hypothesis for the Johansen test implies that there is no cointegration among the variables. Based on our results, since the Eigenvalue and Trace Statistics are both higher than their respective critical values at the 95% significance level, we may reject the null. Furthermore, in Table 4 below, r<=1 indicates the null hypothesis that the number of cointegrating vectors are less than or equal to one. As our test statistics are unable to reject this null, we accept that there is only one cointegrating vector among the variables. Thus, on the basis of the standard Johansen cointegration test (see Table 4 below); we are able to conclude that the variables have one cointegrating vector at the 95% significance level, as per the maximal Eigenvalue and Trace Statistics.

***Table 4: Cointegration Test (Johansen)***

| $H_0$ | $H_1$ | Statistic | Critical Value | | Implication |
|---|---|---|---|---|---|
| | | | 95% | 90% | |
| **Maximal Eigenvalue Statistics** | | | | | |
| r = 0 | r = 1 | 65.7887 | 31.7900 | 29.1300 | Cointegration |
| r< = 1 | r = 2 | 20. 5820 | 25.4200 | 23.1000 | |
| **Trace Statistic** | | | | | |
| r = 0 | r> = 1 | 104.7124 | 63.0000 | 59.1600 | Cointegration |
| r < = 1 | r> = 2 | 38.9238 | 42.3400 | 39.3400 | |

*3.4 Long Run Structural Modeling (LRSM)*

As mentioned above, the evidence of cointegration implies that there is a theoretical relationship among the variables and they tend towards equilibrium in the long-run. However, in order to make the coefficients of the cointegrating vector consistent with the theoretical and a priori information of the economy, we applied the LRSM technique. This is really an attempt to quantify this apparent theoretical relationship among the variables, so as to be able to compare our statistical findings with intuitive expectations. Relying on the LRSM component of MicroFit, and normalizing our variable of interest, namely FDI, we initially obtained the results in Table 5. By calculating the t-ratios manually, we find that all variables are significant.

***Table 5: Exact Identifying Restrictions on the Cointegrating Vector***

| Variable | Coefficient | Standard Errors | Implication |
|---|---|---|---|
| **LFDI** | 1.000 | *NONE* | |
| **LGDP** | -26.7264 | 3. 6705 | Significant |
| **LIPI** | -208.4489 | 27.2850 | Significant |
| **LUNMPLT** | 34.9545 | 2.0147 | Significant |

*3.5 Vector error correction model (VECM)*

From our analysis thus far, we have established that all of the variables used in this study are cointegrated to a significant degree. However, the cointegrating equation reveals nothing about the direction of Granger causality between the variables as to which variable is leading and which variable is lagging (i.e. which variable is exogenous and which variable is endogenous). Information on direction of Granger-causality can be particularly useful for Russian authorities. By knowing which variable is exogenous and endogenous, the policymakers can better construct their policies and interventions, and better forecast or predict their expected results. Typically, a policymaker would be interested to know which variable is exogenous, as he would then direct his intervention at that variable, thus causing a significant effect on the expected movement of the remaining variables. Thus, to discern the endogeneity or exogeneity of the variables, we applied the 'Vector Error Correction Modelling' or VECM technique. In addition to decomposing the change in each variable to short-term and long-term components by virtue of VECM, we are able to ascertain which variables are in fact exogenous and which are endogenous. The principle in

action here is that of Granger causality, a form of temporal causality where we determine the extent to which the change in one variable is caused by another variable in a previous period. By examining the error correction term, $e_{t-1}$, for each variable, and checking whether it is significant, we found that there are two exogenous variables, namely FDI and GDP. The other two variables, namely IPI and UNMPLT were found to be endogenous, as depicted in the table 6 below.

***Table 6: VECM Results***

| **Variable** | **ECM(-1): t-statistic [p-value]** | **Implication** |
|---|---|---|
| **LFDI** | 2.0319[.065] | Exogenous |
| **LGDP** | -1.3240[.210] | Exogenous |
| **LIPI** | -2.4493[.031] | Endogenous |
| **LUNMPLT** | 2.3804[.035] | Endogenous |

The implication of this result is that, as far as the variables included in this study are concerned, the variables of interest to Russian authorities and policymakers should be FDI and GDP. The reason for this is that since these variables are exogenous, they would receive shocks and transmit the effects of those shocks to the other variables. More importantly, in terms of the research objectives of our study, this result indicates that IPI and UNPMLT would respond to the FDI variable.

*3.6 Variance decomposition (VDC)*

Nevertheless, the limitation of VECM is the fact that it does not tell us which variable between FDI and GDP is more exogenous. Thus, purely on the basis of these results, it would be difficult for policymakers to make any serious commitments either way. For this reason, we will carry out Variance Decomposition (VDC) in the next stage of our analysis in order to determine relative exogeneity and endogeneity, so as to further guide the authorities in their decision-making process.

Despite having established that FDI and GDP are the exogenous variables in our study, we have not been in a position to make any pronouncements regarding the relative exogeneity of these two variables, and the relative endogeneity of the remaining variables. In other words, of the remaining variables, which is the most laggard variable compared to others, or, indeed the least? As the VECM is not able to assist us in this regard, we turn our attention to Variance Decomposition (VDC). In a nutshell, VDC decomposes the variance of the forecast error of each

variable into proportions attributable to shocks from each variable in the system, including its own. The variables which are explained most by their own past are regarded as the most exogenous variables, while variables which least explain their own past are classified as the most endogenous. The results of the Generalized VDCs are displayed in Tables 7 below.

***Table 7: Generalized VDC***

| Horizon | Variables | LFDI | LGDP | LIPI | LUNMPLT | Total | Ranking |
|---|---|---|---|---|---|---|---|
| **5** | **LFDI** | 31. 6 | 17. 6 | 23.7 | 27.1 | 100 | **4** |
| **5** | **LGDP** | 4.3 | 40.6 | 38.2 | 16.9 | 100 | **1** |
| **5** | **LIPI** | 10.8 | 34.1 | 33.8 | 21.3 | 100 | **2** |
| **5** | **LUNMPLT** | 19. 5 | 25.2 | 23.1 | 32.2 | 100 | **3** |

| Horizon | Variables | LFDI | LGDP | LIPI | LUNMPLT | Total | Ranking |
|---|---|---|---|---|---|---|---|
| **10** | **LFDI** | 29.7 | 18.8 | 24.9 | 26.6 | 100 | **4** |
| **10** | **LGDP** | 4.1 | 40.8 | 38.6 | 16.5 | 100 | **1** |
| **10** | **LIPI** | 8.3 | 37.5 | 32.4 | 21.8 | 100 | **2** |
| **10** | **LUNMPLT** | 18.4 | 26.3 | 24.1 | 31.2 | 100 | **3** |

| Horizon | Variables | LFDI | LGDP | LIPI | LUNMPLT | Total | Ranking |
|---|---|---|---|---|---|---|---|
| **20** | **LFDI** | 28.7 | 19.4 | 25.5 | 26.4 | 100 | **4** |
| **20** | **LGDP** | 4 | 40.9 | 38.9 | 16.2 | 100 | **1** |
| **20** | **LIPI** | 5.4 | 41.1 | 31.5 | 22 | 100 | **2** |
| **20** | **LUNMPLT** | 17.7 | 26.9 | 24.9 | 30.5 | 100 | **3** |

There are a few key observations that can be made from the above results Firstly, we note that the Generalized VDC results contradict with the results of VECM where FDI now is shown as the most endogenous variable throughout 5, 10, 20 years horizon. This discrepancy might be due to the fact that VECM uses past data and eliminates the theoretical part (trend) from the model. On the other hand, the Generalized VDC results confirm the results of the VECM wherein GDP is found to be the most exogenous variable.

The implications of the information provided by the VDC analysis could be of extreme value to the Russian authorities. By knowing which variable is exogenous and endogenous, the policymakers can better construct their policies and interventions, and better forecast or predict their expected results. Typically, a policymaker would be interested to know which variable is exogenous, as he would then direct his intervention at that variable, thus causing a significant effect on the expected movement of the remaining variables. The implication of this result is that, as far as the variables included in this study are concerned, the primary variable of interest to the

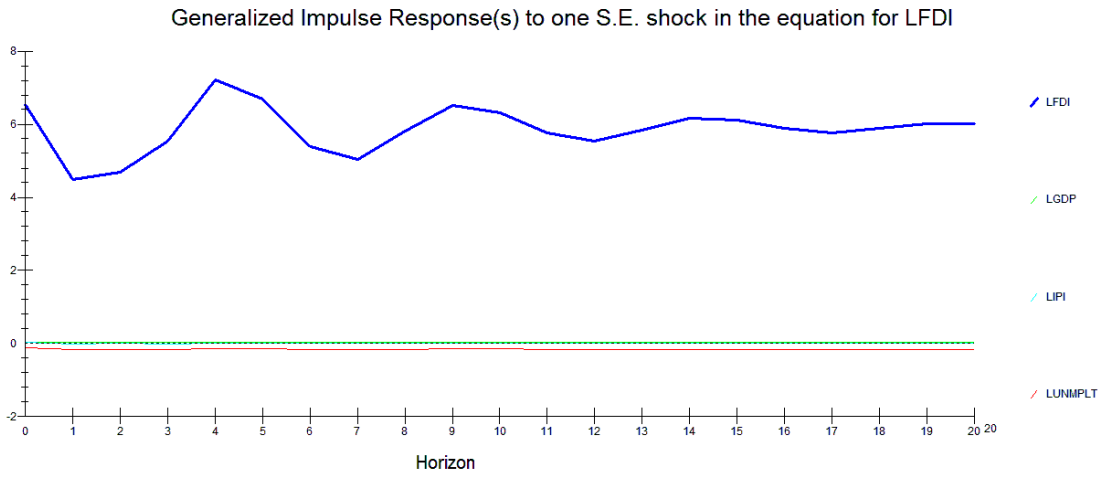
Russian authorities and policymakers should be GDP. The reason for this is that since this is the most exogenous variable, it would receive a shock and transmit the effects of that shock to the other variables included in our study. Furthermore, as IPI displayed some relative exogeneity too, it should also feature in the policy decision-making process of the authorities in Russia.

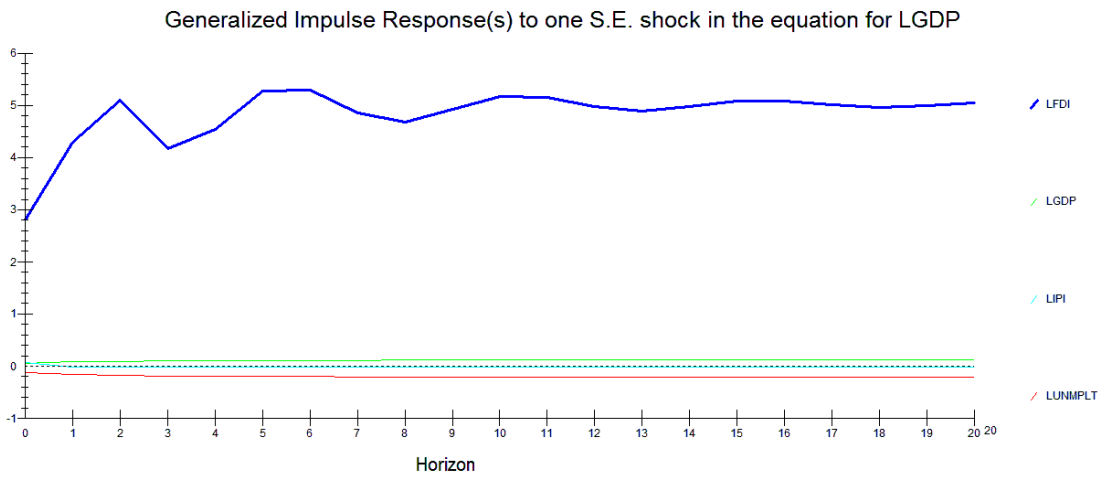
### *3.7 Impulse response functions (IRF)*

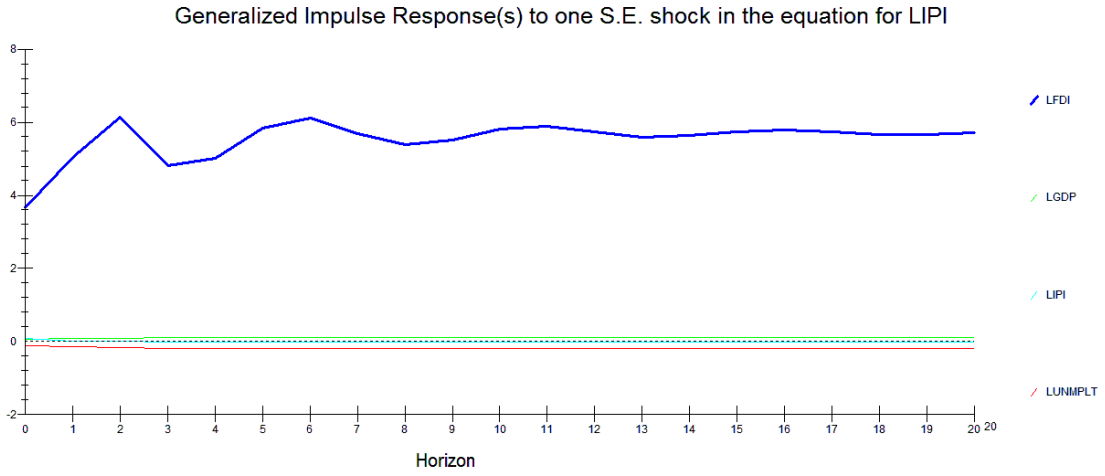
The impulse response functions (IRFs) essentially map out the dynamic response path of a variable owing to a one-period standard deviation shock to another variable. Thus, they produce similar information to VDCs, except that they can be presented in graphical form.

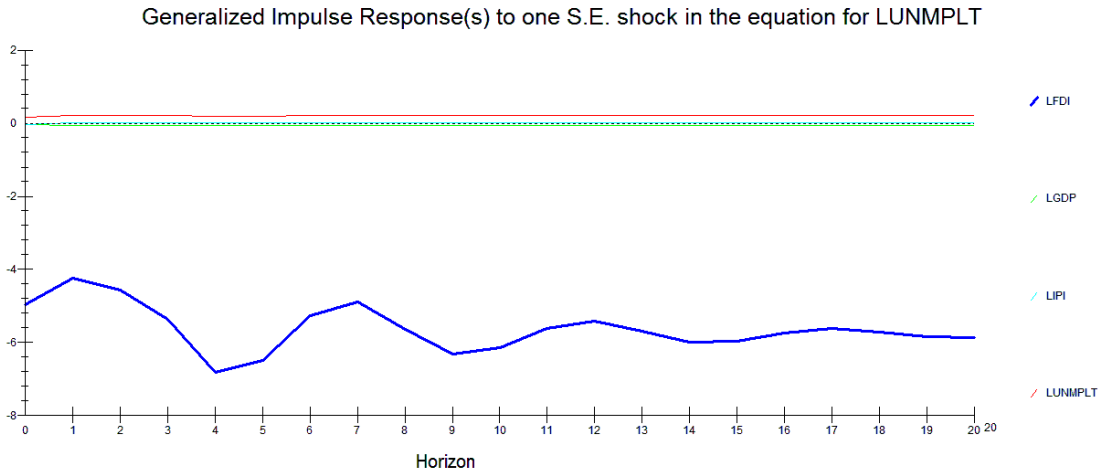
We find that our results are quite consistent with those obtained in the VDC analysis. As per Figure 1, we see that FDI is the most responsive to the individual shocks given to the other variables. This suggests that FDI is the most endogenous variable among all the variables included in this study. On the other hand, we notice that GDP and IPI are the least responsive to the individual shocks given to the other variables. This suggests that GDP and IPI are the most exogenous variables among all the variables included in this study, which is also consistent with our VDC analysis.

***Figure 1: Generalized Impulse Response Functions (IRFs)***




Generalized Impulse Response(s) to one S.E. shock in the equation for LGDP
LFDI
LGDP
LIPI
LUNMPLT
Horizon

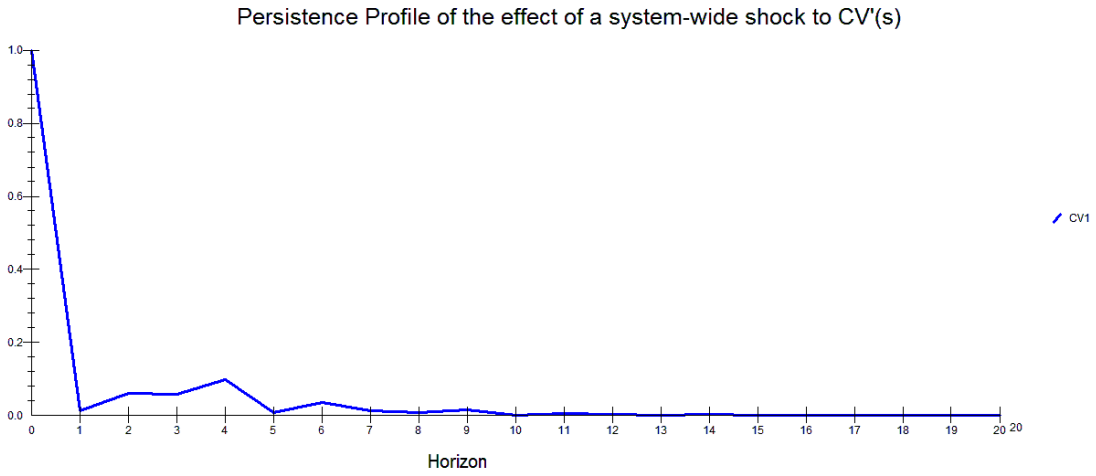

Generalized Impulse Response(s) to one S.E. shock in the equation for LIPI
LFDI
LGDP
LIPI
LUNMPLT
Horizon


Generalized Impulse Response(s) to one S.E. shock in the equation for LUNMPLT
LFDI
LGDP
LIPI
LUNMPLT
Horizon

*3.8 Persistence profile (PP)*

The Persistence Profile (PP) illustrates the situation when the entire cointegrating relationship of the variables is shocked, by a factor that is external to our cointegrating relationship. More specifically, it indicates the time horizon that is required for the relationship to return to equilibrium. The focus here is on the effect of a system-wide shock on the long-run relations, instead of a variable-specific shock as in the case of IRFs. Figure 2 below shows the persistence profile for the cointegrating relationship of this study. It indicates that when the external shock is initially imposed on the variables, they temporarily deviate away from their state of equilibrium. However, it would take approximately ten (10) years for the cointegrating relationship to return to equilibrium following the system-wide shock.

***Figure 2: Persistence Profile (PP)***



## 4.0 Conclusion and Policy Implications

This paper is devoted to exploring the causality direction between FDI and economic growth in Russia using the standard time series techniques.

In this study, we tested cointegration relationship between FDI and economic growth in Russia. Rather than presuming that FDI is one of the determinants of economic growth, to conduct such test, we used Granger causality to test for the possibility of causality running from FDI to economic growth. The result of cointegration test indicated that there was a long-run theoretical relationship between the FDI and economic growth and that the FDI did not lead but lag economic growth at least in the context of Russia.

## 5.0 Limitations of the study

One of the limitations of this study is that a relatively small dataset was employed. The data available for all variable was for 25 years starting from 1992 as there was only one data source (Thomson Reuters Datastream) used for data extraction.

Additional limitation of this research is that economic growth is proxied by GDP, unemployment and industrial production index only. However, economic growth can be represented by additional aspects such as Human Development Index, Literacy rate, Inequality of wealth, etc.

Another more limitation of our study is that we have used the standard time series techniques as the basis for our empirical estimations. Even though these techniques are an advantage over using OLS regression analysis, they are not completely free of assumptions such as existence of linear relationship among the tested variables.

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