**Does Foreign Direct Investment spur Economic Growth**

**in an Oil-based Economy? Evidence from Saudi Arabia**

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**Abstract**

This paper investigates the relationship between foreign direct investment (FDI), and economic growth (GDPPC) for the case of Saudi Arabia during the period 1970-2013. In our econometric model, we introduce a proxy of country infrastructure (INFRA) which is the air transport to explain economic growth. The econometric method is based on Vector Error Correction Model (VECM), and Granger Causality. The long-run association reveals that FDI exerts a positive and significant on the economic growth in Saudi Arabia. Also the Granger Causality test shows that there is unidirectional causality between FDI and growth. Findings indicate also that trade openness (OPEN) did not Granger cause GDPPC. In contrary, there is unidirectional causality between (INFRA) and GDPPC.

**Keywords**: FDI, Economic Growth, Saudi Arabia, VECM, Granger Causality

**JEL Classification**: F21, F43, O16

**1. Introduction**

During the 50s and 60s which were marked by a financial repression, a strong distrust of developing countries to multinationals firms was recorded. From the 70s, which coincides with the financial integration and globalization, awareness on the role of “catalyst of development” for the FDI was established. The standard model of the growth predicts that labour and capital may explain the main part of the growth of the national economy. However, there are other explanatory variables which are able to boost the variations of the aggregated output. The recent theory of the endogenous growth focuses on the FDI as the variable being able to boost the economic growth.

Theory and empirical evidences on the *FDI/Growth* association are ambiguous. The FDI is seemed to have beneficial and harmful effect toward the host countries. The FDI allows the host countries to realize levels of investment highly to the levels of the domestic savings. It’s considered also as the major channel of the transfer of the modern technology and innovation. A liberalized trade regime could most probably generate an environment convenient to the learning and accompanying the human resources and the new technologies. The FDI constitutes also an important propagation channel of the research and development (R&D), including the development of the capital, from the developed countries towards those developing (Grossman and Helpman, on 1991). The FDI could probably generate technological distributions towards host countries in several ways, in particular through the training of the local staff, the improvement of the quality of production of the domestic firms and the building of competitive capacities of the local managers.

The FDI can even have opposite effects on the economic growth in an environment of trade limitation (De Melo, 1999; Lipsey, 2000). Blomstom et al. (1992) demonstrated that, in the host country, the scale of FDI depends on the availability of the stock of human capital. They add that this impact can be showed negative in countries endowed with a low level of human capital. Brewer (1991) showed that the effect of domination exercised by the foreign firms can discourage the local firms to develop their own activities of R&D. Another negative effect of the FDI can result from the excessive extraction of ores or the concentration of the production on one particular good which would engender a fall in export prices and a deterioration of the terms of exchange for the host country.

The controversy of the effects of the FDI on the economic growth is going to be tested in an oil depend Country which is the Saudi Arabia. The economy of Saudi Arabia rebases mainly on its petroleum industry. The oil dependence has been perceived as a lack of diversification of the economy and has raised questions about the sustainability of this economy[[1]](#footnote-2). In 2000, a new code of investment created the SAGIA (Saudi General Investment Authority), which is endowed to allow of very important allocation for all types of investment and in particular the FDI.

The objective of this paper is to investigate the link between FDI and the economic growth in an oil dependent country. For this reason, we have used data related to Saudi Arabia during the period 1970-2013. In addition to the FDI as a financial variable, trade openness as a proxy of trade, we introduce in our model a proxy of infrastructure (air transport) to explain economic growth. We performed a VECM model and the Granger causality test to analyze the FDI-growth linkage. The articulation of this paper is presented as follow. In section 2, we present the related literature. Section 3 aims to give an overview of the FDI and the economic growth in Saudi Arabia. Empirical analysis is presented in the section 4. Finally, in the section 5 we conclude.

**2. Literature Review**

Foreign direct investment (FDI) is perceived to have a positive impact on economic growth through various direct and indirect channels. Economic Performance and economic growth of a country is influenced by multiple factors. Foreign Direct Investment (FDI) has been observed and argued as a significant determinant. The role of Foreign Direct Investment (FDI) in economic development has been the subject of long debate. The FDI-growth literature has so far yielded mixed results on whether FDI contributes to economic growth.

The relationship between foreign direct investment and growth has been tested over several samples. Some studies have discussed this relationship overlarge samples, in fact Lee and Chang (2009) tested the interaction between FDI, financial development and economic growth in 37 countries for the period 1970-2002. Empirical results based on the panel Error Correction Model and the Granger Causality test reveals respectively evidence of a fairly strong long-run relationship and a weak short-run relationship. Overall, the findings underscore the potential gains associated with FDI when coupled with financial development in an increasingly global economy. Xiaoying and Xiaming (2004) investigated the association FDI-growth in a panel of 84 countries over the period 1970-99. Using both single equation and simultaneous equation system results show that there is a significant relationship between FDI and economic growth. FDI not only directly promotes economic growth but also indirectly via human capital, while that of FDI with the technology gap has a significant negative impact. The interaction between FDI and economic growth within the role of financial market has been analyzed, also, by Azman-Saini et al (2010). Based on a data set for 91 countries over the 1975–2005 periods and applying the threshold regression model, results indicate that the benefit of FDI is non-existent.

Analyzing this relationship in the case of developed and developing countries, Borensztein et al (1998) tested the effect of foreign direct investment (FDI) on economic growth in 69 developing countries over the last two decades. Empirical results suggest that FDI is a strong mechanism for the transfer of technology, contributing relatively more to growth than domestic investment. FDI can promote economic growth only when a sufficient absorptive capability of the advanced technologies is available in the host economy. Zeb and Stengos (2014) examined the relationship between Foreign Direct Investment (FDI) and economic growth in a wide range of developing countries. The time period we cover in this study is from 1970 to 2001 and data for all other variables (real GDP, real gross domestic capital formation, real exports, population, and import price index) are obtained from the World Development Indicators (WDI) of the World Bank. By performing smooth coefficient semi-parametric approach, results show that countries with higher levels of FDI inflows experience higher productivity in the exports sector as compared with those with low level of FDI inflows.

In the case of Latin American countries Bengoa and al (2003) investigated the interaction between economic freedom, foreign direct investment (FDI) and economic growth in 18 countries for 1970– 1999. Finding indicates that economic freedom in the host country is a positive determinant of FDI inflows. Also, there is a positive correlation between foreign direct investment and economic growth in the host countries. This result can be explained as follow: the host country requires adequate human capital, economic stability and liberalized markets to benefit from long-term capital flows.

For Asian countries the relationship between FDI and growth was treated. In fact, Chen et al (2012) investigated the association between outward FDI and economic growth for Malaysia over the period 1980-2010. By performing a VECM, the results indicate that there exists a positive long-run relationship between FDI and growth as well as long-run bi-directional causation between them. However, there is no Granger-causality in the short-run between outward FDI and growth. For china case, Hong (2014) employed GMM to analyze this relation in China during the period 1994-2010, based on dynamic panel data from 254 prefecture-level cities in China. Results show that FDI exert positive impact on the economic development. FDI has crowded out the domestic capital and leave the domestic capital and huge foreign exchange reserves with the problem of rational usage.

In the case of MENA countries’ sample, Hamdi et *al* (2013a) examined the relationship between financial deepening, investment activities and economic growth for the case of Tunisia during the period 1961-2010. By using a multivariate framework based on Vector Error Correction Model and Cointegration techniques, the short-run estimation reveals that finance does not led to economic growth in Tunisia while the long-run results show the opposite conclusion. In another study, Hamdi et *al* (2013b) analyzed the relationship between FDI and economic growth for the case of Tunisia during the period 1976-2010. Cointegration and Vector Error Correction Model and Cointegration techniques reveal that FDI did not have significant impact on growth; however exports are the important source for growth in Tunisia. Belloumi (2014) analyzed the relationship between foreign direct investment (FDI), trade openness and economic growth in Tunisia. By applying the bounds testing (ARDL) approach to cointegration for the period from 1970 to 2008, results suggest that there is a long-run relationship between FDI and growth. The results also indicate that there is no significant Granger causality from FDI to economic growth, from economic growth to FDI in the short run. The empirical results fail to confirm the widespread belief that FDI can generate positive externalities for the case of Tunisia.

For Gulf countries, Ahmed Hussein (2009) examined the interaction between foreign direct investment FDI and economic growth in the six GCC countries[[2]](#footnote-3) during the period 1996-2007. The econometric method used in this study is the Ordinary Least Square (OLS). Major findings indicate a weak relationship between FDI and GDP in the panel of the GCC. Almfraji et al (2014) tested the FDI-growth association in an oil production country. For this end they collected dataset from 1990 to 2010 and they performed VAR Impulse Responses and the Granger Causality test. The result indicates that there a long-run relationship between FDI inflows and the economic growth in Qatar.

The main objective of the study of Al Khathlan (2014) is to empirically analyze the role of FDI in the economic growth of Saudi Arabia from 1980 to 2010. By using the famous Cobb-Douglas production function and performing a co-integration analysis finding indicates that FDI has a positive but insignificant role in economic growth in the country over the long term. However, the Granger causality test implies that domestic capital and government expenditure drive output growth in the economy. This result is also consistent with the IRFs over a time horizon of 10 years.

**3. FDI and growth in Saudi Arabia**

In the last 70 years Saudi Arabia has become the world's largest economy in the production and exporting of oil, which has promoted its economic development. Consequently, the dominant output of the Kingdom's economy is oil. According to SAMA (2008), the share of oil revenue in Saudi national gross domestic product (GDP) was approximately 55% in 2007. The private sector share of the GDP is much smaller, and only represents around 28%. The oil has contributed either directly or indirectly to economic development through the building of macroeconomic systems and microeconomic improvements. As well as a dependence on oil, the other concern is a lack of diversification of the economy, which raises questions about the sustainability of the economy. The economic of Saudi Arabia appears more dependent to the oil revenue. The lack of diversification has meant that with the global fluctuation in oil prices, and with a continuing need for revenue to finance its consumption and investment expenditures, the Kingdom has sometimes ended up with remarkable budgetary deficits. In recent years, in order to diversify the economy, the government has been investing in telecommunications, petrochemicals, natural gas exploitation and power generation sectors.

To improve the private sector's participation in the economy, an enhancement to the 'business climate' was essential, and a crucial part of this was legislation to encourage foreign direct investment. Foreign Direct Investment is one of the main drivers of economic efficiency and growth for many developed and developing countries. In Saudi Arabia, attracting FDI as a means to reduce the dependence on the oil revenues has gained critical importance to policymakers. The graph 1 below indicates on the evolution of the net FDI inflows and the GDP growth in Saudi Arabia during the period of 1970-2013.

**Figure 1**: Evolution of the FDI and the economic growth in Saudi Arabia

during the period 1970-2013



*Source: authors from the World Bank Indicators (WDI)*

The figure 1 shows that Saudi knew a high rate of growth during the period 1970-1976. The GDPpc growth crossed from 12,03% in 1970 to reach 19,94% in 1971 and 12,72% in 1976. While the FDI inflow recorded negative values for the same period. FDI in % of PIB take a value of -1,64% in 1971 and -8,3 in 1974. The divergence trend of those indicators indicates that FDI did not well contribute to the growth of Saudi Arabia during this period. This country allows more importance to the oil revenue which is considered as the engine of growth.

Since 1977, the FDI net inflows begin to know positive values. Those positive values coincide with the development plan for 1975-79 to encourage foreign direct investment. For example, we record a value of FDI of 1,06% in 1977. GDPpc growth continue to have positive value during the period 1977- 1981 with respectively values of 7% and 4,69%. Since 1982, Saudi Arabia recorded negative rate of GDPpc growth. Those rate reach -11,1% in 1982 and -8,22% in 1983.

GDPpc gets back to its positive values from 1988s and its fluctuations appear almost stable during the remaining period. Also, the FDI curve is constant during the period 1986-2004. However it records very low values. Since 2005, the FDI net inflowfollows a rising trend. It’s crossed from 3,84% in 2005 to reach 9,68% in 2009.

4. Empirical Analysis

**4.1 Methodology and data**

To test the relationship between FDI and growth, we used a datasets related to Saudi Arabia during the period 1970-2013. The empirical model contains four variables: foreign direct investment inflows (FDI) to GDP. OPEN is a measure of the trade openness of the economy, determined by the sum of exports and imports as a proportion of GDP. For economic growth we used the growth of GDP per capita. The main source of our data is the World Bank’s World Development Indicators (WDI). To reduce the problem of heteroscedasticity, all the variables are transformed into log form. Empirical strategy used in this paper is as follow. Firstly, we test whether the variables contain a unit root to confirm the stationarity of each variable. The Augmented Dickey–Fuller tests (F-ADF) and Philips–Perron (PP) tests are used to verify the stationarity. Secondly, we test the existence of a long-run cointegrating relationship between the variables. This is done by the use of the Johansen cointegration test. Thirdly, a vector error correction model (VECM) method suggested by Engle and Granger (1987) is used if all variables are integrated of order one I (1) and cointegrated. If all variable are not cointegrated, Vector autoregressive (VAR) is more suitable. The econometric model can be written as follow



Where: (GDPPC) is the GDP per capita growth rate of country, FDI is the ratio of Foreign Direct Investment to GDP, OPEN is the Trade Openness, INFRA is a proxy of infrastructure measured by the Air transport, registered carrier departures worldwide and is the term error.



**4.2 Unit root test**

In our study, we use the Augmented Dickey–Fuller (F-ADF) unit root tests to identify whether the variables contain a unit root and confirm the stationarity of each variable. The augmented Dickey–Fuller (ADF) statistic, used in the test, is a negative number. The more negative it is, the stronger the rejection of the hypothesis that there is a unit roots at some level of confidence. Common criticisms of these tests include sensitivity to the way the test is conducted, such that the wrong version of the ADF test is used[[3]](#footnote-4). ADF tests are also quite sensitive to any incorrect establishment of lag parameter. Given this weakness, we also conduct the Phillips-Perron (PP) test (1988), which allows for the presence of a non-zero mean and a deterministic time trend. The results of the Augmented Dickey-Fuller (*ADF*) and Phillips-Perron (*PP*) tests for the four variables of the model are presented in Table 1.

The results show that in the level, the null hypothesis cannot be rejected for all the variables for both the two unit root test ADF and Phillips-Perron (PP) test. GDPPC, FDI, OPEN and INFRA are not stationary in the level. By testing through first difference, the results indicate that the null hypothesis of non-stationary can be rejected. The unit roots tests indicate that each variable is integrated of order one.

**Table 1. Augmented Dickey-Fuller (*ADF*) and Phillips-Perron (*PP*) Unit root tests**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **ADF** | | **PP** | | **Order of Integration** |
| *Level* | *1st diff,* | *Level* | *1st diff,* |
| GDPpc | -2,9314 | -9.821 | -3.305 | -10.5844 | I(1) |
| [-4.186] | [-4.192] | [-4.186] | [-4.192] |
| FDI | -3.8031 | -8.1710 | -3.808 | -8.171 | I(1) |
| [-4.186] | [-4.1923] | [-4.186] | [-4.192] |
| OPEN | -1.2545 | -10.029 | -2.1914 | -10.3736 | I(1) |
| [-4.186] | [-4.1923] | [-4.186] | [-4.192] |
| INFRA | -1.0344  [-4.186] | -5.4813  [-4.1923] | -1.4248  [-4.186] | -5.5691  [-4.192] | I(1) |

*Critical values areinparenthese [ ],*

**4.3 Cointegration test and results**

The cointegration test is based on the multivariate Johansen approach (1988) which uses two statistic tests: Trace test and Max-Eigen value. The objective of the cointegration test is to identify whether it exists a long run relationship between the variables of our study*.* Table 2 presents the results of the trace and the maximum-eigenvalue tests from the Johansen (1980) and Johansen and Juselius (1990) maximum Likelihood analysis. The results given in table 2 below suggest the existence of one cointegration vectors at 5% of significance for the Trace test and for the Max-eigenvalue. This result indicates that there is a long run association and consequently, the VECM model is appropriate to estimate our equation.

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**Table 2. Results for Johansen test of cointegration**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Hypothesized**  **NO.of CE (s)** | **Trace test** | | **Max-eigenvalue test** | |
| **Trace Statist.** | **Critical Value** | **Max-Eigen St.** | **Critical Value** |
| None \* | 52.6104 | 47.21 | 30.0253 | 27.07 |
| At most 1 | 22.5851 | 29.68 | 12.9034 | 20.97 |
| At most 2 | 9.68166 | 15.41 | 9.6816 | 14.07 |
| At most 3 | 2.27E-05 | 3.37 | 2.27E-05 | 3.76 |

Trace test indicates 1 cointegratingeqn(s) at the 0.05 level

 Max-eigenvalue test indicates 1 cointegrationeqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

The results of the trace and the maximum-eigenvalue tests indicate that there exist relationships between variables. Therefore, all the variables are cointegrated. Table (3) below presents the normalized long-run relationship based on the model in the equation (1). The coefficients in the long-run relationship are long-run elasticities.

**Table3. Long-run elasticities, dependent variable is LGDPPC**

|  |  |  |  |
| --- | --- | --- | --- |
| **variables** | **FDI** | **OPEN** | **INFRA** |
| *Coefficients* | 3.722206 | 0.360618 | 0.101179 |
| *Std.Error* | (0.80424) | (0.12008) | (0.05384) |
| *T-Statistic* | [ 4.62820]\*\*\* | [3.00317]\*\*\* | [1.87923]\*\* |
| *C* |  | 29.11717 |  |

The result of long-run association reveals that FDI acts positively and significantly on the economic growth.Although that the Saudi Arabia is considered as a dependent-oil country, the FDI inflows is seemed to be determinant for this economy. FDI transmitted by the multinational corporation have several welfare advantages, one of which is the technology transfer. The main channel through which FDI contributes to economic growth is by stimulating technological progress, which affect positively the economic growth (E. Borensztein (1998)).Foreign firms introduce new products or processes to the domestic market, domestic firms may benefit from the accelerated diffusion of new technology (David J. Teece, 1977).

To fight the competition of foreign company, domestic firms try to increase their productivity by observing nearby foreign firms. An increase of productivity can stimulate the growth economic. Foreign firms initiate more on-the-job training programs than their domestic counterparts (Ralph B. Edfelt, 1975; ReinaldoGonclaves, 1986). Also inflows of FDI can increase employment through establishing linkages with domestic firms through purchases of locally produced goods and services and may introduces new and better quality inputs to be used in the production of upstream domestic firm. However, inflows of FDI might decrease employment in domestic firms. This will happen if foreign firms increase the competition for domestic firms.

The trade openness acts positively and significantly on the economic growth. Normally, countries that are more open have a greater ability to facilate transfer technologies of the rest of the world. Also trade openness promotes the efficient allocation of resources through comparative advantage, allows the dissemination of knowledge and technological progress, and encourages competition in domestic and international markets. Our finding is consistent with the studies of Romer (1993), Grossman and Helpman (1991).

The variable (INFRA) exerts a positive and signivicative effect of the economic growth. The effect of air transport as a proxy of infrastructure on economic growth is not similar to other transport modes. It offers advantage comparative such as: speed, cost, flexibility and reliability. Air transport provides the connections to overseas economies that are essential for the country’s economy to be interconnected with markets and global supply chains in the worldwide. Air transport contributes to the country’s GDP by generating wages, profits and tax payments and also supports jobs and value-added. It is a key infrastructure asset for the country, connecting businesses and people to facilitate the growth of exports and import which are form a crucial part of the economy. Also, infrastructure facilitates international trade, foreign direct investment and tourism, which are determinant for the growth of a country. In addition to the direct financial and the macroeconomic effects, air transportation impacts economy by providing more easy possibilities to access to markets, capital, R&D and technology.

**4.4. VECM results**

According to Engle and Granger, (1987), the existence of cointegration signifies that there is a long-run equilibrium relationship among the variables. The VECM is used to correct the disequilibrium in the cointegration relationship. If a set of variables are found to have one or more cointegrating vectors then a suitable estimation technique is a VECM which adjusts to both short run changes in variables and deviations from equilibrium. The VECM can be written as follows:

|  |
| --- |
|  |

To estimate theVECMmodel, it isnecessary todetermine, in advance, the number of lags, several criteria wasused(LR, FPE, AIC, SC, HQ)[[4]](#footnote-5). The resultof the usedcriteriaare given in thetable 4, it shows thattheoptimum number oflags is equal to2.

**Table 4. Lag length selection**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Lag** | **LR** | **FPE** | **AIC** | **SC** | **HQ** |
| **0** | NA | 50736818 | 29.09363 | 29.26081 | 29.15451 |
| **1** | 170.0636 | 988063.2 | 25.15013 | 25.98602\* | 25.45451 |
| **2** | **34.42771\*** | **753357.1\*** | **24.85475\*** | **26.35935** | **25.40264\*** |
| **3** | 19.93960 | 857808.1 | 24.92311 | 27.09642 | 25.71451 |

The resultsof theVECMmodelare provided inTable 4, theyindicate that the ECT (-1) estimated coefficient is -19,58%, this means that about 19,58 per cent of this disequilibrium is corrected between 1 year. Due to the government-restricted foreign investment policies and late entry into the favorable FDI regime, we find that both LFDI (-1) and LFDI (-2) impacts positively but not significantly the economic growth in Saudi Arabia. Results indicate also that trade openness impacts negatively and not significantly to the economic growth in the short-run. However, the proxy of infrastructure has a positive and signivicative effect on the GDPPC. In summary, we find that only INFRA contributes to the economic growth in the short-run but the other variables do not have any significant effect.

**Table 5. ECM results**

|  |  |  |  |
| --- | --- | --- | --- |
| **Error correction**  **D(LGDPPC),** | | | |
| **Variable** | **Coefficient** | **Standard error** | **T- statistic** |
| **D(LFDI(-1))** | 0.092035 | (0.59458) | [0.15479] |
| **D(LFDI(-2))** | 0.802221 | (0.57829) | [ 1.38722] |
| **D(LOPEN(-1))** | 0.110884 | (0.12380) | [ 0.89565] |
| **D(LOPEN(-2))** | 0.081083 | (0.10760) | [ 0.75357] |
| **D(LINFRA(-1))** | 0.166844 | (0.782203) | [2.2303]\*\* |
| **D(LINFRA(-2))** | 0.039671 | (0.33281) | [ 0.1192] |
| **C** | 1069.67 | (3073.7) | [ 0.3480] |
| ***ECT*** | -0.195826 | (0.09154) | [-2.1392]\*\* |
| **R2** | 0.503759 | | |
| **Adj.R2** | 0.359690 | | |
| **F-Statistic** | 3.496634 | | |
| **Log likelihood** | -450.6123 | | |

T-statistics are in [ ] and Std.Error are in ( )

To test the stability of the model we have used the cumulative sum of recursive residual (CUSUM). The CUSUM test (Brown, Durbin, and Evans, 1975) is based on the cumulative sum of the recursive residuals. This option plots the cumulative sum together with the 5% critical lines. The test finds parameter instability if the cumulative sum goes outside the area between the two critical lines. The CUSUM and the CUSUM of squares figures below show that the dependent variable is stable; consequently our model is stable too.

**Figure 2: CUSUM and CUSUM of squares**

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After testing the short run estimations, we try to investigate the direction of causality between the variables of the model. This is done by the use of the Granger causality tests.

**4.5 Granger Causality test and Impulse response functions**

Granger causality test is a technique for determining whether one time series is useful in forecasting. It can determine whether there is causality relationship between variables. Results in table 6 indicate that there is causality between LFDI and LGDPPC. The probability is less than 5% (0.0317), so we reject the null hypothesis and accept the alternative hypothesis. The causality between those two variables is unidirectional. We find that the variable LFDI causes the LGDPpc but the opposite is not true. Findings indicate also that LOPEN did not Granger cause GDPPC. In contrary, there is unidirectional causality between LINFRA and GDPPC. This result confirms the findings in table 6

**Table 6.**Granger Causality test

|  |  |  |  |
| --- | --- | --- | --- |
| **NullHypothesis:** | **F-Statistic** | **Prob.** | **Direction of Causality** |
| ΔFDI does not Granger CauseΔ GDPPC   ΔGDPPC does not Granger Cause ΔFDI | 4,11017  0,01317 | 0,0317\*\*  0,9092 | Unidirectional |
| Δ OPEN does not Granger Cause ΔGDPPC  ΔGDPPC does not Granger Cause ΔOPEN | 0,04203  6,42105 | 0,8386  0,0153\*\* | Unidirectional |
| ΔINFRA does not Granger Cause ΔGDPPC   ΔGDPPC does not Granger Cause ΔINFRA | 4,78913  0,79232 | 0,0345\*\*  0,3783 | Unidirectional |

*\*\* denotes statistically significant at 5 percent*

Granger-causality may not describe the whole situation about the interactions between the variables of a system. In applied work, it is often of interest to know the response of one variable to an impulse in another variable in a system that involves a number of further variables as well. Impulse response function (IRF) of a dynamic system is its output when presented with a brief input signal, called an impulse. More generally, an impulse response refers to the reaction of any dynamic system in response to some external change.

Figure 3 indicates that the response of LFDI to GDPPC is negative for the three first periods but it becomes positive for all the rest periods. This confirms the positive relation between FDI and economic growth. The response of LOPEN to GDPPC is negative only for the two first periods but it appears positive for all the eight periods. IRF illustrate also that the response of LINFRA to GDPPC is negative for the two first periods then it becomes positive for the eight last periods. According to the figure 3, we conclude that the responses of LOPEN and LINFRA to GDPPC are similar.

**Figure 3:** Impulse response functions



**5. Conclusion and policy remarks**

Theoretically there is a widespread belief that FDI generates positive externalities for host countries. To explore this linkage between FDI and growth we used a dataset related to Saudi Arabia during the period 1970-2013. The main source of our data is the World Bank’s World Development Indicators (WDI). In this paper, empirical approach requires three steps. The first step aims to test whether the variables contain a unit root to confirm the stationarity of each variable. For this end, we use the Augmented Dickey–Fuller tests (F-ADF) and Philips–Perron (PP) tests. While the second tests, are devoted to analyze the existence of a long-run cointegrating relationship between the variables. This is done by the use of the Johansen methods. Thirdly, a vector error correction model (VECM) method suggested by Engle and Granger (1987) is used if all variables are integrated of order one I (1) and cointegrated.

Empirical results show that in long-run regression, FDI promotes economic growth in Saudi Arabia. Also the Granger Causality test shows that there is unidirectional causality between FDI and growth. Findings indicate also that trade openness (LOPEN) did not Granger cause Gross domestic product per capita (GDPPC). In contrary, there is unidirectional causality between investment (LINFRA) and LGDPPC.

This finding may be considered of great interest, the kingdom of Saudi Arabia should continue its efforts to attract foreign investors and to promote FDI by offering many investments incentives. Also, to the encouragement and the support of the FDI, the Saudi Arabia policy should promote the trade openness (LOPEN) which appears an important engine to stimulate the economicgrowth.

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1. For more details see Almahmood. A (2010) [↑](#footnote-ref-2)
2. Saudi Arabia, United Arab Emirates, Oman, Qatar, Kuwait and Bahrain [↑](#footnote-ref-3)
3. For more details see Hamdi et al (2013 a), (2013b) [↑](#footnote-ref-4)
4. LR: sequential modified LR test statistic

   FPE: Final prediction error

   AIC: Akaike information criterion

   SC: Schwarz information criterion

   HQ: Hannan-Quinn information criterion [↑](#footnote-ref-5)