

Does foreign direct investment spur economic growth in an oil-based country? Evidence from Saudi Arabia



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ABSTRACT

This paper investigates the relationship between foreign direct investment (FDI), and economic growth (GDPPC) in an oil-based economy during the period 1970-2016. 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 effect 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.

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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 labor and capital may explain the main part of the growth economic. 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, 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 Mello, 1999; Lipsey, 2000). Blomstrom 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

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this economy. 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 aim of this paper is to study the association between FDI and 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 this work.

2. Literature review

Foreign direct investment (FDI) exerts positive effects 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 over large 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. [Li and Liu \(2005\)](#) investigated the association FDI-growth in a panel of 84 countries observed during the period of 1970-1999. Using both single equation and simultaneous equation system results show that there is a significant relationship between FDI and economic growth. FDI boosts economic growth directly and 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, which positively affect growth more 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 [WD \(2011\)](#). 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 Sanchez-Robles \(2003\)](#) investigated the interaction between economic freedom, foreign direct investment (FDI) and economic growth in 18 countries for 1970- 1999. Finding indicates that economic freedom is favorable for 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 liberalized market, adequate human capital and economic stability to access to long-term capital.

For Asian countries the relationship between FDI and growth was treated. In fact, [Chen and Zulkifli \(2012\)](#) 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 for the period 1994-2010. The sample is composed from 254 cities in china. Findings indicate that there is a positive association between FDI and economic development.

In the case of MENA countries' sample, [Hamdi et al. \(2013a\)](#) examined the relationship between financial deepening, investment activities and growth for the Tunisian context over the period 1961-2010. In this study, they performed the cointegration method and the Vector Error Correction Model (VECM). Result of short run estimation shows that finance does not promote economic growth. However, there is a positive association between finance and growth in the long-run. In second study, [Hamdi et al. \(2013b\)](#) explored

the nexus between FDI and growth in Tunisia over 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 growth in the Tunisian context. Based on the bounds testing (ARDL) approach over the period 1970 to 2008, findings confirm the existence of a long-run relationship between FDI and growth. However, FDI does not granger economic growth 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, [Hussein \(2009\)](#) examined the interaction between foreign direct investment FDI and economic growth in the six GCC countries (i.e., Saudi Arabia, United Arab Emirates, Oman, Qatar, Kuwait, and Bahrain) 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 growth for the sample 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.

2.1. 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 Saudi Arabian Monetary Authority (SAMA) in 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 economy 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 [Fig. 1](#) indicates on the evolution of the net FDI inflows and the GDP growth in Saudi Arabia during the period of 1970-2013.

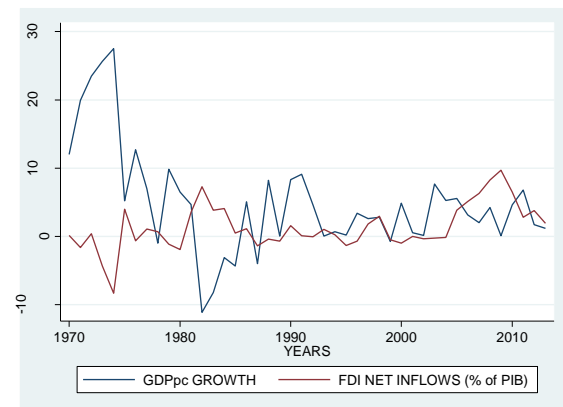


Fig. 1: Annual evolution of FDI and growth in Saudi Arabia during the period 1970-2016

Source: authors from the World Bank Indicators (WDI)

The [Fig. 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 inflow follows a rising trend. It's crossed from 3.84% in 2005 to reach 9.68% in 2009.

3. Empirical analysis

3.1. Data and methodology

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. The economic growth is proxied by the growth of GDP per capita. Data used in this study are collected the World Bank (WDI). To resolve the problem of heteroscedasticity, we applied the logarithm to all variable. The empirical performed in this study is as follow. Firstly, we check if all variables are stationary or not. The Augmented Dickey-Fuller tests (F-ADF) and Phillips-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

$$GDPPC_t = \beta_0 + \beta_1 FDI + \beta_2 OPEN_t + \beta_3 INFRA_t + \varepsilon_t$$

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 ε_i is the term error.

3.2. Unit root test

In our study, we use the Augmented Dickey-Fuller (F-ADF) unit root tests to check 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. The results of the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests (Phillips and Perron, 1988) 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 rejected the null hypothesis of non-stationarity. The unit roots tests confirm 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 [-4.186]	-9.821 [-4.192]	-3.305 [-4.186]	-10.5844 [-4.192]	I(1)
FDI	-3.8031 [-4.186]	-8.1710 [-4.1923]	-3.808 [-4.186]	-8.171 [-4.192]	I(1)
OPEN	-1.2545 [-4.186]	-10.029 [-4.1923]	-2.1914 [-4.186]	-10.3736 [-4.192]	I(1)
INFRA	-1.0344 [-4.186]	-5.4813 [-4.1923]	-1.4248 [-4.186]	-5.5691 [-4.192]	I(1)

Critical values are in parentheses []

3.3. Cointegration test and results

Two statistics are used in the cointegration test of Johansen (1988), they are Trace test and Max-Eigen value. The cointegration test aims to check whether it exist a long run relationship association. 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 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.

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	2.27 E-05	3.37	2.27 E-05	3.76

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level; Max-eigenvalue test indicates 1 cointegration eqn(s) at the 0.05 level; * denotes rejection of the hypothesis at the 0.05 level

Findings of the cointegration tests indicate that there exist relationships between variables. Therefore, all the variables are cointegrated. Table 3

presents the normalized long-run relationship based on the model (1). The coefficients in the long-run relationship are long-run elasticities.

Table 3: 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		

** denotes statistically significant at 5 percent; *** denotes statistically significant at 1 percent

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. FDI promotes economic growth by stimulating technological progress, which affect positively the economic growth (Borensztein et al., 1998). Foreign firms transfer new products or processes to the domestic market, domestic firms may benefit from the accelerated diffusion of new technology (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 (Edfelt, 1975; Goncalves 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 facilitate 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) and Grossman and Helpman (1991).

The variable (INFRA) exerts a positive and significative 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.

3.4. VECM results

According to Engle and Granger (1987), the existence of a long run relationship depends to the existence a cointegration among 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:

$$\Delta GDPPC_{t=\alpha_1} + \sum_{i=1}^p \beta_{1i} \Delta GDPPC_{t-1} + \sum_{i=1}^q \beta_{1i} \Delta FDI_{t-1} + \sum_{i=1}^r \beta_{1i} \Delta INFRA_{t-1} + \sum_{i=1}^s \beta_{1i} \Delta OPEN_{t-1} + \delta_{1i} ect_{t-1} + \mu_{1t}$$

$$\Delta FDI_t = \alpha_2 + \sum_{i=1}^p \beta_{2i} \Delta GDPPC_{t-1} + \sum_{i=1}^q \beta_{2i} FDI_{t-1} + \sum_{i=1}^r \beta_{2i} \Delta INFRA_{t-1} + \sum_{i=1}^s \beta_{2i} \Delta OPEN_{t-1} + \delta_{2i} ect_{t-1} + \mu_{2t}$$

$$\Delta INFRA_t = \alpha_3 + \sum_{i=1}^p \beta_{3i} \Delta GDPPC_{t-1} + \sum_{i=1}^q \beta_{3i} FDI_{t-1} + \sum_{i=1}^r \beta_{3i} \Delta INFRA_{t-1} + \sum_{i=1}^s \beta_{3i} \Delta OPEN_{t-1} + \mu_{3i} ect_{t-1} + \mu_{3t}$$

$$\Delta OPEN_t = \alpha_4 + \sum_{i=1}^p \beta_{4i} \Delta GDPPC_{t-1} + \sum_{i=1}^q \beta_{4i} FDI_{t-1} + \sum_{i=1}^r \beta_{4i} \Delta INFRA_{t-1} + \sum_{i=1}^s \beta_{4i} \Delta OPEN_{t-1} + \mu_{4i} ect_{t-1} + \mu_{4t}$$

To estimate the VECM model, it is necessary to determine, in advance, the number of lags, several criteria was used such as LR (sequential modified LR test statistic), FPE (Final prediction error), AIC (Akaike information criterion), SC (Schwarz information criterion), HQ (Hannan-Quinn information criterion). The result of the used criteria are given in the Table 4, it shows that the optimum number of lags is equal to 2.

The results of the VECM model are provided in Table 5, they indicate 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.

Table 4: Lag length selection

Lag	LR	FPE	AIC	SC	HQ
0	NA	50736818	29.0936	29.26	29.154
1	170.0	988063.2	25.1501	25.9*	25.454
2	34.42771*	753357.1*	24.85475*	26.35935	25.40264*
3	19.93960	857808.1	24.92311	27.09642	25.71451

* denotes statistically significant at 10 percent

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 significant effect on the GDPPC. In summary, we find that only INFRA promotes growth in the short-run. However, there is no significant effect for the other variables.

Table 5: VECM results

Error correction			
D(LGDPPC)			
Variable	Coefficient	Standard error	T- statistic
D(LFDI(-1))	0.0920	0.5945	0.1547
D(LFDI(-2))	0.8022	0.5782	1.3872
D(LOPEN(-1))	0.1108	0.1238	0.8956
D(LOPEN(-2))	0.0810	0.1076	0.7535
D(LINFRA(-1))	0.1668	0.7822	2.2303**
D(LINFRA(-2))	0.0396	0.33281	0.1192
C	1069.67	3073.7	0.348
ECT	-0.1958	0.0915	-2.1392**
R2		0.5037	
Adj.R2		0.3596	
F-Statistic		3.4966	
Log likelihood		-450.6123	

** denotes statistically significant at 5 percent

To test the stability of the model we have used the cumulative sum of recursive residual (CUSUM). The CUSUM test (Brown et al., 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 in Fig. 2 show that the dependent variable is stable; consequently our model is stable too.

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

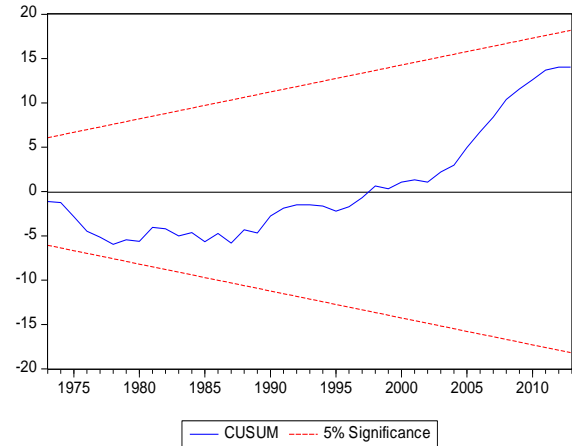


Fig. 2: CUSUM and CUSUM of squares

3.5. 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

Null Hypothesis	F-Statistic	Probability	Direction of Causality
Δ FDI does not Granger Cause Δ GDPPC	4.1101	0.0317**	Unidirectional causality
Δ GDPPC does not Granger Cause Δ FDI	0.0131	0.9092	
Δ OPEN does not Granger Cause Δ GDPPC	0.0420	0.8386	Unidirectional causality
Δ GDPPC does not Granger Cause Δ OPEN	6.4210	0.0153**	
Δ LINFRA does not Granger Cause Δ GDPPC	4.7891	0.0345**	Unidirectional causality
Δ GDPPC does not Granger Cause Δ LINFRA	0.7923	0.3783	

** 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.

Fig. 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 Fig. 3, we conclude that the responses of LOPEN and LINFRA to GDPPC are similar.

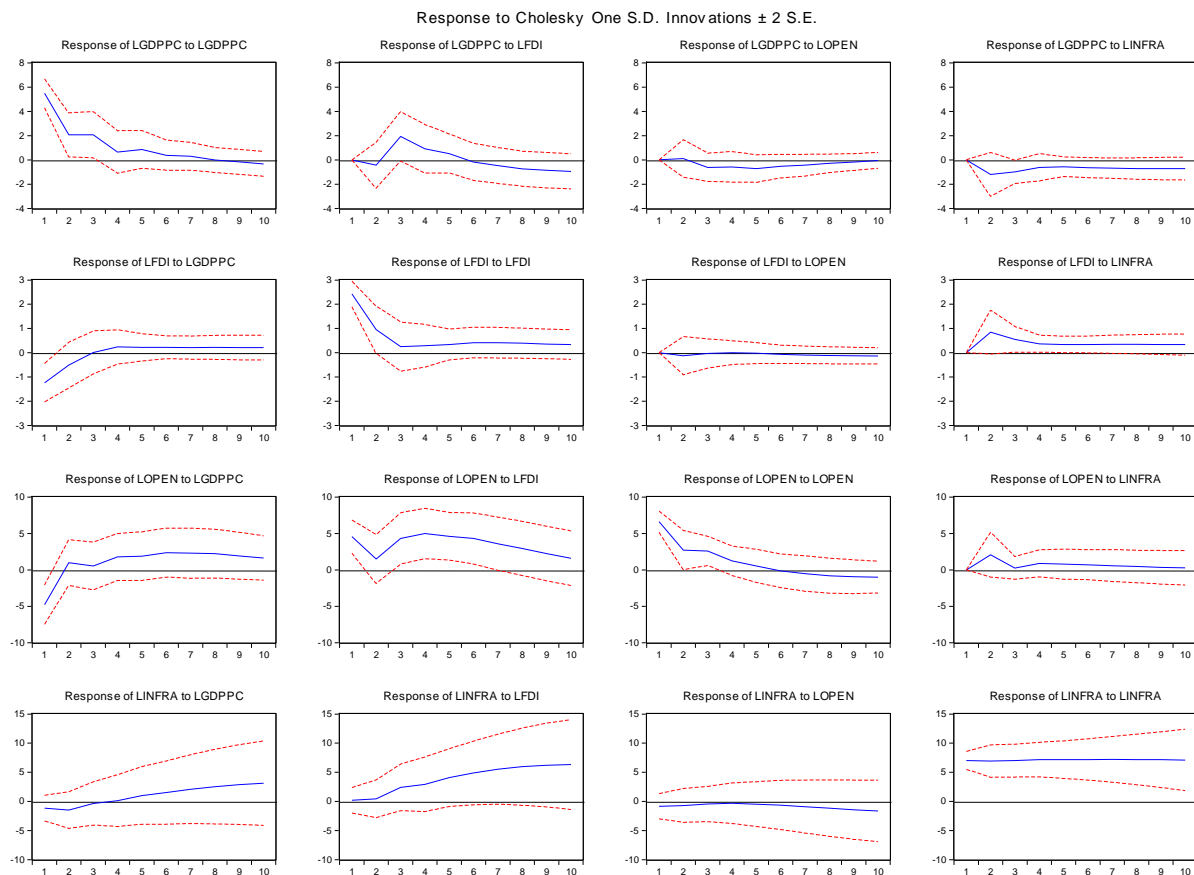


Fig. 3: Impulse response functions

4. 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. Data used in this paper are collected from the World Development Indicators (WDI). The empirical approach used in this paper is based on three steps. The first one checks the stationarity of each variable. To achieve this goal, we performed the Augmented Dickey-Fuller tests (F-ADF) and Philips-Perron (PP) tests. However, the second step, aimed to test the existence of a long-run cointegration between variables. This is performed by 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 economic growth.

Compliance with ethical standards

Conflict of interest

The authors declare that they have no conflict of interest.

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