

## The Interactive Relationship between Economic Growth and Foreign Direct Investments (FDI): A VAR Analysis in Iran

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### Abstract

The impact of FDI on economic growth is neither homogeneous, nor completely clarified. Due to accumulation of capital in the host economy, FDI is expected to encourage the incorporation of new inputs and technologies in the process of production. However, the impact of FDI on economic growth is not so shaped up in empirical studies. Accordingly, while some studies remarked a positive impact of FDI on economic growth, others showed a negative relationship between the two variables. In this paper, we will analyze absorb methods of foreign investment, effective factors in foreign direct investment (including economic, encouragement and protection, and natural and politic factors), and connection between foreign direct investment and growth. We carried out an analysis of vector autoregressive (VAR) type, so as to identify the relationship between FDI and economic growth in Iran over the period 1991–2014. Result shows that economic growth and foreign direct investment have a positive impact on each other; hence there is a reciprocal relationship between them. Also, Granger causality test for GDP growth and foreign direct investment indicate that a reciprocal relationship exists between these two variables.

**Keywords:** Foreign Direct Investment (FDI), Economic Growth, VAR Analysis.

**JEL Classification:** F13, F23, F30.

### 1. Introduction

In an attempt to improve their economic situation, create job, and achieve sustainable economic growth and development, most developing countries are facing the problem of resource shortage for

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investment. In the modern world where capital can be easily transferred, attraction of foreign direct investments is one of the good strategies for fixing this problem. Foreign Direct Investment (FDI) is often seen as an important catalyst for economic growth in developing countries. Development economists have argued that countries pursuing outward-oriented development strategies are more likely to achieve higher rates of economic growth than those that are internally focused. According to De Mello (1999), the enormous effect of FDI on economic growth is probably come from capital accumulation, transfer of new technology to recipient countries, and augmented knowledge stock of recipient countries.

FDI has an impact on economic, social and political growth of countries in different ways. The scope of this influence is far-reaching; therefore, in the impact on employment, import and export, balance of payments, etc., each of them has complexities of its own (Goldsmith, 1969; McKinnon, 1973; Shaw, 1973). The effect of FDI on economic growth is one of the topics discussed in this context. It is an important debate as to how FDI affect economic growth, and conversely how much the economic growth is affected by, which needs to be studied. In this paper, an attempt is made to analyze the interacting relationship between these two variables through estimating econometric models.

The remainder of this paper is organized as follows. Section 2 describes the review of earlier theoretical and empirical literatures. Section 3 presents the data and model. The empirical findings are reported in Section 4. In section 5 some conclusions are drawn.

## **2. Literature Review**

Foreign direct investment (FDI) represents a vehicle for transferring tangible assets, but also intangible assets like technology (for example, innovative product designs and managerial skill). The positive effect of FDI on economic growth is ensured by FDI transferring assets regarding FDI spillover effect and productivity improvement (Lechman and Kaur, 2015). There are a variety of channels for the influence of foreign direct investment on economic growth, the most probable method of which is to create productivity overflow for the influence of FDI on economic growth (Olayiwola,

2000 and Okodua, 2009). The empirical studies regarding the relationship between FDI and economic growth showed mixed influences. Few studies, like those of Chakraborty and Basu (2002) for India, found little or no evidence for FDI contributing to economic growth. Actually, a faster economic growth attracts more FDI inflows (Kherfi and Soliman, 2005, Fidrmuc and Kostagianni, 2015, Cichy and Gradoń, 2016). According to Porter, the introduction of foreign direct investment as a production factor can precipitate economic growth of the host country (List et al., 2003). Shi (2001), De Mello (1999) respectively find the transfer of premium technology by FDI and its influence on economic growth to be affected by the following factors:

- (A) Amount of technologic differences between two countries
- (B) Level of educational investment in the host country
- (C) The aim of the host country for making FDI in the host country

According to endogenous growth models, attraction of FDI through technology transfer can give rise to economic growth. FDI can lead to economic growth by overflows and technology transfer, if growing return on production is achieved. Moreover, Olayiwola (2000), and Okodua (2009) and Noorbakhsh and Paloni (2001) also argue that FDI can have a greater impact on economic growth, if developed economic infrastructures and great and expert human resource are available. In addition to this, FDI has a positive impact on economic growth through effects that it exerts on the changes of industrial methods; Chang (2006). Borenztein et al. (1998), Clowes and Bilan (2014), contend that useful effects of FDI on economic growth are achieved due to the higher efficiency that this kind of investment has owing to advanced technology, rather than further accumulation of capital. Rana and Dowling (1998), Dornean and Oanea (2013), point out that the positive effect of FDI on economic growth can be achieved due to capital efficiency increase as a result of proper and advanced technology transfer. Furthermore, Bernztein et al. (1998) hold that FDI has a positive impact on domestic investment due to transfer of technology, which is in turn an incentive for host company and additional tool for increasing capital offering to domestic investors and subsequently can improve formation of capital in the host country. In addition, foreign direct investment can offset reduction of economic

growth and domestic employment, leading to economic growth improvement in the host company by creating new job opportunities. According to Chang (2006), FDI has proved to be effective due to transfer of technology and consequences of it such as capital efficiency increase, domestic investment incentives, human resource training and development of human capital, improvement of managerial practices, increase of competition in domestic market and increase in productivity on economy growth (Bornestine et al., 1998 Blomestrom et al., 1994, Alfro et al., 2008).

Despite some studies about the relationship between FDI and economic Growth in Iran, there are no common consensuses, so working on this issue is still required. In this section, we briefly review some studies and present their results:

Ahmadi and Ghanbarzadeh (2011) study the impact of openness and FDI on economic growth in Iran over the period 1970–2008, using the Bounds testing approach suggested by Pesaran et al. (2001). Results indicate that openness is positively associated and statistically significant determinant of growth, both in the short run and the long run. The result also suggests that FDI is positively associated with growth in the short run, but negatively related in the long run.

Khosrozadeh, Firoozjan and Amirzadi (2015) evaluate the interactive and independent effects of FDI and trade liberalization on Iran's economic growth. To do so, Bogwatti's theory and ARDL method have been used from 1974 to 2012. Results illustrate that trade liberalization and FDI affect the economic growth both independently and interactive that is, economic openness paves the ground for more FDI and economic growth.

Jalili (2013) investigates the relationship between non-oil exports, FDI and economic growth in the MENA region over the period 2000–2010 using GMM panel data approach. The results suggest a significant positive effect of non-oil exports and FDI on economic growth in selected countries.

Rahmani and Motamedi (2013) examine the effects of FDI on capital formation, labor productivity and economic growth. In effect, they test the hypothesis that FDI helps economic growth in developing countries, not only via capital formation, but also via the increase in productivity. To test this hypothesis, they use a panel data approach in

a simultaneous equations system including three equations and three groups consisting of 111 developing countries over the period 1995–2013. Results show that productivity has a higher effect on economic growth than capital formation. Therefore, the hypothesis that “FDI, by increasing productivity, has a positive effect on economic growth” is not rejected.

Dodangi (2016) analyzes internal and foreign investment’s attraction problems and difficulties. Results indicate that oil prices and oil incomes fluctuations, international sanctions, foreign exchange rates fluctuations, and high inflation rate have led to increase of FDI in Iran.

In addition, studying the econometric models show that national income, GDP, government expenses, inflation rate, degree of economic openness, human capital, and FDI have positive effect on total private investments in Iran.

Mahmoodi and Mahmoodi (2016) evaluate the effect of FDI on economic growth for South Asia over the period 1977–2009. Studying the models, they come to the conclusion that FDI has positive and significant effect on economic growth, and variables such as human capital, economic infrastructure, and capital formation have positive effect on GDP. But population, technology gap and inflation have negative effect on the economic growth.

Asheghian (2016) determine the economic variables that contribute to Iran’s GDP per capita growth over time, and examine the causality between FDI and the relevant variables that are included in the model. To achieve these goals, the study uses a model that is based on the postulates of de Mello. The results indicate that: (1) the major determinants of GDP per capita growth in Iran are value added growth and domestic investment growth; (2) there is no causal relationship between FDI growth and GDP per capita growth in Iran in either direction; and (3) there is no causal relationship between FDI growth and value added growth in Iran in either direction.

Hojabr and Sabzi (2006) employ autoregressive distributed lag (ARDL) approach to examine the impact of effective factors on FDI during the 1966–2002 period in Iran. Their analysis indicates that in the short run real exchange rate, human capital and GDP have a

positive impact on FDI. However, they report the absence of such a relationship for FDI in the long run.

ShahAbadi and Mahmoodi (2006) employ ordinary least squares method to investigate the impact of effective variables on FDI in Iran during the 1959–2003 period. Their analysis shows that: (1) human capital and infrastructures have direct and significant impact on FDI; (2) openness has positive and insignificant effect on FDI; (3) exchange rate has a negative and insignificant effect on FDI; and (4) revolution dummy variable has a reverse and significant effect on FDI.

The relationship between economic growth and foreign direct investment has been a subject of discussion for many researchers and economists in developing countries. It is important to know if FDI inflows really generate economic growth and if a country with higher GDP rate attracts more FDI inflows.

Literature on FDI and economic growth in Iran is composed of a few scholarly studies have tried to investigate the determinants of GDP, and the contribution of FDI to economic growth. The purpose of this study is to determine the economic variables that contribute Iran's GDP per capita growth over time, and examine the causality between FDI and the relevant variables that are included in the model.

### **3. Data Description and Model Presentation**

It is accepted the fact that FDI generate both positive and negative effect, that involve costs and cause benefits. International capital flows strongly influence national welfare through promoting competition on domestic market, increasing innovations (Herman, Chisholm, Leavell, 2004).

In modeling determinants of economic growth, economists have paid a lot of attention to the relationship between economic growth and FDI, particularly in developing countries. The traditional neoclassical growth models postulate that long-run economic growth arises from both technological progress and labor force growth, which are both exogenously determined. In these models, FDI is considered to only have a short-run effect on the growth of output. However, the recent acceptance of endogenous growth theory has promoted research

into channels through which FDI can be expected to encourage economic growth in the long-run (Grossman and Helpman, 1991).

FDI affects the economy of a host country in a variety of ways. First, it brings with it the needed capital, and modern technology that enhances economic growth in the recipient country (Dunning (1993), Borensztein et al. (1998), and de Mello (1999)). Second, through managerial and labor training it augments the knowledge of the host country, stimulating economic growth (De Mello (1999)). Third, it promotes technological upgrading, in the case of start-up, marketing, and licensing arrangements (Markusen and Venables, 1999; de Mello, 1999). Thus, FDI can be considered as an instrument in promoting industrial development and technological upgrading. As such, FDI may enhance productivity and technological progress in the host country, contributing to its economic growth. Not only does FDI affect the economy of a host country, the economy of the host country has also some bearing on FDI. More specifically, the absorptive capacity of the host country impacts the volume and type of FDI that flows into that country. The absorptive capacity of a host country, in turn, depends on the country's trade regime, legislation, and political stability. It also hinges upon scale factors, such as balance of payments constraints, and size of domestic market for the goods produced through FDI. The consideration of these nation-specific factors allows for examination of such FDI-induced externalities or 'spillovers.' (De Mello, 1999).

a) FDI model

Bajjo and Simon (1994), assumed that the first choice a multinational producer must face or not to undertake FDI, which would involve the choice of an output level in the foreign try. The cost function faced by the firm has two components, associated with producing domestic and foreign plants, respectively:

$$C = C_d(Q_d) Q_d + C_f(Q_f) Q_f \quad (1)$$

where C denote total costs, Q is the level of output, and the subscripts d and f refer to the domestic and foreign variables, respectively. Then, the firm would minimize (1) subject to the constraint that output should equal total demand, D:

$$D = Q_d + Q_f \quad (2)$$

Defining the Lagrangean function and differentiating it obtain the necessary conditions for the solution of the constrained optimization problem, for a producer distributing his output between two plants (domestic and foreign). They concluded that output to be produced at the foreign plant is positively related to total demand and negatively related to their unit costs relative to those of the home country plant.

Also, the MNE must face a second choice involving input substitution within the foreign plant. assuming for simplicity that production in the foreign plant takes place two inputs labor (L) and capital (K), by means of a Cobb-Douglas technology, the foreign subsidiary minimize its total costs:

$$C_f = w_f L_f + r_f k_f \quad (3)$$

(where  $w$  and  $r$  denote, respectively, the wage rate and the user cost of capital both in real terms), subject to the constraint given by the production function in Cobb Douglas form

$$Q_f = L_f^\alpha K_f^\beta \quad (4)$$

from above the final expression for the subsidiary's desired capital stock when producing in the foreign plant will obtain:

$$K_f = \left[ \left( \frac{\beta}{\alpha} \right) \left( \frac{w_f}{r_f} \right) \right]^{\frac{\alpha}{\alpha+\beta}} (\gamma_1 D + \gamma_2 (C_D - C_F))^{\frac{1}{\alpha+\beta}} \quad (5)$$

As can be seen from (5), this desired capital stock appears positively related to total demand, as an indicator of the profitability of FDI, and negatively related to the host country's unit costs, relative to those of the home country. Notice, however, that now the effect of relative unit costs is not unambiguous in the case of labor, when substitution between inputs is taken into account: an increase in wages in the host country could lead to a higher (instead of lower) capital stock if a strong substitution effect between labor and capital is in effect in that country. Equation (5) might be augmented by



introducing the effect of trade barriers in the host country by means of an additional term in the cost function (1), that would lead to a positive relationship with  $Q_f$  (and hence with  $K_f$ ): high tariff barriers in the host country would mean an incentive for the firms wishing to gain access to that market, which would settle there by means of FDI in order to overcome such barriers. From the previous discussion, omitting subscripts and aggregating across foreign subsidiaries, we can write an expression for the desired stock of foreign capital in the host country, denoted by  $K^*$ , as

$$K^* = p[AD, RUC, T] + \text{-(?) +} \quad (6)$$

where  $K^*$  would depend positively on the level of aggregate demand (AD) negatively on the relative (host country vis-a-vis home country) unit costs (RUC) (unless there were a strong substitution effect between capital and labor, as previously mentioned- and positively on the level of trade barriers<sup>1</sup>.

In the light of the above theoretical basic models of FDI determinants introduced by Bajio and Simon's (1994), the following model is used:

$$FDI_t = f [GRO_t, K_t, W_t, OP_t, ER_t, HC_t, U_t] \quad (7)$$

Where FDI stands for FDI as net inflows, GRO, K, HC are used for AD variable, W and ER are costs, and OP is trade variables. GRO is the growth rate of GDP, used as a proxy for the market size. K stands for domestic capital accumulation that may be a substitute or a complement for FDI depending on the types of FDI and investment climate in the host country.

OP is the openness. This variable is measured by the sum of exports and imports in goods and services over GDP. The variable of openness is used to capture the liberalization of trade and foreign exchange transactions.

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1. For more information see: Bajo, R., & Simon, S. (1994). An Econometric Analysis of Foreign Direct Investment in Spain, 1964-89, *southern & Economic Journal*, 1(61), 104-120

W denotes wage rate. Also, ER is real exchange rate. In theory, the influence of this variable on FDI is ambiguous, and depends on the motivation of foreign investors. For instance, depreciation makes local assets and production cost cheaper, leading to higher inflows of FDI.

HC denotes human capital. Training and education reflect human workforce skills, and play an important part in attraction of FDI. Presence of well-trained and expert workforce in modern commercial organizations, is an effective factor in flow of FDI. Countries with a high level of human capital are able to achieve higher growth rates through their ability to attract foreign enterprises, and assimilate new technologies with efficacy. Subscript,  $t$  ( $= 1, \dots, t$ ) is the time (year), and  $U_T$  is the error components.

b) Economic growth model

Consider the following production function, depicting an economy that produces a single consumption good:

$$Y = E f(K, L, FDI) \quad (8)$$

where  $Y$  is the real GDP,  $E$  represents the state of economic environment,  $K$  stands for physical capital,  $L$  depicts labor, and  $E$  denotes the economy's productivity level. Assume that production is performed in the recipient country by combining physical capital and labor. Further suppose that the physical capital is composed of domestic capital ( $K_d$ ), and foreign-owned capital ( $K_f$ ) that is generated from FDI. Given a Cobb–Douglass production function, equation (8) can be rewritten in per capita GDP in each period as:

$$y = E f(K_d, H) = E K_d^\beta H^{1-\beta} \quad (9)$$

where  $y$  is the per capita GDP,  $\beta$  is the share of domestic physical capital. To ensure the existence of diminishing returns to domestic capital, assume that  $\beta < 1$ . Suppose that  $H$  depends on domestic-owned and foreign-owned capital, and is represented by a Cobb–Douglass function of the following type:

$$H = (K_d K_f^\lambda)^\eta \quad (10)$$

where  $\lambda$  and  $\eta$  are the marginal and the intertemporal elasticities of substitution between foreign and domestically owned capital stock, respectively. If we merge equations (9) and (10) we get the following equation:

$$y = EK_d^{\beta+\eta(1-\beta)}K_f^{\lambda\eta(1-\beta)} \quad (11)$$

Taking logarithms of equation (11), and then Taking time derivatives , we find that growth rate of per capita GDP are mostly based on economies' productivity level, growth rate of domestic investment, and growth rate of FDI<sup>1</sup>.

In the light of the above discussion, and according to the neoclassical growth theory, we consider growth rate model as follows:

$$GRO_t = F(L_t, K_t, FDI_t, E_t, U_t) \quad (12)$$

Where GRO represents the growth rate of real GDP, E stands for the growth rate of value added, and is used as a proxy for the economies' productivity level. K stands for domestic capital accumulation. FDI is foreign direct investment, and may influence on the economic growth in the two direct and indirect ways. In direct effect, it increases the production, employment, added value and export which lead to direct increment of GDP. For instance, employment increases the individual's income, and this income increment is directly calculated in GDP. Likewise is for added value and export. But, foreign investment increases GDP indirectly as well. For instance, transition of technology, knowledge and know-how through license, imitation and job training. Besides, externalities, technology spillover, human capital formation, efficiency and productivity are the factors which indirectly increase GDP in economic growth. L stands for labor force. The subscript t (= 1,...T) is the period of time (year), and  $U_t$  is the error components.

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1. For more information see: Asheghian, P. (2016). GDP Growth Determinants and Foreign Direct Investment Causality: The Case of Iran, *The Journal of International Trade & Economic Development* , 25(6).

The main data were derived from the world development indicators (WDI) and UNCTAD. All data for the period 1994 to 2014 were measured in current US dollars.

**Table 1: Introduce Variables**

Variables and Symbol	Sources	Units and Expression Used
GRO: Economic Growth	WDI	GDP growth
FDI: Foreign Direct Investment	UNCTAD	Net inflows
HC: Human Capital	WDI	Total number of pupils enrolled at secondary level
K: Capital Formation	WDI	Domestic capital accumulation
W: Wage Rate	Central Bank of Iran	Nominal wage index
OP: Openness	WDI	Sum of exports and imports in goods and services over GDP
ER: Exchange Rate	WDI	Real exchange rate: The nominal exchange rate $\times$ internal Prices / external prices
L: Labor Force	WDI	Labor force, total
E: Growth Rate of Value Added	WDI	Gross value added at factor cost

#### 4. Estimation Result

##### 4.1 Selection of Optimal Lag of FDI Model

To determine lag length, Schwartz-Bayesian index is used to break the correlation between residuals. In this model, optimal lag number test is done between 0 and 1. According to the data given in table 2, lag 1 can be recognized as optimal lag.

**Table 2: Optimal Lag Determination Test**

Lag	AIC Akaike	Schwarz Bayesian criterion SBC	Hannan Queen criterion HQ
0	14.658	15.002	15.123
1	4.1402	4.3215	5.046

In table 3, the results of estimating Baggio-Simon model are presented in VAR. As can be seen, economic growth has a positive effect on FDI, and high economic growth in the host company has built up motivation for foreign investment. Investors prefer an economy with a large market size; because it is a good market for sale. Hojabr and Sabzi (2006), Ahmadi and Ghanbarzadeh (2011), Khosrozadeh, Firoozjan and Amirzadi (2015), Dodangi (2016) and Mohammadvandnahidi, Jaberikhosroshahi and Norouzi (2012) come to the same result.

The explanatory variable exchange rate has a negative impact on FDI. Exchange rate affects benefits derived from FDI. Since exchange rate affect the purchase of certain assets of institution by foreign currency, and the money can yield more return by being transferred to domestic production (or production in a third company), expected future earnings of foreign investment will fall as exchange rate goes up. ShahAbadi and Mahmoodi (2006) come to the same conclusion. But the conclusion is not supported by Hojabr and Sabzi (2006), and Dodangi (2016).

Domestic capital stock has a negative effect on FDI. This negative effect suggests a substitutionary relation between domestic and foreign investment. In other words, domestic investment inhibits foreign investment. This is probably due to the lack of economic infrastructure development, the inability to attract investment, and competition between domestic and foreign investment over accomplishment of quick return projects, because the short time of capital return period has less risks. These results are consistent with the results obtained in the experimental study carried out by ShahAbadi and Mahmoodi (2006).

The positive coefficient of openness indicates that motivation for FDI increases as much as the economy of a host country is free to have import or export of goods, services and investments. In an open economy, importing raw materials or some essential capital goods is easier for investment and export of finished goods. Therefore, trade openness has a positive impact on FDI. This result is the same as ShahAbadi and Mahmoodi (2006), Khosrozadeh, Firoozjan and Amirzadi (2015), Moshiri and Keyanpor (2012), and Gaffari and Akbari (2011).

Human capital is an important factor favoring the knowledge-based economy. So, it is a part of the investment climate of the economy, and implies skilled labor that is, skills are acquired by individuals through investment in education and training. Knowledge is evaluated as one of the main motivations of innovation and development.

A well-educated workforce is perceived as an important incentive for foreign investment location decision. The amount of human capital available in a country suggests the power or capacity of that country in attracting advanced technology. In the way that, the more a country's human capital is, the more will be its foreign investment. Results of this study that are supported by Hojabr and Sabzi (2006), ShahAbadi and Mahmoodi (2006) show that human capital is an important factor which attracts FDI to Iran.

**Table3: Results of Estimating Baggio-Simon Model**

	<b>GRO</b>	<b>W</b>	<b>K</b>	<b>Hc</b>	<b>Er</b>	<b>OP</b>
FDI(-1)	0.88 [2.31]	-0.23 [-0.56]	-0.56 [-1.96]	0.14 [2.52]	-2.14 [-1.55]	1.74 [4.02]
GRO(-1)	0.164 [1.99]	-0.12 [-1.63]	0.07 [1.39]	0.03 [0.74]	-4.01 [-1.96]	0.136 [2.03]
INF(-1)	-0.02 [-2.01]	0.14 [1.97]	0.22 [2.21]	-0.01 [-0.45]	-2.34 [-0.95]	0.55 [3.14]
K(-1)	1.45 [1.78]	-1.5 [-1.41]	0.52 [2.28]	0.03 [0.41]	-2.34 [-1.58]	-0.74 [-1.32]
HC(-1)	0.25 [2.14]	1.69 [1.97]	0.55 [2.22]	0.33 [3.14]	2.66 [2.44]	-0.86 [-0.36]
Er(-1)	0.12 [2.12]	-2.02 [-1.5]	-2.001 [-1.26]	2.55 [0.56]	0.21 [0.32]	-0.02 [-3.52]
OP(-1)	0.12 [1.22]	-0.123 [-2.48]	0.14 [1.55]	0.01 [0.98]	-2.02 [-0.88]	0.12 [0.63]
C	1.06 [1.56]	1.88 [0.97]	1.41 [2.81]	1.02 [2.2]	2.81 [1.72]	0.85 [0.17]

**Table4: Analysis of the Variance FDI**

<b>d</b>	<b>S.E.</b>	<b>GRO</b>	<b>FDI</b>	<b>OP</b>	<b>K</b>	<b>HC</b>	<b>ER</b>	<b>W</b>
1	1.78	3.12	83.21	0.00	0.00	0.00	0.00	0.00
2	2.30	3.23	83.41	0.15	3.66	2.42	0.25	0.12
3	2.45	3.51	75.22	0.63	4.23	2.65	0.36	0.23
4	2.50	3.02	75.05	1.4	5.32	3.00	0.47	1.12
5	2.69	2.85	64.4	3.20	5.66	3.21	0.52	1.44
6	2.79	2.45	63.86	5.20	7.68	3.25	1.22	1.56
7	2.83	2.32	62.41	6.5	8.64	3.36	2.23	1.63
8	2.88	2.14	55.45	8.45	9.98	3.36	3.66	2.03
9	3.01	2.55	53.22	9.24	11.0	3.75	4.36	2.05
10	3.22	2.02	52.01	9.91	12.22	3.88	5.47	2.06

In table 4, it is shown the analysis of the variance FDI for a ten-year period in short time (year 1), medium term (year 2 to 5), and long term (year 5 to 10) in the presence of economic growth variables, including FDI, capital stock, exchange rate, human capital, and trade openness. Results show that in the first period (short term), the variance error in FDI is explained by the variable FDI itself and also economic growth.

In the medium term, all variables affect FDI. In other words, the variable FDI, capital accumulation of the prior period, openness, human capital, economic growth, wage rate, and exchange rate have the most impact on FDI, respectively. In the long run, capital accumulation of the prior period, trade openness, exchange rate, human capital and economic growth have the greatest impact on FDI, respectively. As shown earlier, variables such as capital stock, exchange rate, and trade openness have a growing trend during the expected period; that is, they have a greater influence on attraction of FDI in a country during the terms.

#### **4.2 Estimation of Factors Influencing Economic Growth**

Base on table 5, the economic growth model is estimated by one lag.

Table 5: Optimal Lag Determination Test

Lag	Akaike	Schwarz Bayesian criterion SBC	Hanan Queen Criterion HQ
0	4.45	5.36	6.32
1	-3.26	-2.12	-3.22
2	-3.44	-0.45	-3.41

As can be seen in table 6, all variables have a positive coefficient; that is, they have a positive impact on economic growth. Generally speaking, it is argued that FDI as a factor influencing the total productivity of production factors can increase economic growth. FDI such as capital in the production function has an important impact on economic growth. FDI such as domestic investment increases aggregate demand, and aggregate demand raises domestic output. Behname (2011) and Borensztein et al. (1998) show the same results for different countries, and Khosrozadeh, Firoozjan and Amirzadi (2015), Ahmadi and Ghanbarzadeh (2011), and Mahmoodi and Mahmoodi (2016) indicate that FDI is key determinants of economic growth in Iran.

Capital stock and labor are main factors of production, which have a greater impact particularly on economic growth of developing countries. The factors definitely have a positive impact on economic growth. Dejpasand (2005), Alizadeh et al. (2014), Farzin, Ashrafi and Fahimifar (2012), and Ahmadi and Ghanbarzadeh (2011) have come the same conclusion.

They further mentioned that expectation for greater value added would improve the material live of the poor, which in turn will to GDP growth as a whole. The results of this study is also the same as Choi (2007), Billington (1999), Behname (2011a, 2011b), Wang and Swain (1995), and Wheeler and Mody (1992).

The coefficient indicates that value added has a stronger effect compared to FDI. Thus, an increase in country's value added as proxy of productivity can lead to an increase in economic growth.

Comparing the relationship between FDI and economic growth, and given the model of estimated growth in table 4, it can be said that economic growth has a positive impact on FDI, as FDI has a positive impact on economic growth in this equation; hence, their reciprocal relationship exists.



As can be seen, the results of the variance analysis of GDP indicate that in the first run, it is just economic growth which is influential. In other words, the entire error variance in economic growth, is to be explained by itself.

**Table6: Estimation of Factors Influencing Economic Growth**

	<b>L</b>	<b>K</b>	<b>FDI</b>	<b>GRO</b>	<b>E</b>
GRO(-1)	0.43	0.05	0.31	0.51	0.65
t	1.45	0.41	2.96	2.01	0.73
FDI(-1)	0.03	0.16	0.36	0.02	0.05
t	2.32	3.65	1.90	0.23	0.18
K(-1)	0.06	0.79	0.89	0.26	0.54
t	2.82	3.12	0.44	3.41	0.71
L(-1)	0.66	0.16	1.4	0.47	0.32
t	0.15	0.74	3.36	1.97	0.45
E(-1)	0.42	0.22	1.00	0.63	0.06
t	1.38	0.17	3.25	2.12	4.01
C	0.6	1.63	2.14	4.32	3.21
t	2.41	0.16	3.36	1.77	0.14

In the short term (early periods of prediction) and the medium term, economic growth has the highest contribution, and then the capital stock, the volume of trade; FDI and work force have the greatest impact on economic growth. In the long run term such as the middle term, after the economic growth variable, capital stock, FDI, and workforce have the greatest contribution and influence on economic growth, respectively. The contribution of FDI to economic growth in the short run (first run) is zero, but it grows in the forthcoming periods, and this trend is incremental during the study period.

Granger causality test for GDP growth and FDI indicates that a reciprocal relationship exists between these two variables. The result of the test is shown in table 8.

Table 7: Variance Analysis

d	E	L	K	FDI	GRO
1	0.00	0.00	0.00	0.00	100.00
2	6.45	0.45	3.22	0.03	84.12
3	8.62	1.00	5.36	0.24	69.56
4	8.45	1.23	8.37	1.12	58.22
5	7.23	2.12	9.51	2.16	58.33
6	6.71	3.18	10.36	3.34	58.45
7	5.61	3.36	19.12	4.52	49.74
8	5.44	4.02	25.10	5.19	44.35
9	4.35	4.47	32.12	6.12	39.44
10	4.21	5.78	48.66	6.33	33.14

Table 8: Result of Granger Causality Test

Hypothesis	Statistic F	probability	result
Foreign direct investment is a reason for economic growth	0.4244	0.44123	Hypothesis is not rejected
Economic growth is a reason for foreign direct investment.	3.01639	0.135412	Hypothesis is not rejected.

## 6. Conclusion

The purpose of this study was to examine the determinants of economic growth and FDI in Iran, and to see if there was any time-series support of FDI-led growth hypothesis in the country. To achieve these objectives, the study used an econometric model that was based on the empirical studies. Employing a 23-year annual data, and using the VAR technique, the model was estimated which was correct for autocorrelation.

The main result is that there is a positive relationship between FDI and economic growth in Iran.

The results indicating the significant impact of value added growth and domestic investment growth on GDP per capita growth suggest that Iran should pursue policies that encourage technological improvement and promote privatization, in order to enhance the positive effects of value added growth and domestic investment growth on per capita GDP growth.

The coefficient of an economy's degree of openness (OP) as the sum of nominal export and import divided by the nominal GDP has been included as a proxy to reflect the willingness of a country to accept foreign investment. It has presented a positive sign, and is significant. This demonstrates that openness is another important determinant for FDI to developing countries.

Results of the study conducted that human capital was an important factor, which attracted FDI to Iran. It is especially very important from the point of view of benefits that may be achieved by the economy of Iran from FDI. This factor which from the viewpoint of investors upgrades the competitiveness of the region, comes from "favorable relationship between the price and quality of human capital and high marginal efficiency of the capital".

The policy of attraction of foreign investment receives attention in order to finance the country's domestic investments, as mentioned in this paper. In other words, FDI has a role and relationship to national economic growth, and a positive effect it may have on other economic indicators namely reduction of exchange rate, rising payment balance, technology transfer, increase in employment and productivity, inflating tax earnings and export development. So, policy makers in economy sector should precisely determine the attraction of such investments, contributions of different economic sectors, and contributions of government and private sector in this regard, identify and fix obstacles and problems of FDI in the country.

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