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The Long-run Effect of Foreign Direct Investment on Total Factor Productivity in OPEC Countries

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A B S T R A C T

Nowadays, all developed or developing countries emphasize the importance of productivity as one of the necessities of economic development and the acquisition of competitive advantage in international arenas because in the current world, competition on global scenes has taken other dimensions and efforts to achieve higher levels of productivity are one of the main pillars of the competitions. Thus, most developing countries have invested or are significantly investing in this area in order to promote the attitude of productivity and generalization of its techniques' application and improvement methods. One of the important factors for economic growth and development of countries is also to provide sufficient capital to finance investment. As a result, developing countries have attempted to concentrate the capital through domestic resources, or then completed by foreign investment. Given the importance of the mentioned matter and topic, the study investigated the long-term effects of foreign direct investment (FDI) on the total factor productivity in OPEC countries. The results of the research indicate that the variables of population, foreign direct investment, human capital, domestic credits by the private sector were positively and significantly affected by the total factor productivity. Therefore, the total factor productivity enhanced with the increase of these variables. But the degree of openness of the economy has a negative and significant effect on the total factor productivity. As well as, other results evaluated the long-term effects of foreign direct investment on total factor productivity in OPEC countries. According to the estimation, the long-term effects of variables of total factor productivity and foreign direct investment can be confirmed by Kao co-integration test.

Keywords: Total Factor Productivity, Foreign Direct Investment, OPEC Countries.
Jel: J24, F21, O5.

INTRODUCTION

Undoubtedly, the prerequisite to the economic growth and development and the preliminary qualification for entering the economic activity arena is having capitals available that is considered as the propeller of the economic growth and development(Bernal, 2013; Deming, 2016; Kohli, 2014). In fact, investment is one of the essential and inseparable parts of the economy

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manifested(Shackle, 2010) in two domestic and foreign forms. For the time being, direct foreign investment is one substantial element joining the countries' economies, especially those of the developing communities to the global economy(Moon, 2012; Shackle, 2010). Also, direct foreign investment, as a factor contributing to the transferring of capital, technology, expertise and management, has saved itself a considerable role in corroborating these countries' presence in the global economy and trade(Awosejo, Worku, Muchie, & Temitope, 2017; Sane, 2016). Such a reality has caused the intensification of competition for taking advantage of the existing opportunities in adsorbing foreign investment in line with enhancing the countries' position in the global economy. According to the definitions, direct foreign investment incorporates a long-term relationship reflecting sustainable benefiting from and supervising the private assets in the economy of a country by a company based in another country's economy. The investor can considerably influence the foreign company's management through making the investment(Naveh, Torosyan, & Jalaee, 2012; Trojette, 2016). The advantages of direct foreign investment in the countries include absorption of capital, technology, and up-to-date knowledge, elevation of management ability, increase in employment, improvement of the payment balances and increase in the ability to compete(Cordero & Paus, 2008; Paus & Gallagher, 2007). Of course, it has to be remarked that the management's weakness and improper policies in attracting direct foreign investment can be accompanied by such negative outcomes as the creation of monopoly market structure, in the long run, destruction of the industries with small-scale production capabilities as well as the intensification of joblessness(Bird & Cahoy, 2008; Solanes, 2007).

Also, the countries are constantly making efforts to achieve economic growth and attainment of economic growth is feasible by two sources, i.e. accumulation of production factors and the productivity of the whole factors(Furtado, 2018; Lewis, 2013). This is rendered facilitated when the production factors are used in their optimized forms and this is somewhat reflective of the productivity of all production factors. This is why the productivity of the whole factors, besides instigating the economic factors through the optimal blending of the production resources, human capital, information and communication technology, energy and other factors, leads to the effective use of production factors and, eventually, causes the supply of sustainable economic growth and development. Thus, the productivity improvement has been considered as the best method of achieving continuous economic growth since long ago(Maddison, 2013; Rodrik, 2014).

Nowadays, the importance of productivity, as a prerequisite of the economic development and acquisition of competition superiority in the international arenas, is emphasized by the entire developed countries because competition in the today's world has taken other aspects in the global arenas and endeavoring to achieve higher productivity levels constitutes one of the main pillars of such competitions(Cohn, 2015; Gilpin, 2016; Leigh & Blakely, 2016). This way, the majority of the developing countries has made or is making substantial investments in this regard so as to promulgate the productivity attitudes and generalize it to the application of techniques and methods devised to improve it. Also, productivity has been expanded in its spectrum amongst the countries that have achieved rapid economic progresses in such a manner that it might be said that their economic and technological development is laid on the foundation of their paying off a great deal of attention to productivity and its promotion in the entire levels and classes of the society. The enhancement of productivity is effective on the main economic, social and political phenomena of the communities, such as on the reduction of inflation, increase in the public welfare level, and increase in employment and increase in the economic competition power(Karl, 2007; Rodrik, 2014).

Many of the countries have been able to supply part of their economic growth in lieu of increasing the number of inputs used and new investments made by enhancing the productivity and optimum use of the extant capacities(El Mallakh, 2015; Pineda, 2009). Nowadays, the

countries benefit from the combinational approaches to achieve growth and development, meaning that they, meanwhile creating new capacities, optimally utilize their existent capacities. This is why almost all the developed countries and a great many of the developing countries make the large deal of investments parallel to the improvement and enhancement of productivity(Edwards & Yeyati, 2005; Jahangard, Daneshmand, & Tekieh, 2017; Sarno, 2000). According to the importance of the subject matter and the aforementioned concepts, the present study is seeking to investigate the long-term effects of direct foreign investment on the general productivity of the production factors in OPEC countries; thus, the upcoming sections deal with the study literature, study method, theoretical foundations, proposition of a model and then model estimation and conclusion.

THEORETICAL FRAMEWORK AND LITERATURE

Irandoust and Ericsson (2001) dealt with the investigation of the effect of the direct foreign investment on the product growth and the total productivity of the production factors in Denmark, Finland, Norway and Sweden. Their findings are suggestive of the idea that the direct foreign investment and product are bilaterally associated in the long run in Norway and Sweden and that the Granger's causal relationship is bilateral in Sweden and unilateral in Norway. The results of the study signify the causal relationships between Finland and Denmark. Liu (2008) found out in a study called the direct foreign investment and technology spillover that the effects of technology spillovers on the productivity of the domestic entities differ in the long run as compared to short run in such a manner that the increase in the direct foreign investment causes reduction in the entities' productivity level in the short run due to the costliness of the technology transfer; but, as for the long run, the technology spillover brings about an increase in the productivity of the domestic business entities. He performed the study on China's industrial entities using panel data. Barbosa and Eiriz (2009) dealt in a study named "relating the productivity of the large companies to the direct foreign investment" with the investigation of the idea that whether the foreign companies create productivity spillovers or not. Their analyses results for Portugal's manufacturing industry shows that the foreign entities that the foreign entities in the same industry of the observed entities (horizontal spillover) and the relationship between the foreign entities and their local supporters and/or customers (vertical spillover) were not of any significant effect on the entities productivity. Moreover, they did not identify any difference in the productivity spillover in respect to the business entities' characteristics.

Amini, Rismanchi, and Farhadi Kia (2011) investigated, in an article, the factors influencing the total productivity of the production factors through underlining the direct foreign investment in Iran and 23 other selected countries for a period of time between 1996 and 2006. The total productivity of the production factors was measured based on DIVISIA method and the factors influencing productivity were identified through taking advantage of panel data. The results of their study were indicative of technical progress influences the productivity enhancement through various methods (domestic research and development costs, foreign r\trade and direct foreign investment). Amongst the factors enumerated above, deployment rate of the capacity was found with the greatest influence on the enhancement of the total productivity of the production factors and the accumulation of direct foreign investment scored the lowest effect. Boghean (2015) in an article entitled "the relationship between the direct foreign investment and workforce productivity in EU countries" analyzed the relationship between the direct foreign investment and workforce productivity in EU countries based on the data retrieved from Europe's Statistics Website for the period of time between 2000 and 2012. The data were processed using SPSS based on correlation

method. Paytakhti and Tabaghchi (2015) investigated the effect of globalization on the total productivity of the production factors on 16 selected country members of Islamic conference organization for a period of time between 1990 and 2011 in a study titled "the investigation of globalization effect on the total productivity of the production factors". To estimate the effects of the variables, the panel cointegration technique based on dynamic ordinary least squares (DOLS) was used. The estimation results signify that such variables as "globalization" and "educated and skillful workforce" exert a positive and significant effect on the total productivity of the production factors but such other variables as "inflation" and "global financial crisis" were found negatively and significantly influencing the total productivity of the production factors. In other words, the scientific results demonstrated that the globalization leads to the increase in the total productivity of the production factors.

METHODOLOGY

The economic models are categorized into three groups in terms of their uses of the statistical information: time series data, cross-sectional data and panel data. In panel data method, a series of cross-sectional units are considered for a period of several years. The method is most widely used in micro-economy for the estimation of the production functions of enterprises in an industry or the demand functions of certain related goods. Of course, there are different methods offered for the model estimation based on panel data that are applicable in respect to the study case and objective.

Time series and cross-sectional data do not care for inhomogeneity hence they are prone to the risk of acquiring biased results. Baltagi (2008) and Levine and Renelt (1992) reached in an estimation to the conclusion that the panel data method is capable of taking into account the dynamic variables in terms of time and place; whereas, the time series and cross-sectional studies fall short of doing so. So, an advantage of the panel data is that it presents unbiased and consistent estimations. The panel data method provides for more information, higher variability, lower collinearity, the higher degree of freedom and higher efficiency. The panel data method can better demonstrate the adjustment (moderation or correction) dynamicity. Also, the cross-sectional distributions that seem to be relatively constant do not exhibit multidimensional changes (multifaceted dynamicity) but these changes can be better examined using panel data. In comparison to the cross-sectional data or time series, the panel data patterns allow constructing and testing more complex behavioral models.

As for the problems related to the existence of autocorrelation and variance inconsistency in the models, it has to be stated that the autocorrelation problem is pertinent to the time series data and variance inconsistency is the problem specific to the cross-sectional data and these problems become more complicated in blending the data. It can be asserted in a general classification that the progressive autocorrelation problem should be taken into consideration when the studied time series is long and the cross-section units are limited. In case that the study period time series data are limited and the cross-section units are many, there would be more possibility for the emergence of variance inconsistency between the groups[†]. Panel data are a set of data investigated based on observations by means of a large number (N) of cross-sectional variables that are usually selected randomly for a given period of time (T) in which case there will be two dimensions of time and cross-section. This N × T statistical data is called panel or blended data. According to the fact that the panel data constitute a rich environment for the development of evaluation methods and subjective results, their analyses are the most frequently applied and most innovative topics in

[†] Greene (1993)

the econometric literature. It can be stated practically that the researchers using the method are capable of using time-series or cross-sectional data to concomitantly investigate various issues of any sort of data. Thus, based on the nature of the data used, the present study takes advantage of the panel data to perform model estimation. The panel regressions can be recognized according to the existence of binary indices that are different from time-series and cross-sectional regressions:

$$y_{it} = \alpha + X_{it}\beta + u_{it}, \quad i = 1, \dots, m \quad t = 1, \dots, \mathrm{T} \qquad (1)$$

i is the cross-sections, individuals, households, entities, countries and others of the like and t is the time. Therefore, the index i denotes the cross-section and t designates the aspects of time series. α is a scalar and β is the K × 1 vector; X_{it} is it observation in k explanatory variable. In this type of the data, the error sentence displays a special type of association and it has to be considered when performing model estimation. To simplify the discussion, the model can be exhibited in linear regression form:

$$u_{it} = \mu_i + \lambda_t + v_{it} \quad i = 1, \dots, N \quad ; \quad t = 1, \dots, T \qquad (2)$$

Here, μ_i is the unobservable individual effects, λ_t is the unobservable time effects and u_{it}, as well, displays the disturbance sentence as in all of the other regressions. μ_i and λ_t are individually fixed and respectively denote the individual effects and a given time that has not been inserted in the model.

Theoretical foundations

Foreign direct investment (FDI) encompasses the investment by a real person or a company in another country for business or production. From the perspective of economy science, the activity takes a position opposite to the stock investment as a type of investment influenced by the economic conditions of the target country. Foreign investment is usually undertaken in two forms: enterprise investment (indirect) and foreign direct investment. The purchase of bonds and companies' stock shares in stock exchange transactions and the deposit bills in foreign banks are examples of foreign investment in which case the foreign investor does not play a direct role in the administration of the production unit hence is not envisioned as being financially responsible; but, the foreign direct investment is a type of investment that is carried out for the purpose of acquiring constant and perpetual benefits in an institute situated in a country other than the investing one and it results in obtaining an effective right to vote in the company's management. Foreign indirect investment is amongst the most important economical phenomena of the recent decade that, meanwhile supplying the financial resources required for the countries' economical development, makes considerable contributions to the transferring of knowledge, technology and management methods to the host countries mostly comprised of the developing countries.

One type of investment that has caused an increase in the productivity is the foreign direct investment (FDI). Economical security plays a crucial role in the maximum absorption of the foreign capitals. The business entities that are launched via foreign direct investment make use of more advanced technologies and more novel managerial methods in their production processes so enjoy a higher level of productivity. With the increase in the foreign entities' quotient of the host country's economy, the total productivity of the entire production factors will be augmented in a macro-level and this productivity improvement exerts a direct effect on FDI absorption. Furthermore, FDI absorption has spillover effects on the transferring of the technical knowledge and novel managerial methods from the foreign entities to the native entities. Also, the presence of the foreign companies in the economy of a country might heat up the competition in the domestic markets of a country. The existence of competition might urge the domestic companies to elevate their efficiency and productivity levels and take measures to innovate and/or import new technologies. Due to the same reason, FDI has been introduced as the most important channel for

dispersing the modern technologies. It is worth mentioning that FDI can indirectly heighten the host country's productivity through technological diversification of the domestic companies. This happens because the foreign companies, due to their enjoyment of the advanced technologies, definitely produce better quality products that cannot be procured in a perfect and complete manner inside the country(Amini et al., 2011).

Model

One of the advantages of foreign direct investment is the transfer of knowledge and technology. Thus, the foreign direct investment, in addition to having a positive effect on economic growth, can improve total factor productivity through the transfer of knowledge and technology. Based on the model presented in the previous section, here we investigate and test the effect of the considered variables in the logarithm state.

As a starting point for developing our empirical model, we begin with a Cobb–Douglas production function of the form:

$$Y = K^{1-\alpha} (Lh)^{\alpha} TFP, \quad 0 < \alpha < 1 \qquad (3)$$

where Y is aggregate output, K is the stock of physical capital, and Lh is the amount of human capital augmented, or "quality-adjusted," labour used in production, defined as the number of workers, L, times human capital per worker, h. The respective factor shares in total income are denoted by $1-\alpha$ and α, and TFP represents aggregate TFP, which can be decomposed into the average of firm-level TFPs and the efficiency of resource allocation across firms. Thus, TFP also captures distortions to the allocation of resources as well as improvements in resource allocation (possibly due to FDI) (Herzer & Donaubauer, 2018).

In per worker terms, the production function can be written as:

$$y = k^{1-\alpha} h^{\alpha} TFP \qquad (4)$$

where y is output per worker and k is the stock of physical capital per worker. In an open economy, this stock is composed of domestic and foreign capital. Thus, from Eq. (4) it follows that holding productivity constant, an increase in the physical capital stock per worker raises output per worker (with an elasticity of $1 - \alpha$) regardless of whether the capital stock is domestically or foreign owned. The implication is that FDI directly contributes to economic growth by promoting capital accumulation (provided that there is no one-for-one crowding out of the domestic capital by foreign capital), but FDI may also have an indirect effect on output per worker (and thus income, consumption, and welfare) if it affects TFP.

In order to examine whether and how FDI affects TFP (and thus output per worker through TFP), we assume that TFP is a function of FDI,

$$TFP = f(fdi) = fdi^{\beta} \qquad (5)$$

Thus, the basic empirical model used to analyze the long-run effect of FDI on TFP is as follows:

$$\log(TFP_{it}) = c_i + \lambda f_t + \beta \log(fdi_{it}) + e_{it} \qquad (6)$$

where the subscripts i and t represent country and time period, respectively. Given that both variables are logged, the coefficient β is the elasticity of TFP with respect to the stock of FDI per worker (measuring the percentage change in TFP resulting from a 1% change in the stock of FDI per worker).

We include country fixed effects, ci , to control for any country-specific omitted factors that are relatively stable over time (or do not change at all), such as geography (including country size, location, and natural resource endowments), culture, basic institutions (such as the protection of property rights and the rule of law), and initial levels of technology. We also control for unobserved common factors, ft, such as global financial crises, global business cycles, and freely available knowledge via the internet.

TFP (or the Solow residual) is by definition that part of the output that is left unexplained after accounting for the direct contributions of the inputs. Therefore, TFP can be calculated from Eq. (3) as follows:

$$TFP = \frac{Y_{it}}{K_{it}^{1-\alpha_{it}}(L_{it}h_{it})^{\alpha_{it}}} \quad (7)$$

From Eq. (7), it is obvious that we account for human capital as an input in calculating TFP, as has become standard in the growth and development accounting literature. Since our TFP measure accounts for human capital, it is more accurate than the residual from a production function without human capital as an input(Herzer & Donaubauer, 2018).

RESULT

In order to investigate the effect of each variable more closely, the equation is presented as follows.

$$TFP_{it} = F(FDI_{it}, POP_{it}, Credit_{it}, Openness_{it}, h_{it}) \quad (8)$$

In equation (8), TFP is total factor productivity, FDI is the foreign direct investment, POP is population, Credit is domestic credits by private sector by the private sector relative to GDP, Openness is the degree of openness of the economy, and h is the human capital, and i is the number of countries and t shows the study period. In this function, the effect of total factor productivity on independent variables obtained in selected OPEC countries was examined.

The total productivity factor is calculated first, and the calculation formula was stated in the previous section. In order to provide the correct inference of variables, the reliability of these variables should be assured over time. Negligence in this regard might result in false inference and a false regression, since any econometric analysis and estimation, the unit root of the variables of the model is tested, so that if there is a unit root, the con-integration test is used and the falseness of the relationships is examined. In order to test the reliability of the variables, one of the commonly used unit root tests of panel data of Levine, Lane, and Chu panels is used, which the results are summarized in Table (1).

Table 1. Unit root test

Variables	Levine, Lane, and Chu	probability	Level
Y	-3.21	0.001	I(0)
K	-1.36	0.08	I(0)
LH	-1.79	0.03	I(0)

Source: Calculations research

The null hypothesis suggests the presence of unit root in testing the unit root of pool data of Levine, Lane, and Chu. Based on Table 1, it could be stated that null hypothesis is rejected in all variables with a probability of 90%, indicating their stationary and conforming the use of pool data. In order to determine how the factors affect the model used in panel data, various tests are used. The most commonly used test in this regard is Chow test for using the fixed effect model against the POOL model, the Hausman test for using the fixed effect model against the randomized effects model and the LM test for using the randomized effects model against the POOL model. Finally, in this section, the final model was determined using Chow, Breusch-Pagan tests and Hausman test, which their results are presented in Table (2):

Table 2. Test results

test	Cross-section F	probability	result
Chow	148.42	0.001	fixed effect

Breusch Pagan	260.83	0.001	random effect
Hausman	51.45	0.001	fixed effect
final model	fixed effect model		

Source: Calculations research

Based on the results obtained from the Chow test, the null hypothesis is rejected at the 5% level, that is, Pool data is rejected and the opposite hypothesis, that is, fixed effects, is accepted. Based on the results of the Breusch-Pagan test, and considering the probabilities, the null hypothesis, that is, the absence of any effect on the regression or the main equation is rejected at 95%. In other words, the hypothesis of the Pool of the equation versus its randomness is not accepted. The hypothesis test indicates that the random effects are accepted in the equation. Now, given the results of Chow and Breusch-Pagan, Hausman test is needed to decide on the model selection. The results of the Hausman test show that the null hypothesis or the randomness of the effect in the equation is rejected and the opposite hypothesis stating that the effect is fixed is accepted.

Finally, given these three tests, the final model can be determined and given the results, fixed effects model is confirmed. As shown in Table (3), the final estimation of the model was performed in the mentioned equation.

Table 3. Final estimation

Variables	Coefficients	probability
K	0/48	0/00
LH	0/46	0/00
C	6/91	0/00

Source: Calculations research

The effect of independent variables of human capital K, the labour force was significant at 95 percent. High R2 of the model also indicates that 99% of the variations in GDP are explained by the explanatory variables in the model. The results indicate that the independent variables are affected positively and significantly by GDP. Accordingly, by increasing these variables, GDP increases. Given its coefficients, total factor productivity can be calculated, which based on the following formula, total factor productivity is derived from the final equation of this estimation .

LOGY = 6.91832040444 + 0.465169755822*LOGLH + 0.483766499042*LOGK

$$TFP = \frac{Y_{it}}{K_{it}^{1-\alpha_{it}} (L_{it} h_{it})^{\alpha_{it}}}$$

Based on the estimated coefficients of the equation, the total productivity of production factors can be calculated, and then, the effect of the direct foreign investment on the total productivity of production factors in OPEC countries can be investigated. In order to test the reliability of variables, one of the unit root tests used commonly in panel data of Levine, Lane, and the Chu is used, which its results are summarized in Table (4).

Table 4. Unit root test

Variables	Levine, Lane, and Chu	probability	Level
TFP	-1.36	0.08	I(0)
FDI	-2.86	0.001	I(0)
POP	-5.26	0.001	I(0)
h	-2.77	0.001	I(0)
Credit	-7.06	0.001	I(0)
Openness	-1.35	0.08	I(0)

Source: Calculations research

The null hypothesis suggests the presence of unit root in testing the unit root of pool data of Levine, Lane, and Chu. Based on the Table (4), it could be stated that null hypothesis is rejected in all variables with a probability of 90%, indicating their stationary and conforming the use of pool

data. Finally, in this section, the final model can be specified using Chow, Breusch-Pagan and Hausman tests, which their results are presented in Table (5):

Table 5. Test results

test	Cross-section F	probability	result
Chow	166.98	0.001	fixed effect
Breusch-Pagan	337.61	0.001	random effect
Hausman	8.84	0.11	random effect
final model	random effect model		

Source: Calculations research

Based on the results obtained from the Chow test, the null hypothesis is rejected at the 5% level, that is, Pool data is rejected and the opposite hypothesis, that is, fixed effects, is accepted. Based on the results of the Breusch-Pagan test, and considering the probabilities, the null hypothesis, that is, the absence of any effect on the regression or the main equation is rejected at 95%. In other words, the hypothesis of the Pool of the equation versus its randomness is accepted. The hypothesis test indicates that the random effects are accepted in the equation. Now, given the results of Chow and Breusch-Pagan, Hausman test is needed to decide on the model selection. The results of the Hausman test show that the null hypothesis or the randomness of the effect in the equation is not rejected and the opposite hypothesis stating that the effect is fixed is rejected. Finally, given these three tests, the final model can be determined. In this research, heterogeneity of variance and auto-correlation testes are performed. The results of the heterogeneity of variance test and auto-correlation in the equation indicate that there is heterogeneity and auto-correlation at three levels of 99, 95 and 90 %, which should be resolved. After solving the heterogeneity of variance and auto-correlation problem through STATA13 software, the final results of the estimation can be determined.

Table 6. Final Results

Variables	Coefficients	probability
FDI	7/240	0/05
POP	0/005	0/00
h	0/034	0/00
Credit	0/008	0/00
Openness	-0/012	0/00
C	2/633	0/00
R^2	0/51	

Source: Calculations research

As shown in Table (6), this equation states that the effect of independent variables of foreign direct investment, population logarithm, human capital logarithm, domestic credits logarithm by the private sector relative to GDP, economy openness logarithm, and human capital logarithm on the dependent variable of total productivity of production factor at 95% level, which this effect is significant. R^2 of the above model also indicates that 51% of the variations in total productivity of production factor are explained by the explanatory variables in the model. The results indicate that the variables of population, foreign direct investment, capital investment, and domestic credits by the private sector are affected positively and significantly by the total productivity of production factors. Accordingly, by increasing these variables, total productivity of production factors increases.

However, the degree of openness of the economy has a negative and significant effect on the total productivity of the production factors. Additionally, given the final results of estimating the final model, the variable of direct foreign investment among the independent variables has had a

greater impact on the total productivity of production factors. Finally, the long-term effect of the foreign direct investment on total productivity of production factors in OPEC countries is examined. Based on this estimation, by performing the Kao co-integration test, long-term effects of total productivity of production factors and foreign direct investment in selected OPEC countries are determined. In this research, the method presented by Kao (1999) is used to examine co-integration in the model. This test is performed using the unit root tests DF and ADF. In these statistics, the null hypothesis states the lack of co-integration and the opposite hypothesis suggests the co-integration among the variables of the model. The results of the Kao co-integration test using ADF statistic for the estimation model are shown in Table (7).

Table 7. Kao co-integration test

Kao co-integration test		
result	probability	ADF
The null hypothesis is rejected in the model.	0/01	-2/32

Source: Calculations research

The table results show that the null hypothesis is rejected at 95% confidence level for the model; and therefore, there is a co-integration approach in the model according to Kao statistics, or, in other words, a long-term relationship is confirmed.

CONCLUSION

The effect of the long-term foreign direct investment on total factor productivity in OPEC countries has been investigated through this study. Nowadays, the importance of productivity as one of the necessities of economic development in all developed or developing countries and obtaining competitive superiority in international arena are emphasized, since competition in the current world on global scenes takes other measures and taking efforts to achieve higher levels of productivity is one of the main foundations of these competitions. Thus, most developing countries have made significant investments in this field in order to promote the attitude of utilization and generalization of the use of techniques and methods for improving them. A wide range of productivity has also been found among the countries that have achieved rapid economic progress in recent decades, so that it may be argued that the basis of their economic and technological development is according to the consideration of the issue of productivity and its distribution and dissemination at all levels and classes of society.

Promotion of productivity affects the main economic, social and political phenomena of communities, such as lowering inflation, increasing the level of public welfare, increasing employment rate and increasing the competitiveness of the economy. One of the important factors in the country's economic growth and development is the provision of sufficient capital to finance investment. As a result, developing countries have attempted to focus on the capital concentration through domestic resources and/or completed by foreign capital. Historically, foreign capital has played an important role in the development process of many countries. Considering the importance of the subject and the mentioned materials, the research results indicate that variables including population, foreign direct investment, human capital, internal credits by the private sector will be affected by the total productivity variable of the production factors positively and significantly. The total factor productivity is increased by increasing these variables. Human capital has a positive and significant relationship with the productivity that Aknilo's study in 2006 also emphasizes on the validity of this issue, and there is a positive and significant relationship between the variable of direct foreign investment and the total productivity of the production factors. It can be stated that foreign direct investment and the entry of foreign firms may increase productivity by creating competition and giving incentives to domestic firms, as well as training

skilled labors for domestic firms. According to the final results of estimating the final model, the variable of direct foreign investment among independent variables has a greater impact on total productivity. An increase in domestic credit by the private sector will increase productivity, as it is emphasized in the international economic and development literature. Since it improves the country's economic growth and development and, on the other hand, can increase foreign direct investment. But the degree of economic openness has a negative and significant effect on the total factor productivity. As well as, according to Cao statistic, there is a co-integration in the model, or, in other words, the presence of a long-term relation is approved. According to the research results, the following suggestions are recommended:

- Given the high impact of human asset on increasing productivity, creating incentives and appropriate conditions for raising the level of skills of the workforce, as well as improving quality of the training provided to the workforce and developing knowledge-based occupations are advised in order to optimize the use of graduates from various fields in activities related to their specialty.
- Since FDI not only is a source of capital, but also is a source of new technology transfer, management and organization skills, and marketing networks, it is important to provide an appropriate foundation for attracting FDI. In this regard, developing financial markets, active, constructive and effective interaction with the world, improving infrastructure and reforming institutions function can be considered to encourage production and investment.

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