

## **THE EFFECT OF TRANSPORTATION INFRASTRUCTURE ON FOREIGN DIRECT INVESTMENT ATTRACTION IN IRAN**

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### **—Abstract —**

Weak transportation infrastructure in developing countries, e.g. Iran, presents a big obstacle to foreign direct investment attraction. One way of increasing the flow of foreign direct investment into a country is decreasing the production costs through expanding facilities as well as employing higher technology level. Thus, transportation cost usually is high in these countries and industries are often concentrated in regions with more improved transportation system. The present study aimed to investigate the effect of transportation infrastructure in Iran on foreign direct investment attraction. Hence, the researchers employed Johansen Juselius econometrics method to quantify the short run and long run effect of transportation infrastructure, trade intensity, and market size on foreign direct investment attraction during 1974- 2007. The results emerging from the present study indicated that transportation infrastructure did not affect foreign direct investment attraction in short run, but in long run, it had positive and significant effect on foreign direct investment attraction.

**Keywords:** *Transportation infrastructure, Foreign Direct Investment, Iran.*

**JEL Classification:** H54, F21, 053.

### **1. INTRODUCTION**

Capital is considered as an engine for economic growth and development (Geert and Campbell, 2007:3). However, it has usually been scarce in developing countries. Recently, these countries have asked for foreign loans to provide their

capital deficiency. Yet, their loan default resulted in difficulties and crises, thus instead of foreign loans to compensate their capital deficiency and in order to benefit from an instrument to achieve their economic growth goal, they utilized FDI<sup>1</sup> (Kanaani, 1999:103). There are several causes for foreign investment attraction such as economic policy, economic structure, encouraging, supporting and, political factors. More powerful economic structure and infrastructure of a country causes foreign investors tend to invest more directly in that country. Among the main structural factors of an economy which directly affect foreign investment attraction are market extent, infrastructure installations, expert laborers, development of human resources and, extensive information network. In other words, existence of more expanded economical infrastructure such as roads, harbors, telecommunication systems along with a powerful information network which provides exact and up to date information for investors, will strengthen incentives for capital entry. Weak transportation infrastructure and non-efficient services directly increase cost and time goods reach their destination. Transportation sector as a prerequisite and foundation of development has an effective role in the productive capabilities and talents in communities. It makes unbreakable links between various factors of growth and development through movement of cargo and passengers and brings about faster and broader relations among different economic, social and cultural sectors of countries. Thus, transportation reveals its role and importance as one of the most effective indices of growth and development. Optimum use of this sector's capacity and policies to increase efficiency are highly important. The impact of transportation on a county's spatial structure and body results in concentration or decentralization of economic activities in different regions and consequently, causes to the growth of nearby regions or stagnation of remote areas (Rezaee Arjroudi, Tasbihi, 2007:125-136).

In this study after a brief introduction and review of concepts, theoretical and experimental studies on the impact of transport infrastructure on FDI are presented. Then, the model is estimated and at last, according to obtained experimental results the proposed policy is provided.

### **1.1. Foreign Direct Investment (FDI):**

FDI is an economic activity by which foreign investors build manufacturing enterprises in the host countries. Countries usually attempt to take necessary measures to attract FDI in order to finance foreign exchange resources,

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<sup>1</sup> . Foreign Direct Investment

compensate their lack of national savings and also access technology and technical knowledge.

Developing countries, because of their special circumstances, usually have limited use of technology. And, due to their old technologies, performance of firms is relatively low. Even if part of productivity gap is compensated with lower wage, technological deficiency will affect the quality of products and will reduce their ability to meet new market needs. These countries' access to modern technologies and increase in their efficiency is possible through FDI. Using indigenous technology and expansion of research and development activities will increase overflow effects of FDI. Thus, FDI in addition to financing fulfills other purposes too (Dargahee, 2006:78).

## **1.2. Transportation infrastructure**

Transportation is an activity usually involved in movement of people and goods. Three important effects of transportation in human's economic life as specialization in production areas, mass production, and extension of men's living areas reveal economic importance of transportation (Hooshmand et al, 2006:127). Human being, by specializing in production areas in terms of comparative advantages of places and by establishing a basis for mass production, increase productivity of natural resources of the economy. Thus, transportation and its expansion result in a rise of human's living utility whereas, in terms of climatic conditions against various hazards, he selects a suitable place to live in (Mahmoodi, 2010: 353).

## **1.3. Research literature**

A large part of effective factors on economic development: division of labor; specializing in production areas; mechanization of market development; linking production to consumption areas; optimization of plants, via reduction in production costs and making additional capacity, are related to transportation (Rokneddin Eftekhari, 1992:54). Economic benefits of transport development are spread from building transport network infrastructure such as construction of roads; railways; tracklayers; airports, waterfronts; ancillary equipments and complementary installations toward exploiting infrastructure network in industrial development, construction of industrial centers, establishment of production centers, development of transport, garage services, development of transport facilities, facilitate the choice of the farmer, industrial and services locations, decrease in production costs, utilization of funds and distribution of economic activities.

Absence of roads in a region might limit goods production to that region's consumption. Therefore, despite its natural and geographical superiority, it would not be possible to produce commodities more than its market demand capacity it implies that in a closed economy there would be no possibility for growth and development (Sassan, 1985:13).

Regarding the importance of transportation network expansion and its role on an economy, effective investment in this sector is important. Investment in transportation facilities development leaves a trail of mutual impressibility of usefulness of labor and increases capital efficiency (Mahmoodi, 2010:355). Thus, convenient investments in transportation sector alleviate time and reduce costs and decrease the effect of frictional distance on spatial distribution of economic activities. In transportation investment path, merging market areas, space limitations reduce production areas to possible extent. This raises number of buyers and sellers in border market areas (Rahimi Boroujerdi, setoudeh mollashahi, 2007:68).

Researchers as Wheeler and Mody (1992:63), Loree and Guisinger (1995:290), Richaud (1999:6), Morisset (2000:14), Asiedu (2002:112) and Sekkat (2004:8) emphasized the role of transportation infrastructure in FDI. They believed that strong infrastructures cause decline in transportation costs and create a motive for regional and multinational companies' entry and is accompanied by foreign investment attraction. Weak infrastructure increases companies' costs and results in foreign investment decrease. Inadequate transportation or use of defective equipments due to communicational problems represents the loss of loyalties for companies. Therefore, for high transportation costs they will not select that area for business. Thus, the infrastructure should provide investment climate for foreign investors. In order to attract FDI, access to structures such as roads, highways, ports and communication networks in terms of production should be increased. Wei (2000:7) believes that position with a strong infrastructure is very attractive than elsewhere. Khadaroo and Seetanah (2010:106) studied the effect of transportation infrastructures on FDI, by ARDL method, for Mauritius Island, during 1960-2004. They also, investigated the same research for 20 African countries, by panel data method, during 1986- 2000 and both resulted in positive and significant effect of transportation infrastructures on FDI.

## **2. Model specification**

In this study it is assumed that FDI is a function of variables as transport infrastructures, market size and openness of the economy. Transportation infrastructure causes to decline in inputs prices and therefore decreases production costs and also increases access to markets, variation of outputs and provides tools

for sector development and finally encourages motives for FDI entry. Market size in comparative economy is one of the factors affecting FDI attraction. So that economies with greater scale provide better condition for foreign investors. There are three essential points in attracting FDI, in relation to market size. First, domestic and non-traded sector, particularly, service sector oriented market size is highly effective in FDI attraction. Second, FDI attraction in an export oriented country has a special importance and third, a large measure economy not only supports economic activities but also, provides more opportunities for economic diversification in production. In this study, nominal GDP is as an index used for market sizes. Degree of economic openness which represents the country's trade volume with other countries is determined by total of exports and imports to GDP ratio. Open economy, with respect to external imbalances, is less brittle than a closed economy. Given the above discussed issues the function is as follows:

$$LFDI = F(LKT, LGDP, LOPEN)$$

LFDI, logarithm of FDI

LKT, logarithm of capital stock in transportation sector

LGDP, logarithm of nominal GDP (market size index) and

LOPEN, logarithm of openness degree of economy

To estimate the model, capital stock in transportation sector, gross domestic product and openness degree of the economy (export and import) data are extracted from the most recent information and time series data of national accounts of central bank of Iran and FDI data is extracted from world bank data and statistics compact disc (WDI, 2008)<sup>2</sup>.

### **2.1. Unit root test**

In cointegration analysis statistical features of variables are very important. In fact, cointegration tests examine consistency of statistical feature of equation with theory. Economic variables are usually non-stationary. But cointegration is an exception to this principle and has close relation with economic theories. In this section, by Eviews6 software Augmented Dickey Fuller test (ADF) is used to examine stationarity of variables. On this basis, all variables became stationary by first order difference. In other words above variables are augmented of first order (table 1). Moreover, cointegration Johansen Juselius test is used to estimate the model.

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<sup>2</sup> . World Development Indicators (2008)

Table1- studied variables stationarity in the model

Variable	ADF statistics		Variable	ADF statistics	
	Level	First difference		Level	First difference
LFDI	-2.88	-5.12	LGDP	-0.13	-3.32
LKT	-1.36	-3.60	LOPEN	-1.97	-5.05

Source: research findings. Critical values of ADF statistics in 1,5,10 percent levels are respectively 4.26,-3.55, - 3.21

### 2.2. Optimum lag specification

Before estimating the model, lag length in the model should be specified to assure that error terms have classic characteristics i.e. they do not have serial correlation, are distributed normally with mean zero and variance  $\delta^2$  and are independently distributed. So, according to Schwarz statistics, vector auto-regression lag is selected to be one.

### 2.3. Johansen- Juselius cointegration test and long run results

In this method, first, existence of cointegration and long run equilibrium relation(s) should be defined by maximum Eugene value and matrix trace statistics tests. According to maximum Eugene value test (table 2), and matrix trace statistics test (table 3), a long run cointegration vector is attained.

Table 2: defining number of cointegration vectors according to Maximum Eugene Value Test

Critical value in 95% confidence interval	Test statistics ( $\lambda_{max}$ )	H <sub>1</sub>	H <sub>0</sub>
30.82	32.25	R =1	r =0
24.25	14.07	R=2	r ≤ 1

Source: research findings

Table 3: defining number of cointegration vectors according to matrix trace statistics test

Critical value in 95% confidence interval	Test statistics $\lambda_{trace}$	H <sub>1</sub>	H <sub>0</sub>
55.25	58.49	r ≥ 1	r =0
35.01	26.24	r ≥ 2	r ≤ 1

Source: research findings

Since this paper studied the effect of capital stock in transportation sector, gross domestic product, openness degree of trade on foreign direct investment thus normalizing cointegration vector was performed according to dependent variable, foreign direct investment. Normalized vector was as follows:

$$\text{LFDI} = 2.22 \text{ LKT} + 3.61 \text{ LGDP} + 4.12 \text{ LOPEN}$$

(2.40)            (4.27)            (4.42)

Numbers in the parenthesis indicate t statistics. Results of estimation are completely consistent with economic theories and topics presented in the previous sections. According to the obtained results, the effect of capital stock in transportation sector on FDI was positive and significant at 99% confidence interval. The capital stock coefficient in transportation sector was equal to 2.22 indicated that 1% increase in capital stock resulted in 2.22% rise in FDI. Nominal GDP had a positive and significant effect on FDI and showed that 1% increase in nominal GDP raised FDI by 3.61%. The effect of openness degree of economy on FDI was positive and significant, so that its coefficient was equal to 4.12 which, among other variables, had the greatest impact on FDI.

#### 2.4. Error correction model and short run results

Vector error correction method defines causality among variables and also separates short run from long run causalities. Wald test indicates causality among descriptive and dependent variables. On the other hand, since vector error correction contains long run information, t statistics reveals long run causality relations among descriptive and dependent variables, via significant error correction coefficient. Walt test on coefficients was used to investigate short run causality. The results are presented in table 4.

According to the obtained results in table 4, there were no short run causality relations among capital stock in transportation sector, GDP, openness degree of economy and FDI.

Table 4: the short run causality results of Walt test

Dependent	Independent	Wald test statistics	P-value	Results
LFDI	LKT	0.66	0.42	No causality relation
	LGDP	0.08	0.78	No causality relation
	LOPEN	0.02	0.88	No causality relation

Source: research findings

Based on the short run results, coefficient of VECM (-1) in equation is - 0.68, which indicates that from time  $t$  to  $t+1$ , 68% standard deviation of FDI from its long run path is modified by the model variables and is moved toward its long run equilibrium. It implies that to achieve long run equilibrium, in each period 68% of short run imbalances are adjusted or it takes about a year and five months for short term imbalances to be resolved.

### 3. CONCLUSION

In this study to investigate the effect of transportation infrastructures on FDI in Iran during 1974-2007, two modern time series econometrics approaches were used: cointegration method to estimate long run and error correction model to estimate short run relations. As a result of data analysis, there was positive and significant effect of transportation infrastructures index on FDI in long run, which implied that a 1% increase in capital stock in transportation infrastructure caused to 2.22% rise in FDI. In short run analysis causality among variables from short to long term was jointly observed. And Wald test results indicated that in short run, there were no causality relations among capital stock in transportation sector, GDP, openness degree of economy and FDI.

According to the positive and significant effect of transportation infrastructures on FDI and considering that capital stock in transportation sector attracts foreign investors, it would be convenient to consider transportation infrastructures in Iran and also, regarding developmental ways in transportation sector, to survey middle and long run programs. In this manner, government, in order to decrease costs in the budget, should grant concessions to developmental and other international infrastructural loans.

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