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THE DETERMINANTS OF FDI IN TUNISIA: AN EMPIRICAL STUDY THROUGH A GRAVITY MODEL

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ABSTRACT

In order to analyze the determinants of FDI, several empirical studies have been done by applying different econometric models. The purpose of this article is to identify the determinants of FDI in Tunisia through a gravity model. The results of the econometric estimation show that the main factors of attractiveness in Tunisia in the period between 1980 and 2013 are: the importance of the size of the host country market, trade openness, good infrastructure, geographic proximity, political stability and skilled human capital.

Keywords: Attractiveness of the area, FDI determinants, Tunisia, Gravity model, Tunisian economy, Factors of attractiveness.

JEL Classification: C32, F21.

Contribution/ Originality

This study contributes to provide the main factors of attractiveness in Tunisia by estimating an econometric model of gravity that identifies the determinants of FDI in this country.

1. INTRODUCTION

The attractiveness of territories to FDI is a major challenge for economic policy in most countries for the many positive effects of this type of investment. Indeed, foreign investment appears today as a key factor of development and economic growth of host countries. Moreover, most countries consider that FDI are sources of funding, contribute to the formation of human capital, facilitate integration in international trade and improve environmental and social conditions in host countries. To ensure all these beneficial effects of FDI, the government of the host country

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must prepare an enabling environment for IDE settlements and must have the ability to attract foreign investors to ensure their facilities and to capture their benefits.

By retaining the case of Tunisia, we find that the Tunisian economy is concentrated on FDI flows to ensure technology transfer and absorb the problem of unemployment. Thus, Tunisia is committed in the way of gradual integration into the global economic processes in order to be an attractive country for foreign investors. So attracting FDI has become a primary objective of the Tunisian government because of the positive effects of FDI on the host country. However, we note that FDI flows to Tunisia still disappointing compared to the flows observed to other emerging regions. Hence, we found the interest of a reflection on the determinants of FDI in Tunisia especially in a new context in full mutation. Thus, in this article we present a review of the literature on gravity models that clarify the different determinants of FDI. Then we are interested to present the estimate of our econometric model.

2. A LITERATURE REVIEW ON GRAVITY MODELS

In order to analyze the determinants of FDI, several empirical studies have been done by applying different econometric models. Among these models include the gravity model used to identify key factors in the establishment of foreign companies in the host country. Thus, in the literature, several studies have used the gravity model as a useful way to estimate the determinants of the location of FDI. Among the first studies that created the gravity model are the studies of Tinbergen (1962). The equation for these studies is shown as follows:

$$F_{ij} = G\frac{M_i^{\alpha} M_j^{\beta}}{D_{ij}^{\theta}}$$

F_{ij} : the flow of country i to host country j. This flow is measured by cash flow,

M_i : the GDP of country i,

M_j : the GDP of country j,

D_{ij} : it is the distance between countries,

The working of Linnemann (1966) extended the theoretical basis of this model by analyzing trade flows of a country "i" to country "j". These trade flows are depending on the supply potential of the country "i" of the potential demand of the country "j" and resistance. For the flow of trade between the country "i" and the country "j", it is noted that X_{ij} as mentioned export flows. So the author proposed the hypothesis of the elasticity consistency of the amount of trade based on supply and potential demand:

$$X_{ij} = \beta_0 \frac{(E_i^p)^{\beta_1} (M_j^p)^{\beta_2}}{(R_{ij})^{\beta_3}}$$

X_{ij} : the export flow

(E_i^p) : the supply potential of the country "i"

(M_j^p) : the potential demand of the country "j",

(R_{ij}) : the resistance

Linnemann (1966) has replaced the three explanatory factors in the gravity equation by other variables which are: national income, population, geographical distance and the existence of a preferential trade agreement. So the basic model of international trade became as follows:

$$X_{ij} = \beta_1 Y_i \beta_2 Y_j \beta_3 P_{ij} / \beta_4 N_i \beta_5 N_j \beta_6 D_{ij}$$

X : trade flow,
Y : gross national product,
P : preferential exchange factor,
N : the population size,
D : geographical distance,

But the weakness of the theoretical basis of this model has brought many economists to assess this model by using other models that introduce other variables. For example, the studies of Anderson (1979) developed the theoretical foundations of the gravity model by generalizing the equation of this model while relying on the theory of international trade of Heckscher-Ohlin. In fact, the model essentially says that countries will export products that use their abundant and cheap factors of production and import products that use the countries' scarce factors. From this theory, Anderson deduces the gravity equation from a linear expenditure system.

In addition, the studies of Bergstrand (1985; 1989) improve the model of Linnemann (1966) and developed the theoretical foundations of the gravity equation. This author conducted a general equilibrium model of world trade based on maximizing the utility of consumer and profit of individuals. This model related the trade flows of an exporting country i to an importing country j to the available resources of both countries and transportation costs between these countries. In addition, the author introduces the variables of price, exchange rates, capital and work factor endowments and income per capita. Then Josselin and Nicot (2003) based on the work of Bergstrand and used the same hypothesis of the same function of production of both countries. These authors have integrated the FDI in their generalized equation which is considered an extension of the theoretical model of Bergstrand.

To explain the flow of FDI, several other studies have introduced the variable of FDI flows in their gravity models. These works are those of Eaton and Tarnura (1994). The gravity models in these studies explained the flow of FDI by the importance of economic size for the host country. Concerning the variable of the distance, it should have a negative effect because the remoteness constitutes barriers to FDI.

Finally it may be noted that the model of Gao (2003) is considered the best tool for estimating the determinants of FDI implantation. So this model was developed to identify the determining variables of the location of foreign companies in the host country. Thus, the classical form of the gravity model is presented as follows:

$$Y_{ij} = \mu + \sum_{k=1}^{K} X_{ij}^{k} \beta_k + U_{ij}$$

μ : A constant,

i : The host country,

j : The country of origin

Y_{ij} : The flow of trade or investment from the country of origin "j" to the host country "i".

X_{ij}^{k} : The explanatory variables of the dependent variable Y_{ij}, k = 1…..K

U_{ij} : The model error

$$U_{ij} = v_i + \lambda_j + \varepsilon_{ij}$$

v_i : The unobservable individual effect specific to the host country

λ_j : The unobservable individual effect specific to the country of origin;

ε_{ij} : The random part of the model;

Finally, to provide empirical validation of the many theoretical models and to identify the main determinants of FDI, Ferrara and Henriot (2004) applied the gravity model. The use of this model was necessary for these economists to assess the performance of OECD countries in terms of attractiveness for foreign investors.

3. AN EMPIRICAL STUDY OF THE DETERMINANTS OF FDI IN TUNISIA

After presenting the different empirical models of gravity and having a clear idea about the variables of these models, we will try to make an econometric model of gravity to identify the main

determinants of FDI in Tunisia. So, with reference to the different models Alaya (2008); Anderson (1979); Anderson and Wincoop (2001) the basic model can be presented as follows:

(1)

$$FDI_{ij} = f(X_i, X_j, L_{ij})$$

FDI_{ij}: FDI flows between countries i and j

X_i : The variables of the country of origin

X_j : The variables of the host country

L_{ij} : The bind variables

The linear form of equation (1) is as follows:

(2)

$$FDI_{ij} = \alpha_0 + \alpha_1 X_i + \alpha_2 X_j + \alpha_3 L_{ij}$$

In this work we will study the determinants of FDI flows in countries of origin to a single host country, so the equation can be written as follows:

(3)

$$FDI_{\bullet j} = \sum_{i=1}^{I} (\alpha_0 + \alpha_1 X_i + \alpha_2 X_j + \alpha_3 L_{ij})$$

Substituting (2) into (3) we find the following expression:

$$FDI_{\bullet j} = I\alpha_0 + \alpha_1 \sum_{i=1}^{I} X_i + I\alpha_2 X_j + \alpha_3 \sum_{i=1}^{I} L_{ij}$$

(4)

$$FDI_{\bullet j} = I\alpha_0 + \alpha_1 X_\bullet + I\alpha_2 X_j + \alpha_3 L_{\bullet j}$$

The variable X_i defined the characteristics of the country of origin so we can assume that this variable is independent of the characteristics of the host country. So $X_\bullet$ is a constant for the host country. In this case, we can write equation (4) in this way:

$$FDI_{\bullet j} = \theta_0 + \theta_2 X_j + \theta_3 L_{\bullet j}$$

$\theta_0 : I\alpha_0 + \alpha_1 X_\bullet$

$\theta_2 : I\alpha_2$

$\theta_3 : \alpha_3$

In this case and according to this equation we can consider that the flow of FDI to the host country j depends on the variables of the host country and bind variables.

Many empirical studies on the determinants of FDI identified the attractive factors for FDI, for example: infrastructure, market size (gross domestic product, population), the political and economic stability, natural resources, human capital, the costs of transport, opening rates, inflation, the exchange rate... On this basis, we will enrich the model by adding other variables such as: infrastructure, natural resources, political stability, human capital endowment, the annual rate of inflation.

3.1. Description of the Different Variables

FDI : is the flow of foreign direct investment;
GDP: is the Gross domestic product;
OpenRt : is the opening rates;
Pop : is the total population of Tunisia;
REM : is the remoteness which is the variable of the weighted distance to take account of the geographical position of the host country (Tunisia) from the rest of the world;
ExgRt: is the real exchange rate;
Infr: is the infrastructure;
HK: is the variable of the human capital;
InflRt: is the inflation rate;
Nr: is the natural resource available in Tunisia;
StabP: is the political stability;

3.2. Data

The data were provided by various sources. The Central Bank of Tunisia (BCT) and the World Bank are among the most important sources used in this study. These allow us to acquire data concerning the variables of Gross domestic product of Tunisia, population, exchange rate and inflation rate, human capital, infrastructure, natural resources. Then on the data on the variable of FDI's flow in Tunisia, they were collected from the data of the "FIPA-Tunisia". For the variable opening rate, we crossed two sources of statistical data; data for exports and imports have been derived from the CHELEM database. Finally, as regards the data of the variable distance used to calculate the variable of the remoteness, they were collected from the CEPII database.

3.3. Empirical Results

In the present model, it has a series of observations over time (between 1980 and 2013) for a single country which is Tunisia. So, we are facing a time series. The purpose of this series is not only to link these variables but also to focus on the dynamics of a set of variables. Before making the regression using the software Eviews7.0, it is essential to perform the stationarity tests of this time series using the unit root test of Dickey-Fuller Augmented (Augmented Dickey Fuller test statistic) (ADF). Indeed, the purpose of the stationary is relatively stable initial process which is not stationary in order to avoid the risk of spurious regression and loss of information. The stationary series can be judged either from the comparison of the ADF statistics values and Mackinnon Critical Value or from the test of the significance of the statistical values of ADF and their probability. In this case, we've tested the stationarity of variables and determined the order of integration using the first method, that is to say, the method of comparing statistical values and critical values. So, we have tested the null hypothesis of the presence of a unit root, that is to say the non-stationary of the series against the alternative hypothesis of stationarity.

H_0: the presence of unit root (non-stationarity of the series)

H_1: absence of unit root (stationarity of the series)

The null hypothesis is accepted when the values of t-statistic of Dickey-Fuller Augmented are greater than the critical value. Therefore, it is a case of the presence of unit root, which confirms the non-stationarity of the series. While in the case where the values of t-statistics of Dickey-Fuller Augmented are lower than the critical value of Mckinnon, the null hypothesis is rejected and we accept in this case the hypothesis of the absence of unit root (the stationarity of the series).

After confirming the stationarity of the series, we will present the statistical and economic validation of this model through the empirical results from the Eviews 7.0 software:

Table-1. Estimation results

Variables	Estimation
Gdp	3,17 (2,13)**
Pop	15,89 (2,00)**
OpenRt	7,33 (3,41)***
ExgRt	12,88 (0,75)
InflRt	-9,23 (-1,18)
REM	-12,71 (-2,76)***
Nr	-0,53 (-0,96)
Infr	4,66 (1,86)*
StabP	13,78 (1,90)*
HK	0,68 (2,01)**
Constant	8,08 (1,02)
R-squared	0,79
Durbin Watson	1,92
F-statistic	7,87***

Source: Author calculations,

*,**,*** significant at 10%, 5%, 1% level.

( ) : t-statistic

According to the empirical results, most variables of this model are significant. It can be observed that the variables reflecting the size of the market which are measured by GDP and population are significant at 5% and have a positive sign. This positive effect is expected as the importance of market size reflected an important potential for Tunisia to attract foreign investors. This can confirm that the variable market size is integrated in the decision of the foreign investor to settle in the host country.

Likewise, the human capital variable is significant at 5% and has a positive sign. This result is expected because the investors give great importance to the quality of the workforce in their location decisions. So we can confirm that the quality of human capital of Tunisia positively influences the choice of foreign investors to establish in this territory.

Note that the variable opening rate is significant at 1% and has a positive sign. This result is expected since FDI are attracted by a high degree of openness of the host country. For this, it is appropriate that the host country is open to international trade to facilitate the FDI implantation in its territory.

Also, the coefficient of the variable distance is significant at 1% and negative, which confirms our expectations. Indeed, the geographical position of the host country counts in the decision of the foreign investor because this factor is considered very important for FDI. So if the country of origin is close to the host country this will result a reduction in the cost of transport, which encourages foreign investors to locate there. So the factor of geographical proximity counts a lot in the decision of foreign investors.

For infrastructure variable is significant at 10% and has a positive sign which confirms our expectations. This is explained by the fact that the infrastructure is of good quality, the transaction costs will go down, which encourages foreign investors to locate in the host country. So we can conclude that the quality of infrastructure in Tunisia positively influences the decision of foreign companies.

Similarly, the variable of political stability has a positive and significant sign at 10%. This result is not expected reflecting the selected period which is composed of the two periods; the first period between 1980 and 2010 is characterized by stability and prosperity of Tunisia and a second period of instability for the last three years. The result can be explained by the reduced number of years of instability compared to the interesting number of years of prosperity which allowed having a positive and significant sign of this variable.

The relationship between the variable of natural resources and the FDI variable is not significant and negative at the same time. So even if Tunisia has natural resources, they are not decisive in the decision of foreign investors.

Regarding monetary variables of the inflation rate and the exchange rate have the expected sign but are not significant. This fact, there is not a complementary relationship between these variables and the dependent variable.

Finally, the main factors of attractiveness of Tunisia for FDI in the period between 1980 and 2013 can be identified and are as follows: GDP and population of Tunisia, trade openness, infrastructure, geographical proximity, political stability and human capital.

4. CONCLUSION

The Tunisian government has invested all its effort to guarantee an attractive country for FDI. For the purpose of appreciating the attractiveness, we estimated a gravity model in order to identify the different determinants of FDI in Tunisia. Thus, we have shown that this country has several attractive factors that allow it to be a favorable destination for foreign investors. These factors are identified in this study as follows: the importance of the size of the host country market, trade openness, good infrastructure, geographic proximity, political stability and skilled human capital.

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