CAUSAL RELATIONSHIPS BETWEEN TRANSPORTS, TERRITORIAL MANAGEMENT AND FOREIGN DIRECT INVESTMENT: FRESH EVIDENCE FOR THE DEVELOPING COUNTRIES

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Abstract
Among the traditional determinants, transport infrastructures affect directly and significantly the territorial attractiveness of the foreign direct investment in the host countries. The increasing importance of this new determinant is essentially due to the great causal relationship with several other factors such as the territorial management in the host country. The aim of the present paper is to evaluate the importance of transport infrastructures to develop the territorial attractiveness of the developing countries to the multinational firms through their contribution to developing the territorial management and to enhance the quality of the private investment conditions. To do this, we have used a panel data model for 27 developing countries over the period between 1990 and 2014. The results prove that the transport infrastructures affect positively and significantly the territorial attractiveness by the positive influence on the territorial management. Also, the results indicate that the impact of these infrastructures on the territorial management, subsequently on the FDI attractiveness, becomes more important in presence of a good logistics function.
Keywords: Territorial management, Territorial attractiveness, Foreign direct investment, Transport infrastructures, Logistics function.

1. INTRODUCTION

In the last few years, the transports occupy a great place in public decisions for the development of urban areas. Therefore, the transportation exerts a horizontal influence on the entire production system. It is a structuring factor of the space of large modern cities influencing the location of businesses and stimulating the growth of trades. In addition, the transports' effects may be negative as the nuisances caused by the system (air pollution, phonic pollution, deterioration of the urban landscape, etc.) or

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positive like the changes that the transport system can make to the urbanization and territory development.

Some transport systems have promoted the dispersion of people and activities, other have accelerated their concentration. Also, it is a key factor of territorial management which determinates significantly the dispersion of different activities. In a given area, transports occupy an important place in the pulse process and the spread of development. The opposite is also true; where there is an activity or interest, we must develop the public transport to make the area more accessible. More specifically, into economic activities relocation and firms' Internationalization, the quality of the territorial management has a great importance. For this reason, Brainard (1997) finds that the capacity of the physical infrastructures of transport (airports, roads, public transport, etc.) in a host country is inherent factor in the decision-making process of delocalization of multinational corporations.

In the present work, we try to demonstrate that the transport infrastructures may stimulate significantly the entry of the multinational firms if they contribute effectively in the territorial management in the host country. In the beginning, we have a theoretical study of the relationship between transports, territorial management and the territorial attractiveness of the foreign direct investments. Then, we present the empirical study in which we present the econometrical model, the research methodology and the findings and conclusions.

2. LITERATURE REVIEW

Stilwell and Birkin, (2008) argued that the transport systems influence the spatial analysis also the urban and regional planning which allows the determination of economic characteristics of countries. Maguire et al., (2005); Wilson and Fotheringham (2008) say that any project in the space structuring leads directly to a change in the flows of transport of people and goods. These in turn are mandatory synchronized with corresponding variations in the capacity of existing and future transport infrastructures. For the urban management, a development strategy requires, necessary, a planning policy for transport infrastructures to organize and locate economic activities in space, from which the importance of spatial analysis. Indeed, developers need to know how driving a spatial planning strategy based on the characteristics of its environment, type of activities to exercise and to all transport actions. So transport infrastructures can restructure the physical and economic space of cities.

For the regional balance in a particular country, a good management of transport systems contributes effectively to the creation of certain equilibrium between regions. Indeed, rural regions, which are now well served by transport, play a more important role in the national economic development. They are

more integrated in the production and marketing cycles, which results a higher attractiveness for investors. Also, the transport infrastructure promotes the market openness, the regional integration and the construction of expanded markets. Also, they provide solutions to implement the policies of concentration or spatial redevelopment of the national economy.

Large literature investigates the impact of transport on the territorial management and evaluates its role in the dispersion of economic activities in the spae. Krugman (1991), among others, offers his center-periphery model with which he analyzes the localization and the geographical concentration of American industrial activities in the period of the second half of the twentieth century. Catin and Ghio (1999), based on new assumptions, they improve the initial model of Krugman which gave a starting point for several other works. Remaining within the framework of regional distribution in comparative statics, Krugman and Venables (1995, 1996) have incorporated in their model the availability of intermediate goods and inter-sectoral training effects. Martin and Rogers (1995) have addressed the role of infrastructures and public capital and found that both factors influence positively the concentration of activities on areas more than others. Also, in their localization projects, firms consider the availability and quality of transport infrastructures. Indeed, an urban center with an efficient transport system and a fine administrative and commercial structure can exert a stronger attraction on firms.

The capacity and quality of transport infrastructures especially those that provide international transport affect the functioning of multinationals and domestic firms. Erenberg (1993) speaks about the influence of transport infrastructure on the work of firms. He also believes that if the State does not provide these types of infrastructures, the domestic private sector and multinational companies operate less efficiently, and every attempt on their part to provide their own networks would lead to duplication and waste of resources. In addition, Zhou et al. (2002) explain that the transport infrastructure is directly related to the nature of production, which requires the availability of roads, railways, ports and other installations for purposes of operational efficiency. In the same vein, several empirical researches suggest that public infrastructure has a significant impact on productivity and costs in the private companies (Aschauer, 1989; Nadiri and Mamuneas, 1994; Morrison and Schwartz, 1996; Haughwout, 2001).

For the MNC, transport is not a secondary factor; it gets a direct influence on production costs by becoming a determinant of competitive power of enterprises. Today, these companies know well that a good management of their transport systems, internal and external, can improve the mobility of their stocks and management of their products in space and in time. Indeed, the reduction of wasted time and the minimizing of supply and delivery deadlines are possible if the infrastructures are successful and managed effectively. In this sense, the efficient transport becomes essential for the competitiveness

of the company therefore for the entire country. Wei (2000) indicates that the development of the transport infrastructure is very important to obtain a good attractiveness to international investors.

Concerning the FDI attractiveness and its main factors, Markusen and Maskus (1999), Gao (2003) and Yélé (2005) indicate that the traditional determinants (economic and institutional) have the most significant importance. They found that the FDI attractiveness is directly and significantly affected by these factors. However, in recent years, new elements are getting increasing importance and they are increasingly considered by the decision makers in the MNCs. Transport systems its quality and performance in host countries, are among the new factors that we seek to evaluate their importance in the development of the competitiveness of developing countries in this field through their role to increasing the territorial management and to develop the quality of the investment conditions.

3. THE ANALYTICAL FRAMEWORK

According Borja (2007), the territorial attractiveness of one country means its ability to attract the foreign capital and investors. Moreover, it is the power exercised more or less hard on firms and households which can facilitate their integration into the local economy and can contribute to the development. Indeed, Coeur and Rabuad (2003) indicate that the attractiveness of a territory is the ability to attract and retain business, companies and people based on their merits. According to these definitions, we seek to evaluate the impact of transport infrastructures on the territorial attractiveness of the foreign direct investment through the development of the quality of the territorial management. We proceed to test the following hypothesis.

H1*: the economic factors remain the major FDI determinants in host countries.*

H2*: transport infrastructures promote the FDI territorial attractiveness.*

H3*: the transport infrastructures are a key factor to manage effectively the territories.*

H4*: the impact of the transport infrastructures on the territorial management is more important in presence of an effective logistics function.*

3.1. Description of Research Methodology

Anwar and Nguyen (2010), Anwar and Sun (2011), Bekhet and Othman (2011) use the Cobb–Douglas production function to analyze the relations between the FDI and other variables. Driss (2007), Karray and Driss (2009) and Sekkat and veganzones- Varoudakis (2004) among others, include transportation and logistics in their empirical models to examine the impact of the two variables on FDI attractiveness.

While, they find that transport infrastructures and logistics function stimulate positively and significantly the territorial management therefore the FDI attractiveness in the host countries. For this purpose, we employ the Cobb–Douglas production function including capital and labor as additional factors of production to investigate these relations for 27 developing countries.

The empirical model that we develop in this study aims to examine the interrelationship between FDI, transport infrastructures and logistics functions where the FDI attractiveness depends on transport, logistics and others inputs. The extended Gobb-Douglas production framework helps us to explore the linkage between the three variables. The model is consistent with the broader literature on the determinants of territorial attractiveness (Driss, 2007) and takes the following form:

$$FDI = f(GDPC, OPEN, CHAN, TRSP, LGT) \quad (1)$$

Eq. (1) states that the entry of foreign investor on a host country is affected by a set of exogenous variables such as infrastructures of transport, logistics function and other variables, namely, Gross domestic product per capita (GDPC) trade openness (OPEN) and real exchange rate (CHAN) (see, inter alia, Anwar and Nguyen, 2010; Anwar and Sun, 2011; Lee, 2013; Lucas 1993). We write Eq. 1 with time series specification as follows:

$$FDI_t = \beta_0 + \beta_1 (GDPC_t) + \beta_2 (OPEN_t) + \beta_3 (CHAN_t) + \beta_4 (TRSP_t) + \beta_5 (LGT_t) + \varepsilon_t \quad (2)$$

Since our study is a panel data study, Eq. (2) can be written in panel data form as follows:

$$FDI_{it} = \beta_0 + \beta_1 (GDPC_{it}) + \beta_2 (OPEN_{it}) + \beta_3 (CHAN_{it}) + \beta_4 (TRSP_{it}) + \beta_5 (LGT_{it}) + \varepsilon_{it} \quad (3)$$

Where i represents country (in our study, we have 27 countries); t represents time (our time frame is 1990- 2014; ε is the standard error term. β1, β2, β3, β4, and β5 represent the long-run elasticity of GDP per capita, openness degree, real exchange rate, transport infrastructures and logistics function respectively.

3.2. Data Source and Variable Description

We use annual data covering the period between 1990 and 2014 for 27 developing countries; namely, Algeria, Bahrain, Bangladesh, Cameroon, Côte d'Ivoire, Democratic Republic of Congo, Egypt, Ghana, India, Indonesia, Iran, Jordan, Kenya, Kuwait, Mongolia, Morocco, Mozambique, Nigeria, Oman, Pakistan, Qatar, Saudi Arabia, Syria, Turkey, Tunisia, Vietnam, Zambia, which are considered for this panel analysis. The data are taken from the World Development Indicators

(http://data.worldbank.org/indicator: 2015). The selection of the starting period was constrained by the availability of data.

In equation 3, we have an endogenous variable, FDI inflows, which we try to explain by using a sample of exogenous variables. Firstly, we have the economic factors that can influence significantly the FDI inflows; the gross domestic product per capita (GDPC, constant 2005 US$), the economic openness measured by the ratio trade (exports + imports) to GDP, also we find the real exchange rate. Among the explanatory variables, we have introduced the transport infrastructures exactly the roads presented by the kilometers total number of paved routes in each country. Finally, we have used the logistics function measured by the exportation of the ICT services among the total exportation of services.

3.3. Study of Stationarity and Cointegration Relationship

The IPS method provides a unit root test in the context of a panel data model using the individual statistics mean of the regressions. This test gives us a more robust result; also it helps us to overcome the low power of Leving Lin (LL) tests in small samples (see table 1).

TABLE 1 UNIT ROOT TEST

	In level		In first difference	
	Calculated-t	prob	Calculated-t	Prob
FDI	-2.6254	0.1056	-2.4526	0.0120
GDPC	-2.5482	0.0755	-5.5891	0.0014
OPEN	-3.9845	0.0649	-6.9562	0.0052
CHAN	-3.7548	0.0523	-6.4525	0.0068
TRSP	-2.4514	0.0746	-6.6227	0.0001
LGT	-4.6527	0.0561	-6.5548	0.0000

The IPS test shows that the set of data series is stationary in level, but in first difference it is affected by a unit root. It should be noted that the number of maximum lags is fixed to 3; the lag numbers selection for each individual is programmed for this test by Pedroni. Applying the IPS test, we find that the property of non-stationarity for all variables in the panel is confirmed that brings us to study the existence of long-term relationships between these variables. The most appropriate test, to examine the existence of cointegration relationships, is the Pedroni test based on unit root tests on the estimated residuals. The idea of cointegration tests on panel data comes from a test of the unit root presence in the estimated residuals.

Pedroni has developed seven cointegration tests on data from homogeneous and heterogeneous panel; these tests take into account the heterogeneity in the cointegrating relationship. These Pedroni tests are divided into two groups, a first consisting of four tests based on the dimension “Within” and a second

one component three tests based on dimension "Between". Pedroni has shown that under appropriate normalization based on Brownian motion functions, each of the 7 statistics follows a normal distribution centered reduced for N and T important enough. From the results of Pedroni cointegration tests, we can notice that all the statistics are below the critical value of the normal distribution for a threshold of 5% (-1.32). Therefore, all of these tests confirm the existence of cointegration relationships.

TABLE 2 PEDRONI COINTEGRATION TEST

	v-stat*	Rho-stat*	Pp-stat*	Adf-stat*	Rho-stat**	Pp-stat**	Adf-stat**
FDI, GDPC, OPEN, CHAN, TRSP, LGT	-2.6230	-1.5572	-2.2847	-3.4859	-4.6254	-2.9564	-3.9561

** Tests based on BETWEEN dimensions
* Tests based on WITHIN dimensions

3.4. Econometric Specification

In this section, we will study the impact of the transport infrastructures on the territorial management in the host country therefore on the foreign direct investment attractiveness. Theoretically, specification tests revert to determine if we can assume that the econometric model is exactly the same for all countries, or the contrary, there are specific characteristics of each country. To validate the specification model, two tests are critical: Fisher's test to verify the existence of an individual effect and the Haussman test that identifies the nature of these effects.

Firstly, to test the homogeneity of the Panel, we applied the test of Hsiao (1986). The F-statistic follows an F distribution with (K +1) (N-1) and NT - N (K +1) degrees of freedom and is written as follows:

$$F = \frac{(SCR_b - SCR_a)/(N-1)(K+1)}{SCR_a/NT - N(K+1)}$$

SCR_b : The sum of squared residuals without fixed effects.

SCRa: The sum of squared residuals with fixed individual effects.

N: The number of countries →N = 27

T: The number of years → T = 25

K: The number of explanatory variables and control → K = 5.

If *F* is above the theoretical α%, we reject the null hypothesis of the absolute homogeneity. If it is below this threshold, we accept H_0. In this case, calculated F is significantly greater than the statistical F which is equal to 3.154. The result allows us to reject the Panel's perfectly homogeneous structure. According

the same results, we have a model of heterogeneous panel with individual effects. The model may be presented as follow:

$$FDI_{it} = \alpha + \beta_1 (GDPC_{it}) + \beta_2 (OPEN_{it}) + \beta_3 (CHAN_{it}) + B_4 (TRSP_{it}) + \beta_5 (LGT_{it}) + \lambda_{it} + \varepsilon_{it} \quad (4)$$

With

α: constant,

X_{it}: vector of exogenous variables,

β : long–run elasticity,

λ_{it}: specific unobservable individual effects to the host country i at time t,

ε_{it}: the error term.

In the next step, we must use the Hausman test to determine the nature of the individual effects (fixed or random). The tested hypothesis concerns the correlation between the individual effects and the explanatory variables. The results of Hausman test are in table 3. For the considered sample, the statistic realization of the Hausman test is 11.35. In a model with six variables (K = 5), this statistic follows a chi-square with 5 degrees of freedom. According to this result, we reject the null hypothesis of no correlation between individual effects and explanatory variables. So, in our model the exogenous variables are correlated with specific structural and timeless volume of FDI received by the host country. Here, we must favor the adoption of a model with fixed effects and retain the unbiased estimator (estimator within).

TABLE 3 RESULTS OF INDIVIDUAL EFFECTS SPECIFICATION TEST

Correlated Random Effects - Hausman Test			
Pool: Untitled			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	11.354220	6	0.0027

3.5. Results and discussions

To measure the influence of transport infrastructures and some different economic factors on the territorial attractiveness, we use the following logarithmic specification:

$$Log\ (FDI_{it}) = \alpha + \beta_1 log(GDPC_{it}) + \beta_2 log(OPEN_{it}) + \beta_3 log(CHAN_{it}) + \beta_4 log(TRSP_{it}) + \beta_5 log(LGT_{it}) + \lambda_{it} + \varepsilon_{it} \quad (5)$$

Where

FDI_{it} = endogenous variable,

α = constant,

$x_{i,t}$ = explanatory variables,

β_k = long run elasticity,

λ_{it}: specific unobservable individual effects to the host country i at time t,

ε_{it}: the error term.

To test this model, we adopt the ordinary least-squares method.

TABLE 4 REGRESSION RESULTS OF MODEL WITH FIXED EFFECTS

Dependent variable: FDI				
variables	**coefficient**	**Std.error**	**t-statistic**	**prob**
C	16.12510	4.534366	3.556197	0.0000*
LOG(GDPC)	0.31548	0.158067	1.995861	0.0232**
LOG(OPEN)	0.125474	0.041646	3.012845	0.0001*
LOG(CHAN)	0.215480	0.097281	2.215001	0.0025*
LOG(TRSP)	0.332514	0.103790	2.485963	0.0029*
LOG(LGT)	0.125362	0.071693	1.748592	0.0038*
R-squared	0.856822	Meandependent var		5.451964
S.E. of regression	1.215648	S.Ddependent var		2.513648
F-statistic	16.51649	Sumsquaredresid		380.4859
Prob(F-statistic)	0.000000	Durbin-Watson stat		1.124967

*significant at 1%; **significant at 5%; ***significant at 10%

According to the coefficient of determination (R^2 = 0.856) and the Fisher's test (F-statistic = 16.51) the model appears significant. Also, the obtained statistics show that the gross domestic product per capita (GDPC), economic openness (OPEN), exchange rate (CHAN), transportation infrastructures (TRSP) and logistics function (LGT) influence significantly the flows of FDI attracted by the countries of our sample.

The results in table 4 indicate that the FDI inflows are significantly affected by the GDP per capita in the host country. Theoretically, the GDP per capita reflects the qualities of the local markets. Usually, a country with a relatively high GDP per capita has a greater purchasing power. In the present case; we found that the FDI inflows in developing countries increase by 0.315% if the per capita GDP grows by 1%. The positive and significant impact confirms the great contribution of the GDP level as an important factor which can influence significantly the final decision of the international investors. The estimated coefficient is positive and statistically significant at the 5% level. For these reasons we can say that the results confirm those of Markusen and Maskus (1999), Gao (2003) who verify the role of the GDP per

capita in the attractiveness of the FDI.

For the trade openness, we found that it affects directly and positively the final decision of the multinational companies. In other words, we can say that an increase by 1% in the trade openness in these countries generates the raise of the attracted volumes of FDI by 0.125%. For MNCs, the high degree of economic openness (OPEN) is a good indicator of the implementation ease in a foreign country and it represents the simplicity of procedures to achieve an export or import operations. Barga and Mendoça (2004) among others argue the statistical significance of the commercial openness to enhance the competitiveness of the developing countries. In their work, they argued that, for a sample of 38 developing countries, the economic openness represents a key factor to develop the territorial attractiveness of the FDI. Also, Yélé (2005) confirm the positive impact of the commercial openness on the FDI attraction.

Finally, we have the exchange rate of the national currency in U.S. dollars; the instability of the exchange rate is an unfavorable element to the FDI attractiveness. Statistics related to this variable show that the exchange rate is a powerful determinant of FDI to developing countries. According to table 4, we can say that the exchange rate has a statistically significant impact on the territorial attractiveness of the FDI. In the same order of ideas, Bénassy-Quéré, Fontagne and Lahrèche-Révil (1999) argue that the exchange rate can be counted among the most important economic determinants of FDI and each country should stabilize its currency against the countries may bring to it as much as possible FDI. Indeed, a depreciation of the local currency may be attractive for foreign investors so that an assessment can lead to repulsion effects.

According to these results, we can say that the per capita GDP, trade openness and real exchange rate affect significantly the FDI inflows in the developing countries. Basing on these findings, we can argue the validity of the first hypothesis H1. The results demonstrate clearly that the developing countries have a territorial attractiveness of the international investors strongly affected by the economic factors. Also, the majority of these investments are of vertical nature which demands a more important role of transports and a more effective territorial management.

In our econometric study, we have the transport as a key variable which has an important impact on the FDI attractiveness trough its impact on the territorial management. In table 4, the value related to transport infrastructure impact confirm the results of Coughlin, Joseph and Arromdee (1991) and Loree and Guisinger (1995) who confirm the role of transports as an important factor to improve the attractiveness of the territories. A magnitude of 0.332 implies that a 1% increase in the infrastructures of transport increases the FDI inflows in the developing countries by around 0.332%. Indeed, a positive

sign is expected because the MNCs are usually motivated by the good performance of the transport systems in the host countries. In our case, the transport appears as a major determinant of FDI. This result shows that a transport system can improve the quality of territorial attractiveness in the host country in the same way as traditional determinants of FDI. Also, the results support the validity of the hypothesis 2 (H2).

Concerning logistics, we found that the FDI increased by 0.125% if the ICT services offered to the foreign investors increased by 1%. For our sample, the coefficient is positive and significant at 1% level. The results confirm the necessity of the investments in ICT and their availability for the service of domestic and foreign companies. In this context, the supply chain management is seen as a major axis of streamlining for the activities of MNCs and a good criterion for selecting new sites' localization of activities. In the same order of ideas, Allab and al (2000) explains that the management of stocks and stores are strongly affected by the increased use of ICTs. It thus becomes possible to work with computer systems, online mode regardless of the location of operators. In this area, new techniques such as Radio frequency Identification Data (RFID) or Global Positioning System (GPS) can increase service quality, relevance of information, traceability of products and also improve productivity.

In the end we can confirm the major importance of the transport infrastructures as well as logistics for the effective functioning of the private sector. Also, to make the new techniques available and operational, we need a territory managed effectively and capable to ensure the good functioning of these ICT. Also, the compatibility between the physical infrastructures and the ICT is very important to obtain the estimated results. So, the management of a given territory becomes easier if we have an effective transport infrastructures and a good logistics function. For this reason we have the third and fourth hypothesis well confirmed.

4. CONCLUSION

In this work, we studied the factors of FDI attractiveness in 27 developing countries by using panel data in an econometric model with fixed effects. The obtained results confirm ideas shared in several works such as the robustness of economic factors (GDP per capita, economic openness and exchange rates). In addition, our results showed that the transport infrastructures and logistics have a great importance for the MNCs and their decision of localization abroad is largely affected by the quality of transport systems and the logistics function in the host countries. Also, the two last factors have a great importance in the territorial management which has an important role to attract the MNCs.

For the countries of our sample, we have found that transport holds a central place in the local economy and it has a very important role in the commercial exchanges in the entire world. For this reason, we

find that these countries should work to develop their transportation systems to promote the arrival of the MNC. For example, in the North African countries, maritime transport is the backbone of its commercial exchange with the European Union. Upgrading the port systems of these countries to international standards is a carrier of productivity gain for supply chains and competitiveness of local economies. However, even these projects increase the port capacity and facilitate trade between the two Mediterranean shores, the problem of logistics infrastructure in the countries does not stop there; we also turn to the situation of land infrastructures. Indeed, in this region roads remain insufficient and rail freight is weak and unable to provide a good access to the port areas (Invest in Med, 2009).

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