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FDI Determinants and Geographical Interdependence in MENA Region

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I. Introduction

The inward FDI cartography in MENA region deserves wider attention. In fact it is worth mentioning the critical dissimilarities in term of the FDI amount within the region. Both well endowed countries in capital (oil countries) and non-oil ones (where the capital is relatively scarce) consider the international investment as one of the most important pillars of their economic and social project. Host countries' governments largely favor the flow of FDI because they believe in the related advantages driven by foreign firms ranging from employment promotion to technology transfer and other externalities that could spread in the local economy. Yet, since several decades pro FDI arguments (at least from theoretical point of view) have been often underlined by theoretical and empirical studies. As a matter of fact policy makers in MENA region and elsewhere were relatively impacted by a literature that seems to be mostly pro FDI cause[1]. In some academic works as well as professional reports the hypothesis of publication bias in term of the FDI package benefits should be considered seriously. Indeed the advantages of the international investment are sometimes overrated and in other cases presented as guarantee.

FDI is believed to be growth-driver through a bundle of spillover effects in term of technology transfer, human capital development, trade, etc. Such positive effects have not always been empirically proven and a growing literature seek to prove that the positive effects of FDI are not automatic or guarantee but depend closely of the host economic conditions (absorptions capacity and other economic and institutional factors) and the kind and quality of FDI being attracted, (Alfaro and Charlton, 2007). The question about the quality of FDI is still up to date and awareness about this issue is on the rise[2].

The proliferation FDI worldwide in the last few decades has induced to the emergence of an important number of theoretical and empirical studies about the determinants and effect of FDI. However, empirical literature of FDI determinant reveals mixed results and inconclusive evidence despite the scholar efforts to overcome the imperfections of the mobilized techniques and methodologies.

[1] For a good survey of the impact of FDI in host economies we can refer to Kumar (1996), Blömstrom and Kokko (1996), and Blomström and Kokko (1999) and more recently Kim and Aguilerra (2015) and Nielson et al. (2017).
[2] Recently in September 2016 the United Nations Industrial Development Organization (UNIDO) with the Kiel Institute organized in Vienna a conference to discuss about the quality of FDI and economic development.

The FDI is a multidimensional and multidirectional phenomenon and should be treated as such. In a systemic and consistent multidisciplinary review including 153 quantitative studies on FDI location over the period 1976-2015, Nielson et al. (2017, p.77) state that "despite the vast literature on foreign location choices, there is still room for improvements both in terms of theoretical extensions, data collection and methodological advancements". Understanding both the impact and factors driving FDI by adopting a holistic approach has been since a long time a challenging task for many scholars. Empirically speaking taking into account of the whole factors affecting the FDI is still an unreached goal. The quality of data provided, the complexity and the dynamism of multinational firm's strategies and their unpredictable behavior are just few factors among a long list to be cited. Moreover, most theories of FDI determinants are developed from the perspective of transnational firms neglecting by the way the aggressive behavior of host developing countries to attract international investment (Hsiao and Shen, 2003). Subsidies, Tax heavens, fiscal incitation, bilateral agreements and economic zones, are just few tools among a long list of FDI promotion policies adopted by developing countries to host foreign firms.

A huge number of published and unpublished empirical studies on determinants of FDI used potential common standard factors and different techniques. However, we are curious to know what is missing and what else should be included to explain the ambiguous results obtained. Despite the existence of a plethora of empirical research on FDI location most studies are treating the subject in an atomistic way with little attention to the host countries interaction. This is not the aim of this work nevertheless we try to add a new explanatory parameter linked to the spatial interdependence in the context of MENA. Afterward, a closer look on the determinants of FDI in MENA region will be welcome. Given the importance geographical interferences in the context of FDI in MENA region, it is surprising that this crucial aspect was ignored by empirical works. Neglecting a key factor of the FDI puzzle will be probably felt in econometric results. Accordingly, some pull factors of the FDI MENA countries' snapshot will be omitted[3]. Taking into account the neighboring effects (effects between MENA countries) is an important feature that should be added to the empirical studies of MENA inward FDI map. This may lead to a better understanding of the FDI unequal distribution in the whole region."Space, in fact, is not

[3] Spatial econometric models (spatial lag model and spatial error model) deal with the unobserved determinants of inward FDI that would be otherwise be caught by the error term in OLS regression.

composed of units isolated from each other. What happens in each of them can influence others: there is spatial interaction", (Jayet, 1993, p.7).

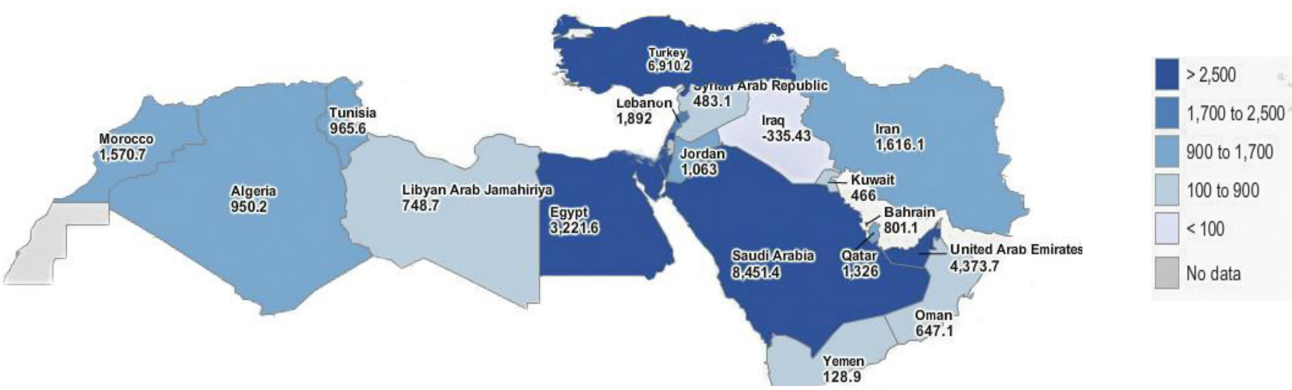
To the best of our knowledge the only study that focused on FDI spatial interactions in MENA region was performed by Siddiqui and Iqbal (2017) and they fail to find any spatial autocorrelation of FDI in the case of US foreign investments in MENA countries. However they observe a strong evidence of spatial effects induced by alternative proxies of infrastructure.

The inclusion of the substitution and/or complementarity effects is relevant to analyze the inbound FDI in host MENA countries. Moreover, it helps to consider the FDI promotional policies from a wider angle view. The decision to invest abroad is multilateral in nature and, therefore, should be captured by the eviction and/or crowding in effects between countries. Host countries in many cases are supposed to compete to host transnational firms. In this tournament these firms could trade-off between potential host countries and powerfully bargaining with local governments, (Michalet, 1999, Oman, 2000 and Barros and Cabral, 200). Often transnational corporations (especially those with global strategy) will establish a short list of the best host countries with high potential and excluding outlying ones i.e. those who are unattractive to their expectations. The cleavage between countries by multinational firms is not a new concept. For example, based in a wide survey performed by multinational firms operating in different countries, Michalet (1999) highlighted the concept of core and peripheral countries vis-à-vis foreign firms. The core countries i.e. those with a high potentially will be on the short list and peripheral countries being much less attractive will fall behind. An interesting statement of this study is that FDI competition will occur between countries having almost the same level of attractiveness in other words countries that belong to the same pool. Moreover, one can imagine a kind of hierarchical process similar to Mataloni (2011) process through which a multinational firm will initially select a region followed by a choice of countries within the geographical scope of that region. For Jiang (2017, p.438) "the cross border of an MNE's subsidiaries reflects accumulated country choices for investment locations over time, creating a corporate geography superimposed on territorial geography". In respect to what has been said we can affirm that geographic interference in the context of FDI location choice is not a myth but a reality that certainly exists and has been for a longtime neglected by empirical literature. Fortunately, in recent years there is an increasing emphasis about this issue.

Interdependence in FDI decisions across host countries could be produced by agglomeration and externalities (demonstration and contagion effects for example) and imperfect capital markets that limit the funds of multinational firm have to invest abroad, (Blonigen, 2007). Apprehending the role of space in relation to capital inflows may help to explain the disparate distribution of FDI between MENA countries and to further understand the determinants of the international investment in this region.

Undeniably the Figure.1 displays the heterogeneous FDI distribution through the region. Hence one can predict that geographic spillovers are likely to occur. For this reason a spatial analysis is highly performed. In fact, Saudi Arabia, Turkey, United Arab Emirates and Egypt (the big 4) explain a share of 70.38% of the total cumulative FDI in MENA 13 ranging from 1990 to 2015[4]. The unequal repartition of FDI is sounding and the top 4 countries are surrounded by neighbors with a low share not exceeding in best cases the value of 5%. According to data, we can argue that MENA countries are not on the same curve of foreign investors' preference and the big 4 are the privileged localizations and they are possibly crowding out their neighboring countries.

Figure 1. FDI inflows in MENA in million US $ (average 1990-2015)



Source: Author's construction using data from UNCTAD 2016.

[4] For more details see Appendix 4.

II. The Spatial Econometric: A New Perspective for International Investment Study

In many cases, the decision of foreign firms to invest in a host country will not depend exclusively of the conditions of that country but also will be influenced by those prevailing in a third country, (Yeaple, 2003). For instance, the dramatic wave of investments to China in the last decade cannot be merely analyzed as a unique result of a decision of Chinese authorities to open the door to foreign investors and to adopt more liberal reforms. Moreover, issues such as the process of disinvestment, delocalization and FDI flows leakages arising in other countries should be also taken into account. It was acknowledged that a certain amount of FDI flows toward the Chinese economy were at the expense of other Asian proximate countries or other countries from the globe (Mercereau, 2005 and Barry and Tong, 2007). Despite the fact that spatial interdependence in term of FDI is well accepted among scholars the empirical literature however remain silent. Coughlin and Segev (2000) sparked the interest to consider spatial econometric techniques to explore the US FDI motivation across Chinese provinces. The authors found a positive spatial correlation between adjacent Chinese regions i.e. the FDI in a region is positively linked with FDI flows to the neighboring region. The authors attribute the idea of agglomeration economies to explain this phenomenon. After Coughlin and Segev (2000) we tale just few papers (Blongein et al. 2007, Baltagi et al. 2007, Blanco, 2012 and Nwaogu and Ryan, 2014) including spatial interdependence in their econometric estimations.

The aforementioned papers should be considered as a step forward to bridge the gap between empirical studies and the emergence of new theoretical theories at of FDI and multinationalization of firms in the end of 90s. Actually, most of the empirical works in the last two decades inspired by the theoretic renewal were carried out in the context of gravity model which mainly controls parent and host countries characteristics. The aim was to transpose the foreign firms and their related strategies (Horizontal or vertical and both of them) in a two country framework[5]. Henceforth the third country effect (the impact coming from neighboring countries with immediate proximity) was neglected. However it is worthwhile to indicate that the most effort has been done to adapt the empirical studies to the new theoretical context by according the priority to empirically prove these new concepts.

[5] For a survey of see Blonigen and Piger (2011).

Thus it is interesting to identify the way to capture the neighboring effect in term of kind FDI and its motivations. In fact, the third country effect is apprehended by two factors namely the spatial lag (the dependent variable i.e. the flow of FDI in a given spatial unit i depending on the dependent variable observed in each geographical adjacent units j) and surrounding market potential (spatial interdependence linked to economic conditions (explicitly the market size) prevailing in the neighboring countries.

In the end of the 1990s, the FDI literature experienced an important progress sparked by Markusen et al. (1996) through the development of the Knowledge Capital Model (KCM). The beauty of the KCM is being a unified or a hybrid model where multinational firms vertical and horizontal IDE can coexist (at least theoretically) despite they follow two different logics. Broadly speaking vertical multinational firms seek to exploit international factor price differentials by splitting the production process internationally (cross-border fragmentation) in two types of activities. They locate their headquarters services (R&D, advertising and production intensive in physical or human capital) in the skilled-labor parent country and localize their unskilled- labor activities in the host country abundant in unskilled labor for costs purpose. The production is exported back to the home country. This two-country FDI is known as pure vertical FDI. The vertical FDI is expected to generate negative spatial lag effect since the multinational firms adopting such strategy will put potential host countries into a kind of head to head competition and will select the best location among them. In other words FDI flowing to a particular host country will substitute for FDI toward other host countries. However the impact of surrounding market potential (market size of contiguous countries) will be insignificant since firms with vertical strategy will re-export the production back to their home countries, then the market will be irrelevant.

The export platform FDI take place when trade costs are low enough between host potential destination markets compared to the trade costs between the home and destination countries. In that case the multinational firm will select the most favorable destination market (the plat form country) to serve other destination host markets through exports[6]. Blonigen et al. (2007) argue that this kind of FDI will evince the other destination markets and by the way the spatial lag effect will be negative. However this negative spatial lag effect will be jointly happen with a positive surrounding market potential since the amount of the FDI flows toward the export-platform country will increase with the market size of surrounding countries being served through the exports from the platform. Then in the context of export platform FDI a negative spatial lag and positive surrounding market potential could coexist.

The motivation of horizontal firms is to save trade frictions (transport costs and barriers to entry the host market country). The decision to engage on horizontal FDI is conducted on the basis of the famous concept of proximity-concentration tradeoff: the proximity to the host markets allows the firm to save trade costs but will induce sunk costs to establish a new plant in the host country. This simple version of horizontal FDI is known as pure horizontal FDI. According to Blonigen et al. (2007) the pure horizontal of FDI has no implication in term of spatial relationship with proximate countries (third country effect) since the decision to embark in horizontal has been taken without considering a third country. The same statement is valid for the effect of surrounding market potential.

The third type of international investment that should be indicated is a kind of vertical specialization with agglomeration (Baltagi et al. (2007) and better known as complex vertical FDI. This type of FDI occur when a multinational firm decides to further fragment the production processes by relocating a part of its production in different countries to take advantages of more favorable production conditions prevailing in other countries. According to Blonigen et al. (2007, p.1307), “In this form of FDI and production, having suppliers (related or unrelated) in neighboring regions is likely to increase FDI to a particular market. In addition, there may be other cross-region forces that generate agglomeration incentives besides supplier networks, including the location of immobile resources (e.g., mining of natural resources)”. For example, multinational firms will establish a production unity in a destination country x (let say

[66] One can note that the export platform FDI will benefit of the proximity to the host countries (served by a well located affiliate) without implying additional plant-level costs fixed costs.

Italy) given that they already produce in proximate country k (Switzerland). FDI from home country (Deutschland) toward Switzerland will be likely to complement FDI from Deutschland to Italy, (Nwaogu and Ryan, 2013). This kind of FDI is likely to occur in regions with similar characteristics in term of backward and forward suppliers network, natural resources endowment and so on, (Nwaogu and Ryan, 2013). Due to the existence of these agglomerative forces and dynamics, it is expected that complex vertical FDI will impact positively the FDI toward neighboring countries. In other words a positive spatial lag is likely to arise. For the surrounding market potential variable, econometrically speaking if the agglomeration effects are caught by its associated coefficient then the sign will be positive and insignificant if the coefficient apprehend the market size aspect, (Nwaogu and Ryan, 2013 and Garretsen and Peeters, 2009).

The existence of multilateral decision-making has significant implications for empirical studies on FDI, as multilateral decision game implies that the selection process across diverse host countries is not independent. Thus, empirical works not controlling for spatial interdependence might suffer from omitted variables and will probably provide biased results, (Blonigen et al. 2007 and Baltagi et al. 2007).

Among the reasons explaining the geographic interactions overlook in the context of FDI, we can quote the econometric complexity to deal with spatial spillovers. Nevertheless, in recent years one can note the prominent progress in term of the spatial econometrics techniques and its growing use in the international economic field. The lacking of software able to execute econometric regressions should be also cited (Geoda is one of the few exceptions, Stata provide some user written commands). The availability of geo-coded data and long run economic data should be also cited since spatial regressions are data consuming. The specification of spatial econometric models is based on the implementation of a spatial weight matrix to associate a variable at one point to the observations for that variable in other spatial unit in the sample under study, (Anselin, 1988).

Spatial linkages in MENA inward FDI should be empirically taken into account to overcome bias omission and to provide a panoramic snapshot of the determinants of FDI in the region.

Empirically speaking, we have to include the spatial interdependence in the econometric regressions with other common FDI explanatory variables.

III. The Econometric Analysis

In first step we set a benchmark model Eq. (1). The dependent variable FDI (in current million of US dollars to individual MENA countries) will be regressed on a range of pull factors (growth of GDP, nominal exchange rate, resources endowment, trade openness, domestic credit provided by banking sector, the infrastructure, the human capital and other institutional factors). The estimation results [through four alternatives techniques: OLS and Two Stages Least Square (2SLS) regressions with Fixed Effect (FE) and Random Effects (RE)] will be compared with those provided by Equation [2] controlling an additional variable related to Surrounding-Market-Potential (S-M-P) and Equation [3] including both the S-M-P variable and the spatial interdependence term $\rho.W.FDI$.

$$FDI_{i,t} = \propto_0 + \propto_i \ X_{i,j} \ + \epsilon_{i,t} \qquad \text{[Eq.1]}$$

$$FDI_{i,t} = \propto_0 + \propto_i \ X_{i,j} \ + Surrounding\ market\ potential_{i,t} + \epsilon_{i,t} \qquad \text{[Eq.2]}$$

$$FDI_{i,t} = \rho W_y FDI_{i,t} + \propto_i \ X_{i,j} \ + Surrounding\ market\ potential_{i,t} + \epsilon_{i,t} \qquad \text{[Eq.3]}$$

IV. The Estimation FDI Determinants in MENA Countries

IV.1. The Benchmark model

To estimate the determinants of inbound FDI in MENA regions we use panel data of 13 countries[7] between 1990 and 2015. The period and countries were selected to supply both balanced panel data and a large sample size dataset to adequately run spatial regressions. Unfortunately, after a scrutinizing process some relevant indicators (labor cost, governance indicators and indexes about economic liberalization) were not included in the empirical work because they don't cover the whole period or not available for a sufficient number of years.

[7] Algeria, Bahrain, Egypt, Iran, Jordan, Kuwait, Morocco, Qatar, Saudi Arabia, Sudan, Tunisia, Turkey and United Arab Emirates.

To inspect the factors explaining the FDI flows toward MENA economies we have begun by regressing the following simple equation on a number of explanatory variables commonly cited in the empirical literature and usually included in econometric models[8].

$$FDI_{i,t} = \propto_0 + \propto_i \; X_{i,j} \; + \epsilon_{i,t} \qquad \text{[Eq.1]}$$

Where FDI is the dependent variable expressing the net flows of FDI in million of current US $ and $X_{i,j}$ is a vector of explanatory variables including: the economic growth (*Gr*) measured by annual percentage growth rate of GDP at market prices, ENERGY (energy production Kt of oil equivalent), Human capital (*HumanCap*) measured by the average years of schooling and the return to education. This indicator of human capital is based on the average years of schooling from Barro and Lee (2013)[9] and an assumed rate of return to education, based on Mincer equation estimates around the world, (Psacharopoulos, 1994)[10]. The domestic credit provided by banking sector % of GDP (*CREDIT*), trade openness approximated by the sum of merchandise exports and imports divided by the value of GDP (*OPEN*), the exchange rate defined as local currency units relative to the U.S. dollar (*XR*), the number of telephone subscribers per 100 persons (*TEL*), quality of bureaucracy (*BureauQual*) and Government Stability (*GovStab*). Data are compiled from the World Bank, UNCTAD, ICRG, OECD and Penn World Tables[11].

In the first step we run a fixed and random effect model. The estimation of Eq. [1] by OLS will be considered as benchmark results against which one might compare. We rely on a fixed effect model (a random effect specification was rejected by Haussman test) and regressions are estimated with a weighted least-squares procedure, employing a White correction for heteroskedasticity (cross-section weights) to ensure heteroskedasticity-consistent standard errors.

In a second step, to deal with the potential endogeneity problem of explanatory variables (feedback effects) a number of instrumental variables are included in the regressions. Then, tests

[8] There is an abundant and controversial literature on the determinants of FDI (see Dunning, (1993), Chakrabati (2001), Balasubramanyam (2001), Baltagi et al (2008), Blonigen and Piger (2011), Kim and Aguilera (2015) and references therein).

[9] Barro, Robert J. and Jong-Wha Lee (2013), "A new data set of educational attainment in the world, 1950-2010" Journal of Development Economics 104: 184–198.

[10] Psacharopoulos, G. (1994), "Returns to investment in education: A global update", World Development 22(9): 1325–1343.

[11] For more details see data source in appendix.

of endogeneity and validity of instruments are carried out before regressions[12]. Moreover, the Stock-Yogo (2005) test of weak instruments is performed[13]. Also, the Sragan Sargan-Hansen test of over identification has been done[14].

The variable suspected to be the source of endogeneity (*Gr and ENERGY*) was instrumented by some lagged explanatory variables (BureauQual_lag GovStab_lag, Gr_lag ENERGY_lag and OPEN_lag). The use of lagged endogenous regressors as instruments is often recommended because they are generally correlated with the explanatory variables (since they represent their lag values) and generally uncorrelated with the current value of the error term. All the tests indicated above support the hypothesis of the validity of the instruments included in the regressions (see table 1). Finally, the matrix of partial correlations and the variance inflation factor (VIF) test (see respectively appendix 1 and 2), show that there are no serious problems of multicolinearity between the explanatory variables included in the regressions.

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[12] We use the Kleibergen-Paap rank LM test to examine if the equation is identified that is the matrix is full rank i.e., instruments are "pertinent" (correlated with the explanatory variables and not with the error term).

[13] Weak identification occurs when the instruments are weakly correlated with the explanatory variables (the endogenous regressors), then the instruments are weak and the estimation results too.

[14] The Sargan-Hansen test assess under the null hypothesis that the instruments are valid (uncorrelated with the error term).

Table 1: Determinants of FDI in MENA Countries (Period: 1990-2015, Sample =13)

OLS							2SLS		
Specification 1: FE Model				**Specification 2:** RE Model			**Specification 3: IV FE Model**		
FDI	**Coef.**	**t**	**P>t**	**Coef.**	**z**	**P>z**	**Coef.**	**z**	**P>z**
Gr	57.88**	2.13	0.05	48.61	1.66*	0.097	91.57*	1.64	0.10
Energy	0.027**	2.11	0.05	0.017	2.95***	0.003	0.063***	2.72	0.006
HumanCap	5194.19**	2.46	0.03	4814.79	2.45***	0.01	5010.01***	5.16	0.000
XR	-0.12	-0.79	0.44	-0.029	-0.24	0.81	-0.049	-0.6	0.55
Open	76.41**	2.37	0.04	25.81	1.18	0.23	74.08***	4.9	0.000
TEL	27.39	0.32	0.75	-20.73	-0.31	0.75	23.27	0.49	0.623
CREDIT	55.55	1.88	0.08	48.62	1.89**	0.05	45.93***	2.69	0.007
GovStab	81.59	0.67	0.51	150.03	1.67*	0.09	13.61	0.13	0.897
BureauQual	-1921.34**	-2.14	0.05	-1776.07	-1.87**	0.06	-2303.59***	-3.71	0.000
cons	-16099.12***	-3.21	0.01	-10437.93	-2.83***	0.005			
N=338, R^2=0.30 F(9,12) = 12456.06, Prob > F =0.0000 F test that all u_i=0: F(12, 316) = 12.86 Prob> F = 0.0000 Hausman test: chi2(7) = 60.86 Prob>chi2 = 0.0000				N=338, R^2=0.28 Wald chi2(9) = 501.92, Prob > chi2=0.0000			Number of obs =337, R^2=0.28, F(9, 315) =14.51, Prob > F =0.0 ***Underidentification test:*** Kleibergen-Paap rk LM statistic = 8.325 Chi-sq(4) P-val = 0.0804 ***Weak identification test (Cragg-Donald Wald F statistic):*** = 12.269 **Stock-Yogo weak ID test critical values**: 5% maximal IV relative bias 13.97 10% maximal IV relative bias: 8.78 20% maximal IV relative bias: 5.91 30% maximal IV relative bias:4.79 10% maximal IV size:19.45 15% maximal IV size:11.22 20% maximal IV size:8.38 25% maximal IV size:6.89 ***Hansen J statistic*** **(overidentification test of all instruments):**3.044 Chi-sq(3) P-val =0.3849		
Note: The standard errors of the regression coefficients have been derived using White consistent cross-section standard errors & covariance. ***, **,* represent respectively statistical significance at 1, 5 and 10% level.									

Broadly speaking, the regression results in table 1 match well both with the empirical literature and our expectations especially for certain key variables. Economic growth has a positive sign and statistically significant at 5% in the fixed effects regression (the baseline model) and the model with random effect. However this variable is significant only at 10% in the random effects model (specification 2) and the model with instrument variables (specification 3). Growth, the market size and scale economies are the main determinants of horizontal FDI (market seeking FDI). For vertical FDI (which is the most important kind of FDI in some MENA countries) the economic growth can also play a positive role, at least it will be felt by foreign firms as a good sign of economic health and stability.

The variable *ENERGY* (a proxy for resource endowment) is positively significant at 5% (specification 1) and 1% (specification (2) and (3)). Indeed, this is not an atypical result and matches well the reality of FDI in the region: many foreign firms invest in MENA to access to natural resources particularly gas and petroleum. This kind of FDI that explain an important amount of FDI in MENA region (both in oil and non oil countries) is one of the most classic forms of the international vertical investment and the main purpose is to extract natural resources. The human capital has the expected positive sign and is highly significant at 1% in the all specifications. Human resources are not only crucial for attracting foreign firms but also reflect the ability or absorption capacity of an economy to benefit from FDI spillovers through direct and indirect channels.

Curiously the exchange rate is not significant at any regression. Probably because we used the nominal instead of the real exchange rate (unavailable for several MENA countries). The exchange rate (as a proxy of cost factor or price competitive factor) is expected to be relevant for foreign affiliates adopting a vertical strategy and need to export back (totally or partially) their production to their parent countries or shifting it to a third country (export platform FDI). In both cases the depreciation of the local currency against the dollar (an increase of the exchange rate) will affect positively the competitiveness of the products being exported by lowering the factor costs in the host country and/or increasing the products price competitiveness at export. The infrastructure (approximated by the number of telephone subscribers per 100 persons) is a key factor of business environment is supposed to reduce transaction costs by making the related activities of foreign firms more fluid and less costly in money and time is however not significant. Maybe this result would have been different if we had consider an accurate indicator of infrastructure (still unavailable for MENA countries). We can imagine an appropriate composite index capturing both the quality of digital and non-digital infrastructure.

For the three specifications the variable credit (a proxy of access to finance) has the appropriate sign and is significant at 10% level for specification (1) and 5% for specification (2) and (3). The government stability (a risk indicator) has the appropriate sign but is not significant at any specification. The other institutional indicator describing bureaucracy quality is significant at 5% but presents an unexpected negative sign. This may be explained by the fact that except United Arab Emirates having a score of 3 since 1998, the other countries within the sample have in average a low value of this indicator (the mean value is around 1.99)[15], and showing a very weak variation (standard deviation is equal to 0.49%). Indeed the indicator holds the same low score value (i.e. bad bureaucracy) for many years and this is true for several MENA countries meaning that things are not evolving and the *status quo* is the rule. One can suppose the transaction costs that could induce for foreign as well as local firms.

IV.2. The Spatial Analysis

IV.2.1. The Weighted Spatial Matrix: A Prerequisite for the Spatial Analysis

The weighted spatial matrix W brings out the potential of interaction (substitution or complementarity) between observations of each host countries pairs i, j of MENA region. It is worthwhile to note that since each observation is weighted by the distance or proximity (contiguity for example); the potential of interaction increase with geographically-proximate countries and decrease with remoteness ones. There is a wide range of techniques to specify the structure of the spatial weight matrix[16]. This latter can be for example weighted by contiguity: (i, j) locations interact when they are contigus i.e sharing a common border. Then we obtain a binary matrix with value 0 and 1. Another alternative is to use a band distance weight $(i, j$ locations interact when being within a critical distance band).

The scalar $\rho W_y FDI_{i,t}$ record the inward FDI in year t { $t \epsilon [1990, 2015]$ } toward MENA countries (MENA 13) weighted by the bilateral distance between country i and country j where $i, j = \{1,2, \dots \dots .13\} \forall\, i \neq j$. The parameter ρ will be estimated and in case of rejection of the null $\rho = 0$, the spatial autocorrelation or dependence will be proved. It is worthwhile to point out that the square matrix W will be composed by a block of diagonal matrix of dimension $13 \times 13\, \{(n \times n)\}$ with each block apprehend a single year's observations for any year t,

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[15] The highest score of the indicator is equal to 4 points and the worst score is equal to 0.
[16] It is recommended to use a variety of weighted spatial matrix W in the estimation process because results may be very sensitive to the structure of matrix W.

$t \epsilon [1990, 2015]$. Formally for any year t between 1990 and 2015 the matrix W_t can be represented as following:

$$\begin{bmatrix} 0 & W_t(d_{i,j}) & W_t(d_{i,n}) \\ W_t(d_{j,i}) & 0 & W_t(d_{j,n}) \\ W_t(d_{n,i}) & W_t(d_{n,j}) & 0 \end{bmatrix}$$

The cells $W_t(d_{i,j})$ show that for any couple of hot countries the weight will decrease with the distance. Geographically-proximate countries will be attributed a higher weight and vice versa. Accordingly, the effect of the eviction or complemeantarity will go down with remote countries and close countries are likely to exercise a higher impact. “Everything is related to everything else, but near things are more related than distant things”, (Tobler 1970, p. 236)[17].

In our work the spatial weight matrix is a diagonal matrix accounting 26 matrices of dimension 13×13 in the main diagonal. The other matrices are zero-matrices of dimension 13×13. W is row standardized i.e. the sum of each row is equal to unity.

The establishing of the spatial weight matrix is rather intuitive. Moreover, the existence of a rich variety of methods to build such matrix makes the choice of the adequate way quite arbitrary. To overcome this difficulty we compute in a first time a Moran’s I and Geary’s spatial correlogram to decide about the appropriate distance band to choose for the implementation of the spatial white matrix. To do this we run the command *spatcorr* based on cumulative distance bands. For each distance band, the Z-value of the null hypothesis of global spatial independence is provided which is very useful for the choice of the appropriate distance band. Hence, to refine the choice of the distance band we rely on the statistics exposed in both collegrams[18].

[17] Tobler, W. (1979). “Cellular Geography.” In *Philo.oph"* in Geograph", edited by S. Gale and G. Olsson, pp. 579-86. Dordrecht: Reidel. Cited in (Anselin, 1988, p.8)

[18] It is useful to note that Moran index is more commonly used in the literature and considered more robust than the Geary’s index.

Table 1: Moran's I and Geary's C spatial correlogram

Moran's I spatial correlogram: FDI					Geary's c spatial correlogram: FDI					
Distance bands	I	E(I)	sd(I)	z	p-value*	c	E(c)	sd(c)	z	p-value*
(0-10]	-0.015	-0.003	0.011	-1.102	0.135	0.962	1	0.145	-0.261	0.397
(0-20]	-0.036	-0.003	0.006	-5.726	0.000	1.094	1	0.043	2.167	0.015
(0-30]	-0.029	-0.003	0.004	-6.774	0.000	1.052	1	0.029	1.809	0.035
(0-40]	-0.025	-0.003	0.003	-8.365	0.000	1.077	1	0.034	2.297	0.011
(0-50]	-0.019	-0.003	0.002	-8.802	0.000	1.021	1	0.021	0.970	0.166

We select the Euclidean distance band of] 0-40] (equivalent to a band expressed in Km of]0-3851]). In fact if we combine the results of the statistic Z and its P-value provided by Moran and Geary tests, it will be suitable to choose the band distance of]0-40]. In other words to be considered as neighbors, the distance $d_{i,j}$ between a couple of countries i and j $\forall i \neq j$ used in the definition of the weight spatial matrix should not exceed the threshold distance of 3851 km. For each $d_{i,j}\, \forall i \neq j \in]0-3851\,]$ i and j are considered as neighbors otherwise the country *i and j* will not considered as neighbors and will not be weighted, *i.e.* will be attributed a value of zero in the spatial weight matrix . In addition we test other Euclidean band distance]0-20] and]0-30][19] but the]0-40] distance band selected give better results for spatial dependence tests and for spatial regression models. It is interesting to note that contrary to Blanco (2012) and Blonigen (2007) we didn't choose the shortest bilateral distance[20] within the sample as the distance reference receiving a weight of unity. In Blanco (2012) and Blonigen et al. (2007) the weight attributed to the other distance in the sample will decrease as suggest by the following formula : $\frac{Shortest\ distance}{d_{i,j}}\ \forall\, i \neq j.$

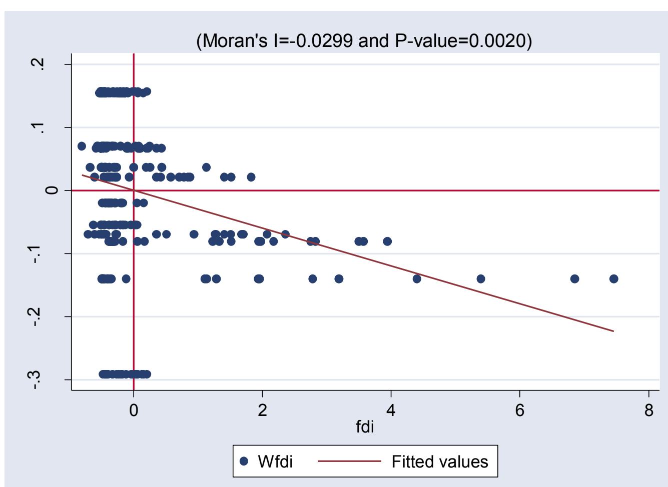
[19] Respectively equivalent to [0-1920 km] and [0-2880 km].
[20] Rejected by Moran tests.

IV.2.2. A Diagnostic of the Spatial Interdependence

A) A Snapshot of FDI Spatial Autocorrelation in MENA region

The Moran Index is very useful to have a first insight about the existence and the nature of FDI spatial autocorrelation between MENA countries. According to the negative Moran's Index values obtained regardless the band distance (see Table1) and the scatter plot (see Fig.1) we can emphasize a negative relationship of FDI inflows in MENA region (the Moran index has a statistically negative value and the slope of line fitting the scatter is negative). The eviction or competition effect seems to be dominant in the context of FDI in MENA 13. In addition we can state that this negative relationship is prevailing both between low and high values of FDI and low and low values of FDI. In other word the crowding out effect is likely to happen between MENA countries having similar low amount of FDI in one hand and between MENA countries with high values and those attracting low amount of inward FDI in the other hand.

Fig.1: Moran's scatter plot – Inward FDI in MENA13



Source: Author calculation

B) The Inclusion of the First Spatial Interdependence Factor: The Surrounding-Market-Potential (S-M-P)

Following Blongein et al. (2007), Blanco (2012), Nwaogu and Ryan (2014) and Regelink and Elhorst (2015) we include in specification (4), (5) and (6) an indicator of surrounding market potential to account of the spatial interdependence linked to economic conditions prevailing in the neighboring countries. The indicator is computed similarly as in Blongein et al. (2007) and Blanco (2012). For a MENA country i the index is calculated by the sum of GDP per capita in other MENA countries weighted by the distance between countries, for all MENA countries where $i \neq j$. The surrounding market potential will affect the FDI flows in different way according to the kind FDI or the main motivation leading the multinational to invest abroad. Hence the sign expected will be controversial[21] as we work with highly aggregated data.

[21] For more detail we can refer to Blongein et al. (2007) paper where we can find a good explication of the relationship between the motivation of FDI and the surrounding potential market.

Table 2: Augmented Model of FDI Determinants in MENA countries:
[Surrounding Market Potential (S-M-P) included]
Period: 1990-2015, Sample =13

Specification 4: FE Model				**Specification 5: RE Model**			**Specification 6: 2SLS FE Model**		
FDI	Coef.	t	P>t	Coef.	z	P>z	Coef.	z	P>z
Gr	53.62*	1.78	0.076	46.58	1.49	0.13	93.33*	1.720	0.085
Energy	0.016	1.19	0.23	0.016***	2.82	0.005	0.056***	2.370	0.01
HumanCap	3711.64***	2.69	0.007	3934.93***	2.92	0.003	3994.53***	3.960	0.000
XR	-0.2	-1.49	0.13	-0.048	-0.4	0.69	-0.098	-1.050	0.292
OPEN	83.94***	5.28	0.000	36.93***	2.59	0.01	79.312***	4.990	0.000
TEL	77.04	1.32	0.18	-3.64	-0.07	0.94	57.443	1.060	0.288
CREDIT	36.98**	1.92	0.05	39.3**	2.11	0.035	33.638*	1.720	0.086
GovStab	61.08	0.45	0.65	137.84	0.99	0.32	-4.060	-0.040	0.968
BureauQual	-1610.63***	-2.43	0.01	-1661.79***	-2.49	0.01	-2100.37***	-3.480	0.001
S-M-P	7.97***	3.05	0.002	5.013**	2.11	0.03	5.467**	2.220	0.027
_cons	14397.82***	-5.75	0.000	-10208.75	-4.23	0.000			
Number of obs=338; R^2=0.32 F(10,315) = 15.32; Prob > F =0.0000 F test that all u_i=0: F(12, 315) = 13.72 Prob > F = 0.0000				Number of obs=338; R^2=0.30 Wald chi2(10) = 111.38 Prob > chi2 =0.0000			Number of obs =337; R^2=0.30, F(10, 314) =13.04; Prob > F =0.000 ***Underidentification test***: Kleibergen-Paap rk LM statistic = 8.714 Chi-sq(4) P-val = 0.0687 ***Weak identification test (Cragg-Donald Wald F statistic):*** = 12.319 **Stock-Yogo weak ID test critical values**: 5% maximal IV relative bias 13.97 10% maximal IV relative bias: 8.78 20% maximal IV relative bias: 5.91 30% maximal IV relative bias:4.79 10% maximal IV size:19.45 15% maximal IV size:11.22 20% maximal IV size:8.38 25% maximal IV size:6.89 ***Hansen J statistic*** **(overidentification test of all instruments):**3.044 Chi-sq(3) P-val =0.3849		

***, **,* represent respectively statistical significance at 1, 5 and 10% level.

The estimation results (see Table 2) are roughly robust to the inclusion of the spatial interdependence variable S-M-P except the fact that the variable *ENERGY* becomes for unknown reason insignificant in specification (4).

However according to the regression results we can state that surrounding market potential improve the attractiveness of the whole region. In fact the variable S-M-P is positively significant at 1% in the specification (4) against 5% in specification (5) and (6). Accordingly it seems that foreign firms are sensitive to the global economic situation in the whole region. A better economic condition in the neighboring countries will be interpreted as better external stability situation surrounding the host country. In case where a foreign firm plans to potentially move to a neighbor country - if it decides to extend its activities or in case when it is constrained to disinvest from the host country- the surrounding market potential will be a significant factor that could be taken into account by foreign firms before investing abroad. In other words it is advantageous for a company to make profitable its activities when good perspectives in neighboring countries and economic agglomerations are palpable. Furthermore, in case of export-platform FDI, the surrounding market potential is important for a foreign firm with the intention to locate in one country and supply the neighboring markets through exports.

IV.2.3. The Spatial Regression Model

In their work Blongein et al. (2007) focus exclusively on spatial lag model. The reason behind is that unlike the spatial error model (which the main contribution is to improve standard errors where estimation errors are spatially dependent), the spatial lag model allow the crowding in/out effect to manifest through the variable $\rho.W.FDI$ included in the right hand side of the regression equation. Indeed, the estimated ‘‘spatial lag’’ coefficient (the famous ρ) capture the simultaneous correlation between one country inward FDI and other neighbor countries[22]. Actually, the beauty of spatial regression is to allow the eviction or complementarity effect to manifest through the inclusion of a spatially lagged dependent variable as an additional predictor. In other words the FDI in a host country will not only depend of the specific explanatory factors of that country but also will affect by FDI inflows in the nearby countries. “Everything is related to everything else,

[22] If there is no spatial dependence, and FDI in a host country does not depend on neighboring FDI values, the parameter ρ accounting for spatial autocorrelation of FDI will be equal to zero. Econometrically speaking this consists to accept the null hypothesis: $\rho = 0$.

but near things are more related than distant things", (Tobler 1970, p.236)[23]. "Certainly, the analysis of the effects on one variable by others does not really use all the characteristics of space until it is combined with an examination of the interactions between observations", (Jayet, 1993, p.7). The space of observations is characterized by the interactions between these observations. Hence, more or less intense relationships may exist between spatial units.

Before running the spatial econometric regressions it is necessary to make a diagnostic via diverse tests to select the appropriate model. Standard spatial model are devoted to treat the two aspects of the spatial lag dependence and spatial error dependence. Commonly the choice is about the two alternative models namely the spatial lag and the spatial error model. However, sometimes tests are not enough accurate. As a result, in many cases the choice between the two models is up to the researcher and it will depend closely of the subject studied. For example, Blonigen et al. (2007) and Blanco (2012) acknowledge that the spatial error model is not adequate for spatial investigation of FDI since it contribute only by the enhancement of the standard error and remain silent about the nature of the FDI spatial interdependence[24] (contrary to the spatial lag model, the term $W_y.FDI$ does not exist in the spatial error model). Hence in our work the preference will be for the spatial lag model (also known as spatial autoregressive model) and the results of the spatial error model will be simply presented for comparative and/or informative purpose. Fortunately, we found that econometric tests support the spatial lag model.

As indicated in table 3 (fitted model 2), the LM test for spatial lag is more significant than LM test for spatial error (LM for spatial error model is not significant) [LM= 6.213 and P-value= 0.013 against LM=0.369 and P-value equal to 0.54 for spatial error model] and robust LM for spatial lag model is significant (P-value =0.005) and the robust LM for spatial model is not (P-value =0.149). Then according to tests the spatial lag model should be retained to run the econometric regressions for the data sample[25]. Besides, we note that the inclusion of the spatial variable S-M-P in the tests improve the statistics in favor of the spatial lag model (fitted model 2

[23] Tobler, W. (1979). "Cellular Geography." In *Philo.oph"* in Geograph", edited by S. Gale and G. Olsson, pp. 579-86. Dordrecht: Reidel. Cited in (Anselin, 1988, p.8).

[24] Indeed, the spatial error model is applied to manage the spatial dependence emanating from errors in measurement via the error term or by the omission of variables.

[25] Contrary, if LM test for spatial error is more significant than LM test for spatial lag and robust LM test for spatial error is significant but robust LM test for spatial lag is not, then the suitable model is spatial error model, (Anselin and Florax, 1995).

compared to fitted model 1). One can state that the fact of having taken into account of surrounding potential market (S-M-P) in the previous estimations was not meaningless and improve the "spatial" feature of these regressions.

Table 3: Spatial Lag Model vs. Spatial Error Model tests

	Fitted model 1			Fitted model 2: S-M-P (included)		
Test	Statistic	df	p-value	Statistic	df	p-value
Spatial error:						
Moran's I	-2.792	1	1.995	-0.36	1	1.282
Lagrange multiplier	2.843	1	0.092	0.369	1	0.543
Robust Lagrange multiplier	0.004	1	0.947	2.079	1	0.149
Spatial lag:						
Lagrange multiplier	5.94	1	0.015	6.213	1	0.013
Robust Lagrange multiplier	3.102	1	0.078	7.923	1	0.005

Notes:
Fitted model 1: *FDI = Gr + ENERGY + HumanCap + XR + OPEN + TEL + CREDIT + GovStab + BureauQual*
Fitted model 2: *FDI = Gr + ENERGY + HumanCap + XR + OPEN + TEL + CREDIT + GovStab + BureauQual+S-M-P*

Note: Row-standardized weight matrix and Euclidean distance band: 0.0 < d < 40.0

The estimation results (see table 4 below) of the spatial lag model by Maximum Likelihood (using the command *spatreg* in Stata) show that the previous specification (4) and (5) are robust to the inclusion of the spatial term $W_y.FDI$ despite the variable *Gr* becomes insignificant (it was only significant at 10% in the fixed effect model [specification (4)] and insignificant in the random effect model). The other key variables namely *ENERGY, HumanCap, and OPEN* are significant. However, the variable *OPEN* shows an unexpected negative sign[26]. This could be explained by the inclusion of the spatial weight matrix in the regression and/or the prevalence of non-linear relationship between the dependent variable and the proxy of economic openness.

A concave or convex relationship may exist between FDI and the explanatory variable open. Nabamita and Sanjukta (2009) have detected this dual relationship while estimating the determinants of FDI in developing countries. According to the authors the non-linearity (concave

[26] Nevertheless, this can be justified for a horizontal investment seeking to circumvent tariff and non-tariff barriers to supply the host country by establishing a local affiliate.

or convex) indicates that for a similar changes in a given explanatory variables the change in the rate of FDI inflows vary[27].

The variable of particularly interest i.e. the spatially autoregressive parameter $W_y.FDI$ is significant at 1% and display a negative sign indicating that the eviction is the dominant effect in the MENA region. The negative spatial autocorrelation arise when high values correlate with low neighboring values and vice versa[28]. In other words, in MENA region the high flows of FDI toward certain countries coexist with low flows toward other neighbor countries. Intuitively, one can suppose that the gap between the top MENA countries in term of FDI and those falling behind is explained by the fact that the former are coming at the expense of the latter. The big host countries with high attractiveness are overshadowing the countries with much lower potential and these countries are crowded out because they are unable to compete actually with the leaders. Furtherer, one can suppose that the overseas spotlight is mostly in the direction of the core MENA countries.

Disaggregated data are highly recommended to provide more details about this issue. Moreover, it has been found that negative spatial autocorrelation arises when locations are surrounded by neighbors with disparate values of the same variable[29]. This matched well with stylized facts in term of inbound FDI in the MENA region (see figure 1 p.4).

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[27] To deal with their potential non-linear effect on inward FDI Nabamita and Sanjukta (2009) introduce the square of the explanatory variables showing such correlation.
[28] Positive spatial autocorrelation occur when high values correlate with high neighboring values or when low values correlate with low neighboring values.
[29] Conversely, positive spatial dependence is observed when high or low values of a variable cluster in space.

Table 4: Spatial Regressions: Spatial Lag Model vs. Spatial Error Model
Period: 1990-2015, Sample: 13

Maximum Likelihood Spatial lag model				**Maximum Likelihood Spatial error model**			
FDI	Coef.	z	P>|z|	FDI	Coef.	z	P>z
Wy_fdi	-1.72	-2.86***	0.004				
Gr	34.48	1.02	0.307	*Gr*	27.10	0.79	0.429
ENERGY	0.0082	3.57***	0.000	*ENERGY*	0.0082***	3.34	0.001
HumCap	5221.92	4.96***	0.000	*HumCap*	4913.67***	4.39	0.000
XR	-0.10	-1.07	0.284	*XR*	-0.088	-0.8	0.425
OPEN	-33.80	-3.25***	0.001	*OPEN*	-37.41***	-3.17	0.002
TEL	15.96	0.45	0.651	*TEL*	-36.01	-0.94	0.348
CREDIT	27.77	1.86*	0.064	*CREDIT*	41.33**	2.31	0.021
GovStab	-17.65	-0.12	0.902	GovStab	173.69	1.21	0.228
BureauQual	-1372.23	-2.13**	0.034	*BureauQual*	-705.75	-1.09	0.274
S-M-P	3.20	1.8*	0.071	***S-M-P***	-0.026	-0.01	0.989
_cons	662.24	0.29	0.774	_cons	-6716.26***	-3.59	0.000
				lambda	-1.941***	-7.31	0.000
Number of obs = 338 Log likelihood = -3303.44 Squared corr. = 0.276 Sigma = 4212.12 Wald test of rho=0: chi2(1) = 29.432 (0.000) Likelihood ratio test of rho=0: chi2(1) = 15.706 (0.000) Lagrange multiplier test of rho=0: chi2(1) = 6.213 (0.013) Acceptable range for rho: -2.281 < rho < 1.000				Number of obs = 338 Log likelihood = -3305.80 Squared corr. = 0.198 Sigma = 4230.84 Wald test of lambda=0: chi2(1) = 53.492 (0.000) Likelihood ratio test of lambda=0: chi2(1) = 10.980 (0.001) Lagrange multiplier test of lambda=0: chi2(1) = 0.369 (0.543) Acceptable range for lambda: -2.281 < lambda < 1.000			

***, **,* represent respectively statistical significance at 1, 5 and 10% level.

IV.2.4. The Transmission channels

After underlying the spatial effects by focusing to the FDI lagged variables of host countries and Surrounding-Market-Potential (SMP) we focus on the main channels through which the spillover effects generated by the neighboring countries on a given host MENA country. For this we run the Spatial Durbin Model (SDM) to identify effects from the other neighboring variables, (see table 5). In fact, contrary to the spatial lag model (the SAR) where the spatial effects are only limited of the two variables indicated (SMP and $W_y.FDI$), the SDM makes possible to take into account other variables that could play a prominent role in the spatial interdependence upshot. The model was performed by considering a binary contiguity weighted matrix (ij locations interact when they are contigus i.e sharing a common border) since the Stata command "spweightxt" used is not compatible with other kind of matrix[30].

Table 5: Spatial Durbin Model; period: 1990-2015, Sample =13

	FDI	Coef.	z	P>z	Direct effect	$t_{-Stat.}$	Indirect effect	$t_{-Stat.}$
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Gr	46.06	1.52	0.127	47.30*	1.57	-1.26	-0.04
	Energy	0.01*	1.56	0.118	0.01*	1.61	0.00	-0.04
	HumanCap	1295.94	1.04	0.300	1330.78	1.06	-35.31	-0.03
	XR	-0.49***	-4.18	0.000	-0.50***	-4.29	0.01	0.11
	Open	-11.48	-1.04	0.296	-11.79	-1.07	0.31	0.03
	TEL	189.86***	4.7	0.000	194.96***	4.83	-5.17	-0.13
	CREDIT	17.30	1.06	0.291	17.77	1.08	-0.47	-0.03
	GovStab	97.32	0.61	0.543	99.94	0.62	-2.65	-0.02
	BureauQual	-739.98	-1.28	0.201	-759.87	-1.31	20.16	0.03
	S-M-P	-3.75**	-1.85	0.065	-3.85	-1.9	0.10	0.05
Lagged Spatial Factors	Wx_ Gr	60.53**	2.22	0.027				
	Wx_Energy	-0.01***	-6.48	0.000				
	Wx_Humancap	636.39	0.71	0.480				
	Wx_XR	0.22***	2.71	0.007				
	Wx_Open	-32.82**	-2.28	0.023				
	Wx_TEL	-107.97**	-3.49	0.000				
	Wx_credit	25.35*	1.67	0.096				
	Wx_GovSta	-35.82	-0.32	0.752				
	Wx_BureauQual	-115.83	-0.21	0.830				
	Wx_S-M-P	20.76***	7.31	0.000				
	_cons	-241.27	-0.11	0.916				

Observations = 338; R^2= 0.48; Wald Test = 296.174 P-Value > Chi2 (20) = 0.0000; F-Test = 14.8087 P-Value > F(20 , -20) = 0.0000. ***, **,* represent respectively statistical significance at 1, 5 and 10% level.

Compared to the spatial lag model one can note that exchange rate (XR) and the proxy of infrastructure (TEL) become significant respectively at 5% and 1% while energy is only significant at 10%. The variable SMP has changed its sign from positive to negative while openness and CREDIT turn into insignificant variables. It seems that the inclusion of the contiguity matrix has impacted the econometric tests result.

[30] The stata module is developed by Shehata, E. (2013).

Regarding the spatial effects driven by neighboring countries and affecting a given host MENA country (see column 1) we conclude that the economic growth, the exchange rate and Surrounding-Market-Potential (SMP) (computed respectively by W_x_Gr, W_x_XR, W_x_ S-M-P) in the neighboring countries generate positive spillovers on the host country. Hence, the economic conditions prevailing in the neighboring countries affect positively the amount of FDI attracted by a given host country in the MENA region. We can advance that foreign investors are sensitive to the whole economic conditions in the region. The variables, W_x _energy W_x _tel display a significant negative sign at a level of 1% same thing for openness but at only a level of 5%. In other words an increase of these variables in the neighboring countries leads to a decrease in the inward FDI in the host country. Probably, foreign firms consider these variables more specifically and consider them exclusively as idiosyncratic variables. Accordingly, this will produce some disparities in term of attractiveness between MENA countries considered individually and consecutively a trade-off between the different countries may occur all other things are being equal. The direct effect[31] (the own country effect of classical determinants) and the indirect effect (the effect of the same determinants from neighboring countries i.e. the spatial effect) relative to the indicated variables sustain partially this idea since they show opposite sign even if for the indirect effect we didn't record any significant impact (see column 4 and 6). One could suggest that the own country effects of energy, openness and infrastructure are significant determinant of a host country FDI in the region. However, the impact of the same variables coming from neighboring countries will probably impede the inbound FDI for a host country.

[31] Estimation results (see column 4) reveal that economic growth, energy resources and infrastructure are in line with the theory and contribute positively and significantly to the development of FDI. However, openness shows an unexpected negative sign. Furthermore, the depreciation of the exchange rate seems to be considered as a risk variable (aversion to volatility) by investors.

Conclusion

According to the econometric results from alternative tests we found a negative spatial interdependence in MENA region in term of inbound FDI. The crowding out is likely to be the dominant effect even if it could coexist with the crowding in, but it seems that substitution is widely prevailing over complementarity (i.e. the net effect is a spatial negative autocorrelation). These results comply well with the predictions of the theory as well as previous empirical works and are compatible with the pure vertical nature of FDI prevailing in the region. Indeed, if low cost seeking motives are the driving forces behind FDI (i.e. vertical incentives or export-platform FDI dominate) we would expect the multinationl firms activities to be substitutive across neighboring countries since the FMN will prefer a country over others. Actually, the positive spatial spillovers induced by hypothetical presence of complex vertical FDI are too weak to overcome the competition effect.

Regarding the channels through which the spatial effects are transmitted from the neighboring countries to a given host MENA country we found that economic growth, the exchange rate and Surrounding-Market-Potential (SMP) are the main transmission canals of positive spillovers. Probably, foreign firms are sensitive to the whole economic conditions in the region when they decide to invest in a given MENA country. At the same time, the resources endowment, the economic openness country and the infrastructure relative to the neighboring countries generate negative spillovers which mean that a raise in these factors in the MENA neighboring countries leads to a decline in the inward FDI in the host country. In a context of vertical FDI, foreign investors consider these variables more specifically and consider them as idiosyncratic aspects leading them to select the most appropriate location vis-à-vis other proximate countries in term of their activities they are intending to set up. Henceforth, MENA countries will be considered more specifically and individually. Accordingly, a trade-off or head to head competition between the different MENA countries may occur all other things are being equal. As a matter of fact policy makers should keep in mind this kind of a game theory when they have to deal with the FDI promotion strategy designed to influence the decision process of multinational firms and convince them to invest in the country.

The repartition of FDI in MENA countries is unequal; this is of course not an exception since it's the rule elsewhere. Countries with high potential will be in the short list of multinational firms and all things being equal will attract the greater fraction of the amount of potential FDI, the other will relatively fall behind. In other words, individual MENA countries are likely not listed on the same curve of foreign investors' preference. Spatial interdependence could in some extent explain the imbalanced FDI distribution in MENA region. Though, FDI should not be totally considered as an exogenous factor. Actually, the decision of a transnational corporation to invest in a country is impacted by a bundle of intrinsic factors of that country. MENA countries should enhance their own attractiveness to maximize the positive spillover effects and counterbalance the negative ones.

The existence of an international tournament to host multinational firms is an old story and with globalization the worldwide competitions is becoming harder and more "ferocious". The existence of competition effect within the MENA region should not completely be considered as a bad news especially if it will motivate policy makers to do better reforms and to show more creativity to catch up the leader countries in the region. Both demonstration and agglomeration effects induced by countries like Turkey and United Arab Emirates should be fully exploited by neighboring countries. Cooperating with competitors is generally beneficial. Diversifying the pull factors for foreign investors through an ingenious policy is necessary not only to be in the focus of multinational firms but also to attract the best ones i.e. those able to generate important spillover effects in the host economy. The abolition of tariff and non-tariff trade barriers between MENA countries, the development of technological capabilities and the modernization of infrastructure will attract complex vertical FDI (vertical specialization with agglomeration) reputed to be a source of positive spatial effects. Moreover, much more stability and less hostile bilateral relationship in the region will be positively felt by investors abroad. Moreover, this could restrain the trade-off effect related to political and insecurity issue (turbulence, embargo, lack of transparency and so on will probably impede the image of the whole region and increase the likelihood of bilateral and multilateral trade-off). In fact, MENA region has sufficient potential and enough "space" to host different kinds of FDI and are able participate much more in the globalization where transnational firms are the major players.

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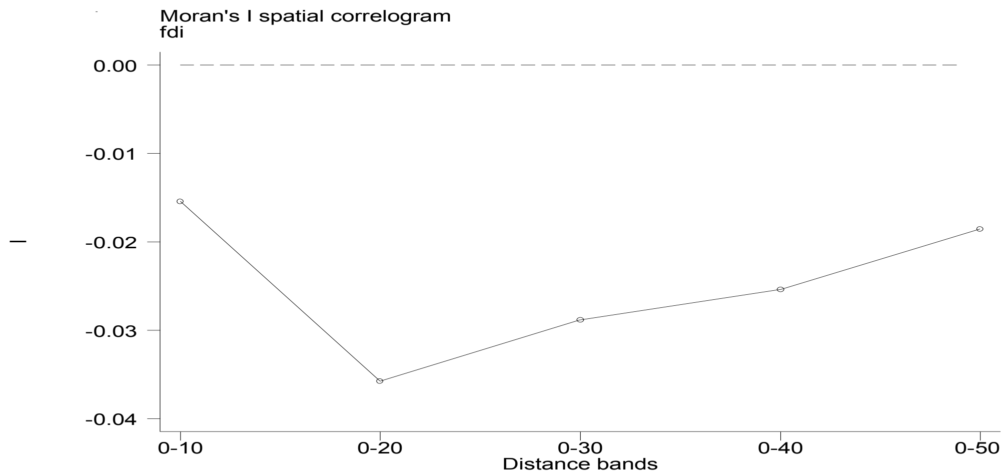
Appendix 1: Correlation Matrix

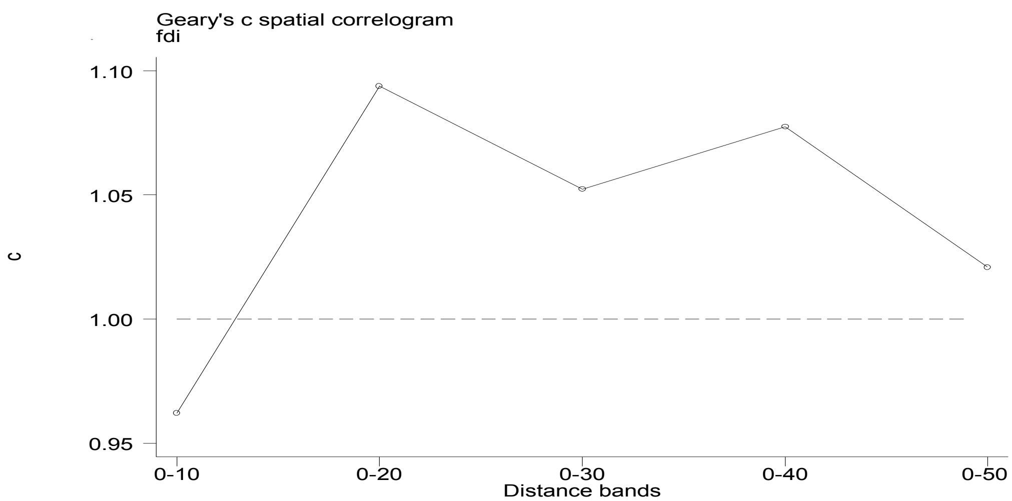
	Gr	ENERGY	HumanCap	XR	OPEN	TEL	CREDIT	GovStab	BureauQual	S-P-M
Gr	1									
ENERGY	-0.0043	1								
HumanCap	0.06	0.20	1							
XR	-0.06	0.17	0.0025	1						
OPEN	0.05	-0.05	0.65	-0.18	1					
TEL	0.07	0.15	0.53	0.37	0.35	1				
CREDIT	-0.08	-0.13	0.52	0.04	0.60	0.20	1			
GovStab	0.20	0.04	0.38	-0.17	0.26	0.16	0.23	1		
BureauQual	0.06	0.14	0.49	0.01	0.48	0.45	0.35	0.26	1.00	
S-P-M	0.07	0.19	0.52	0.03	0.51	0.43	0.31	0.19	0.18	1

Appendix 2: *Variance Inflation Factor Test*

Variable	VIF	1/VIF
HumanCap	2.85	0.35
OPEN	2.76	0.36
TEL	2.14	0.47
CREDIT	1.91	0.52
S-P-M	1.71	0.58
BureauQual	1.67	0.60
XR	1.51	0.66
ENERGY	1.27	0.79
GovStab	1.24	0.81
Mean VIF	1.9	

Appendix 3: Moran's I and Geary's C spatial graph





Appendix 4: Host country share of accumulated inward FDI in (Period: 1990-2015)

Country	Share %
Saudi Arabia	25.90
Turkey	20.95
Emirates	13.66
Egypt	9.87
Iran	4.95
Morocco	4.80
Qatar	4.06
Jordan	3.18
Tunisia	2.96
Sudan	2.94
Algeria	2.91
Bahrain	2.38
Kuwait	1.43
Total MENA 13	100

Source: Author calculation from UNCTAD Data base 2016

Data Source

Indicators	Sources
Foreign direct investment in million of current US $	United Nations Conference on Trade and Development, UNCTAD Statistics database online, 2016. http://unctadstat.unctad.org
Domestic credit provided by banking sector (% of GDP) Telephone lines (per 100 people) Annual percentage growth rate of GDP at market prices GDP per capita (current US$) The official nominal exchange rate (local currency units relative to the U.S. dollar).	World Bank, World Development Indicators Database online, 2016. http://data.worldbank.org/indicator
Energy production (Kt of oil equivalent)	OECD Database online, 2016. http://www.oecd-ilibrary.org/
Index of Human Capital per Person the average years of schooling and the return to education. Based on the average years of schooling from Barro and Lee (2013) and an assumed rate of return to education, based on Mincer equation estimates around the world (Psacharopoulos, 1994).	Penn World Tables PWT Version 8.0 University of Groningen. Database online, 2016. http://cid.econ.ucdavis.edu/pwt.html
Distance (Km) between capital cities Latitude and Longitude (in degree)	CEPII- Database http://www.cepii.fr/
Bureaucracy Quality: describes the institutional strength and quality of bureaucracy. High points (the highest score is equal to 4 points and the worst score is equal to 0) are given to countries where bureaucracy has the strength and expertise to govern without drastic changes in policy or interruptions in government services. **Government Stability:** Measure the government's capacity to execute its announced programs, and its aptitude to keep up. The risk rating assigned is the sum of three subcomponents (Government Unity, Legislative Strength and Popular Support). A score of 4 points equates to very low risk and a score of 0 points to very high risk.	International Country Risk Guide (ICRG), The PRS Group, Inc. 2010 and online update