Export Diversification in MENA Countries and Spatial Spillovers[1]

Portland State Univresity

[1] alayamarouane@gmail.com

I. Introduction

In 1930 Mac Laughlin by published a pioneering on diversification. Afterward, in 1940s and 1950s literature on diversification experienced a rapid pace. After the collapse of the import substitution strategy in the late 1970s, economic diversification became one of the most debated topics. Nowadays, the subject is still highlighted in a wide range of research fields.

Export diversification occurs when there is: (1) a growth of existing exports products ("traditional products") that are already being exported to traditional, old markets (growth in the 'intensive margin' of exports) (2) a growth in exports resulting from export flows to new markets and new products (the extensive margin of trade). Thus, broadly speaking export diversification results from export variations in term of new products or new market (extensive diversification) and/or the growth of existing products being exported (intensive diversification). Accordingly, changes in export diversification in a country or a region reflect the introduction (or disappearance) of new export product varieties (changes in the extensive margin) or changes in traditional exports (changes in the intensive margin), (Amurgo-Pacheco and Pierola, 2007, Brenton and Newfarmer, 2007, Baldwin and Di Nino, 2006).

MENA countries are particularly concerned about economic diversification. Indeed, many countries in the region are natural resources' dependent and focus to gradually move away from this trap. In fact, one of the most remarkable features of trade in MENA countries is their export overreliance on a few export commodities whose prices could fall sharply. The recent crude oil prices drop off in the COVID-19 context is a good example. Gourdon (2009) underlines the sluggish and the limitation of export diversification of MENA countries compared to other countries in their process of discovering new exports. The author added that the products being exported by MENA economies are mostly low skill unsophisticated products. This point of view is also shared by the World Bank (2007, p.5), "MENA countries find themselves squeezed between low-wage competitors in poor countries who dominate mature industries and innovators in rich countries, who dominate industries undergoing rapid technological change. Exploiting unused potential for export growth and finding new export opportunities is therefore critical for MENA countries to reposition on world markets in areas in which they can build up comparative

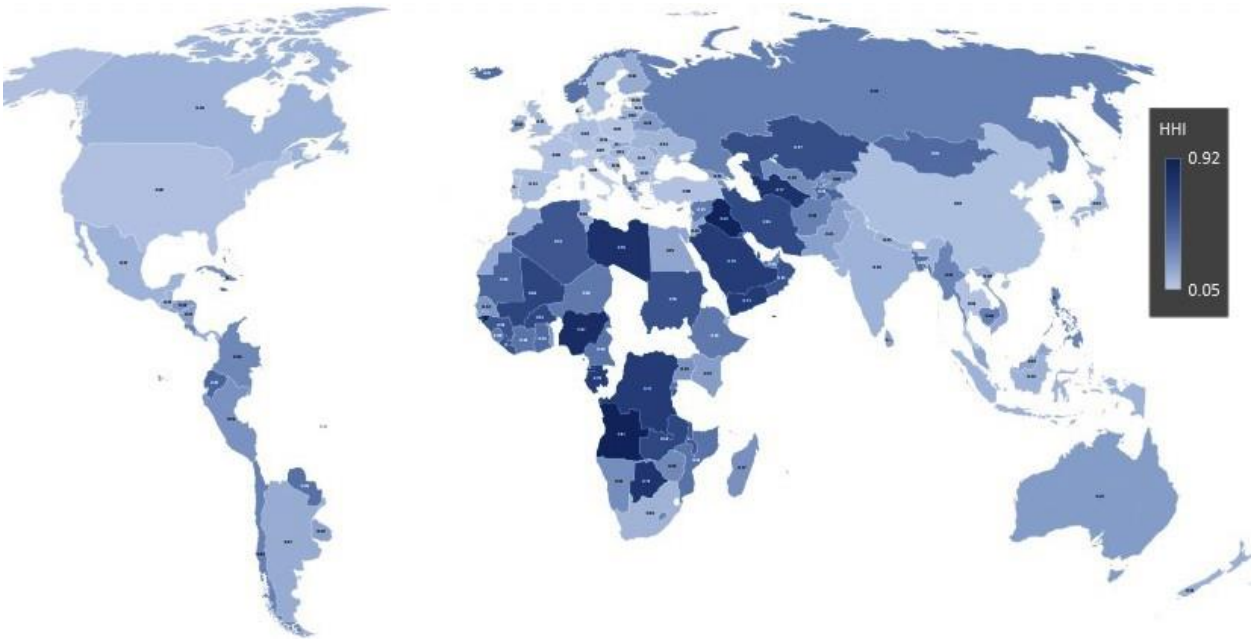
advantages". In fact, MENA countries exports are concentrated on a few products, often primary commodities and/or intensive unskilled labour products, with very volatile demand. This implies high income instability, which in turn leads to high growth volatility. Of course, this will expose the MENA countries to different kind of chocs and put them at the risk of uncertainty. Their stability, which is far to be perfect, may be seriously affected. Therefore, in the context of MENA countries we think that export diversification is a main concern and should be considered as a policy objective per se. Moving up the value chain to produce more sophisticated products, enhancing the economic and social resilience and boosting exports and growth are among the arguments that need to be highlighted.

Even though a profound effort has been made to understand the factors that drive economic diversity, there is still room for improvements for theoretical and methodological developments. It is worthwhile to note that the aim of empirical studies is to focus on factors explaining the economic diversification, but the treatment of the subject is usually performed in an independent way with little attention to countries' interactions. Therefore, the neglected third country effect should be paid a particular attention. The economic diversification in one country will not depend exclusively on the intrinsic conditions of that country but will be influenced as well by the factors prevailing in other countries and regions. Space, in fact, is not composed of units isolated from each other. The units in the space interact and what happens in a unit is in some extent impacted by other ones. Space and location matter.

The importance of intraregional spillovers (the neighboring effects in MENA) in the context of economic diversification in MENA region will be the aim of this study. The idea is to detect the spillovers effects between MENA countries by running a spatial analysis. The objective of this study is twofold. Firstly, we explore the potential "local" spillovers (spillovers inside the region) Secondly, we explore the determinants of economic diversification in the context of MENA region by adopting a spatial approach.

II. Export concentration in the world : A picture is worth one thousand words

Figure 1: Herfindahl-Hirschmann Index
Average of the period 2000-2020



Source: Author's calculation from UNCTAD data

The figure 1 provides a world cartography of export concentration[2] measured by the average of the Herfindahl-Hirschmann Index for the period 2000-2020. In the MENA region and Africa the dominant colour is the dark blue and this is a sign of a high export concentration. The light blue color (a high export diversification) is mostly found in Europe and North America.

As expected, high values are displayed by oil reach countries like Algeria, Libya , Saudi Arabia, Iraq, Iran, Qatar, Oman, and Kuwait (the HHI ranges between 0.52 and 0.89). The United Arab Emirate, Syria and Bahrain show a HHI value around 0.35 which is close to the world average (equal to 0.32). Also, the data indicate that the exports of non-oil countries (Lebanon, Morocco, Tunisia, Egypt, and Jordan) are more diversified (HHI is between 0.13 and 0.18) than the well-endowed resource MENA countries. All things being equal, it seems that the correlation between export concentration and resource donation are well established. Finally, it is worthwhile to note

[2] Export concentration and export diversification will be used alternatively in this paper.

that Turkey is the most diversified economies in the region with a HHI equal to 0.08 like the European standard.

II. Spatial econometric: A useful framework to study export diversification

"We only have little understanding of the driving forces behind the export diversification, and especially of what might lead to the emergence of new products and services in export-orientated economies", (World Bank, 2007, p.5). In fact, the World Bank statement contrast considerably with the mediatization of the export diversification benefits and the enthusiasm of researchers to valid them. Indeed, we lack a well-developed theoretical framework of economic diversification. This explain why most of the empirical works are based on de facto models and/or intuitive econometric regressions. Regarding the importance of export diversification and the related economic policy recommendations a more significant effort should be allowed to this field of research. This could be insightful and policy relevant.

Another gap that worths to mention is the way the empirical studies apprehend the subject of economic diversification. Most empirical studies are conducted in an atomistic way with little attention to countries interactions. This means that the multidimensionality of the export diversification and its geographical feature are generally neglected. Space is not composed of units isolated from each other. The units in the space interact and what happens in a unit is likely impacted by other ones. The spillovers as well as externalities and shocks are among the mechanisms that could be put forward to sustain such an argument. LeSage (2014, p.14) argues that :"A (spatial) spillover arises when a causal relationship between the r^{th} characteristic/action of the *i*th entity/agent (X_i^r) located at position i *in* located at position i in space exerts a significant influence on the outcomes/decisions/actions (y_j) of an agent/entity located at position j. In the context of a spatial regression relationship where $y_j, j = 1, \dots n)$ is a vector of outcomes/decisions/actions of an agent/entity located in region/location j, and x: is a matrix of k characteristics/actions of all n regions/entities/agents, a formal definition would be: $\partial y_j / \partial x_i^r \neq 0$ which implies a spillover/impact from the rth characteristic/action of region/agent/entity i that impacts the outcome/decision/action in region *j*".

Contrary to the classical econometric regressions, the spatial models (with the neighbouring effect considered) can deal with the interdependence across the countries and regions. The existence of a variety of economic connections across the countries require considering the time aspect as well as the geographic dimensions by including the countries' locations and their connectivity. The concept of spatial autocorrelation is derived from the concept of homogeneity. This latter describes a specific state of a geographical distribution in which the values of the variables are similar, convey common characteristics, structural, functional, or distribution similarities. This similarity is frequently the consequence of analogous procedure such as data construction or generation, which is shaped by past events or modes that have a larger or smaller impact on the achievements' period (greater or smaller amount of time). The purpose of autocorrelation measurement is to identify whether (or not) a form of (spatial) dependence exists between the spatial realizations of a given variable, (Dubé and Legros , 2014).

Given the importance geographical interactions in the context of export diversification, it is surprising that this crucial aspect was ignored by most previous empirical works. Neglecting a key determinant of export diversification such as the neighboring effect will be probably felt in econometric results[3]. In fact, if the existence of spatial autocorrelation is proved, the OLS econometric regressions will lead to biased results (Anselin, 1988). Of course, this will affect the accuracy of the related economic policy. The economic world is widely open and dynamic and what occurs in one country or region will be spread to others especially those in immediate proximity. "Space, in fact, is not composed of units isolated from each other. What happens in each of them can influence others: there is spatial interaction", (Jayet, 1993, p.7). Hence, the spatial effect should not be ignored or neglected . In fact, space and location matter.

According to Dubé and Legros (2014, p.60), "spatial autocorrelation describes the average resemblance of the values of a series in relation to the values located" in the neighborhood. In other words, the value of a variable, in a given location, may be related to the values taken by this same variable in nearby areas. The phenomena located in a same area influence other phenomena

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

located nearby, which in turn interact with other spatially close phenomena. All these interdependencies reveal a certain level of organization of the values of a variable in space". Contrary to OLS econometric regressions, spatial econometric models of interdependence apprehend well the complexity of processes by focusing on spatial and space-time interactions. They are not limited to find evidence of but give answers to how and why these interactions take place. Indeed, the spatial econometric models can bring out: the nature (positive or negative) and the intensity of potential economic diversification spillover effects; the direct and indirect channels through which these spillovers would arise; and the detection of clusters (hot spots and cold spots).

III. Export Diversification Spillover Effects: Myth or Reality ?

The most common test for the existence of Global Spatial Autocorrelation is the Moran's I index. Formally, the Moran's I for a given variable x can be expressed as following:

$$I^* = \frac{\sum_{i=1}^{N} \sum_{i=1}^{N} W_{ij}^{*}(x_i - \overline{x})(x_j - \overline{x})}{\sum_{i=1}^{N}(x_i - x_j)^2}$$

Where W is the weight matrix and N the sample size and $\bar{x}$ is the mean of the variable x .

Moran's measurement can be roughly considered like a spatial adaptation of the correlation coefficient. It determines the linear relationship between the value of a given variable, and the value of the same variable in the neighborhood. However, Moran's I is very different from coefficients of correlation because of the role of the weight (the weight matrix). Also, the interpretation of Moran's I differs significantly from coefficients of correlation. The Moran Index is very useful to have a first insight about the existence, the nature, and the magnitude of spatial autocorrelation between the countries included in the sample.

Moran' I index is very useful to have an idea about the global autocorrelation. However, to deeply investigate the phenomena being studied we need to focus on local spatial autocorrelation. Indeed, local spatial autocorrelation allows to check whether, for a given observation *i* (let say the export diversification of a given country at time t), is surrounded by similar observations of other countries, or if it is (in the opposite case) is being surrounded by very dissimilar observations. Explicitly, it's about understanding if a value of the observation *i* is positively (resemblance) or negatively connected (dissimilarity) with neighboring observations. Similarly, local measurement allows us to detect outliers[4] (atypical localizations) which is not the case with global autocorrelation measure. Therefore, through global autocorrelation investigation it's possible to learn more about the clustering of high or low values. This is commonly known as hot spots (high values) and cold spots (low values). The Moran scatter plot can be divided into four quadrants each of them describes a kind of spatial correlation. For example, in the High-High quadrant (North-East) are displayed the weighted values of the HHI index (the spatially lagged variable: W_{HHI}), whish is high and at the same time surrounded by observations of high value of the "raw" HHI observations of neighboring countries. The low-low (South-West) quadrant is the opposite case: W_{HHI} is linked to low values of the neighboring countries. In the High-low (South-East) quadrant the high values of W_{HHI} coexist with low values of neighboring countries. In the opposite side the Low-High (North-West) quadrant displays the case where the spatially lagged variable W_{HHI} is surrounded by high values of neighboring countries. Accordingly, the sample countries in this study can be grouped in these four categories.

To calculate the Moran's I we firstly run a spatial correlogram test to select the appropriate band distance for the definition of neighboring concept. Once the distance band is picked up we build an inverse distance spatial matrix which can be considered as a theoretical presentation of the space composed by the 153 countries included in the study.

[4] As we can see on the HHI scatter plot The Democratic Republic of the Congo (ZAR code) is the only outlier that has been detected.

Table 1: Moran's I spatial correlogram of export concentration (Sample: 153 countries, Year: 2019)

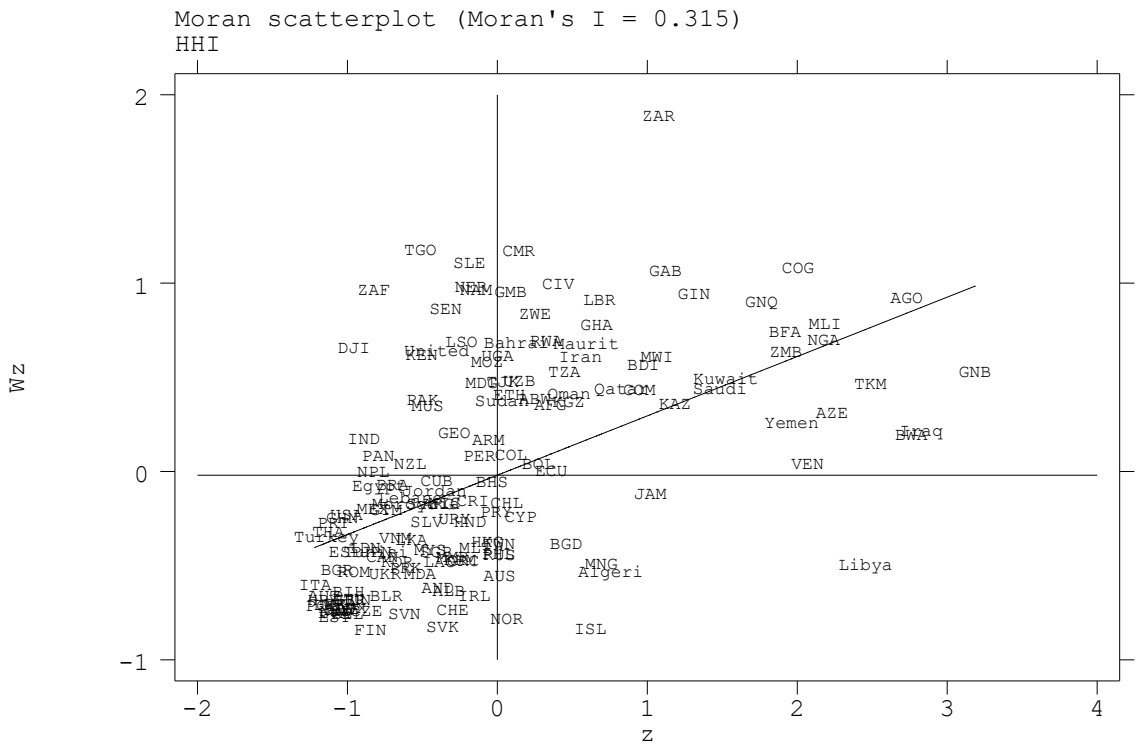
Distance bands	I	E(I)	sd(I)	z	p-value*
(0-10]	0.455	-0.007	0.063	7.3	0.000
(0-20]	0.345	-0.007	0.035	9.942	0.000
(0-30]	0.26	-0.007	0.028	9.663	0.000
(0-40]	0.182	-0.007	0.023	8.083	0.000
(0-50]	0.065	-0.007	0.02	3.497	0.000

*1-tail test

The Euclidean distance band of [0-30] has been chosen for the establishment of the spatial weighted matrix. Accordingly, for each $d_{i,j}\ \forall i \neq j\ \epsilon\ [0-30\ ]$ *i* and *j* are considered as neighbors otherwise the country *i and j* will not be considered as neighbors and will not be weighted, *i.e.* will be attributed a value of zero in the spatial weight matrix . In fact, if we combine the results of the statistic Z and its P-value provided by Moran test and the condition that every country should have at least one country, the [0-30] band distance will be the best choice.

The Moran scatter plot (Figure 2) as well as the Lisa cluster map (Figure 3) indicate a positive spatial correlation in term of export concentration. Indeed, the Moran's I slope is positive (equal to 0.32) and the Lisa cluster Map displays a clustering of like values (low values correlate with low neighboring values (blue spots) and high values (red spots) correlate with high neighboring values) which is an indication of positive spatial autocorrelation.

Figure 2: Moran's I scatter (sample:153 countries, year:2019)

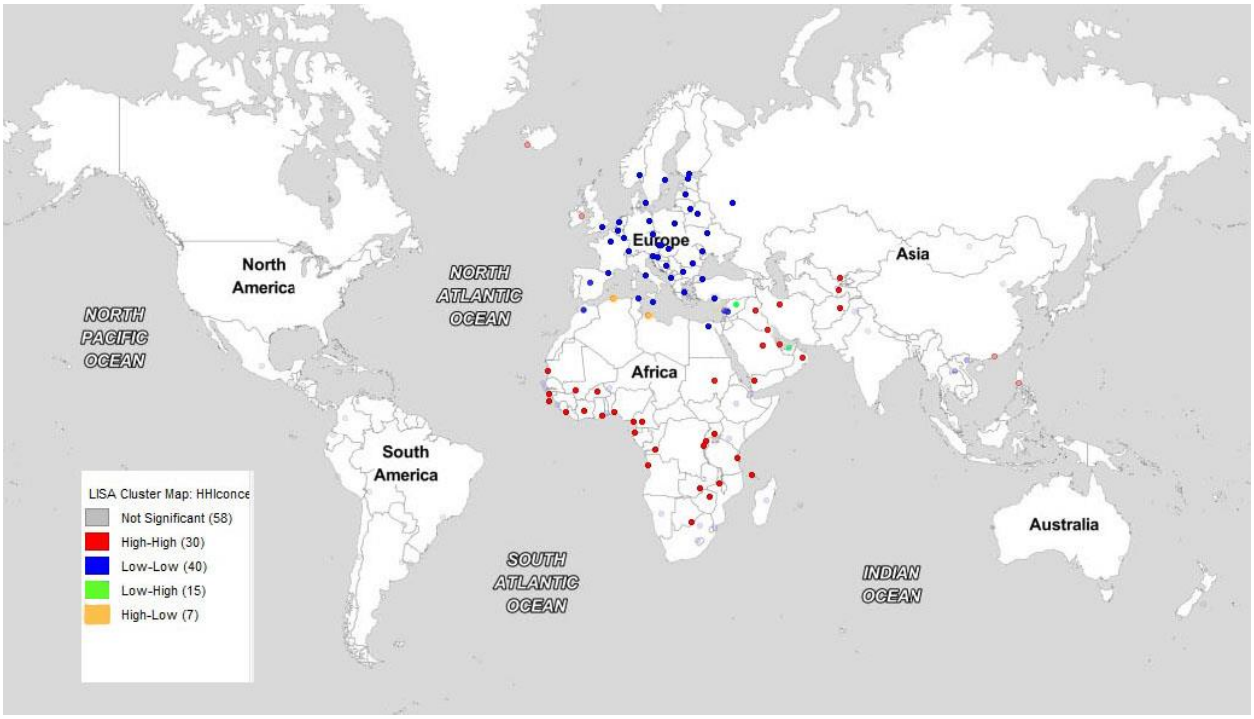


The Lisa cluster map (Figure 3) shows that the hot spots (High-High) are mainly composed by African and MENA countries namely the GCC oil-countries (Bahrain, Iran, Iraq, Kuwait, Oman, Qatar, Saudi Arabia, Sudan, Mauritania, and Yemen). Intuitively, this mean that the countries in this category (High-High) are those whose concentration index is high and surrounded by neighbors whose index is also high. Of course, this is match correctly with the GCC reality.

In other side, the cold spots include mostly European countries and six countries from MENA region (Egypt, Jordan, Lebanon, Morocco, Tunisia, and Turkey). It is not a surprise that these countries share the same cluster with the European countries since they display relatively the same characteristics: a weak export concentration and their neighbors (among which some countries belong to the European continent) have also a relatively low HHI index. In the High-Low cluster we find Algeria and Libya. In fact, the two countries have a high level of export concentration and are surrounded by countries with a low HHI values (like Tunisia, Morocco, Egypt that are close to Libya and Algeria and other are proximate to European countries). In the opposite Syria and the United Arab Emirates fall in the Low-High category. Both countries have a relatively low HHI

index and are close to countries with a high level of export concentration (like Saudi Arabia, Iraq, Kuwait, Bahrain, Iran, Oman, and Qatar).

Figure 3: Concentration Clusters : Hot Spots vs Cold Spots
(Sample: 153 countries, year: 2019, indicator: HHI)



Source: Author's calculation Using UNCTAD data

IV. The Spatial Econometric Regressions

To run spatial econometric regressions, we should incorporate a weighted spatial matrix W into the model. This matrix represents a theoretical configuration of the space and will bring out the potential of interaction between observations of each countries pairs i, j. The positive and symmetric $n \times n$ spatial matrix[5] is composed by elements $W_{i,j}$ at location i, j.

[5] n is the number of spatial units.

By convention $W_{i,j} = 0$ for the diagonal elements which means that a location cannot be a neighbor wit itself.

$$W = \begin{pmatrix} w_{1,1} & \cdots & w_{1,n} \\ \vdots & \ddots & \vdots \\ w_{n,1} & \cdots & w_{n,n} \end{pmatrix}$$

It is worthy to note that since each observation is weighted by the distance or proximity (contiguity for example); the potential of interaction increases with geographically proximate countries and decay with remote locations. There is a large range of techniques to specify the structure of the spatial weight matrix[6]. 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 (countries are not contigus) and 1 (countries are contigus). Another alternative is to use an inverse distance or a band distance weight (i, j locations interact when being within a critical distance band). Since it is recommended to experiment a variety of weighted spatial matrix W in the estimation process (because results may be very sensitive to the structure of matrix W) we used four different kinds of matrices (contiguity weighted matrix, matrix based on inverse distance, matrix with band distance, a matrix based on negative (or inverse) exponential[7] and a matrix based on the shortest distance[8]) while running spatial econometric regressions in the study. The best results were given by matrix based on inverse distance. Then this matrix is adopted to run the econometric regressions.

[6] It is recommended to experiment a variety of weighted spatial matrix W in the estimation process because results may be very sensitive to the structure of matrix W.

[7] $w_{i,j} = \frac{1}{e^{d_{ij}}} = e^{-d_{ij}} \quad \forall\, i \neq j; i, j = 1, \ldots\ldots, N$

[8] A spatial matrix weighted by the shortest distance is the case when the weight attributed to the other distance in the sample will decrease as suggest by this formula $: \frac{Shortest\ distance}{d_{i,j}} \ \forall\, i \neq j$ the shortest bilateral distance within the sample as the distance reference receiving a weight of unity. The shortest distance within the sample is between Bahrain and Qatar (equal to 143 km) receives a weight of unity while all other distances within the sample receive a weight which declines with the distance as indicated by the following formula $Wi, j = \frac{143}{d_{i,j}} \ \forall\, i \neq j$

There is a plethora of spatial econometric models, and one crucial issue is to choose the right one for the subject treated. Spatial regression models are statistical models that account for the presence of spatial effects, i.e., spatial autocorrelation (or more generally spatial dependence) and/or spatial heterogeneity. In this study the choice is based on spatial econometric tests as well as the subject we are investigating. Broadly speaking there are three canonical spatial models namely the Spatial Lag Model or Spatial Autoregressive Model (SAR), the Spatial Error Model (SEM) and the Spatial Durbin model (SDM). We opt for the SAR and SDM model because they are more appropriate for the detection of spillover effects. Also, the tests performed give preference to the SAR model against the SEM model.

The SAR model postulates that levels of the dependent variable *y* depend on the levels of *y* in neighboring regions captured by the weighted matrix *W* and represented by ρW_y

$$y = \rho W_y + \alpha + \beta X + \varepsilon \qquad \text{[Eq.1]}$$

The Spatial Error Model (SEM) in this model, the spatial influence comes only through the error terms $\mu = \lambda W_\mu + \varepsilon$ and is not very useful to detect spillover effects.

$$y = \alpha + \beta X \mu \qquad \mu = \lambda W_\mu + \varepsilon \qquad \text{[Eq.2]}$$

The Spatial Durbin Model (SDM): just adds average-neighbor values of the independent variables to the specification through the expression $WX\theta$

$$y = \rho W_y + \alpha + \beta X + WX\theta + \varepsilon \qquad \text{[Eq.3]}$$

V. Estimation Results

For the econometric regressions we use panel data of 15 MENA countries[9] extracted from the World Bank, the UNCTAD, the IMF, the CEPII and the Heritage Foundation database[10]. We run both the SAR model and the SDM over the period 2000-2019 to estimate the determinant of export diversification and to deal with the spillovers effects as well as their channel of transmissions (see Table 2 and Table 3 below).To estimate the export diversification, we use as dependent variable the Herfindahl-Hirschmann index which is a measure of the degree of concentration with values ranking between 0 and 1. When the index value approaches one, it means that a country has a greater reliance on a limited group of exports, while a value closer to zero represents a higher degree of export diversification. The HHI can described by the following formula:

$$H_j = \frac{\sqrt{\sum_{i=1}^{n}\left(\frac{x_i}{X}\right)} - \sqrt{1/n}}{1 - \sqrt{1/n}}$$

Where:

Hj = country or country group index
xi = value of exports of product *i*

$X = \sum_{i=1}^{n} x_i$ and n = number of products (at SITC Revision 4, 4-digit group level).

We estimate the HHI index on a set of explanatory variables[11] namely: the GDP per capita (GDPCAP), the GDP per capita square, the foreign direct Investment (FDI), the human capital (Humancap), the oil rent (OILRENT), the exchange rate (XR), the productive capacities Index (PCI), the governance[12] (GOVERNANCE), trade freedom (TradeFREEDOM) and the intensive (INTENSIVE) and extensive (EXTENSIVE) components of export diversification.

[9] Algeria, Bahrain, Egypt, Jordan, Kuwait, Iran, Lebanon, Oman, Morocco, Qatar, Saudi Arabia, Sudan, Tunisia, Turkey, and the United Arab Emirates.
[10] For more details about the variables used and data sources see Table 4 in appendix.
[11] For a summary of the expected impact of the explanatory variables on export concentration we can refer to the Table 5 in appendix.
[12] Obtained by calculating average of the following six governance indicators: Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption.

Table 2: Maximum Likelihood Spatial Lag Model

$$HHI_{i,t} = \rho W_y HHI_{i,t} + \propto_i X_{i,j} + \epsilon_{i,t}$$

SPECIFICATION 1				SPECIFICATION 2			
Standardized Weight Matrix (W):(300x300) NC: 15, NT:20 Period:2000-2019				Standardized Weight Matrix(W):(225x225) NC: 15, NT:15, Period:2000-2014			
	Coef.	z	P>z		Coef.	z	P>z
HHI				**HHI**			
GDPCAP	6.94E06***	3.78	0.000	GDPCAP	4.90E-06***	2.37	0.018
GDPCAPSQ	-5.64E-11***	-3.3	0.001	GDPCAPSQ	-4.13E-11**	-2.02	0.043
FDI	-3.75E-06***	-2.67	0.008	FDIUNCTAD	-1.27E-06	-0.81	0.417
OILRENT	0.01***	15.46	0.000	OILRENTSOFGDP	0.01***	12.48	0.000
Humancap	-0.00051	-1.22	0.222	Humancap	-0.001**	-2.37	0.018
XR	1.21E-07	1.16	0.352	XR	3.51E-06	0.9	0.367
PCI	-0.011***	-4.16	0.000	PCI	-0.012***	-3.77	0.000
GOVERNANCE	-0.12***	-6.75	0.000	GOVERNANCE	-0.09***	-4.14	0.000
Trade_FREEDOM	5.13E-04	0.99	0.32	Trade_FREEDOM	8.49E-04	1.38	0.16
_cons	0.40***	4.58	0.000	**INTENSIVE**	0.022***	3.46	0.000
				EXTENSIVE	-0.013	-0.61	0.54
				_cons	0.36***	3.6	0.000
/Rho	0.36***	3.96	0.000	**/Rho**	0.50***	5.16	0.000
/Sigma	0.10***	14.34	0.000	/Sigma	0.10***	12.07	0.000
R-Squared=0.76 F-Test = 116.51 P-Value > F(8 ,277)0.0000 LM Error (Burridge)= 0.0192 P-Value > Chi2(1) 0.8861 LM Lag (Anselin)= 21.6384 P-Value > Chi2(1) 0.0000				R-Squared=0.76 F-Test = 64.42 P-Value > F(10 ,200)0.0000 LM Error (Burridge)= 0.078 P-Value > Chi2(1) 0.78 LM Lag (Anselin)= 24.38 P-Value > Chi2(1) 0.0000			

***, **,* represent respectively statistical significance at 1, 5 and 10% level.Standard deviations are robust to heteroskedasticity

In the econometric regression and in line with the spirit of spatial econometrics the dependent variable i.e. the HHI index in a given spatial unit *i* depends on the dependent variable observed in each geographical adjacent units *j*. The estimation results of the SAR model (specification 1) show that the productive capacities, FDI, and governance impact negatively and significantly (at a level of 1%) on the export concentration. According to the results, one can state that the aforementioned factors act like a catalyzer in the process of export diversification. The oil rent impact positively and significantly (at 1%) on export diversification. This fits well with the predictions that well-

endowed countries in natural resources tend to suffer from resource curse syndrome and are not inclined to diversify since fuel exporters enjoy substantial rents that may lessen the long-run benefits of export diversification (the Dutch disease syndrome). In a study of 11 MENA oil exporters for the period spanning from 1996 to 2017 Matallah (2020) found that the combined effect of the governance and oil rent could lead to more export diversification. The author advances that the good governance can move away these oil-countries from resource curse by investing oil revenues in favour of more export diversification.

The results related to the GDP per capita, and the GDP per capita square (both significant at 1% and have respectively a positive and negative coefficient) show an inverse U-shaped relationship between the level of development and export concentration. Accordingly, in the early development stages of MENA countries the trend is for export concentration. This contrast with what has been predicted by previous empirical works. In fact, it has been proven that countries first diversify but there exists, relatively late in the development process, a turning point at which they start specializing again. In other words, the GDP per capita (a proxy of the level of development) and concentration follow a U-shaped relationship. However, in the context of the MENA region, this logic could be different. In MENA region the GDP per capita in oil-countries is already high. Probably, this will artificially impact the estimation results and might bias the estimation results. The results may be different if the GDP per capita would have been adjusted for oil income. This said, the estimation results indicate that the human capital, trade freedom, and the exchange rate are statistically not significant.

Also, the variable of interest namely the spatial lag variable ρW_{HHi} describing the effects coming from the neighbouring countries is positively significant at 1%. This means that in MENA region the dominant kind of trade spillovers act for more concentration. This match well with the results that have been already found by Moran's I and the Lisa cluster map. Most MENA countries are in the High-High quadrant of the Moran's I scatter plot and the dominant color on the MENA region is red indicating a kind of "Hot spots cluster". It seems that the MENA region especially the GCC is falling into an export concentration trap and the neighboring effect act more on concentration than on export diversification.

The results of the augmented model (specification 2) for which the two variables intensive and extensive margin of exports have been added show similar results except the fact that FDI becomes insignificant and the coefficient of human capital turn into positively significant. The intensive margin of exports impacts positively and significantly at a level of 1% the export concentration which is likely to occur given the definition of the intensive margin of exports: a growth of existing exports products ("traditional products") that are already being exported to traditional, old markets). Hence, the increase in the amount of the same products being exported will, all things being equal, increase the concentration of the export basket. The extensive margin of export (a growth in exports resulting from export flows to new markets and new products) is not significant. Probably, the dynamism of exports has not yet reached a threshold level to reduce the concentration of exports in the MENA region.

Table 3: Maximum Likelihood Spatial Durbin model

$$HHI_{i,t} = \rho W_y HHI_{i,t} + \propto_i \ X_{i,j} \ + W\theta + \epsilon_{i,t}$$

SPECIFICATION 3				**SPECIFICATION 4**			
Standardized Weight Matrix (W):(300x300) NC: 15, NT:20 Period:2000-2019				Standardized Weight Matrix (W):(225x225) NC: 15, NT:15, Period:2000-2014			
HHI	Coef.	z	P>z	**HHI**	Coef.	z	P>z
GDPCAP	3.30E-06*	1.87	0.061	GDPCAP	3.00E-06	1.61	0.11
GDPCAPSQ	-2.53E-11	-1.49	0.137	GDPCAPSQ	-3.42E-11*	-1.71	0.09
FDI	-2.92E-06**	-2.3	0.021	FDI	-7.60E-07	-0.66	0.51
OILRENT	9.549E-03***	15.21	0.000	oilrentsofgdp	07.6E-03***	8.48	0.000
PCI	-0.021***	-7.18	0.000	PCI	-0.027***	-6.77	0.000
GOVERNANCE	-0.051***	-2.84	0.005	govaverage	5.4E-03	0.21	0.83
Humancap	-6.9E-04**	-1.91	0.05	Humancap	-1.6E-03***	-3.91	0.000
XR	-6.99E-07	-0.68	0.493	XR	2.24E-06	0.52	0.61
TRADEfreedom	5.56E-05	0.11	0.914	tradefreedom	7.74E-04	1.22	0.22
				INTENSIVE	0.019155***	3.24	0.000
				EXTENSIVE	0.035654***	3.04	0.000
Wx_FDI	-1.3E-05***	-4.32	0.000	**Wx_FDI**	-1E-05***	-2.87	0.000
Wx_ OILRENT	5.5E-03***	3.58	0.000	**Wx_ OILRENT**	3.8E-03**	2.13	0.03
wx_ PCI	0.027***	5.77	0.000	**wx_ PCI**	0.037***	4.59	0.000
_cons	-0.084	-0.69	0.493	**Wx_INTENSIVE**	-0.02	-0.62	0.53
				Wx_EXTENSIVE	0.20***	3.35	0.000
/Rho	0.21*	1.65	0.100	/Rho	0.24*	1.64	0.10
/Sigma	0.094***	15	0.000	/Sigma	0.088***	12.48	0.000
R-Squared=0.81 F-Test = 104.76 P-Value > F(12 ,273)0.0000 LM Error (Burridge)= 21.064 P-Value > Chi2(1) 0.0000 LM Lag (Anselin)= 2.42 P-Value > Chi2(1) 0.11				R-Squared=0.85 F-Test = 37.77 P-Value > F(16 ,194)0.0000 LM Error (Burridge)= 11.94 P-Value > Chi2(1) 0.0000 LM Lag (Anselin)= 2.09 P-Value > Chi2(1) 0.15			

***, **,* represent respectively statistical significance at 1, 5 and 10% level.Standard deviations are robust to heteroskedasticity.

The specification 3 and 4 represent the Spatial Durbin Model which is very useful to detect the spillover channels of export diversification. In fact, contrary to the Spatial Lag Model (the SAR model) where the spatial effects are limited to only one variable (ρW_{HHi}) , the SDM contains other variables $WX\theta$ that enable the detection of spillover effects from the idiosyncratic characteristics of the neighboring countries in addition to the effect described by the spatial dependent variable ρW_{HHi}. Econometrically speaking, the SDM captures the spillovers effects from the dependent variable of the neighboring countries as well as those generated by the explanatory variables of the same neighboring countries. The estimation results show that the spatial effects driven by neighboring countries in term of export concentration (captured by the variable ρW_{HHi}) confirm what have been revealed by the SAR model. However, the SDM adds more information about the channels through which the spillover spread across the neighboring countries by including the interaction between the explanatory variables of the individual neighboring countries (described by $WX\theta$). According to the SDM results, the variable ***Wx_FDI*** is negatively significant. This means that the export concentration in a given country decrease (or the export diversification increase) by the amount of FDI toward its neighboring countries. It has been proven that the FDI promote the export diversification[13] (then reduce the export concentration) and given the fact that the multinational firms in the region may act as a network, we could understand such a result. The variables Wx_OILRENT and Wx_PCI, Wx_EXTENSIVE are positively significant. Following the logic of the SDM, these variables describe the effect on a given MENA country through the characteristics of its neighboring economies. Hence, if the oil rent increase in a neighboring country this will in turn affect the export concentration in the other countries and so on. It's like a loop or snowball effect. Consequently, the concerned countries could fall into an oil trap which in turn will increase the export concentration of the other individual countries in the region. Wx_PCI, Wx_EXTENSIVE have a positive and significant sign. This means that the export diversification in a given country is impeded by the productive capacity and the extensive margin exports prevailing in its neighboring countries. This is a counter intuitive and unexpected result. This could result from the multicollinearity problems that characterize the SDM model. In fact, the explanatory variable describing the neighboring effects is presented twice in the model and risks to be origin of some multicollinearity problems.

[13] For more details see Table 5 in appendix.

VI. Conclusion

In this study we opt for spatial econometric models to estimate the determinants of export diversification. We think that in context of export diversification the space and locations matter. Hence, the subject should be considered in a regional perspective. The export diversification in one country will not depend exclusively on the intrinsic conditions of that country but will be influenced as well by the factors prevailing in other countries and regions. Space, in fact, is not composed of units isolated from each other. The units in the space interact and what happens in a unit is in some extent impacted by other ones. The estimation results show that MENA countries are falling into a kind of export concentration trap. In fact, there is a kind of feedback loops between neighboring countries in favor of export concentration. However, this is not a fatality since the export diversification is not exclusively exogenous. Indeed, according to the econometric results the export concentration could be mitigated by some factors that are under the control of the country like the productive capacity, governance and so on.

In the context of MENA countries, we think that export diversification is a main concern and should be considered as a policy objective per se. Indeed, many countries in the region are natural resources' dependent and focus to gradually move away from this trap. How it could and should be done? There is no simple and unique response to this challenging question. Indeed, export diversification is a multidimensional and eclectic economic concept. However, the subject is generally treated under the politicians' umbrella without providing a clear and realistic strategy. Lederman and Maloney (2009, p.51) emphasize that " there is no "resource curse," but there is a curse of export concentration, the implication is that policy makers should strive to provide a policy framework conducive to product and market diversification - but not necessarily one that promotes, through subsidies and incentives, diversification away from natural resource areas into manufactures". Indeed, "resource dependence is likely to be endogenous to a country's overall political and economic development trajectory. Careful attention therefore needs to be paid to how prevailing institutional arrangements interact with resource endowments, and how this might affect prospective reform trajectories", (Ross et al, 2011, p.1).

The strategy of the economic diversification should not be disconnected from the systemic and chronic weaknesses prevailing in MENA countries. Certainly, the diversification process is complex and uncertain, but the *statu quo* is more hazardous.

REFERENCES

Aitken, B., Hanson, G.H. et Harisson, A. E. (1997), "Spillovers, Foreign Direct Investment, and Export Behavior", Journal of International Economics, 43, pp. 103-132.

Amurgo-Pacheco, A. and Denisse Piérola, M. (2007), "Patterns of export diversification in developing Countries: Intensive and Extensive margins", HEI Working Paper No: 20/2007.

Anselin, L. 1988, Spatial Economy: Methods and Models; Kluwer Academic Publisher: Dordrecht, The Netherlands,1988.

Banga, R. (2003), "The Export Diversifying Impact of Japanese and U.S Foreign Direct Investments in Indian Manufacturing Sector", ICRIER Working Paper No. 110, September.

Baldwin, R. and Di Nino, V. (2006), "Euros and zeros: The common currency effect on trade in new goods", HEI Working Paper 21-2006.

Bebczuk, R., and Berrettoni, D. (2006), "Explaining Export Diversification: An Empirical Analysis", CAF Research Program on Development Issues, Department of Economics, Universidad Nacional de La Plata.

Ben Hammouda, H. N. Oulmane and Jallab, M. S. (2009), "D'une diversification spontanée à une diversification organisée : Quelles politiques pour diversifier les économies d'Afrique du Nord ? ", Revue Economique vol. 60, N° 1, janvier 2009, p. 133-156.

Berthémely, J.C. (2005), "Commerce international et diversification économique", Revue d'économie politique, 2005/5-volume 115, pp.591-611.

Brenton, P. and Newfarmer, R. (2007), "Watching More Than the Discovery Channel: Export Cycles and Diversification in Development", World Bank Policy Research Working Paper No. 4302.

Brunnschweiler, C. N. and Bulte, E. H. (2008), "The resource curse revisited and revised: A tale of paradoxes and red herrings", Journal of Environmental Economics and Management 55 248–264.

Bonaglia, F. and Kiichiro F. (2003), "Export Diversification in Low-Income Countries: An international challenge after Doha", OECD Development Centre, Technical Papers 209.

Cadot, O., Carrere, C. and Strauss-Kahn, V. (2007), "Export diversification: What's behind the hump?, University of Lausanne and INSEAD, mimeo.

Crespo, N. and Fontoura, M. (2007) "Determinant Factors of FDI Spillovers - What Do We Really Know?", World Development, 35(3): 410-425.

Damania, R.T. and Bulte, E.H. (2005), "Resource intensity, institutions and development", World Development (33), 1029–1044.

Dubé, J. and Legros, L., 2014, Spatial Econometrics Using Microdata, Wiley, London.

Estevadeordal, A. and Martincus, C.V. (2006), "Specialization and Diverging Manufacturing Structures: The Aftermath of Trade Policy Reforms in Developing Countries", Development Studies Working Papers N.o. 220, Centro Studi Luca D'Agliano.

Faini, R. (2004), "Export Concentration and Export Diversification: The Pattern of Export Structure", World Bank, Middle East and North Africa Region,Washington, DC.

Gourdan, J. (2009), "FDI Flows and Export Diversification: Looking at Extensive and Intensive Margins", in José R. López-Cálix, Peter Walkenhorst, and Ndiamé Diop, 2010, Trade Competitiveness of the Middle East and North Africa Policies for Export Diversification, World Bank, Washington, DC.

Gylfason, T. (2001), "Natural Resources, Education, and Economic Development", CEPR Discussion Paper No. 2594.

Herzer, D., and D. Nowak-Lehmann (2006),"What does Export Diversification do for Growth? An Econometric Analysis", Applied Economics, 38 (15): 1825-38.

Jayaweera, S. (2009), Foreign Direct Investment and Export Diversification in Low Income Nation, Thesis, The University of New South Wales.

Jayet H. (1993), Analyse spatiale quantitative, Economica, Paris.

Kassicieh, S. (2002),"Effect of technology on international competitiveness and export portfolio diversification", University of Phoenix, mimeo.

Lederman, D. and Maloney, W. F. (2009)," Trade structure and Growth'', In Richard Newfarmer, William Shaw and Peter Walkenhorst Editions, Breaking Into New Markets: Emerging Lessons for Export Diversification, World Bank, Washington, DC.

LeSage , J.P. (2014),"What Regional Scientists Need to Know about Spatial Econometrics'', The Review of Regional Studies, Vol.44, pp.13-32.

Matallah, S. (2020), "Economic diversification in MENA oil exporters: Understanding the role of governance", Resources Policy, Vol. 66, pp.101-602.

Mehlum, H. Moene, K. and Torvik, R. (2006), "Institutions and the resource curse", Economic Journal (116), pp.1–20.

Nassif, C. (2009),"Promoting New Exports: Experience From the Middle East and North Africa", In Richard Newfarmer, William Shaw and Peter Walkenhorst Editions, Breaking Into New Markets: Emerging Lessons for Export Diversification, World Bank, Washington, DC.

Naudé, W. and Rossouw, R. (2008), "Export Diversification and Specialization in South Africa: Extent and Impact", United Nation University Research Paper No. 2008/93.

Osakwe P. N. (2007), "Foreign Aid, Resources and Export Diversification in Africa: A New Test of Existing Theories", African Trade Policy Centre working paper No. 61.

Prebisch, R. (1959), "Commercial Policy in the Underdeveloped Countries", American Economic Review, Papers and Proceedings 49 (2): 251–73.

Ross, M., Kaiser, K. Mazaheri, N. (2011), "The "Resource Curse" in MENA? Political Transitions, Resource Wealth, Economic Shocks, and Conflict Risk", Policy Research Working Paper 5742, The World Bank.

Sachs, J., and Warner, A. (2000), "Natural Resource Abundance and Economic Growth". In G.M. Meier and J.E. Rauch (eds), *Leading Issues in Economic Development*, 7th ed., Oxford University Press, Oxford.

Sachs, J., and Warner, A. (1995), "Natural Resource Abundance and Economic Growth", Revised. NBER Working Paper 5398, National Bureau of Economic Research, Cambridge, MA.

Sachs, J., and Vial, J. (2001), "Can Latin America Compete?" In The Latin American Competitiveness Report, 2001-2002, edited by J. Vial and P. Cornelius, pp. 10-29. Cambridge, Massachusetts: Center for International Development and World Economic Forum.

Sorsa, P. (1999), "Algeria, The Real Exchange Rate, Export Diversification and Trade Protection", IMF WP/99/49.

UNCTAD (2005), World Investment Report 2005: Transnational Corporations and the Internationalization of R&D, United Nations, New York and Geneva.

World Bank, (2007), "Export Diversification in Egypt, Jordan, Lebanon, Morocco, and Tunisia", Report 40497-MNA, World Bank, Washington, DC

APPENDIX

Table 4: Data Source

Indicator	Sources
Foreign direct investment in million of current US $ GDP per capita (current US$) Herfindahl-Hirschmann index 4-Digit Productive capacities index (PCI): The overall PCI score is the geometric average of the values of the eight PCI categories, namely, natural capital, human capital, energy, transport, ICT, institutions, structural change and private sector. PCI scores range between 0 (lowest score) and 100 (the highest score).	United Nations Conference on Trade and Development, UNCTAD Statistics database online, 2016. http://unctadstat.unctad.org
Intensive margin of export diversification Extensive margin of export diversification	International Monetary Fund https://data.imf.org/
The official nominal exchange rate (local currency units relative to the U.S. dollar). Oil rent (% GDP)	World Bank, World Development Indicators Database online, 2016. http://data.worldbank.org/indicator
Distance (Km) between capital cities Latitude and Longitude (in degree)	CEPII- Data base http://www.cepii.fr/
Trade Freedom Scale : 0 (repressed) to 100 (free).	Economic Freedom data base of the Heritage Foundation and Wall Street Journal https://www.heritage.org/index/explore
The World Bank's Worldwide Governance Indicators (WGI) data base - Voice and Accountability, - Political Stability and Absence of Violence/Terrorism - Government Effectiveness - Regulatory Quality - Rule of Law - Control of Corruption. These six indicators range from 2.5 (bad) to 2.5 (good), the data are	The World Bank's Worldwide Governance Indicators (WGI) data base https://info.worldbank.org/governance/wgi/

Table 5: The expected impact of the explanatory variables on export concentration

Variable	Expected sign	Authors	Arguments
GDP/capita	+	Imbs and Wacziarg (2003), Amurgo-Pacheco and Piérlo (2007), Berthémely (2005), Cadot et al. (2007)	Per capita income and concentration follow a U-shaped relationship: countries first diversify but there exists, relatively late in the development process, a turning point at which they start specializing again
GDP/capita square	-		After a transition point countries re-concentrate
FDI	+/-	Banga (2003)	FDI promote export diversification by acting upon the export-intensity of the non-traditional export sector (the direct effect) and by increasing the export intensity of domestic firms in the non-traditional export sector through spillover channels (the indirect effect).
		Crespo and Fontoura (2007)	The imitation of foreign firms and the collaboration with them will make the overseas markets' access easier for the local firms. Surpassing some specific barriers to entry like costs of forming distribution networks and learning about consumer's tastes and preferences and regulatory conditions are among the externalities of coexisting with foreign firms.
		Jayaweera (2009)	The author found a positive impact of FDI impact positively on export diversification through spillovers mechanisms . This effect is inverted for nations which export a high proportion of oil and natural resources, i.e. FDI act to more concentration.
		Gourdon (2009)	FDI reduces the export concentration (measured by Theil index) for the all subgroups of MENA region (Gulf Cooperation Council; resource-rich, labor abundant countries; resource poor, labor-abundant countries).
Natural resource	-	Bonaglia and Kiichiro (2003)	"Natural resource-abundant countries would have a weaker incentive to industrialise, since they can easily earn the foreign exchange needed to finance their imports without industrialising", (Bonaglia and Kiichiro, 2003, p.3)
		Bebczuk et al. (2006)	Bebczuk et al. (2006) find that fuel exports to total exports (a proxy of natural resources) affect negatively export diversification (measured by the Herfindahl index) in a sample of 56 countries between 1970 and 2002.
		Osakwe (2007)	In a study including 22 African countries over the period 1985-2002 Osakwe (2007) concludes that oil has a negative effect on diversification (measured by the share of manufactures in total exports).
		Bebczuk and Berrettoni (2006)	Found that oil amplifies the export concentration because fuel exporters enjoy substantial rents that may lessen the long-run benefits of export diversification (the Dutch disease syndrome).
Trade Freedom	+	Gourdon (2009)	The results of panel regression (127 countries over the period 1998-2006) show that trade barriers (measured by the share of import duties on total imports) increases the export concentration. Trade barriers move up export concentration by slowing the development of new products and markets rather than by equalizing the shares of traditional exports.
		Faini (2004)	The decline in export profitability (due to tariffs barriers and associated transaction costs) will allow only a relatively limited number of firms to be able to reach export markets. In some activities, firms may find it not profitable to export abroad or they may only export toward a few foreign markets. Accordingly, trade barriers are expected to impede the diversification process.
The exchange rate	+/-	World Bank (2007)	"An appreciated real exchange rate in particular would favour exporters with a higher import-to-ratio, such as exporters of capital-intensive or high-tech products. In contrast, exporters of labor-intensive products often face aggressive competition on their product markets. A loss in competitiveness would hit them harder than exporters in (higher technology) product markets", (World Bank, 2007, p.36).
		Sorsa (1999)	Depreciation of the real exchange rate could lead to diversification of exports and the whole economy.
		Martincus and Estevadeordal (2006)	A study on ten Latin American countries over the period 1985-1998 shows that the higher the most favoured nation tariffs and real exchange rate are the greater the absolute manufacturing specialization will be
Poroduction capacity	+		The production capacity in a country may be a determining factor of diversification by contributing to create a growth process and increasing the productivity of the new economic sectors. Diversifying the export basket of a country require the emergence of new activities i.e. additional investments. Hence, economies which invest or produce little are unlikely to diversify.
		Gourdan (2009)	An increase of domestic investment reduces export concentration by expanding exports of non-traditional products.

Source: Author's compilation