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ECONOMIC INTEGRATION AND NEIGHBORHOOD ECONOMIES: A CASE OF THE ARAB MAGHREB UNION

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Abstract

The aim of this paper is to show that transfer costs between Arab Maghreb countries represent the main impediment to intra-regional trade development and so to the Arab Maghreb Union. First, we estimate the weight of intra-Maghreb trade globally by introducing measurements of transfer costs in a gravity model. Then, we use a VAR model on panel data for the four Maghreb countries between 1980 and 2007, to show the important role played by long-term transfer costs in enhancing Tunisian exports, particularly to countries of the Arab Maghreb Union. The obtained results suggest that there is a positive and direct correlation between improvements in infrastructures and in institutions' quality in Tunisia, on the one hand, and its exports, particularly to the different Maghreb countries, on the other. Enhancing the infrastructures and the quality of institutions could serve as the basis for a better perspective of intra-regional trade and, therefore, a starting point towards the relaunching of the Arab Maghreb Union.

Keywords: Trade integration, Arab Maghreb Union, Transfer costs, Transport infrastructures, Institutions' quality, VAR mode

INTRODUCTION

The development of physical infrastructures and services, especially transportation, is mentioned in treaties establishing regional economic communities. A transportation system, which is adequate, efficient, secure, reliable and cheaper, help widen and integrate markets, increase foreign direct investment, facilitate the movement of people and goods, promote regional integration, contribute to peace and encourage private sector's participation in regional economic development.

Achieving the goals of the development of basic infrastructure at the national level is more than a priority for Maghreb States. However, this must be supported by further development of regional infrastructures, without which the full potential of trade and economic growth would not be used.

Indeed, Maghreb countries do not have economies of scale to achieve a revival of trade and to contribute to poverty reduction. This is why, the development of regional infrastructure is essential for promoting exchanges as well as economic growth. Henceforth the focus on infrastructures is important. This means in practice that coordination mechanisms have to be established between the different modes of transport (road, rail, sea, and air), for passengers as well as goods and services. In short, we need to promote interoperability, multimodality and interconnectivity of networks at the regional level, and in the longer term, at the continental level.

The interest of this work is obvious. It helps to stimulate reflection on the economic feasibility of the Maghreb. Its aim is to show the place and role of transport infrastructures, telecommunications and institutions' quality in regional integration policy to revive and build the Arab Maghreb Union (AMU) and, consequently, in the sustainable development of member countries. This work reflects the need to adopt a regional approach in this area where Maghreb countries are deeply disadvantaged by expensive and unreliable regional transportation and trade processes.

The revival of the Arab Maghreb Union is a necessity, even an emergency. However, with a low level of infrastructure and poor quality of institutions, the prospects of a regional integration strategy, based on an integration of merchandise trade to materialize growth, forecast poor results.

Our goal is to show that an effective revival of the AMU has to do first with a preparation of an adequate framework that allows the region to be more integrated. This framework consists of a reduction of transfer costs to promote intra-regional trade, make better use of economies of scale and encourage the relocation of firms to form settlements and draw lessons from the new geographical economy. Regional integration is now feasible and beneficial.

This article includes three parts. In the first, we validate the relationship between transport infrastructures and the quality of institutions on the one hand, and international exchanges, on the other. In the next, we estimate their weight in international trade by introducing a gravity model of variables that measures transfer costs. In the third part, applying a VAR model on panel data, we highlight the important role of long-term transfer costs in the improvement of Tunisian exports, particularly to the countries of the AMU.

INTERNATIONAL TRADE, TRANSFER COST, TRANSPORT AND TELECOMMUNICATION INFRASTRUCTURES AND QUALITY OF INSTITUTIONS

Trade costs, which may be divided into traditional costs (transportation costs and costs related to tariff and non-tariff trade policy) and non-traditional costs (information and communication costs, institutional costs ...), occupy a central place in modern literature on international trade. Despite the considerable decrease of these costs over the past decades and the strong globalization of the world economy, international trade is still undergoing significant costs.

Combes et al (2006) consider that costs related to trade or transfer costs are made up of transport costs, which include natural barriers resulting from physical geography such as distance, mountain, isolation or seas, tariff and non-tariff barriers that include all types of trade policies, technical barriers (quality of institutions) and even environmental and phytosanitary barriers including exchange fees, and, finally, information costs as well as cultural differences.

It seems that transfer costs are still high, and especially on the international level. The analysis of Anderson and Van Wincoop (2004) proposes an average rating for developed countries, which would amount to 74% of the FOB price of manufactured goods. WTO (2004) adds that high transfer costs are a barrier to trade and prevent trade liberalization. According to the same source, for the majority of African countries, the impact of transport costs on exports (share of transportation costs in the amount of trade) is five times higher than the impact of tariff costs. Similarly, according to a World Bank study (2001), 168 out of 216 U.S trading partners see that transport cost barriers were higher than tariff barriers. The effective protection level resulting from transportation costs are often higher than that provided by customs duties.

In addition, poor transport infrastructure or inefficient transport services result in higher direct transport costs and longer delivery times. An improvement in the infrastructures of a given country can significantly reduce trade costs. Limao and Venables (2001) point out that if the infrastructure of a given country is ….this will result in an increase of 68 per cent of the volume of trade, the equivalent of an approximation of 2005 km.

The telecommunications infrastructure, on its part, plays a crucial role in international trade. According to the WTO (2004), effective telecommunications are a cheap way of research, collection and exchange of information, which are a key factor in any economic activity. Elsewhere, Jansen and Nordas (2004) assert that there is a strong positive correlation between the density of fixed and mobile telephone lines and the importance of trade to GDP.

On the other hand, a good quality of institutions of exchange partner countries would increase bilateral trade in so far as they would reduce the costs and risks inherent in international trade.

Many empirical studies confirm the relationship between institutions' quality and bilateral trade. Mauro (1998) observes that the poor quality of institutions is associated with a lack of spending on maintenance of public infrastructure. Limao and Venables (2001) explain that trade flows are very sensitive to public infrastructure: good quality of institutions of exchange partner countries would increase bilateral trade.

Anderson and Marcouiller (2002) conclude that weak institutions increase the risks inherent in international transactions: non-compliance with contracts and predation (Corruption and theft). Moreover, De Groot et al. (2003) propose that improving the quality of formal institutions tends to coincide with an increase in trade. Finally, Méon and Sekkat (2004) emphasize the indirect effect of institutions' quality on trade via its effects on key variables for trade flows. For these authors, low quality of institutions significantly reduces domestic investments, which are critical to trade.

THE IMPORTANCE OF TRANSFER COSTS IN GLOBAL TRADE

Here, first we present the different variables that determine transfer costs and, using a gravity model, we estimate their weight in international trade.

Presentation of gravity model and definition of variables

The gravity model used in this work was inspired by "the basic equation" used by Fontagné et al (2002). It takes the following general form:

$$\ln X_{ijt} = \alpha_0 + \alpha_1 \ln Y_{i,t} + \alpha_2 \ln Y_{j,t} + \alpha_3 \ln y_{i,t} + \alpha_4 \ln y_{j,t} + \alpha_5 \ln D_{i,j} + \alpha_6 H_{i,j} + \sum_z \alpha_z Z_{z,i,j} + \varepsilon_{ijt}$$

Along With:

X_{ijt} : Exports from *i* to j in year *t*

y_{it} : GDP per capita of the exporting country at time *t*.

y_{jt} : GDP per capita of the importing country at time *t*.

Y_{it} : GDP of the exporting country at time *t*.

Y_{jt} : GDP of the importing country at time *t*.

D_{ij} : Distance between the capitals of exporting and importing countries

Z : Is a vector of dummies capturing preferential trade agreements: PTAs (unilateral preferential access free trade agreement, common market ...)

H: Is a binary variable capturing the sharing of a common language and historical ties.

Our research model is:

$$\ln X_{ijt} = \alpha_0 + \alpha_1 \ln PIB_{i,t} + \alpha_2 \ln PIB_{j,t} + \alpha_3 \ln PIB/T_{i,t} + \alpha_4 \ln PIB/T_{j,t} + \alpha_5 \ln Distcap_{i,j} + \alpha_6 FC_{ij} + \alpha_7 Langcom_{i,j} + \alpha_8 Passcol_{i,j} + \alpha_9 UMA_{i,j,t} + \varepsilon_{ijt}$$

Definition of gravity model variables and data sources

Table 1 in Appendix 1 summarizes the different variables of the model as well as the data sources. Transfer costs are particularly explained by the level of infrastructure. There are terrestrial, air, marine and telecommunication infrastructures.

Transfer costs also include non-tariff barriers, whose main measure is the quality of institutions in a given country. To measure the quality of institutions, we have retained the indices of Economic Freedom of the World, 2008 (EFW 2008). EFW indices allow judgment on five areas:

(1) Size of government (expenditures, taxes and enterprises)

(2) Legal structure and property rights.

(3) Access to sound money (inflation under control, fluid circulation and exchange)

(4) Free exchange.

(5) Regulation of credit, labor and economic activity.

This index ranges from 0, poor quality of institutions in country i and 10, very good quality of institutions in country i. INSi represents the quality of institutions in country i. As a result, the variables we will estimate their weight in international trade are:

INFTERRi,t: total rail network of country i at time t in km, this variable represents the level of terrestrial infrastructure in country i at time t.

INFAIRi,t: freight carried in million tonnes- km of country i at time t, this variable represents the level of air infrastructure in country i at time t.

INFMARi,t: port traffic of goods in million tonnes in country i at time t, this variable represents the level of marine infrastructure in country i at time t.

INFTELECi,t: the number of fixed lines per 100 inhabitants in country i at time t, this variable represents the level of telecommunication infrastructure in country i at time t.

The source of data for these variables is World Development Indicators, 2008.

INSi, t: Represents the quality of institutions in country i.

The data source of the index measuring the quality of the institutions is Economic Freedom of the World 2008. Our objective is to estimate the weight of the different variables measuring transfer cost. We selected 57 countries (Table 2, Appendix 2) including five Maghreb countries (Morocco, Algeria, Tunisia, Mauritania and Libya).

Definition of gravity model variables and data sources

Our aim is to quantify the importance of transfer costs in international trade. To do so, we estimate a gravity equation (the estimation results are presented in Appendix 3, Table 3) and we introduce successively (Achy, 2007), each of the variables measuring transfer costs, presented earlier, while keeping the same sample. The estimation results are presented in the following table:

Table 1: Result of Estimates of variables measuring

Transfer costs by GCM method

Variables	$INFTERR_i$	$INFAIR_i$	$INFMAR_i$	$INFTELEC_i$	INS_i
Coefficients	0,033 (1,45)	0,013** (2,17)	0,216*** (14,52)	0,323*** (29,36)	1,009*** (25,27)
Number of observations	55119	71004	17269	72974	72081
Numbre of pairs	2869	3119	2418	3119	3028
Homogeneity test	47,45	53,94	64,2	66,09	65,79
Prob>F	0,0000	0,0000	0,0000	0,0000	0,0000
Breush et Pagan test	2.4e+05	3.1e+05	36719.85	4.1e+05	4.1e+05
Prob>chi2	0,0000	0,0000	0,0000	0,0000	0,0000
R^2	70,56	66,39	69,43	66,46	67,34

*** Significance on 1 %, ** Significance on 5 %,

* Significance on 10 %, Values in () are the z statistics.

The coefficient of the INFTERRi variable is positive but not significant. The coefficient of the INFAIRi variable is positive and statistically significant. The elasticity associated with this variable indicates that an increase of 1% in freight carried (in million tonnes- km) in country i, and then an improvement in the level of air infrastructure, result in an increase of 0.013% in its exports. The coefficient of the INFMAR variable is positive and statistically significant. The elasticity associated with this variable shows an increase of 1% in port traffic of goods (in million tonnes) in country i and subsequently an improvement in the level of marine infrastructure in this country, resulting in an increase of 0.21% in its exports. The coefficient of the INFTELEC variable is positive and statistically significant. The elasticity associated with this variable reveals an increase of 1% in the number of fixed lines (per 100 inhabitants) in country i 1% and henceforth an improved level of telecommunication infrastructure in this country, resulting in an increase of 0.32% in its exports. The coefficient of the INSi variable is positive and statistically significant. The elasticity associated with this variable reveals that an increase of 1% in the quality of institutions in country i results in an increase of 1% in its exports.

THE IMPACT OF NEIGHBORHOOD ECONOMIES ON INTRA-MAGHREB EXPORTS: THE CASE OF TUNISIA

In the following section we try to shed light on the significant role played by transfer costs in improving Tunisian exports, particularly to AMU countries. To do so, we apply a VAR model on panel data.

METHODOLOGY

Our target is to identify the dynamic relationships existing among Tunisia's exports (Xij) to its Maghreb partners. The level of air infrastructure (INFAIR), the level of terrestrial infrastructure (INFTERR), the level of telecommunication infrastructure (INFTELEC) and the quality of institutions (INS) of exporting Countries (INFAIR, INFTERR, INFTELEC and INS) are the dependent variables. In order to achieve our objective, we will apply a vector autoregressive (VAR) model to panel data.

Definition of VAR Model

The VAR model consists of modeling a vector of stationary variables from its own history and each variable is explained by the past of the whole set of variables. The autoregressive representation of order *p* rated *VAR (p)* can be modelled as follows:

$$Y_t = c + A_1 Y_{t-1} + A_2 Y_{t-2} + ... + A_p Y_{t-p} + \varepsilon_t \quad (1)$$

With $Y_t = \mathrm{nx1}$ vector of variables (In our case, lnXij, lnINFAIR, lnINFTERR, lnINFTELEC and lnINS). It is a constant vector of dimension *(nx1)*. ε_t is a vector of error terms of dimension *(nx1*) that follows a white noise process. A_i = nxn is a matrix of invariant coefficients.

Unit root tests on panel data

Unit root tests on panel data

To determine the order of integration, we use Levin and Lin tests as well as those tests proposed by Im, Pesaran and Shin (IPS) (Im, Pesaran and Shin in a series of contributions 1997, 2002 and 2003) to test the stationarity of our series (Hurlin and Mignon, 2006).

The determination of the number of optimal delay

In order to determine the delay of VAR model, we use Akaike (AIC) and Schwarz (SIC) Information Critera, which are based on the provision of information generated by further delays. The recommended order is the one that optimizes (minimizes).

Cointegration of variables

To check whether the regression performed on non-stationary variables will not be misleading, an absence of cointegration test must be first carried out either by Kao test or by Pedroni tests (Pedroni, 1999, 2004), which are the most used and the least criticized.

EMPIRICAL RESULTS

Our aim is to follow the dynamics of bilateral exports from country i to country j following a shock on transfer costs. In this study we just focus on Tunisian exports to Maghreb countries and we adopt an approach in terms of VAR on panel data.

Modeling: Results and interpretations

Presentation of the model: The model takes into account four variables, represented by series covering the period from 1980 to 2007, which represent the level of infrastructure (INFAIR, INFTERR, INFTELEC) and a variable that represents costs related to non-tariff barriers, administrative barriers, technical barriers .... (INS). All variables are expressed in logarithmic terms to avoid problems associated with the effects of magnitude and to facilitate the interpretations. Thus, the model we will study takes the following form:

$$\ln X_{i,j,t} = \alpha_0 + \alpha_1 \ln INFAIR_{i,t} + \alpha_2 \ln INFTERR_{i,t} + \alpha_3 \ln INFTELEC_{i,t} + \alpha_4 \ln INS_{i,t} + \varepsilon_{it}$$

Non-stationarity tests or unit root tests: To determine the order of integration we use Levin and Lin (LL) as well as Im, Pesaran and Shin (IPS) non-stationarity tests (see Table 2)

Table 2: Results of unit root tests

		Calculated Value	Probability	Conclusion
lnXij	*Test LL*	-0.45373	0.3250	**Stationary in-first difference**
	Test IPS	0.65682	0.7444	
	Test LL	-4.68808	0.0000	
	Test IPS	-4.31812	0.0000	
lnINS	*Test LL*	0.26360	0.6040	**Stationary in-first difference**
	Test IPS	1.46273	0.9282	
	Test LL	-6.10534	0.0000	
	Test IPS	-4.70318	0.0000	
lnINFTERR	*Test LL*	-0.07315	0.4708	**Stationary in-first difference**
	Test IPS	-0.85090	0.1974	
	Test LL	-6.40957	0.0000	
	Test IPS	-4.69567	0.0000	

lnINFTELEC	*Test LL*	-3.68208	0.0001	**Stationary in-second difference**
	Test IPS	-0.65572	0.2560	
	Test LL	2.40062	0.9918	
	Test IPS	1.56974	0.9418	
	Test LL	-5.84799	0.0000	
	Test IPS	-6.94542	0.0000	
lnINFAIR	*Test LL*	-3.68360	0.0001	**Stationary**
	Test IPS	-5.67357	0.0000	
	Test LL			
	Test IPS			

The tests' results suggest that apart from lnINFAIR variable, which is stationary in level, the other variables become so only after a first differentiation as well as a second differentiation for lnINFTELEC.

The number of optimal delay: Using Akaike (AIC) and Schwarz (SIC) Criteria, we determine the number of optimal delay of VAR model. A summary of the two criteria used to determine the optimal delay of VAR model's optimal delay is provided in Table 3.

Table 3: Determination of the number of optimal delay

Information Criteria	VAR (1)	VAR (2)	VAR (3)	VAR (4)
Akaike (AIK)	1,529	***1,394***	1,398	1,516
Schwarz (SC)	1,670	***1,656***	1,788	2,041

The number of the delay that optimizes (minimizes) the Akaike and Schwarz information criteria is 2.

Cointegration test: The application of LL and IPS stationarity tests reveals that the set of statistical series is affected, at least, by a unit root. The non-stationarity of panel variables leads us to study the existence of a long-term relationship between them. Pedroni's absence of cointegration test allows us to determine whether there is a long-term cointegration relationship between the variables knowing that the number of the delay is set to 2.
Pedroni has developed seven tests whose null hypothesis is the absence of cointegration (Hurlin and Mignon, 2007). The seven tests developed by Pedroni are (Hurlin and cute, 2007):

- *Tests based on the dimension within (panel cointegration statistics):*

• non parametric test variance of ratio (ρ -statistic panel).

• non parametric test type of statistical Phillips-Perron rho (ρ-statistic panel).
• non parametric test type t statistic Phillips-Perron (panel t-statistic).
• Parametric Test type t-statistic Dickey-Fuller Augmented (panel t-statistic).

➢ *Tests based on the size entre (group mean panel cointegration statistics):*

• non parametric test of statistical type rho Phillips-Perron (group ρ-statistic).
• non parametric test type t statistic Phillips-Perron (group t-statistic).
• Parametric Test type t-statistic Dickey-Fuller Augmented (group t-statistic).

Table 4: Results of Perdoni's absence of cointegration tests

Variables:	lnINS, lnINFTERR, lnINFTELEC, lnXij	
Tests		
	Statistic	Prob.
Panel v-Statistic	0.601149	**0.3330**
Panel rho-Statistic	2.151454	0.0394
Panel PP-Statistic	-0.971111	**0.2490**
Panel ADF-Statistic	-2.381506	0.0234
	Statistic	Prob.
Group rho-Statistic	3.181842	0.0025
Group PP-Statistic	-1.082415	**0.2221**
Group ADF-Statistic	-0.196990	**0.3913**

Given that there is no method which allows to select one test over another, the choice of the final specification was made based on the largest number of times for which the test appeared insignificant (Ary Tanimoune, 2003).

According to Pedroni's absence of cointegration tests we can deduce that on the whole, the tests are not significant (four tests), which means we accept the null hypothesis of absence of cointegration for a threshold of 5%.It follows that all of these tests require the absence of a cointegration relationship. Therefore, we can estimate the VAR model.

Model estimation by VAR method

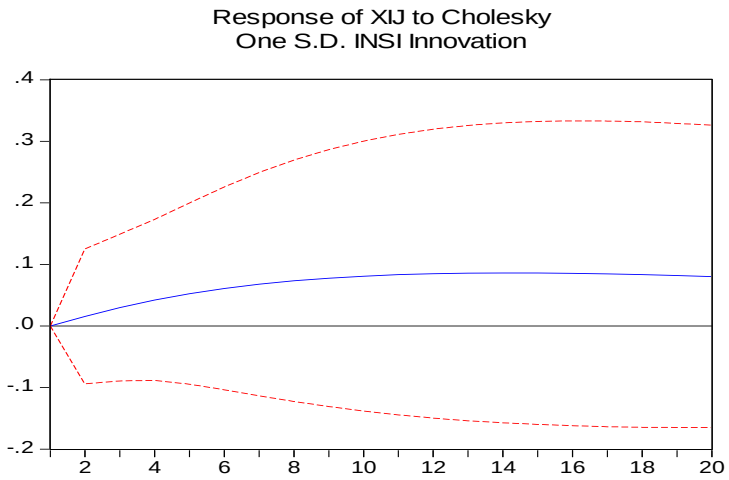
In the case of VAR model, each of the equations can be estimated by OLS independently of each other. Applying a VAR model in this study helps us analyze the impact of an improvement in the level of infrastructure and the quality of institutions, and therefore the impact of the reduction of transfer costs on Tunisian exports to the Maghreb countries, through the simulations of random shocks and the decomposition of variance.

Impulse responses: Impulse response functions allow to measure the impact of a shock on the model's variables and to trace the effect of an innovation's impact on variables' current and future values. The obtained results of the simulated shocks' impact on the variables, indicating the cost of transfer (lnINS, lnINFTERR, lnINFAIR and lnINFTELEC) in Tunisia, and on its exports to the Maghreb countries are presented graphically.

• Tunisian exports' response to Maghreb countries following a shock on the quality of Tunisian institutions:

The following graph represents impulse response functions on 20 periods of Tunisian exports to Maghreb countries following a positive shock on the variable quality of Tunisian institutions. We notice that a positive shock on the quality of institutions in Tunisia has a direct positive impact on its exports to the Maghreb region.

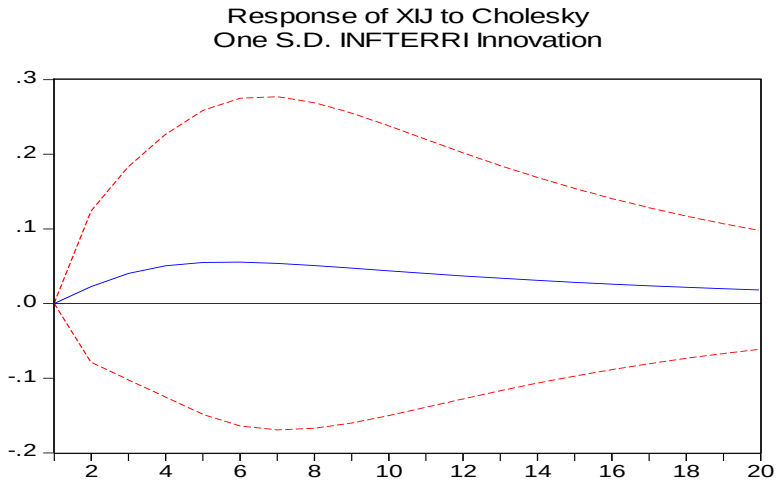
Graph 1: Export Response following a shock on INS:



• Tunisian exports' response to Maghreb countries following a shock on the quality of terrestrial infrastructure:

The following graph shows impulse response functions on 20 periods of Tunisian exports to Maghreb countries following a positive shock on the variable terrestrial infrastructure. We observe that a positive shock on this variable has a direct positive impact on its exports to the Maghreb region.

Graph 2: Export Response following a shock on INFTERR:

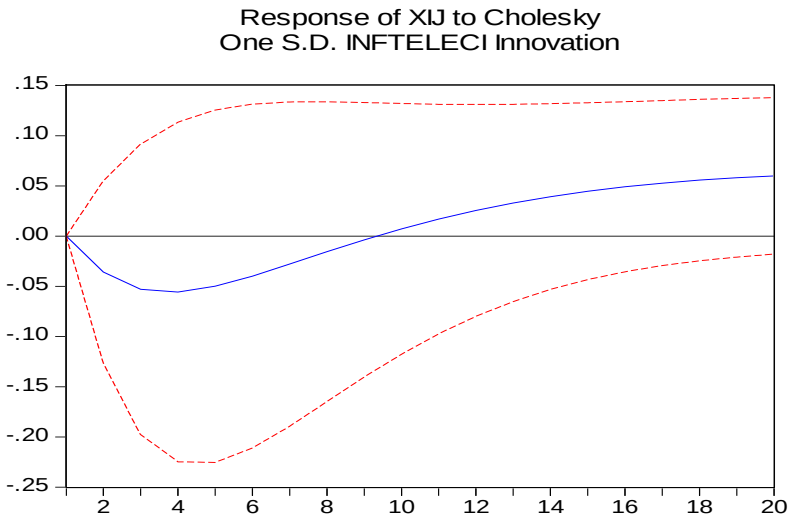


• Tunisian exports' response to Maghreb countries following a shock on the quality of telecommunication infrastructure:

The following graph displays impulse response functions on 20 periods of Tunisian exports to Maghreb countries following a positive shock on the variable telecommunications infrastructure. We note that a positive shock on this variable has a negative impact on Tunisian exports to the Maghreb region at the start of the period. Besides, the balance is found at around the 8th period and the impact becomes clearly positive starting from this very period.

However, a few anecdotal cases suggest that, in lower income countries, new technologies can sometimes create barriers between those who are connected and those who are not (WTO, 2004) which explains this tendency.

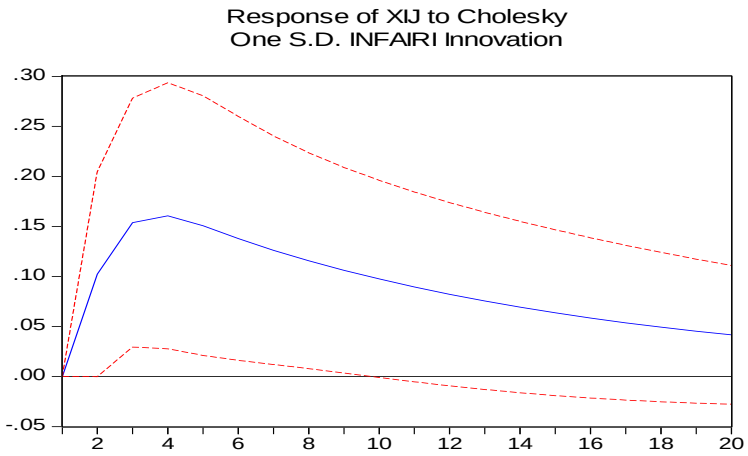
Graph 3: Export Response following a shock on INFTELEC:



• Tunisian exports' response to Maghreb countries following a shock on the quality of air infrastructure:

The following graph illustrates impulse response functions of 20 periods of Tunisian exports to Maghreb countries following a positive shock on the variable air infrastructure. We note that a positive shock on this variable has a positive impact on its exports to the Maghreb region.

Chart 4: Export Response following a shock on INFAIR:



Interestingly, the analysis of the results of impulse response functions reveals that shocks to the variables are not transitional. This is because the variables do not restore their long-term balance at the end of the 20 periods. However, it should be noted that the tendency is towards the balance.

CONCLUSION

In this work we have attempted to highlight the important role that long term transfer costs play in the improvement of Tunisian exports, particularly to the Maghreb countries, in order to promote intra-regional trade and boost the Arab Maghreb Union. Lower transfer costs have a direct impact on intra-Maghrebinian trade via an improvement of transport infrastructures and a better quality of institutions.

Applying a VAR model on panel data in the case of Tunisia, we have shown that there is a positive and direct relationship between the improvement of infrastructures and institutions' quality in this country and its exports, particularly to the different Maghreb countries. Improvements in infrastructures and the quality of institutions could serve as the basis for a

better perspective of intra-regional trade and, therefore, a starting point towards the relaunching of the Arab Maghreb Union.

The limitation of this study is to ignore the specialization in the Maghreb region. Specialization is crucial in the development of intra-regional trade. Subsequently the specialization in the Maghreb region may be the future research issues.

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APPENDICES

Appendix 1
Description of variables

Variables	***Description***	***Sources***
$\mathbf{X_{ijt}}$	Total exports (by sector) from country i to country j, in F.O.B terms and in current dollars.	Chelem Database, International Trade by CEPII.
$\mathbf{GDP_{i(j)}}$	Gross domestic product of country i (j) in date t. expressed in constant dollars (2005) adjusted for Purchasing Power Parity (PPP).	World Development Indicators 2009 (World Bank 2009).
$\mathbf{GDP/T_{i(j)}}$	Per capita gross domestic product of country i (j) in date t. expressed in constant dollars (2005) adjusted for Purchasing Power Parity (PPP).	World Development Indicators 2009 (World Bank 2009).
$\mathbf{Distcap_{ij}}$	Distance between country i capital city and country j capital city.	"Distances" database by CEPII available at http://www.cepii.fr
$\mathbf{FC_{ij}}$	Dummy variable equals 1 if both i and j countries, that are partners in exchange, share a common border, 0 otherwise.	"Distances" database by CEPII available at http://www.cepii.fr
$\mathbf{Langcom_{ij}}$	Dummy variable equals 1 if both i and j countries, that are partners in exchange, share a common language, 0 otherwise.	"Distances" database by CEPII available at http://www.cepii.fr
$\mathbf{Passcol_{ij}}$	Dummy variable equals 1 if both i and j countries, that are partners in exchange, had the same colonizer after 1945, 0 otherwise.	"Distances" database by CEPII available at http://www.cepii.fr
$\mathbf{AMU_{ijt}}$	Dummy variable equals 1 if both i and j countries, that are partners in exchange, are members of the Arab Maghreb Union in date t,0 otherwise.	Built by the author.

Appendix 2
List of countries

United States	**Brazil**	**Slovakia**
Canada	**Argentina**	**Poland**
France	**Chile**	**Romania**
Germany	**Colombia**	**Albania**
Italy	**Peru**	**China**
Netherlands	**Algeria**	**Mauritania**
United kingdom	**Morocco**	**Libya**
Denmark	**Tunisia**	
Finland	**Egypte**	
Norway	**Nigeria**	
Sweden	**Indonesia**	
Iceland	**India**	
Austria	**South Korea**	
Switzerland	**Hong Kong**	
Spain	**Singapore**	
Greece	**Taiwan**	
Portugal	**Malaysia**	
Turkey	**Philippines**	
Japan	**Thailand**	
Australia	**Pakistan**	
New Zealand	**Russia**	
South Africa	**Ukraine**	
Venezuela	**Estonia**	
Écuador	**Lithuania**	
Mexico	**Czech République**	

Appendix 3
Résultat des estimations by GCMs

Variables	Coefficients
$lnPIB_{it}$	1,140*** (63,50)
$lnPIB_{jt}$	0,977*** (54,32)
$lnPIB/T_{it}$	0,519*** (21,16)
$lnPIB/T_{jt}$	0,449*** (18,38)
$lndistcap_{i,j}$	-0,920*** (-24,90)
FC_{ij}	0,421** (2,32)
$Passcol_{i,j}$	0,874*** (4,26)
Langcom	0,912*** (8,51)
$AMU_{j,t}$	0,525*** (8,15)
Constant	-52,828*** (-113,17)
Number of observations	**73928**
Number of pairs	**3119**
Homogeneity test	**65,84**
Prob>F	**0,0000**
Breush-Pagan Test	**4.2e+05**
Prob>chi2	**0,0000**
R^2	**0,6601**

*** Significance at the threshold of 1 %, ** Significance at the threshold of 5 %,
* Significance at the threshold of 10 %. Values between (.) are statistics z