International Journal of Economics and Finance; Vol. 5, No. 5; 2013
ISSN 1916-971X E-ISSN 1916-9728
Published by Canadian Center of Science and Education

Trade Creation and Trade Diversion between Tunisia and EU: Analysis by Gravity Model

Ahmed Zidi[1] & Saïd Miloud Dhifallah[2]

[1] Research Unit Enterprise, Economy and Environment, Higher Institute of Management of Gabes, Tunisia

[2] Faculty of Economics and Management of Sfax, Higher Institute of Technological Studies Tataouine of Tunisia, Tunisia

Correspondence: Saïd Miloud Dhifallah, Faculty of Economics and Management of Sfax, Higher Institute of Technological Studies Tataouine of Tunisia, Tunisia. E-mail: SaidMiloud.Dhifallah@isggb.rnu.tn

Received: February 2, 2013 Accepted: April 4, 2013 Online Published: April 18, 2013

doi:10.5539/ijef.v5n5p131 URL: http://dx.doi.org/10.5539/ijef.v5n5p131

Abstract

Since the middle of nineties, there has been a great rise of free trade agreements (FTAs) between the North and South countries. Indeed, the objective of this article is to know if FTASbetween an ndustrialized region as Europe and a small country as Tunisia are capable of increasing exchanges among them and then improving the trade of the weakest country. Our aim is to know if agreements between industrial countries and developed countries are able to increase trade between them and therefore improve the trade of the less developed country. To answer to this question we evaluate the two effects of regional integration: trade creation and diversion trade. We obtain two main results: the first result is after five years of the agreement between Tunisia and Europe, there is no trade creation. The second result shows that the preferential agreement between the two partners does not generate trade diversion of imports. However, there is a trade diversion of exports.

Keywords: creation and diversion of trade, regional agreements, gravity model, panel data, fixed effects models, random effects models

1. Introduction

The proliferation of regional agreements like North / South in which the industrialized countries and the developing countries (DCs) are equal business partners is one of the traits that most marked the international system over the past fifteen years. This development has highlighted the need to undertake a new analysis of regional integration (RI) for two reasons. First, because developing countries today are turning to these agreements to promote their development and it is therefore useful to evaluate the effectiveness of these agreements. Secondly, because regionalism is part of the global economic environment and its impact on developing countries must be better understood.

The case of the Euro-Mediterranean Agreement between the European Union (EU) and the countries of South-Eastern Mediterranean (SEM) is an example of this type of agreement. Within the framework of the Barcelona Conference in November 1995, twelve Mediterranean countries signed a free trade agreement (FTA) with Europe. Tunisia started the process in 1995 by signing an Association Agreement which has been ratified by both parties in 1998. Other countries followed suit, including Morocco in 1996, Jordan, Egypt, in 1998, Lebanon in 2000 and Algeria in 2002. Syria is, now, dealing with the EU and recently, Libya seems,also,to be fascinated by these initiatives. The Middle East and North Africa MENA region is particularly subject to multiple tensions and economic difficulties. These countries are characterized by high population growth and high unemployment that exceeds 14%, which mainly affects young people and graduates of these countries (World Bank, 2003). This region knows a high dependence on foodand some needs in economic and social infrastructure .It also suffers from a growth rate that stagnates miserably. Their trade is unbalanced and strongly oriented towards the EU while South-South trade is particularly low. These countries are also vulnerable beings evicted from the commercial momentum with their main partner, following the recent enlargement of the EU (May 2004) to new candidate countries mainly Eastern European Countries. In this particularly tense economic climate, the signatures of many MENA regional agreements with the EU can be a way to avoid the disconnection of these countries and an effective instrument to improve their foreign trade, the key to growth and employment.

On the eve of these agreements, it is useful to ask what are the economic consequences of the new Mediterranean policy of the EU within the framework established in Barcelona in 1995 on the SEM.

In this paper, we study the case of the Association Agreement Euro-Tunisian. Tunisia is the first country to sign a FTA with the EU in 1995. The study of the agreement between Tunisia and the EU is of particular interest because it is the first to be implemented in 1996 (Note 1). It is now in its twelfth year of operation. Given the relatively advanced stage of implementation of the agreement with Tunisia, it is interesting to analyze the effects already registered on the Tunisian economy and draw lessons for other Mediterranean countries that took the same initiative. The lessons relate to the effects of the FTA on trade flows in terms of creation and trade diversion.

The literature on regional integration has insisted, according to Viner's works, on creation and trade diversion. There is trade creation when a country reduces or eliminates its tariffs on imports from members of the FTA and its imports from these countries increases. This increase is considered beneficial because it is supposed to improve the welfare of the country. There is trade diversion when the establishment of a free trade zone pushes the country, which usually provides to countries around the world at low costs, to change suppliers for the benefit of less competitive member countries. This diversion will result in additional costs and may reduce the country's national income (Note 2).

The target of this research is to determine which one of these effects will prevail. To meet this goal, we have chosen an econometric specification to measure the magnitude of these two effects, the gravity model, for a number of years from 1986 to 2010 involving 41 countries. The gravity model explains imports between two countries according to their GDP, their GDP per capita, the distance between the centers of economic, historical and cultural variables and finally a set of dummy variables that measure the effects of trade liberalization.

The second section provides a review of previous studies. Then in the third section, we will outline the theoretical framework of this study. In the fourth section, we will present the empirical testing of the theoretical model. Then, in the fifth section, we interpret our results. The final section concludes.

2. Literature Review

First, a free-trade area is defined as an agreement, in which, there are no tariffs on internal trade. However, each country safeguards its external tariff. Thus, Viner J. (1950) studied the impact of FTAs on the well-being of the partner countries. Henceforth, an FTA is not always advantageous since it is a shape of arrangement of free trade and protectionism

We include this type of free trade as an example of second-best policy, since it is certainly not ideal to remove one distortion while preserving others. For this, there is a distinction between the two effects of FTA which are the trade creation and the trade diversion. Indeed, regional trade agreements (RTA) seek to reduce tariff and non-tariff barriers. In this framework, J. Viner (1950) suggests that free trade improves the well-being thanks to a better allocation of resources.

Thus: trade creation, resulting from a reduction of tariff and non-tariff, replaces a more expensive domestic production by cheaper production in partner countries. There is an improvement of the well-being which aims at facilitating prosperity, and, consequently, an increase in consumer's surplus. In contrast, there is a trade diversion, if the production of the partner country replaces less expensive imports from the rest of the world (RW). In this case, the prosperity is fragile. Thus, the regional integration promotes the prosperity only if trade creation outweighs trade diversion.

We will review previous empirical studies. The first study used here is that of Lionel and Peridy (1995) entitled "Uruguay Round and developing countries: the case of North Africa." The objective of this article is to review the impact of GATT on the export performance of North Africa (NA). In fact, they use a gravity model that incorporates the actual structure of exports from the NA such as Tunisia and Morocco and the impact of non-tariff barriers. Henceforth, they showed that the trivialization of preferences benefiting the Maghreb in the European market, will badly affect its exports. In this framework, Tunisia will be more affected than Morocco. This due to the importance of the preferential margin of Tunisia against Morocco. Similarly, most of the losses concern manufacturing and agricultural products that benefiting from lower non-tariff barriers.

Similarly, we adopt the study by the IMF to Morocco (2004) "Impact of the Barcelona Process on trade of Morocco". It shows that there is trade creation between the EU and Morocco. Thus, the Barcelona Process has created trade between the EU and Morocco, and the creation of the scope will likely medium term. Indeed, it seems that the anchoring of the Moroccan economy to the European economy space, helped increase trade between the two parties. Thus, the use of the gravity model proves that there is no diversion of trade between

Morocco and the EU. Also, this study argues that the creation of the Euro-Mediterranean Agreement does not result in an increase in intra-regional trade. Subsequently, the benefits of this integration are limited. Therefore, we have to conclude that the trade liberalization efforts proved by Morocco as part of the FTA with the EU seem relevant and could even be accelerated.

Similarly, we consider the study by Josselin and Nicot (2003) entitled "geo-economic gravity model of trade between the EU countries, the CEECs and TMC." They deal with the issue of EU enlargement to the East and more specifically the integration of the CEECs to the EU. In this framework, they studied "the transformation of the economic and geopolitical environment led the EU to redefine its relations with both the Third Mediterranean Countries (TMC) with the" excluded "from Central European Countries and Eastern Europe (CEECs). Especially the Maghreb countries and Turkey, which have economies more dependent on to Europe and their comparative advantages which are closest to the CEECs, are at risk of foreclosure. "Thus, they analyzed the evolution process of trade between the three blocs (EU, CEE and PTM). Similarly, they do a comparison of models of exchange block countries. Also, they evaluated the impact of the integration of the CEECs to the EU on the structure of trade between the EU and MNCs. In fact, this extension induces a risk of eviction in favor of the CEECs.

The study that contributed most to the construction of our empirical model is that of Akoété AGBODJI Ega (2008). He tried to evaluate the creation and trade diversion in the case of UEMOA (Economic and Monetary Union of West Africa). For this, he tried to analyze the impact of individual economic and monetary union on intra-UEMOA. In this sense, he used a dynamic gravity model. Thus, he showed that membership of the Common Monetary Area and the implementation of economic reforms has had a significant impact in terms of diversion of imports and exports. However, it has been shown that there is no trade creation within the area.

3. Theoretical Analysis

3.1 Theoretical Foundations of Gravity Models

Gravity models have been used for more than forty years in the international trade theory to analyze the effects of preferential agreements on bilateral trade flows. Gravity models have appeared in the literature with the questioning of the traditional foundations of trade. These models originally suffered from a certain lack of theoretical foundations, but authors as Helpman (1987), Anderson (1979) and Bergstrand (1985, 1989) have provided a rigorous theoretical justification and have greatly improved their quality (Baier and Bergstrand, 2001, Balgati, 2001 (Note 3).

In many theoretical derivations (Anderson 1979, Bergstrand 1985, Deardorff, 1995 and recently Baier and Bergstrand, 2001), the gravity model explains the traditional volume of trade between two countries i and j in terms of revenues in countries, their populations and transportation costs. To analyze the association agreements Euro-Tunisian these models we think are interesting for several reasons. First, because the gravity model has the distinction of integrating the weight of the geographical, historical indeed cultural proximity in bilateral trade between the two countries. Then, these models can be adapted to specific characteristics of the Euro-Tunisian trade relations, since they are closer to the theory of international trade and explain trade between industrialized countries and developing countries. Finally, by their nominative contribution, these tools can measure the consequences of a change in business strategy on trade of concerned country

This model is based on the assumption that imports of country i from country j depend on gravity variables such as (GDP, GDP per capita and DIST). The basic specification of the gravity equation includes factors of the importing country (sometimes GDP and GDP per capita), the supply factors of the exporting country (GDP and GDP per capita) and also geographical distance as a proxy for transportation costs. These equations were used to describe many different streams such as like immigration, foreign direct investment, and they are widely used in the context of international trade through their empirical performance. Thus, some economists are skeptical of their theoretical foundations.

The basic gravity equation is generally defined as follows:

$$ln\, M_{ijt} = \beta_0 + \beta_1 lnGDP_{it} + \beta_2 lnGDP_{jt} + \beta_3 lndist_{ij} + U_{ijt} \quad (1)$$

3.2 The Choice of Explanatory Variables

✓ **Gross Domestic Product (GDP):** the more important is the GDP of partner countries is, the more important are the propensities between them. An increase in GDP of importing country causes an expansion of its richness and then a growth in its import requests. Similarly, an increase in GDP of the exporting country leads to increased wealth and competitiveness. Therefore, GDP importing and exporting countries should have a positive impact on bilateral imports.

✓ **Gross Domestic Product per capita (GDP per capita):** the addition of GDP per capita of importing and exporting countries to control the wealth effect. Thus, if a country experiences an increase in its GDP and if its population also increases, while the wealth effect will be limited by the latter. For this, the GDP per capita can have a negative impact on bilateral imports due to the poor economic conditions of partner countries.

✓ **G distance (DIST):** measures the distance between two trading partners, it's considered as a measure that greatly affects trade. It serves as a kind of "proxy" for transportation costs. Therefore, the greater the distance between two countries is, the higher are the transport costs, increasing at the same time the prices of traded goods, which reduces the competitiveness of the country with his partner. Therefore, it will have some bad consequences on its bilateral imports.

✓ **Bilateral Real Exchange Rate (RER):** this one aims to highlight the impact of the price. Thus, an increase in this variable represents a depreciation of the currency of the importing country (i) relative to the exporting country (j), and then, there is a reduction of imports of country i from country j. Therefore, the expected sign of this variable is negative.

✓ **Cultural and historical variables (contiguity (Contig), common language (Comlang) and colonization (Col) before 1945):** with the aim of facilitating trade. Therefore, the expected sign of these variables and positive.

Henceforth, to study the impact of regional cooperation between partner countries, we introduce a set of dummy variables that measure the impact of the Tunisia-EU FTA.

3.3 Model and Anticipated Results

We will use a gravity equation to analyze the impact of free trade agreement of 1995 between Tunisia and the EU on the Tunisian trade. We will base our empirical approach on the IMF report (2004) where there is analysis of the impact of the Barcelona Process on trade of Morocco. Also, we rely on the study by L. Fontagné and Péridy (1995). Where they showed that the overall negative effect of GATT 94 is justified by the reduction of the margin of preference enjoyed by the countries of the NA and the export structure in which the products are usually more preferred are represented. Finally, we will mainly base on the item Akoété (2007) for an explanation of the latter. Thus, we try to estimate an equation of the type:

$$\begin{aligned}\ln M_{ijt} = {} & \alpha_0 + \alpha_1 \ln GDP_{it} + \alpha_2 \ln GDP_{jt} + \alpha_3 \ln GDPC_{it} + \alpha_4 \ln GDPC_{jt} + \alpha_5 \ln Dist_{ij} + \alpha_6 \ln RER_{ijt} + \\ & \alpha_7 Contig_{ij} + \alpha_8 Comlang_{ij} + \alpha_9 Col_{45} + \alpha_{10} M_{T\text{-}EU} + \alpha_{11} X_{T\text{-}RW} + \alpha_{12} M_{T\text{-}RW} + U_{ijt} \end{aligned} \quad (2)$$

To verify the impact of agreement on bilateral imports, we include some dummy variables to capture the effect of agreements between Tunisia and the EU from one side and between Tunisia and RW from another side.

First, a dummy variable indicating gross creation on Balassa's trade (1967) where there is an increase in bilateral imports between Tunisia and the EU countries. Then another dummy variable represents the ability to export to Tunisia in the RW. Finally, a dummy variable indicating the evolution of Tunisia's imports Tunisia preventing from RW. In summary, it is noted:

- An effect of net trade creation if $\alpha_{10} > 0$ and $\alpha_{12} = 0$;
- A diversion effect on exports if $\alpha_{10} > 0$ and $\alpha_{11} < 0$;
- A diversion effect on imports if $\alpha_{10} > 0$ and $\alpha_{12} < 0$.

We could summarize by making a table of variables and their expected signs.

Table 1. The expected sign of independent variables

Independent variables	Expected sign
GDP_i	+
GDP_j	+
GDPCi	+ or -
GDPCj	+ or -
$Dist_{ij}$	-
RER_{ij}	-
Contig	+
Comlang	+
Col_{45}	+
$M_{T\text{-}EU}$	+
$X_{T\text{-}RW}$	+ or -
$M_{T\text{-}RW}$	+ or -

Note that in order to assess the impact of the creation of the FTA between Tunisia and the EU on the structure of trade between the two parties, we must consider that the trade between partner countries and the RW has been changed due to the removal of tariff and non-tariff following the implementation of the Association Agreement.

Now that we have our model estimation, let's attain the empirical analysis in order to investigate our expectations.

4. Empirical Analysis

4.1 The Specification of the Empirical Model

The gravity equation estimated covers a period of twenty-five years (1986 to 2010) concerning 41 countries. The data are annual and the variables in the equation of gravity, in order to take an additive form, are expressed in natural logarithms. Thus, we try to estimate an equation of the type: see equation (2)

i = Tunisia (fixed)

j = 1, ..., 40

❖ Dependent Variable:

Mijt: is bilateral imports (CIF) real country i from country j for the period in million U.S. dollars at constant prices (base year 2000).

❖ Independent Variables:

- GDPit: the ability to import from country i in year t;
- GDPjt: Potential export supply of country j in year t;
- GDPCit: expresses the Gross Domestic Product per capita of the importing country for the period;
- GDPCjt: expresses the Gross Domestic Product per capita of the exporting country for the period;
- DISTij: expresses the geographical distance between the two countries i and j. We use the index called "distwces" in the CEPII database for our model.
- RERijt: expresses the bilateral real exchange rates calculated from the exchange rate of each country with the United States (local currency / U.S. dollar). To perform these calculations, we issued the no-arbitrage condition (otherwise it would have been impossible to split the different exchange rates). Thus, we recover the database IFS the nominal exchange rate of each country in relation to the dollar (NER country / $ to uncertainty for the country) and the index of consumer prices of countries (ICP country) for each year from 1986 to 2010. For countries where we do not have serial consumer prices, we consider the GDP deflator. RER bilaterally with uncertainty for country i is calculated as follows:

$$\mathrm{RER}_{\mathrm{country}i/partnerj} = \left(\frac{ICP_{partnerj}}{ICP_{\mathrm{country}i}}\right)_t \times \left(\frac{\mathrm{NER}_{\mathrm{country}i/\$}}{\mathrm{NER}_{partnerj/\$}}\right)_t$$

- Contig: is the dummy variable for contiguity value 1 if both partners have a common border and 0 otherwise.
- Comlang: is a dummy variable that takes the value 1 if the two countries share the same language and 0 otherwise.
- Col45: is a dummy variable that takes the value 1 if the partners had a link settlement before 1945, and 0 otherwise.
- For these variables, a number of dummy variables were added to capture the effect of agreements between Tunisia and the EU on the one hand and Tunisia and the rest of the world on the other.
- MT-EU: is a dummy variable taking value 1 if the importing country is Tunisia and the exporting country j is part of the EU, and 0 otherwise;
- XT-RW: is a dummy variable taking value 1 if the exporting country is Tunisia and if the importing country j is part of the RW, and 0 otherwise;
- MT-RW: is a dummy variable taking value 1 if the importing country is Tunisia and the exporting country j is part of the RW, and 0 otherwise;
- Uij: is the error term.

4.2 Choice of Estimation Method and the Various Tests

In the case of a gravity model of bilateral trade, some authors defend the idea that panel estimation is necessary,

if we do not get biased estimates. Indeed, the absence of non-availability of data over a long period, we have a limited number of observations and therefore relatively low quality of the model fit. To overcome this problem, we adopt a panel estimation allows us to study the temporal and spatial pattern of bilateral trade.

Almost all previous studies have used the method of "fixed effects" to estimate their gravity equation. In fact, when it comes to estimating a "panel" for different countries, one should tolerate separate intercepts for the different observations. This is what makes this method interesting. However, in the context of this work we should determine "econometrically" what method will be the best one for the estimation of our data. Firstly, a question arises; determine which of the two specifications (fixed or random effects) is most appropriate. One way to solve this problem is to perform the Hausman test, which determines whether the coefficients of the two estimates are statistically different. For the test results, we believe our two equations (one for fixed-effects and random effects for the other), then we perform the test.

In addition, the estimation period of the predefined template, extends from 1986 until 2010. Regressions were performed on three sub-periods. Firstly, the first sub-period is from 1986 to 1994 that is to say, before the signing of the FTA between Tunisia and the EU. Then, the second sub-period is from 1995 to 2004 that is to say the period when the agreement is implemented. Finally, the third sub-period is from 2005 to 2010 will that is to say, after the integration of the countries of Central and Eastern Europe (CEECs) to the EU. Forty countries are represented in the sample. We are interested in commercial relations between Tunisia and the EU on the one hand and Tunisia and the RW on the other. To do this, currency countries are split into two blocks:

❖ Block the European Union: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom and Poland.

❖ Block of the RW: Algeria, Morocco, Libya, Egypt, Jordan, Syria, Iran, Turkey, USA, Brazil, China, Japan and India.

4.3 Data Sources

Our empirical study consists of a panel of 41 countries for the period from 1986 to 2010. The choice of the sample of countries and the study period is justified by the fact that Tunisia has adopted a policy of openness from the beginning of the eighties in the context of structural adjustment programs, agreements (GATT and WTO recently) and regional agreements. In addition, this choice is strongly dictated by the availability of statistical information. In fact, there are different sources of data. Data on gross domestic product, gross domestic product per capita, the real bilateral exchange rate indices and consumer price series are collected from the World Bank (WDI, 2010) and supplemented by the International Monetary Fund (IFS, 2010) Database. In particular, data on imports are taken from external trade statistics of the National Institute of Statistics (1986 to 2010) and the database HATWE (2010). We used Stata 11.

The main purpose of this study is to test the impact of the FTA between Tunisia and the EU using the gravity model. For this, we attempt to evaluate the two effects associated with regional integration, trade creation effect and the effect of trade diversion.

To estimate our baseline model by the appropriate techniques, we will use the specification tests which actually correspond to the three tests of Fischer. This is to determine how our model must be specified, if the hypothesis can be accepted by panel. Thus, our analysis is based on the notion of homogeneity of the parameters of our model. Therefore these specification tests are designed to make a diagnosis of the possible need to integrate heterogeneous dimension and how this heterogeneity must be specified. If heterogeneity is detected only in constants, you must verify that the individual effects model is estimated using techniques within (fixed effects) or by the procedure of MCG (random effects). Finally, to determine which model should be learned we will use the standard specification test of Hausman (1978).

Before turning to the econometric estimates, we will try to test the stability of the coefficients using the Chow test. Similarly, we will try to detect if there is heterogeneity problem, which will determine the specification tests.

4.4 Tests on Panel Data

4.4.1 Chow Test

The Chow test is used to test the stability of regression coefficients in three different sub-periods. Thus, one can easily perform this test, following step by step procedure:

Table 2. Step 1: Estimation of the model for the whole period (going from 1986 until 2010)

Dependent Variable: $\ln M_{ij}$				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.902750	9.239365	-0.205939	0.8369
ln GDP_i	1.180119	4.272392	0.276220	0.7825
ln GDP_j	0.966807	0.042783	22.59802	0.0000
ln $GDPC_i$	0.032785	0.304068	0.107821	0.9142
ln $GDPC_j$	-0.795706	0.062267	-12.77889	0.0000
ln $Dist_{ij}$	1.14E-10	2.40E-11	4.735829	0.0000
ln RER_{ij}	-0.000538	0.000392	-1.372564	0.1703
$M_{T\text{-}EU}$	-0.503048	9.231877	-0.054490	0.9566
$X_{T\text{-}RW}$	-1.717946	9.232290	-0.186080	0.8524
$M_{T\text{-}RW}$	-1.717946	9.232290	-0.186080	0.8524
$Contig_{ij}$	1.169452	0.100031	11.69085	0.0000
$Comlang_{ij}$	0.746355	0.088576	8.426198	0.0000
Col_{45ij}	1.031267	0.124003	8.316450	0.0000
R-squared	0.759229			
Adjusted R-squared	0.754827			
F-statistic	172.4625			
Prob (F-statistic)	0.000000			
Sum squared resid	235.2994			

Note: Was SSR = 235.30.

Table 3. Step 2: Estimation of the model for the first sub-period, before the signing of the agreement (1986 to 1994)

Dependent Variable: lnMij				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.812714	0.773509	-2.343496	0.0199
ln GDP_i	0.984367	0.865942	16.46732	0.0000
ln GDP_j	0.974594	0.064120	15.19952	0.0000
ln $GDPC_i$	-0.961497	0.104913	-9.164688	0.0000
ln $GDPC_j$	-0.942387	0.123892	-9.342156	0.0000
ln $Dist_{ij}$	-1.563707	0.201798	-7.748878	0.0000
ln RER_{ij}	0.011684	0.057698	0.202506	0.8397
$M_{T\text{-}EU}$	5.046558	0.199593	25.28423	0.0000
$X_{T\text{-}RW}$	3.678943	0.189325	15.90432	0.0000
$M_{T\text{-}RW}$	4.690439	0.272828	17.19190	0.0000
$Contig_{ij}$	0.030932	0.193199	0.160104	0.8729
$Comlang_{ij}$	0.166693	0.168962	0.986573	0.3248
Col_{45ij}	0.744907	0.187139	3.980514	0.0001
R-squared	0.802524			
Adjusted R-squared	0.794624			
F-statistic	101.5974			
Prob (F-statistic)	0.000000			
Sum squared resid	67.27096			

Note: Was SSR1 = 67.27.

Table 4. Step 3: Estimation of the model for the second sub-period, after the entry into force of the agreement (1995 to 2004)

Dependent Variable: $\ln M_{ij}$				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.698687	0.756365	-0.923744	0.3564
ln GDP_i	0.865597	0.054481	15.88802	0.0000
ln GDP_j	0.794383	0.048943	14.32567	0.0000
ln $GDPC_i$	-0.658309	0.091413	-7.201480	0.0000
ln $GDPC_j$	-0.547892	0.087654	-6.987652	0.0000
ln $Dist_{ij}$	-2.010389	0.173498	-11.58740	0.0000
ln RER_{ij}	0.076368	0.042944	1.778321	0.0764
$M_{T\text{-}EU}$	5.449329	0.161275	33.78914	0.0000
$X_{T\text{-}RW}$	4.890654	0.217643	23.90321	0.0000
$M_{T\text{-}RW}$	5.405040	0.222417	24.30140	0.0000
$Contig_{ij}$	0.032877	0.158696	0.207169	0.8360
$Comlang_{ij}$	-0.379665	0.142015	-2.673408	0.0080
Col_{45ij}	0.725909	0.153448	4.730651	0.0000
R-squared	0.848549			
Adjusted R-squared	0.843121			
F-statistic	156.3186			
Prob(F-statistic)	0.000000			
Sum squared resid	55.46063			

Note: Was SSR2 = 55.46.

Table 5. Step 4: Estimation of the model for the third sub-period (going from 2005 until 2010)

Dependent Variable: $\ln M_{ij}$				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.141881	43.80424	0.071725	0.9429
ln GDP_i	5.365594	29.50128	0.181877	0.8559
ln GDP_j	0.992142	0.088823	11.16982	0.0000
ln $GDPC_i$	-0.008401	0.477358	-0.017600	0.9860
ln $GDPC_j$	-0.741985	0.117431	-6.318475	0.0000
ln $Dist_{ij}$	1.23E-11	2.79E-11	0.439505	0.6609
ln RER_{ij}	-0.000476	0.000394	-1.209104	0.2284
$M_{T\text{-}EU}$	-9.246258	43.72926	-0.211443	0.8328
$X_{T\text{-}RW}$	-10.55287	43.72744	-0.241333	0.8096
$M_{T\text{-}RW}$	-10.55287	43.72744	-0.241333	0.8096
$Contig_{ij}$	1.375446	0.207892	6.616158	0.0000
$Comlang_{ij}$	0.730777	0.179609	4.068711	0.0001
Col_{45ij}	1.581808	0.288815	5.476895	0.0000
R-squared	0.780815			
Adjusted R-squared	0.762894			
F-statistic	43.57041			
Prob(F-statistic)	0.000000			
Sum squared resid	52.87175			

Note: Was SSR3 = 52.87.

We calculate the test statistic that follows a Fisher distribution: F (k, n-3k) = 17.94.

Thus, we note that the value obtained from the Fisher statistic is greater than the critical value (F (13.695) ≈ 1.70 for α = 5%). We therefore reject the hypothesis of constant coefficients. There is structural change between the three sub-periods. For this, one has the interest to study the impact of the FTA between Tunisia and the EU on the Tunisian economy. We now turn to the specification tests that will detect if there is heterogeneity or not.

4.4.2 Specification Tests or Tests of Homogeneity

In fact, when we use the technique of panel data, the first step is to check is whether the specification

homogeneous or heterogeneous. Thus, we will test the equality of the coefficients of the model studied in the individual dimension. In economic terms, the objective is to check if the theoretical model adopted is exactly the same for all countries, or on the contrary there are specificities for each country.

Thus, it is possible to introduce the notion of fixed effects whose main interest is to understand, through decomposition constant, unobservable heterogeneity in the behavior of countries in the panel. Therefore, our fixed-effects model can be written as follows:

$$\ln M_{ijt} = \alpha_0 + \beta_{ij} + \alpha_1 \ln GDP_{it} + \alpha_2 \ln GDP_{jt} + \alpha_3 \ln GDPC_{it} + \alpha_4 \ln GDPC_{jt} + \alpha_5 \ln RER_{ijt} + U_{ijt} \quad (3)$$

Where β_{ij} traces bilateral fixed effects.

In fact, the constant term α_0 depending on the model includes, in general, the influence of a set of variables not specified in the explanatory model. As this set, whose influence is synthesized by the constant term is assumed common for country i, j for all partners, all periods t and all pairs of countries. We can assume the contrary, this set of variables is not formalized, is different depending on the country (i), partners (j) and the observation period (t), or pairs of countries (ij). The fixed effects models therefore propose, on the one hand, treating individual heterogeneities, such as a constant parameter β_i, β_j, β_t and β_{ij} and secondly, to allocate, in the end, an econometric relationship separate specification for each type i, j, t, or ij, which we focus here.

Thus, in a gravity-type model with simple fixed effects [Matyas (1997 and 1998), Harris and Matyas (1998), Egger and Pfaffermayr (2003b)] we can propose a decomposition of the constant which takes into account the specific behavior of country partners and those periods. A gravity-type model with fixed effects combined offers, meanwhile, rather a decomposition of the constant function, the specific behavior of the country (i) in time, the partners (j) in time and the one that interests us most, bilateral (country effects / partners noted (β_{ij})) [Cheng and Wall (2004), Baltagi (2001), Egger and Pfaffermayer (2003b), Glick and Rose (2002), Egger and Pfaffermayr (2003a)].

In fact, bilateral fixed effects β_{ij} remain relevant because they allow introducing in the analysis of all time-invariant phenomena that affect the country pairs [Egger and Pfaffermayr (2004) and Maurel (2004)]. In this sense, this model has several configurations that are possible.

- The constants β_{ij} and coefficients are identical. In this context, our model can be described by a panel homogeneous and therefore OLS can be used to estimate our model.
- β_{ij} constants and coefficients are different across countries. For this, we have different models to estimate and then we reject the panel structure.
- β_{ij} constants are identical, against the coefficients are different in different countries. In this case, we have N equations to estimate.
- Coefficients are identical, whereas the constants β_{ij} are different countries. In this case, we obtain a model with individual effects.

Thus, we adopt an homogeneity procedure which going to ensure what type of panel we have to follow in our model.

Table 6. Specification tests or homogeneity

	Heterogeneity constants	Homogeneity of coefficients
First sub-period	F(28,225)= 139.67	F(7,225)= 5,43
(1986-1994)	Prb>F= 0. 0000	Prb>F= 0.9602
Second sub-period	F(28,254)= 288.08	F(7,254)= 2,36
(1995-2004)	Prb>F= 0. 0000	Prb>F= 0.1969
Third sub-period	F(40,198)= 1.51	F(7,198)= 0.17
(2005-2010)	Prb>F= 0.0357	Prb>F= 0.9538

From this table, we can see that there is a consistency coefficient for the three sub-periods, since the gain is greater than 10%. For cons, the constants β_{ij} are heterogeneous as for the three sub-periods the gain is less than 10%. So our reference model is specified as a panel with individual effects.

4.4.3 Typology of Models Suited to the Study of Bilateral Trade

First, we begin by specifying the models adopted for each type of effects (fixed or random effects). In addition, the introduction of fixed effects in the analysis has a dual interest since - apart from without traditional

determinants of trade - it takes into account the dynamic behavior of various countries and their bilateral relations heterogeneities. This allows to identify whether partners, particularly other presents specific (strategic or not) and if they evolve in time and in space. The goal is of course whether or not they have a favorable influence trade.

As our problem is to highlight the influence of variable standards of trade, the regional agreements and, finally, that the heterogeneity of bilateral behavior we have chosen to test a fixed effects model as described in equation (4).

If this model has the advantage of allowing the introduction of fixed effects, it prohibits as we mentioned above taking into account all time-invariant variables such as distance and cultural variables, historical and language such as (Contig, Comlang and Col45).

However, regarding the choice of model, it is actually hardly possible to stop the alternative model (4) (FE). It is essential to check if the component is not β_{ij} random type and if the FE model should not be replaced by a random-effects model (5) which we denote RE where the hazard is compound type. This is using the Hausman tests (which is actually a $\chi 2$ test (dlFE)) for determining the choice between FE model and RE model.

Thus, the RE model is written as follows:

$$\text{Ln } M_{ijt} = \alpha_0 + \alpha_1 \ln GDP_{it} + \alpha_2 \ln GDP_{jt} + \alpha_3 \ln GDPC_{it} + \alpha_4 \ln GDPC_{jt} + \alpha_5 \ln Dist_{ij} + \alpha_6 \ln RER_{ijt} + \alpha_7 Contig_{ij} + \alpha_8 Comlang_{ij} + \alpha_9 Col_{45ij} + \omega_{ijt} \quad (4)$$

Where;

$w_{ijt} = U_{ijt} + \beta_{ij}$ is hazard

RE in this model, it should be noted that all time-invariant variables can be reintroduced. Once the choice of model is made, it may be carried out to estimate the effects of regional agreements between Tunisia and the EU. To determine the model best suited to our problem we use estimation techniques within and GLS.

Table 7. Comparison of FE and RE models

	Periods					
	1986-1994		1995-2004		2005-2010	
Exogenous variables	Within	GLS	Within	GLS	Within	GLS
Constant	-6.561 (-3.40)*	-1.619 (-0.49)	-3.44 (-2.99)*	3.378 (1.10)	-20.304 (-0.66)	24.150 (1.62)***
$\ln GDP_i$	1.234 (4.32)*	0.975 (4.26)***	1.89 (2.15)*	0.921 (3.21)*	0.432 (0.18)	0.765 (1.45)***
$\ln GDP_j$	1.051 (3.22)*	0.893 (3.98)*	2.18 (2.40)*	0.828 (2.49)*	0.413 (0.15)	1.632 (2.19)*
$\ln GDPC_i$	0.312 0.46	-0.612 -0.25	-2.321 (-3.65)*	-0.21 (-2.54)*	-0.532 (-0.15)	-0.421 (-1.52)***
$\ln GDPC_j$	0.213 0.35	-0.538 -0.13	-2.099 (-2.14)*	-0.638 (-1.73)**	-0.307 (-0.10)	-1.862 (-1.92)**
$\ln RER_{ij}$	0.113 (3.55)*	0.109 (3.59)*	0.030 1.36	0.035 (1.63)***	-0.062 (-1.10)	-0.051 (-0.89)
$\ln Dist_{ij}$		-1.013 (-1.30)***		-1.638 (-1.75)**		-3.709 (-1.71)**
$Contig_{ij}$		0.492 (2.31)*		0.836 (1.95)**		5.529 (1.91)**
$Comlang_{ij}$		1.398 (2.29)*		0.699 (1.19)		4.633 (3.04)*
Col_{45ij}		0. 888 (1.95)**		0.875 (2.01)*		0.566 (2.01)*
R^2	0.13	0.25	0. 06	0. 22	0. 18	0. 37
N[a]	261	261	290	290	246	246
N[b]	29	29	29	29	41	41

Notes: The values in the parentheses represent the t-statistics; (***) significance at 1% level, (**) significance at 5% level and (*) significance at 10% level. [a] Number of observations, [b] Number of bilateral effects.

Thus, we can see that the estimation for the three sub-periods, whatever by Within or GLS, gives the same outcomes and significant results .

So the estimation technique used, the variables GDP, RER (for the first two sub-periods), common border (Contig), common language (Comlang) and colonization before 1945 (Col45) exercise overall for the three sub-periods, a force of attraction between partners is tending to enlarge the integration to them. However, the expected sign of the variable is negative RER which is not the case for our estimate. In fact, the GDP of partners countries is for the first two sub-periods, the variables common border, common language and settlement before 1945 for the three sub-periods were the strongest factors which best explain the level of Tunisian imports from its partners.

Instead, the variables GDP per capita (except with the estimation technique Within the first sub-period), RER (for the third sub-period) and distance play in the sense of a repulsive force. Thus, the variable GDP per capita of partners countries is (with GLS estimation technique) for the first sub-period, the same for the two other sub-periods (with the two estimation techniques) and the variable distance three sub-periods (with GLS estimation technique) hold high elasticities and thus higher explanatory power.

Table 8. Test for the presence of individual effects

	First sub-period	Second sub-period	Third sub-period
Fischer test	F(28, 225) = 139.67	F (28, 254) = 288.08	F (40, 198) = 1.51
	Prob > F = 0.0000	Prob > F = 0.0000	Prob > F = 0.0357

Although the Prob> F is less than the confidence threshold (here 5%) for the three sub-periods, then there is presence of individual effects.

Henceforth, in the presence of individual effects model, the question that immediately arises is how these individual effects must be specified: should we adopt the hypothesis of fixed effects or effects contrary to the hypothesis random? For this, we use the test Arbitration of Hausman (1978). Indeed, this specification test is a general test that can be applied to many problems of specification in econometrics.

So, this test seeks to explore the possibility of a correlation or a default specification. Assuming we have two types of estimators for the parameters of our model. The first estimator is supposed to be unbiased estimator minimum variance under the null hypothesis of correct specification of the model (no correlation). In contrast, under the alternative hypothesis of misspecification, this estimator is supposed to be biased. Both assumptions Hausman can be specified as follows:

$$\begin{cases} H_0^1 : \mathrm{E}(\beta \mathrm{ij} / Xij) = 0 \\ H_a^1 : \mathrm{E}(\beta \mathrm{ij} / Xij) \neq 0 \end{cases}$$

With Xij : the matrix of explanatory variables.

Hausman (1978) advocates the specification test based on the following statistic:

$$H = \left(\beta_k^F - \beta_k^A\right)' \left(Var\left(\beta_k^F - \beta_k^A\right)\right)^{-1} \left(\beta_k^F - \beta_k^A\right) \qquad \forall \text{ k} = 1,2,3,\ 4,\ 5,6,7$$

Under the null hypothesis of correct specification, this statistic is asymptotically distributed according to a chi-square with k degrees of freedom. Thus, under the null hypothesis that the theoretical model can be specified with individual random effects and should retain GCM estimator (BLUE estimator). By cons, under the alternative hypothesis, the model must be specified with fixed individual effects and must retain or LSDV estimator within (the unbiased estimator). The table below summarizes the Hausman test (1978) to our model.

Table 9. Hausman test

	First sub-period	Second sub-period	Third sub-period
Stat-Hausman	$\chi^2(7)$= 3.06 (0.5483)	$\chi^2(7)$= 2.69 (0.6102)	$\chi^2(7)$= 1.79 (0.7745)

From this table, we can conclude that our model is specified by a panel with individual random effects since the Hausman statistic is less than the critical value of chi-square with seven degrees of freedom ($\chi^2(7)$ = 7.14 for = 5 %) for the three sub-periods. In this case, we use the method of Generalized Least Squares (GLS) to estimate our model.

4.4.4 The Unit Root Tests on Panel Data

The non-stationarity is detected from basket unit root tests. In fact, the analysis of non-stationary panel data only developed very recently, since the pioneering work of Levin, Lin and Chu (2002). Indeed, the econometrics of non-stationary panel data by Baltagi and Kao (2000) aims to combine the “best of both worlds”: the treatment of non-stationary series with the time series methods and increased number of data and the power of tests with the use of the individual dimension. Moreover, another benefit from the addition of the individual dimension to the temporal dimension due to the fact that the asymptotic distributions of unit root tests on panel data are asymptotically normal as they are from non-standard ‘a single time dimension.

However, for our model, the size of observations is less than 20 years (see table below) and then absence of unit roots. Thus, our model is stationary.

Table 10. Size of observations

	Nombre d'années
First sub-period (1986-1994)	9
Second sub-period (1995-2004)	10
Third sub-period (2005-2010)	6

The size of the observations for each sub-period is very low. For this, the stationarity of the variables of our model is irreversible and we do not check this stationarity for the application of unit root tests whether heterogeneous or homogeneous ,t-Statistics give below the critical value of the law standard normal distribution at 5% risk threshold equal to -1.64.

4.4.5 Heteroscedasticity Test

Heteroscedasticity describes data that does not have a constant variance. The heteroscedasticity does not bias the estimated coefficients, but the usual inference is no longer valid because the deviations found are not good. Heteroscedasticity is a situation encountered frequently in panel data. It is therefore important to detect and correct.

Detection of heteroscedasticity

Several tests exist to detect resembling heteroscedasticity. Two of these tests, which are; the Breusch-Pagan test and the White. In our approach, we use the White test. Indeed, the general idea of this test is that it takes the explanatory variables to the power of 2, and the interactions between the explanatory variables in the regression of the squared residuals.

Table 11. Detection of heteroscedasticity

	White	Chi-square	Probability
First sub-period	1.32978	7.5987	0.84957
Second sub-period	1.06879	7.95874	0.85367
Third sub-period	0.94875	7.29781	0.87491

From this table, we can see that the waste variances are homogeneous as White statistics (for the three sub-periods) are less than the critical values of chi-square. Hence, homoscedasticity is a dominant character for the three sub-periods.

4.4.6 Autocorrelation Test

Similarly, for the correlation, the new aspect which we must pay attention to the possibility of correlated errors between individuals. We must also ensure that errors are not autocorrelated and, for each individual.

Table 12. Autocorrelation test

	F-Statistiques	Probabilités
First sub-period	4.68971	0.795847
Second sub-period	3.59871	0.849512
Third sub-period	2.69871	0.946812

We can see from the autocorrelation test that the residue of each sub-period is not auto correlated over time. To do this, we accept the hypothesis of absence of autocorrelation of the residuals problem and we retain the estimation results within and GLS.

In conclusion, there are no problems of heteroscedasticity and autocorrelation.

As it appears that the RE model is under test, the more relevant it can be chosen to study the interaction between partners and the effects of diversion / creation of traffic.

Like the work of Aitken (1973), Gros and Gonciarz (1996), Bayoumi and Eichengreen (1997), Ghosh and Yamarik (2003), Soloaga and Winters (2001) and Carrere (2006), we introduced into the model RE dummies in order to tap the effect of agreements, between Tunisia and EU on the one hand and Tunisia and the rest of the world on the other hand:

The GLS estimation technique for the three sub-periods is confirmed by the statistics of Hausman (1978) since

the Hausman statistics are lower than the critical value of chi-two to seven degrees of freedom. This estimate is filtered by the problem of heterogeneity of variances of coefficients and error term. Also, it was no residual autocorrelation and correlations between the explanatory variables. We interpret the equation (5) of trade between countries and for three sub-periods by the Generalized Least Squares technique (GLS) as constants or specific characters are variations over time.

5. Interpretation of Results

Now we look at the impact of the Association Agreement Tunisia-EU Tunisian economy through.

Table 13. Institutional and natural exchanges between Tunisia and its partners

	Periods		
	1986-1994 (1)	1995-2004 (2)	2005-2010 (3)
	R^2= 0. 81	R^2= 0. 87	R^2= 0.37
	N= 261	N= 290	N= 246
	Number of pairs = 29	Number of pairs = 29	Number of pairs = 41
exogenous variables	α (t)	α (t)	α (t)
C	-2.398 (-1.25)***	-1.198 -0.75	38.131 (1.56)***
Variations in the time variable			
$lnGDP_i$	0.982 (7.32)*	0.941 (7.12)*	0.654 1.01
$lnGDP_j$	0.971 (6.55)*	0.900 (6.20)*	1.205 1.02
$lnGDPC_i$	-0.921 (-4.21)*	-0.823 (-4.76)*	-0.534 -1.03
$lnGDPC_i$	-0.802 (-3.21)*	-0.703 (-3.67)*	-1.434 -1.05
$lnRER_{ij}$	0.054 (1.81)**	0.078 (1.81)***	0.032 0.67
Time-invariant variables			
$lnDIST_{ij}$	-1.463 (-2.89)*	-1.919 (-4.19)*	-6.463 (-1.57)*
$Contig_{ij}$	0.052 (2.11)*	0.097 (2.23)*	9.194 (1.95)**
$Comlang_{ij}$	0.259 (2.62)*	0.297 (1.81)**	4.238 (1.98)**
$Col45_{ij}$	0.781 (1.65)***	0.723 (1.71)***	0.586 (2.11)*
Variables RA			
$M_{T\text{-}EU}$	4.931 (9.81)*	5.443 (12.13)*	-0.527 -0.15
$X_{T\text{-}RW}$	-6.057 -0.40	-11.831 (-1.08)*	-0.095 -0.03
$M_{T\text{-}RW}$	4.587 (6.74)*	5.313 (8.84)*	2.448 0.49

Notes: The values between parentheses represent statistics student, (*) significance at 1% level, (**) significance at 5% level and (***) significance at 10% level.

Based on the results in Table 13 it shows us that although the coefficient of determination R^2 "between" is significant that the extent it is equal to 81% for the first sub-period (1986-1994), then is increased is 87% for the second sub-period (1995-2004), which would mean a gain in accuracy. Finally, it has decreased to 37% for the third sub-period (2005-2010). Thus, we can conclude that all the variables considered significantly explain the dependent variable: Tunisian imports from its partners.

As the signs of the coefficients, the results of the tests in this model clearly confirm a priori the sign mentioned by the theoretical model. However, we found that the GDPC variable is negative. It is certainly due to bad circumstances which, for a number of consecutive years, may affect the economies of partner countries.

In the last estimate, we can distinguish natural determinants of trade (GDP, GDP per capita, DIST, RER, common border, common language and settlement before 1945) the institutional determinants ($M_{T\text{-}EU}$, $X_{T\text{-}RW}$ and $M_{T\text{-}RW}$). However, for natural determinants of trade can be seen although the GDP of partners countries the bilateral real exchange rates and the historical and cultural variables (contiguity, common language and settlement before 1945) explain the positive exchanges (for the three sub- periods). However, the GDP per capita of partners countries and distances, which reflect transport costs, explain negative exchanges (for the three sub-periods).

It is, moreover, the country GDP of partner countries, the GDP per capita countries of partner countries the bilateral real exchange rates (for the first two sub-periods), geographic distance and cultural and historical variables (for the three sub-periods) that have the greatest explanatory power.

Thus, we introduce three dummy variables and it aimed to assess the effects of trade creation ($M_{T\text{-}EU}$) and misappropriation of trade in terms of export ($X_{T\text{-}RW}$) and diversions import ($M_{T\text{-}RW}$). Henceforth, according to the

table 13, we see that the two dummies $M_{T\text{-}EU}$ and $M_{T\text{-}RW}$ have higher elasticities and therefore have a greater explanatory power even before the force of the Association Agreement between Tunisia and the EU.

If we analyze the effects of regional Association Agreement of 1995 between Tunisia and the EU we find that the coefficient of the variable ($M_{T\text{-}EU}$), which measures the effects of the FTA, becomes higher after the time of signing of the association. It goes from (4.931) for the first sub-period (1986-1994) to (5.443) for the second sub-period (1995-2004) and then decreasing and becomes negative (-0.527) for the third sub-period (2005-2010). More precisely, Tunisia and the EU are trading more than 138 times (exp (4.931)) over the natural predicted level by the model and that was before the period of association agreements. After the period of agreements application (1995-2004) the commercial trades between Tunisia and the EU are about 231 times (exp (5.443)) more than predicted norms the gravity variables. This means that there has been an intensification of trade after the integration period. Arguably overall association agreements euro-Tunisiangenerated a trade creation effect between the first two sub-periods. However, we note that the third sub-period there was a decrease of variable ($M_{T\text{-}EU}$) and thereafter there is no intensification of trade between Tunisia and the EU, then no creation of trade between the two sides because of the enlargement of the EU to Eastern Europe. As trade diversion for exports towards the rest of the world, we see that there is a decrease in the coefficient of the variable ($X_{T\text{-}RW}$) there is at the same time increasing the coefficient of variable ($M_{T\text{-}RW}$) (for the first two sub-periods) and then there is a diversion of trade for exports. However, for the variable ($M_{T\text{-}RW}$) there is an increase of the coefficient changes from (4.587) for the first sub-period (5.313) for the second sub-period is decreased then becomes (2.448) for the third sub-period. Thus, we conclude that fear is no misappropriation of trade import requirements. We can explain this result by the fact that most Tunisian trade is already with the EU and therefore a trade diversion effect will not be large (Note 4). The second reason is that the parallel reduction of tariffs on products of list1 (capital goods) from Europe, the Tunisian government has declined equivalent tariffs List 1 from the rest the world. List 2 (intermediate goods and raw materials) has not had the same treatment but are not very substitutable goods to local produce so the risk of diversion there is also low. For cons, the third sub-period there was a decrease in the variable ($M_{T\text{-}RW}$) means that there is trade diversion to the detriment of RW and this is due to the enlargement of the EU.

Nevertheless,According to table 13 we can constant, that the coefficient α_{10} is positive for the two first sub-periods. At the same time, the coefficient α_{12} is positive for all three sub-periods. Subsequently, there is trade creation in the sense of J. Viner (1950) as the increase in trade between Tunisia and the EU takes place mainly at the expense of domestic producers. Similarly, we note that the coefficient of the variable α_{11} ($X_{T\text{-}RW}$) is negative for all three sub-periods and therefore there is trade diversion in exports (by Endoth, 1999 and Soloaga and Winters, 1999).

However, if we examine the evolution of the variable measuring the effects of trade creation after the integration period, we note that the effect of trade creation remains weak and uncertain. Recall that Tunisian exports to the EU are around 80% of Tunisian exports and the fact that manufactured exports already enjoy free access to the European market can not expect any new side effects exports. Therefore if there is an effect of creation can not come from the import side.

An important conclusion that can be drawn from the analysis is that there was no significant change in coefficients and therefore no trade creation during the first five years of the FTA although the list 1 (capital goods) and List 2 (intermediate goods and raw materials) is fully liberalized. The last year of tariff products list 2 took place in 2000. The rather modest growth factors occurs only three years, from 2000, we suggest that the trade creation occurred after the reduction of tariffs for goods from the list 3 (consumer not competing with local products (Note 5)) and List 4 (consumer goods with few substitutes compared to local products).

One reason for the weakness of the trade creation effect is mainly due to the fact that trade liberalization has long been limited to capital goods and intermediates that do not have a high substitutability in relation to national production.

Another important reason is the existence of other barriers other than tariffs on imports continues to operate. For example, it has eliminated tariffs on imported capital goods but was replaced by an increase in VAT. Also the establishment of a system of taxation implemented until the end of 2001, which is to set the value of imports not according to statements by the importer but the Minister of Industry has resulted in effective rates much higher (Lahouel M. and A. Marouani, 2003). Finally, despite significant political opening, Tunisia is still experiencing significant levels of protection, tariff structure very complex and complicated customs procedures and complex. The number of tariff rates charged by the Tunisian government is very high (52 rates) with values that can sometimes reach 215% (IMF, 2003).

As the tariff schedule set by the EU and Tunisian authorities had the effect of increasing the degree of effective protection in the implementation of free trade agreements. Estimates made by the Institute of Quantitative Economics (1999) show for the Tunisian economy an increase in the effective rate of protection, which rose from 56% in 1995 to 88% in 1999 possibly in protected areas such as agriculture and manufacturing sectors (metal products) where Tunisia is not necessarily an advantage. This has pushed companies to invest in sectors where Tunisia has no comparative advantages. This policy seems to be responsible for a misallocation of resources and not redirecting investment to exporting activities. In addition to the country's economic structural problems, dismantling timetable seems generated significant costs.

6. Conclusion

Application of gravity models was carried out in the framework of the FTA between Tunisia and the EU. Thus, according to many empirical studies, the coefficients of the gravity variables have the expected signs and are generally significant: GDP variables have a positive sign, the GDP per capita variables are assigned a negative sign (although as we have mentioned above, not always), confirming the hypothesis of Linneman (1996) that the degree of openness of an economy and negatively correlated with the variable population. The sign of the coefficient of the distance is negative.

Following the results, it seems that the gravity model explains bilateral trade well. But you cannot assign the level of intra-regional trade only by geographical proximity, GDP, POP and because it finds unambiguously that membership in preferential agreements is a predisposing factor intensity of bilateral trade.

If we analyze the effects of regional Association Agreement of 1995 between Tunisia and the EU we note that there is a greater exchange after the integration period. In fact, we can say that overall association agreements Euro-Tunisian generated trade creation effect. As trade diversion vis-à-vis the rest of the world, we see that there is no significant diversion of trade to the detriment of the EU countries. This means that the agreement did not generate a negative effect in the sense of import diversion. However, there is a diversion of export.

Thus, the Tunisian experience could be interesting for other Mediterranean countries, because the tariff dismantling schedules that have been negotiated are very similar to that of Tunisia. These countries can expect an effect of trade creation but several years after the implementation of the agreement and a significant increase in the protection of their domestic manufacturing industries for several years after the entry into force of the agreements. To avoid these costs it may be useful to reconsider the timing of trade liberalization set in the context of free trade agreements. Also a further reduction in tariff rates, very complex in the SEM, and customs and administrative procedures is strongly recommended. These measures should reduce distortions and trade costs and at the same time facilitate the recovery of the activity of the domestic supply. Thus it is not certain that the Euro-Mediterranean policy as it has been defined by the EU is the best way to accelerate economic integration in the Mediterranean basin. Our results show, however, that while trade creation is modest, the SEM are moving more and more towards the integration in their natural exchange zone, the EU.

References

Agbodji, A. E. (2008). The Impact of Subregional Integration on Bilateral Trade: The Case of UEMOA. *Faculté des Sciences Economiques et de Gestion University of Lomé, Togo*. 1-34. Retrieved from http://www.aercafrica.org/documents/rp186.pdf

Aitken, N. D. (1973). The effect EEC and EFTA on European Trade: A Temporal Cross-Section Analysis. *American Economic Review, 63,* 881-892. Retrieved from http://www.jstor.org/stable/1813911?origin=JSTOR-pdf

Anderson, J. E. (1979). A theoretical foundation for the gravity equation. *American Economic Review, 69,* 106-113. Retrieved from http://www.jstor.org/stable/1802501?origin=JSTOR-pdf

Balassa, B. (1967). Trade Creation and Trade Diversion in the European Common Market. *Economic Journal, 27*(8), 1-17. http://dx.doi.org/10. 2307/2229344

Baltagi, B. H. (2001). *Econometric Analysis of Panel Data*. Chichester: Wiley.

Baltagi, B. H., & Kao, C. (2000). No stationary Panels, Cointegration in Panels and Dynamic Panels. A Survey. In B. Baltagi (Ed.). *Advances in Econometrics, 15*(3), 7-51. http://dx.doi.org/10.1016/S0731-9053(00)15002-9

Bergstrand, J. H. (1985). The gravity equation in international trade-some microeconomic foundations and empirical evidence. *Review of Economics and Statistics, 67,* 474-481. http://www.jstor.org/stable/1925976

Bergstrand, J. H. (1989). The Generalized Gravity Equation, Monopolistic Competition, and the

factor-Proportions Theory in International Trade. *Review of Economics and Statistics, 71*(1), 143-153. Retrieved from http://www.jstor.org/stable/1928061?origin=JSTOR-pdf

Bergstrand, J. H., & Baier, L. S. (2003). Endogenous Free Trade Agreements and the Gravity Equation. *Department of Finance and Business Economics,* April. Retrieved from http://www3.nd.edu/~jbergstr/Working_Papers/EndogenousFTAs.pdf

Carrère, C. (2006). Revisiting the effects of regional trade agreements on trade flows with proper specification of the gravity model. *European Economic Review, 50,* 223-247. http://dx.doi.org/10.1016/j.euroecorev.2004.06.001

Cheng, H., & Wall, H. J. (2005). Controlling for Heterogeneity in Gravity Models of Trade and Integration. *The Federal Reserve Bank of St. Louis, Review, 87*(1), 49-63. Retrieved from http://research.stlouisfed.org/wp/1999/1999-010.pdf

Egger, P., & Pfaffermayr, M. (2003a). The Impact of bilateral treaties on foreign direct investment. *Journal of Comparative Economics, 32*(4), 788-804. http://dx.doi.org/10.1093/acprof:oso/9780195388534.003.0008

Egger, P., & Pfaffermayr, M. (2003b). The Proper panel econometric specification of the gravity equation: A three-way model with bilateral interaction effects. *Empirical Economics, 28*(3), 571-580. Retrieved from http://link.springer.com/article/10.1007/s001810200146

Egger, P., & Pfaffermayr, M. (2004). Distance, trade and FDI: a Hausman–Taylor SUR approach. *Journal of Applied Econometrics, 19*(2), 227-246. http://dx.doi.org/10.1002/jae.721

Endoth, M. (1999). Trade creation and trade diversion in the EEC, the LAFTA and the CMEA: 1960-1994. *Applied Economics, 31,* 207-216. http://dx.doi.org/10.1080/000368499324435

Ghosh, S., & Yamarik, S. (2003). Are regional trading Arrangements trade creating? An application of extreme bounds analysis. *Journal of International Economics*, *63*, 369-395. http://dx.doi.org/10.1016/S0022-1996(03)00058-8

Glick, R., & Rose, A. K. (2002). Does a currency union affect trade? The time-series evidence. *European Economic Review, 46,* 1125-1151. http://dx.doi.org/10.1016/S0014-2921(01)00202-1

Gros, D., & Gonciarz, A. (1996). A Note on the Trade Potential of Central and Eastern Europe. *European Journal of Political Economy, 12*(4), 709-721. http://dx.doi.org/10.1016/S0176-2680 (96)00024-9

Harris, M. N., & Mătyăs, L. (1998). The Econometrics of Gravity Models. *Melbourne Institute Working Paper*, n°5/98, Melbourne.

Hausman, J. A. (1978). Specification Tests in Econometrics. *Econometrica, 46*(6), 1251-1271. Retrieved from http://www.jstor.org/stable/1913827?origin=JSTOR-pdf

Helpman, E. (1987). Imperfect competition and international trade: Evidence from fourteen industrial countries. *Journal of the Japanese and International Economics, 1*(1), 62-81. http://dx.doi.org/10.1016/0889-1583(87)90027-X

IMF. (2004). Impact of the Barcelona Process on trade of Morocco. *IMF report number 04/164*.

Josselin, D., & Nicot, B. (2003). A geo-economic gravity model of trade between the EU countries, the CEECs and PTM. *European Journal of Geography,* 237. Retrieved from http://www.cybergeo.revue.org/4219

Levin, A., Lin, C. F., & Chu, C. S. J. (2002). Unit root tests in panel data: Asymptotic and finite-sample properties. *Journal of Econometric, 108*(21), 1-24. Retrieved from http://www.uio.no/studier/emner/sv/oekonomi/ECON5120/h07/undervisningsmateriale/JOECT_UnitRootPanel.pdf

Linnemann, H. (1966). *An Econometric Study of International Trade Flows*. Amsterdam: North-Holland.

Lionel, F., & Péridy, N. (1995). Uruguay Round and developing countries: the case of North Africa. *Economic Review, 46,* 703-715.

Mătyăs, L. (1997). Proper Econometric Specification of the Gravity Model. *The World Economy, 20*(3), 363-368. http://dx.doi.org/ 10.1111/1467-9701.00074

Mătyăs, L. (1998). The Gravity Model: Some Econometric Considerations. *The World Economy, 21*(3), 397-403. http://dx.doi.org/ 10.1111/1467-9701.00136

Maurel, M. (2004). Current Account Constraint as a Barrier to International Trade: Evidence from the European

Enlargement Process. *Economic Systems, 28*(3), 301-317. http://dx.doi.org/10.1016/j.ecosys.2004.03.007

Soloaga, I., & Winters, L. A. (2001). Regionalism in the Nineties: What Effect on Trade? *North American Journal of Economics and Finance, 12*(1), 1-29. http://dx.doi.org/10.1016/S1062-9408(01)00042-0

Viner, J. (1950). *The Customs Union Issue*. New York: Stevens & Sons Ltd.

Notes

Note 1. Association agreements between the EU and Morocco were ratified in 2000, Jordan and Algeria in 2002 and Lebanon in 2003.

Note 2. The trade diversion phenomena are even more accentuated in the context of Euro-Mediterranean agreements because they are shaped “center periphery”, in which the EU is the main beneficiary of partnerships separately negotiated and it maintain barriers between different countries of the southern Mediterranean. Recent IMF studies have shown that such agreements redirect flows to the EU.

Note 3. Balgati’s work, provides a solid theoretical support for the study of gravitational models with fixed effects.

Note 4. The risk of trade diversion is more in the case of Egypt, Jordan, as imports from the EU is less than 50%.

Note 5. According to a study by Dr. A. Lahouel and Marouani 2003, the ratio of total imports of consumer goods in GNP increased from 13.8% in 2000 to 16.1 in 2001. But almost 75% of this increase is attributable to the offshore sector and the remaining 25% are more specific market. It therefore appears that there was indeed a creation effect for this class of products, but most of this creation is in fact the rapid expansion of offshore activities which re-export their goods rather than strong growth in the local market.