98th EAAE Seminar Chania
Marketing Dynamics within the Global Trading System: New Perspectives
29 June – 2 July, 2006

EU Market Access for Mediterranean fruit and vegetables: A gravity model assessment

Charlotte EMLINGER[1], Emmanuelle CHEVASSUS LOZZA[2], Florence JACQUET [1]

[1] IAMM/UMR MOISA, Montpellier, France
[2] INRA Nantes, France

Abstract. Since 1995, a liberalization process -the so-called Barcelona Process- has taken place in the Mediterranean area. It aims at establishing a free trade area for 2010 in the Mediterranean Basin. For the moment full liberalization concerns industrial products trade whereas agriculture remains sensitive. Among agricultural products, the fruit and vegetables (F&V) sector is essential for Mediterranean countries, and the EU is their first trading partner. In this context, two questions arise: Firstly, to what extent protection influences trade for the med countries, compared to the other countries? Secondly, what would be the impacts of a greater liberalization on F&V trade between the EU and Mediterranean Countries?
Our model, based on the new developments of gravity trade model focuses on the difficulties faced by the Mediterranean countries to enter on the EU market, compared to the other EU partners, considering the relative impact of the different trade costs. It is estimated at the product level, in a sector with a huge specificity: some products may be very perishable and thus particularly time sensitive. The Mediterranean basin appears as a highly heterogeneous country bloc. Beside the actual level of preferences allowed by the EU, two main elements vary according to the exporting country: its tariff sensitivity and its "non-tariff" trade resistance. Thus, with respect to the Euromed liberalization, the higher the tariff sensitivity, the higher the impact of liberalization on trade and this impact can be limited by a high trade resistance (NTB, logistic constraints…).

Key Words: Fruit and Vegetables, EU-Med agreement, gravity models, transport cost, tariffs

Introduction

Since 1995, a liberalization process – the so-called Barcelona Process - has taken place in the Mediterranean area. It aims at establishing a free trade area for 2010 in the Mediterranean Basin. For the Mediterranean countries, in the agricultural sector, the main issue of the process is firstly the supply of basic commodities (cereal, meat and dairy products), that are essentially imported from the EU, and secondly a better access for their fruit and vegetable exports to the European market. These products represent the main exports of these countries, and the European Union is their first trading partner. On the other side, for the European Union, the main concern in the Barcelona process is not only the promotion of its cereal and dairy exports but also the protection of fruit and vegetable European producers. Indeed, the regulation of trade with third countries, in the fruit and vegetable sector, is the key element in the common organization of the market. It has several objectives, the first being of course the protection of European producers in a sensitive sector, where production is most often highly seasonalized and where perishable products are difficult to stock.

For the moment this partnership is only based on bilateral trade agreements between the European Union and each Mediterranean country, and the full liberalization only concerns industrial products whereas agriculture remains sensitive, particularly fruits and vegetables (F&V). Thus, Mediterranean countries still have to face important trade barriers when exporting agricultural (horticultural) products to the European market despite the preferences allowed by the EU these last years. Indeed, the agreements only provide limited concessions for each partner for precise products and limited quantities and calendars.

Within this context, two questions emerge. Firstly, to what extent European protection influences fruit and vegetables trade? Secondly, what would be the impacts of a greater liberalization of fruit and vegetables trade on Mediterranean exports of fruit and vegetables to the EU? In other words, what is the export potential of the Mediterranean Countries to the European market?

To answer these questions, the objective of the paper is to analyze the main determinants of the European market access of fruit and vegetables, by using a gravity model. It focuses on the constraints faced by the Mediterranean countries to enter on the EU market, considering the impact of the different trade costs. These "trade costs" (Anderson and Van Wincoop 2005) include both transport and border related costs (tariff barriers, non tariff barriers, information costs or border formality costs).

The remainder of the paper proceeds as follows: Section 1 first presents the Mediterranean countries position as suppliers of fruit and vegetables for the European Union (EU15), and then compares tariffs and preferences allowed by the EU for these different suppliers. Section 2 presents the theoretical foundation of the gravity model, based on Anderson and Van Wincoop (2003). This model allows comparison of the access to the EU market for the Mediterranean Countries with the access for the European producers and to other third countries. After a presentation of data and econometric methodology implemented in the third part, the fourth part provides estimation results, a major result being the heterogeneity among Mediterranean countries concerning the access conditions to the European Market. Finally, section 5 concludes.

1. Market access for fruit and vegetables coming from Mediterranean countries

The European Union (EU15) plays a major part in the fruit and vegetables world market: it is both the first importing (57.7%) and exporting (51.3%) area in the world. Intra-European trade is very important, accounting for 77% of EU imports. The Mediterranean countries involved in the Barcelona Process (Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, Syria, Tunisia and Turkey) are the first non-European trading partners of the EU with a market share of 4.8% that is similar to their market share in the world market. Their principal exports are hazelnuts, dried fruits and citrus, but also tomatoes and several vegetables. Countries of Southern Hemisphere (Chile, Uruguay, Argentine, South Africa, Kenya, New Zealand and Australia) are also important suppliers (3.14%) of the European Union (apples, grapes). The New Members States of the European Union (Slovakia, Slovenia, Czech Republic, Poland, Lithuania, Latvia, Estonia, Malta, Cyprus and Hungary) were small little exporters (2%) toward the EU15 in 2003.

Table 1. World and European Union suppliers of fruit and vegetables in 2003.

	World Imports		**EU Imports**	
Suppliers	**Million dollars**	**percentage**	**Million dollars**	**percentage**
EU	46 700	51,33%	40 400	76,99%
NMS	1 490	1,64%	1 050	2,00%
Mediterranean countries	4 090	4,50%	2 510	4,78%
Southern hemisphere countries	5 060	5,56%	1 650	3,14%
Rest of the world	33 643	36,98%	6 864	13,08%
Total	90 983	100,00%	52 474	100,00%

Source: COMTRADE database

Despite the fact that the Barcelona process is commonly presented as a regional agreement, it is really a set of bilateral agreements with each of the southern Mediterranean countries. These countries differ significantly with very small exporters (Algeria or Lebanon), four countries - Turkey, Morocco, Israel and Egypt – playing a major part in the F&V trade. They account for more than 95% of the F&V exports of the area. Concerning the products, for each country, trade is also highly concentrated around four products - 50% of the F&V exports.

Table 2. Mediterranean World and European Union suppliers of fruit and vegetables in 2003

	World Imports		EU Imports	
Exporters	**Million dollars**	**percentage**	**Million dollars**	**percentage**
Algeria	17,9	0,44%	15,7	0,52%
Egypt	209	5,11%	119	3,94%
Israel	876	21,43%	757	25,04%
Jordan	149	3,65%	4,2	0,14%
Lebanon	48,7	1,19%	1,1	0,04%
Morocco	561	13,72%	501	16,57%
Syria	202	4,94%	11,1	0,37%
Tunisia	114	2,79%	104	3,44%
Turkey	1 910	46,73%	1 510	49,95%
Total	4 088	100,00%	3 023	100,00%

Source: COMTRADE database

For the bilateral trade agreements, state of progress of these negotiations differs from one country to another. For instance, the agreement with Tunisia was signed as early as June 1995, Libya has for the moment an observer status, and no trade agreements have been signed, and negotiations with Syria are ongoing. Finally, other countries such as Morocco, Egypt and Israel have already renegotiated their initial trade agreement. Within the framework of the negotiations for EU membership, Turkey has signed a Customs Union agreement with the EU, in continuation of association agreements signed as early as 1963.

Even if association agreements have been signed, not all products are concerned but some may benefit from other preferences granted within the framework of other preferential agreements (notably the GSP). Thus, for Med Countries, the liberalisation process does not only depend on the Barcelona process but also on other agreements. So, F&V products coming from Mediterranean countries can enter on the EU market either under the EU-Med regime or under another preferential regime (GSP) or under the MFN regime. Finally, the EU-Med preferences account only for 26% of the tariff lines in the F&V sector. Compared to the NMS, the Mediterranean countries benefit less from bilateral preferences but 47.3% of their tariff lines may benefit from the GSP regime.

The European tariffs applied to the Med Countries are, on average, a little higher (8.8%) than those applied to the NMS (8.4%) and to the others countries of the world (5.2%). Since a high proportion of their tariff lines are submitted to the MFN regime (Table 3), countries from the Southern Hemisphere must pay high tariffs compared to the other countries – more than 10%.

Hence, on average, Mediterranean countries don’t seem to have high preferences for their access to the European market, despite the Barcelona process. However, analysing preferences at the country level reveals heterogeneity among the countries. Concerning tariff regimes (Table 3), Turkey and Lebanon essentially have bilateral preferences (85% and 67% of tariff lines), and Turkey does not benefit from any GSP preferences. On the opposite, 83% of Israel tariff lines are submitted to the MFN regime without any preference.

Table 3. Repartition of tariff lines (CN10) by country and tariff regimes for fruit and vegetables 2003

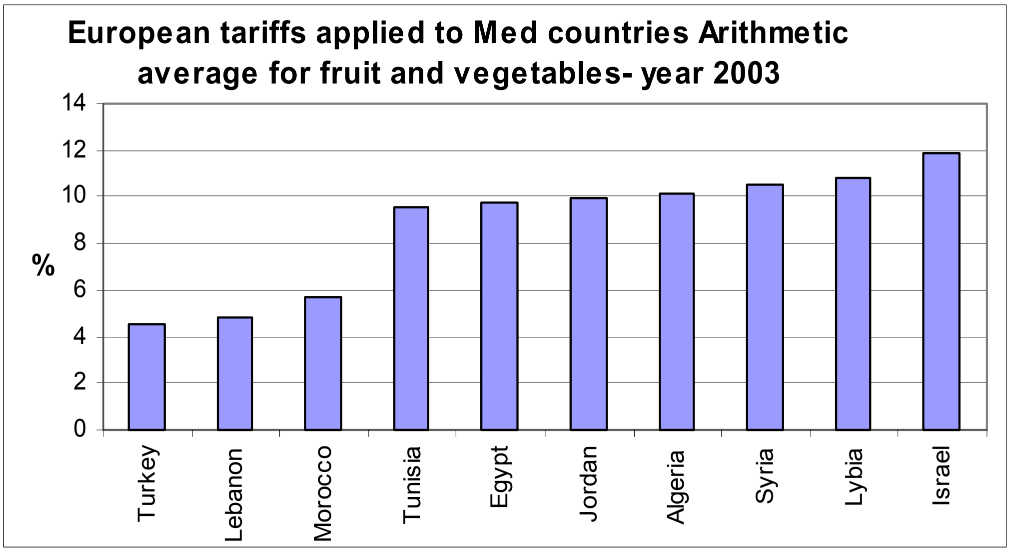
	MFN	Bilateral preferences	GSP	Total
Algeria	23%	10%	67%	100%
Egypt	22%	9%	69%	100%
Israel	83%	17%	0%	100%
Jordan	23%	8%	69%	100%
Lebanon	12%	67%	21%	100%
Libya	26%	0%	74%	100%
Morocco	17%	49%	34%	100%
Syria	25%	1%	73%	100%
Tunisia	22%	13%	66%	100%
Turkey	15%	85%	0%	100%

The lines are counted month by month

MEDITAR

Concerning the level of the protection applied by the EU, the heterogeneity among Mediterranean Countries remains also important (Graph 2). Turkey, Lebanon, but also Morocco benefit from the lowest tariffs while Israel seems to be submitted, on average, to the highest protection.

Graph 2.



COMTRADE and MEDITAR

To sum up this part, it would appear that tariffs and trade are not systematically linked. Hence, Israel which is a major exporter on the European market, still has to face high tariffs and doesn't benefit from huge preferences; whereas Lebanon benefits from high preferences and low tariffs and has a very low market share in the European market. Other components should explain trade to the EU. From these results and in the context of the liberalization, the question to be raised is how much exporting countries are sensitive to a decrease of tariff. Does their access to the EU market depend on other determinants? To answer these questions, we use a gravity-type model, the derivation of which is presented in the following section.

2. The Gravity Model

The Gravity-type model is a widespread model in international trade analysis which permits analysis of bilateral trade volume and nature. It is applied for various purposes, but it is particularly used to assess market access, trade resistance and impacts of regional agreements. Indeed, it permits estimation of trade creation or diversion in case of a regional agreement (Nahuis 2004, Soloaga and Winter 1999), and thus it brings an important contribution to the regionalism debate. On the other hand, the "border effect" methodology (Chen 2004, Head and Mayer 2004, Mayer and Zignago, 2005) do an analysis of a market access measurement comparing imports from foreign countries to imports from domestic producers in order to have a benchmark of the best market access possible, the one faced by national producers. Other authors applied the model to evaluate trade resistance (Péridy, 2005).

Our model is based on the new developments of the gravity equation made by Anderson and van Wincoop (2005). We assume that consumers have identical and homothetic preferences and that products are differentiated by origin. The representative consumers in country i maximize a CES utility function U_{ik}:

$$U_{ik} = \left[\sum_j b_{jk}^{\frac{1-\sigma}{\sigma}} c_{ijk}^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \quad (1)$$

Under the following budget constraint:

$$\sum_j p_{ijk} c_{ijk} = \sum_j m_{ijk} = m_{ik} \quad (2)$$

We denote i the importing country, j the exporting country, k the product, c_{ijk} the consumption by i of product k from j and b_{jk} consumers' preference for products k coming from j. σ corresponds to the elasticity of substitution of imports of j. P_{ijk} is the price of good k coming from country j paid by consumers in country i, m_{ik} is the country i expenditure for good j. P_{ijk} differ from price in country of origin p_{jk} due to trade cost t_{ijk} that are not directly observable. We follow the iceberg assumption about trade costs that leads:

$$p_{ijk} = p_{jk} t_{ijk} \quad (3)$$

The maximization of (1) under constraints (2) give the bilateral imports by country i from country j for a given good k:

$$m_{ijk} = \left(\frac{b_{jk} p_{jk} t_{ijk}}{P_{ik}} \right)^{1-\sigma} m_{ik} \quad (4)$$

P_{ik} is the country i's CES price index for good k:

$$P_{ik} = \left[\sum_j \left(b_{jk} p_{jk} t_{ijk} \right)^{1-\sigma} \right]^{\frac{1}{1-\sigma}} \quad (5)$$

The general equilibrium structure of the model imposes market clearance. We consider both international and intranational trade, so with x_{jk} production of good k by country j, market clearance leads to:

$$x_{jk} = \sum_i x_{ijk} = \sum_i m_{ijk} \quad (6)$$

Applying the equation (5) to this market clearing condition, we obtain:

$$x_{jk} = \sum_i \left[\left(\frac{b_{jk} p_{jk} t_{ijk}}{P_{ik}} \right)^{1-\sigma} m_{ik} \right] \quad (7)$$

We follow Anderson and van Wincoop 2001 using market clearance (7) to solve for the coefficient b_{jk}:

$$b_{jk}^{1-\sigma} = \frac{x_{jk}}{\sum_i \left[\left(\frac{p_{jk} t_{ijk}}{P_{ik}} \right)^{1-\sigma} m_{ik} \right]} \quad (8)$$

Substituting this expression of b_{jk} (8) in (7), it yields

$$m_{ijk} = x_{jk} m_{ik} \left(\frac{p_{jk} t_{ijk}}{P_{ik}} \right)^{1-\sigma} \frac{1}{\sum_i \left[\left(\frac{p_{jk} t_{ijk}}{P_{ik}} \right)^{1-\sigma} m_{ik} \right]} \quad (9)$$

We pose $A_{jk} = \sum_i \left[\left(\frac{p_{ijk}}{P_{ik}} \right)^{1-\sigma} \frac{m_{ik}}{m_{wk}} \right]$ with m_{wk} total expenditure for product k in the world. It corresponds to a CES index of price competitiveness of j for the good k. This index assesses the global competitiveness of country j on the total destination markets. $\left(\frac{p_{ijk}}{P_{ik}}\right)$ is the price competitiveness of j on market i. This ratio is weighted by the share of country i in the total demand. Introducing this index in (9), we obtain:

$$m_{ijk} = x_{jk} m_{ik} \left(\frac{p_{jk} t_{ijk}}{P_{ik}}\right)^{1-\sigma} \frac{1}{A_{jk} m_{wk}} \qquad (10)$$

That leads to:

$$\frac{\frac{m_{ijk}}{m_{ik}}}{\frac{x_{jk}}{m_{wk}}} = \left(\frac{p_{jk} t_{ijk}}{P_{ik}}\right)^{1-\sigma} \frac{1}{A_{jk}} = IR_{ijk} \qquad (11)$$

We actually regress not the volume of bilateral flow as in traditional gravity equation, but the index of relative bilateral intensity IR_{ijk}. This index compares the share of the imports of good k coming from j in the total imports of i to the market share of the exporter j in the international market. An index equal 1 means that the flow of good k between i and j is only determined by the size of the partners. A coefficient different from 1 means that trade is determined by other factors than the size (equation 11): if it is greater than one, it denotes privileged trade links between i and j for good k whereas an index less than one refer to trade resistance between the two countries which could be explained by a low competitiveness of i, but also by the trade costs.

Trade costs t_{ijk} are defined to include all costs incurred in getting a good to a final user other than the production of the good itself (Anderson van Wincoop 2004). These costs comprise transport costs, tariffs and non tariffs barriers, but also information costs, the use of different currencies or the marketing cost. The main problem is to measure these costs for which data are not always available. So, this mandates capturing trade cost by observable cost proxies.

We follow Péridy 2005 and decompose trade costs into different factors: the distance d_{ij} between i and j (proxy of transport costs), tariffs applied by i towards j for good k t_{ijk} and other border variables B_{ijk} that are traditionally used in gravity model in order to take into account information costs and other elements that we cannot measure, as common language, common frontier, and common history.

3. Data and econometrics

The above theoretical development leads to the estimable gravity equation:

$$\ln(IR_{ijk}) = \ln(\frac{m_{ijk}}{m_{ik}}) - \ln(\frac{x_{jk}}{m_{wk}})$$

$$= (1-\sigma)\ln(\frac{p_{jk}}{P_{ik}}) - \ln(A_{jk}) + (1-\sigma)(\ln tariffs_{ijk} + \ln d_{ij} + Contig_{ij} + Colony_{ij} + Periss_{k} + zone_{j})$$

(12)

Insofar as one of our objectives is to assess the impact of different trade barriers and, more precisely, to point out those which prohibit trade, we must take into account not only the actual bilateral trade but also “zero values”, i.e. all potential bilateral flows. In this case the suitable procedure is to model the decisions that produce zero values (the decision to export or not), rather than to use the censored regression tobit model mechanically, where zero values are assumed to appear due to censoring (Maddala, 1992). Thus, the most appropriate econometric method for this purpose is a **Heckman procedure** (Heckman, 1979)

The model is estimated on annual data and in cross section, for the year 2002 at the product level - the product level being defined in the FAO nomenclature (i.e. about 55 products for the fresh F&V sector). We focus our analysis on EU imports from all its trading partners (EU and non EU members – among them Med and non Med countries). Thus the dependent variable includes both **international** (m_{ijk}) **and intra-national flows** (m_{iik}); however, the latter are not available at a so disaggregated level. Thus, we had to generate these flows from the data on production (coming from FAOSTAT) and trade (coming from COMTRADE database). For this, we have computed the balance sheet between supply and demand for each product and countries. This needs specific attention on the consistency between the two databases, taking into account the problem of reexportation which entails for example that some countries without production can present important amount of exports for some products.

Relative price are calculated from production price data of FAOSTAT database for each country and product. Nonetheless, as data needed to calculate A_{jk} are not available; we don't introduce this variable in our estimation.

For the **transport costs** between two countries – we have taken as proxy the distance between the capitals of i and j d_{ij} and the internal distance calculated by the CEPII [1] . Because of the time sensitivity of fruit and vegetable, these transport costs must be a huge concern in this sector; and the more perishable the product, the higher the costs. Thus, besides the distance we have introduced a multinomial variable corresponding to the degree of perishability of the products. Four groups have been made, using data on time keeping, respiratory intensity, and fragility from the least (group 1) to the most perishable (group 4) (Appendix 1).

As far as **the contiguity variable** (Bij) is concerned, we have introduced a dummy variable equal to 1, if the two trading partners have a common border, otherwise equal to 0. **The common history** has been caught through the dummy colony equal to 1, if the exporting country was a colony of its trading partner.

In order to take into account all the preferences allowed, tariffs included in the model are **applied tariffs** by the EU to each of its trading partners. The data come from TARIC database (DG Taxud). Although the model is estimated on annual data and for the FAO nomenclature, we must measure the protection at the most disaggregated level in order to have a comprehensive picture of the protection: i.e. monthly data at the 10-digit level of the combined nomenclature. This allows us to catch variations of the tariffs during the year due to the seasonality of protection and the different calendars of preferences. Moreover, the calculation of ad-valorem equivalent may be problematic in the F&V sector, due to the so called entry price system applied to some sensitive products such as tomatoes, cucumbers or citrus…. This system implies that the level of protection depends on the level of the import price. If the import price is greater than a threshold – the trigger price – the exporter only pays the ad-valorem part of the duty. If the price is below the trigger price, the exporter has to pay also a specific duty. This duty is at the maximum when the price falls below a certain level, equal to 92% of the trigger price. Consequently, the measurement of the ad-valorem equivalent necessitates choosing an import price. Here, in this paper, we have chosen to measure the protection at its maximum level, i.e. at the 92% of the trigger price. Finally, for these specific products, preferences allowed by the EU may be either an exemption or a reduction of the ad-valorem tax, the level of the specific duty remaining the same. However, Morocco has negotiated lower entry prices for some products (tomatoes and oranges), and preferences allowed for this country are higher. In order to catch this preferential advantage for these products, we have calculated the ad-valorem equivalent on the Morocco prices.

Finally, once the ad valorem equivalent is calculated at the most disaggregated level for each country, we must aggregate this monthly data calculated at the 10-digit level of the combined nomenclature in annual data defined in the FAO nomenclature. We use two methods of aggregation. First, we compute an arithmetical tariff average which permits us to catch the whole protection applied during the year, even if some month, the tariffs are so high that they prevent imports. This average is introduced in the selection part of our Heckman estimation – probit part - in order to take into account the overall tariff barrier applied at the entrance of the EU market. In the second computation, the average applied by the EU to its trading partner, is weighted by the monthly imports of the EU from this country (by using COMEXT database). This estimation measures the taxes really paid by the exporters when they have entered the EU market in 2002. We introduce this measure in the regression part of our estimation. Finally, in our estimation, we replace tariffs t_{ijk} by $(1+t_{ijk})$ in order to avoid losing observations for which tariffs are equal to zero.

4. Results

>From an econometric point of view, the two modeling steps (selection and regression on export volume) are not independent (value of the Chi^2), which justifies the use of the Heckman procedure. Because, results of the Probit are quite similar of that of the regression step, we only present the regression step results of the Heckman Procedure (table 4). We'll present in the text, the differences when necessary.

[1] Available on the CEPII website : http://www.cepii.fr/

Table 4. Results.

	Estimation by zone			Estimation by country		
	Coeff.	*Std err*	Sign.	Coeff.	*Std err*	Sign.
exporter price competitiveness on importing market	-0,178	*0,026*	***	-0,2	*0,026*	***
Exotic good	1,245	*0,2*	***	1,635	*0,199*	***
Colony	0,886	*0,171*	***	1,066	*0,166*	***
Common Border	0,41	*0,168*	**	0,237	*0,163*	NS
Tariffs applied to the ROW	**-0,921**	***0,063***	***	**-0,78**	***0,062***	***
Tariffs Med Countries	0,119	*0,092*	NS	-	-	-
Tariffs Morocco	-	-	-	0,402	*0,206*	*
Tariffs Israel	-	-	-	0,243	*0,175*	NS
Tariffs Algeria	-	-	-	-2,836	*0,757*	***
Tariffs Lebanon	-	-	-	-2,098	*0,44*	***
Tariffs Tunisia	-	-	-	0,923	*0,225*	***
Tariffs Syria	-	-	-	0,792	*0,387*	**
Tariffs Jordan	-	-	-	0,445	*0,374*	NS
Tariffs Egypt	-	-	-	-0,438	*0,187*	**
Tariffs Turkey	-	-	-	0,357	*0,139*	**
Tariffs New Member States	0,266	*0,114*	**	0,033	*0,112*	NS
Tariffs Southern Hemisphere countries	1,123	*0,107*	***	1,226	*0,104*	***
Country dummies						
Med Countries	0,685	*0,219*	***	-	-	-
Morocco	-	-	-	1,06	*0,347*	***
Israel	-	-	-	3,763	*0,403*	***
Algeria	-	-	-	0,797	*1,693*	NS
Lebanon	-	-	-	0,409	*0,726*	NS
Tunisia	-	-	-	-2,451	*0,567*	***
Syria	-	-	-	-7,183	*1,217*	***
Jordan	-	-	-	-0,514	*1,258*	NS
Egypt	-	-	-	1,081	*0,447*	**
Turkey	-	-	-	0,899	*0,322*	***
New Member State	0,483	*0,28*	*	0,922	*0,274*	***
South Hemisphere Countries	1,567	*0,264*	***	1,574	*0,255*	***
European Union Border Effect	1,108	*0,205*	***	1,319	*0,202*	***
Home Effect	5,605	*0,376*	***	5,565	*0,367*	***
Distance	-0,998	*0,074*	***	0,017	*0,095*	NS
Distance Perishability 2	-	-	-	-1,317	*0,1*	***
Distance Perishability 3	-	-	-	-1,489	*0,099*	***
Distance Perishability 4	-	-	-	-1,463	*0,113*	***
Perishability 2	-2,091	*0,129*	***	7,826	*0,785*	***
Perishability 3	-3,27	*0,126*	***	8,007	*0,764*	***
Perishability 4	-2,306	*0,14*	***	8,56	*0,844*	***
Constant	8,285	*0,659*	***	0,568	*0,826*	NS
Number of obs	***19154***			***19154***		
Censored obs	*10221*			*10221*		
Uncensored obs	*8933*			*8933*		
Wald chi2(17)	*3215,7*			*3964,8*		
Prob > chi2	*0*			*0*		
Log likelihood =	*-35790*			*-35142*		
LR test of indep chi2(1)	*197,99*			*179,07*		
Prob > chi2	*0*			*0*		

Results for “classical” variables are in line with expectations from a gravity model. Distance restricts trade between two countries. Conversely, having a common border and a common history (colony) stimulates trade between partners. Moreover, the bilateral price competitiveness has a significant impact on trade: the higher the production price p_{ik} of the exporting country compared to the internal price on market i P_{ik}, the lower the volume of exports. The dummy "exotic good" is used in order to catch the fact that some products are not produced in the EU countries, and it has the expected sign.

1. Perishability increases transport costs

Trade is sensitive to **perishability** group (column 1 Table 4). The more perishable the products (from group 2 to 4), the greater the trade resistance, compared to the non-perishable products (group 1). However, the impact is greater for group 3, which appears the more time sensitive. This effect could be explained by the fact that products of group 4 can be exchanged frozen which can reduce the time sensitivity.

To assess the impact of perishability on **transport costs** we introduce interaction terms between perishability and distance (column 2 table 4). The variables "distance-perishability" allow to compare the impact of distance for the different perishability groups, with group 1 as reference. The coefficient of the distance is not significant, that means that the distance has no impact for products of group of reference i.e. non perishable products (group 1). Conversely, the coefficients of distance-perishability term are significant and high, that means that for the other groups of product distance have an important effect on trade. This relation is clearer in the selection results, where the more perishable the product, the higher the impact of distance on probability to trade. However, the coefficient of perishability group dummies is now positive and significant; moreover it is increasing with the degree of perishability. As we catch the transport cost impact with the distance-perishability term, the perishability group dummies capture the product-specialization effect. Indeed, products of groups 2, 3 and 4 are globally more exchanged than products if groups 1.

2. The EU border effect

Our estimation displays a significant and important **home effect** of 5.6, and a notable **EU border effect** (1.108). In other words, each European country trades much more with itself than with other countries (home effect) and moreover European countries import more from the European market than from the rest of the world (EU border effect).

Coupling the **perishability groups with the EU and the Home dummy** points out the importance of perishability of products on trade resistance (Table 5). The perishable products are more exchanged within the EU and notably within the national territory.

Table 5.

	Coefficient	*Std err*	significance
EU	-0,96	*0,238*	***
EU Perishability 2	3,169	*0,256*	***
EU Perishability 3	2,915	*0,25*	***
EU Perishability 4	3,108	*0,274*	***
Home	2,373	*0,531*	***
Home Perishability 2	4,219	*0,64*	***
Home Perishability 3	4,808	*0,605*	***
Home Perishability 4	3,949	*0,625*	***

3. The access of Mediterranean basin to EU market

The first estimation (column 1 table 4) allows us to compare the **impact of the European protection** on fruit and vegetable flows coming from third countries, by distinguishing four groups of countries: Mediterranean basin, Southern Hemisphere countries, New Member States (NMS) and the Rest of the World (ROW). Tariffs have a significant and negative impact on European import for the ROW (-0.921). For the other areas, the coefficient is the tariff differential between the given area and the ROW. For example, for the NMS which coefficient is 0.266 and significant, the tariff impact is equal to -0.921+0.266=-0.655. Conversely, tariff impact is not significantly different between Mediterranean countries and the rest of the world. Finally, for Southern Hemisphere the positive impact of European tariffs on trade of fruit and vegetables is a puzzling result (-0.921+1.123= 0.202). This should mean that tariffs stimulate trade. But in fact, this result can be explained by the product specialization of these countries. They are specialized in highly protected products by the European Union, such as apples or grapes. They can export on European markets because of their competitiveness and because of their production calendar.

Country group dummies compared to EU dummy catch the **trade resistance** faced by different areas for access to the European F&V market, once taken into account protection, transport costs and price competitiveness. The trade resistance for ROW is equal to the inverse of the EU dummy coefficient (-1.108). Mediterranean countries have a better access to the European market than the ROW but they still have a trade resistance at the entrance of the EU market (0.685-1.108=- 0.423) which could be explained by determinants as Non Tariffs Barriers or logistic constraints... This trade resistance is equivalent for the New member States. Once more, Southern Hemisphere Countries have a specific advantage on the European market.

4. The heterogeneity of the Mediterranean basin

In the above results, tariff elasticity for Mediterranean area isn't different from the rest of the world and New Member States. As noted in the first part of the paper, the Mediterranean basin is a heterogeneous area with respect to trade and level of protection applied at the entrance of the European market. The question is what is the impact of protection for each country individually? In the second column of table 4, we disaggregate the Mediterranean area in order to refine the above results for each Mediterranean country.

Global results on competitiveness, production, consumption, common border and history are the same as in the first estimation. EU border effect, home effect, Southern Hemisphere effect remain the same, but the new specification of the model makes the coefficient of tariff non-significant for the New Member States.

As previously, the tariff coefficient for each country is compared to the coefficient value of the ROW. Among Mediterranean countries, we can distinguish different profiles. Israel and Jordan coefficient are not significant; their tariff elasticity is the same than the ROW one. Syria's exports to the European Union are not sensitive to tariffs: the coefficient is close to zero (-0.780+0.792=0.012). For Algeria, Lebanon and Egypt the sensitivity to tariff is very high compared to the ROW. Conversely Turkey and Morocco tariff sensitivity is lower than for other countries. Lastly, Tunisia presents puzzling results, having a positive coefficient of tariff sensitivity.

Concerning the country dummies, Tunisia and Syria display a very high trade resistance: especially for Syria (-7.18-1.319= -8,499), which European market access constraints are not due to tariffs. Algeria, Lebanon and Jordan face the same trade resistance as the ROW. Finally, on the other side, Turkey, Egypt, Morocco have a better access to the EU access compared to ROW but still have trade resistance. Conversely, despite high tariffs, Israel has a non price competitive advantage on the EU market (3.76-1.319= 2.441). The Israeli logistic and organizational competencies can be at the origin of these advantages.

By way of a first conclusion, with respect to the Euromed liberalization process the Mediterranean area appears as a **highly heterogeneous country bloc**. To assess the potential impact of a decrease of protection, two elements must be taken into account: the tariff sensitivity of the exporting country (tariff elasticity) and its other trade resistance (captured by the country dummies). The higher the tariff sensitivity the higher the impact of liberalization on trade and this impact can be eroded by a high trade resistance (NTB …).

	non price competitive advantage compared to EU	**Trade Resistance Compared to EU suppliers**	
		non price competitive advantage compared to ROW	**disadvantage compared to ROW**
High Tariff sensitivity ≥ROW	Israel	Egypt	Lebanon Algeria Jordan
Low Tariff sensitivity <ROW		Turkey Morocco	Tunisia Syria

Israel and Egypt are the two countries that may be more sensible to a decrease of tariffs, because their exports have an important elasticity to tariffs and because they display important other advantage for EU market access, probably due to logistic and organization competitiveness. **Morocco and Turkey** also present other important advantages but they display smaller elasticity to tariffs, so they should be less sensitive to a decrease of tariffs than Israel and Egypt. **Algeria, Lebanon and Jordan** have high tariffs sensitivity but present a huge trade resistance, even compared to the rest of the world in accessing European market. Thus the competitiveness of these countries depends not only on tariffs, but also on non-tariffs components such as organization, adaptation to European norms or logistic capacities. Therefore the positive impact of a decrease of tariffs may be canceled by a non competitive position of these countries. Lastly, **Tunisia and Syria** display also important disadvantage compared to other countries.

5. Conclusion

In order to assess the impact of the EU-MED trade liberalization we built a gravity model focused on EU fruit and vegetable imports. The model is estimated on annual data for the year 2002 at a disaggregated product level (using FAO nomenclature for 55 products) and includes both trade between EU and all its trading partners and intra-EU trade. The index of relative bilateral intensity in flows is explained by relative prices and "trade costs", those trade costs including distance and perishability (as proxies of transport cost) and EU applied tariffs. The dummies allow capturing trade resistance (with European suppliers as benchmark), that face the different areas and countries to access the European market, and advantage in accessing European market compared to the others countries of the world (non price competitive advantage), once taken into account protections, transport costs, price competitiveness, common frontier and common history.

A first set of conclusions concerns the Mediterranean area considered as a block. The results show that the tariff elasticity for the Mediterranean area isn't significantly different than the one observed for the Rest of the World. Concerning non price competitive advantage, it appears that the Mediterranean countries have a better access to the EU than the Rest of the World but that they still have a trade resistance at the entrance on the EU markets, probably due to non-tariff component.

A second set of conclusions shows that with respect to the Euro-Med liberalization process, the Mediterranean area appears as a highly heterogeneous bloc. Israel is the only country that does show better non price competitive advantage on the EU market than the EU countries themselves, revealing other advantages than prices such as logistic or organizational competitiveness. It has also the highest average tariff and high tariff elasticity. Thus the impacts of liberalization on Israeli exports should be very important, ceteris paribus.

Morocco and Turkey are currently the two countries that share the highest part of the Euro-Med fruit and vegetable market, and they benefit of high preferences (low tariffs). They are in a medium position from the point of view of non price competitive advantage and tariff elasticities. Consequently, the impact of liberalization should not be that positive for those countries, and can even be jeopardized by the erosion of their preferences.

It is also interesting to observe that Egypt is a country which displays important non price competitive advantage and high tariff sensitivity, with current tariffs being quite high. Being the fourth exporter in the market, the impact of liberalization could impact significantly its exports but also the overall volume of Med exports.

Finally, the other Mediterranean countries appear to be in different situations one from another. But we should not expect important impacts of liberalization on their exports because either they show low tariff sensitivity (Tunisia, Syria) or low current tariffs (Lebanon), or none of them present significant non price competitive advantage.

Several improvements are foreseen in this work. The first limit concerns the measure of protection. As protection is monthly defined and varies within the year, we use annual arithmetical average of protection for the selection part of our Heckman estimation and import weighted average for the regression part of the estimation. However, some month, tariffs are so high that they prevent imports, what we cannot take into account in the selection step of the estimation with annual average. Secondly, extending our model over several years (cross section model) could allow to test the robustness of our estimations.

Acknowledgment

We would like to thank Jacques Gallezot and Monique Harel (INRA)

References

Anderson, J. E. and van Wincoop, E. (2003). “Gravity with gravitas: A solution to the border puzzle”. American Economic Review 93: 170-192.

Anderson, J. and E. van Wincoop (2004). “Trade Costs”. Journal of Economic Literature 42(3): 691-751.

Chen, N. (2004). “Intra-national versus international trade in the European Union: Why do national borders matter?” Journal of International Economics 63: 93-118.

Emlinger C., Jacquet F., Petit, M. "Les enjeux de la libéralisation agricole dans la zone méditerranéenne." Région et développement (Forthcoming)

Head, K. and T. Mayer (2004). “The Empirics of Agglomeration and Trade”. *Handbook of Regional and Urban Economics.* V. Henderson and J. F. Thisse. 4.

Heckman, J. J. (1979). “Sample selection bias as a specification error”. Econometrica 47: 153-61.

Mayer, T. and Zignago, S. (2005). Market access in global and regional trade. CEPII, Paris.

Nahuis, R. (2004). “One size fits all? Accession to the internal market; an industry-level assessment of EU enlargement”. Journal of Policy Modelling 26: 571-586.

Soloaga, I. and A. Winters (2001). “Regionalism in the nineties: What effect on trade?” *North* American Journal of Economics and Finance 12: 1-29.

Péridy, N. (2005). “Towards a new trade policy between the USA and middle-east countries: Estimating trade resistance and export potential”. World Economy 28: 491-518.

Appendice 1. Perishability groups

Group 1	Almonds Beans, Dry Beans, Green Broad Beans, Green Chick-Peas Garlic Hazelnuts (Filberts) Lentils Onions and Shallots, Green Onions, Dry Peas, Dry Pistachios
Group 2	Apples Avocados Bananas Carrots Dates Grapefruit and Pomelos Kiwi Fruit Lemons and Limes Oranges Pears and Quinces Pineapples Potatoes Sweet Potatoes Tang.Mand.Clement.Satsma
Group 3	Artichokes Asparagus Cabbages Cauliflower Cherries Chillies&Peppers, Green Cucumbers and Gherkins Grapes Mangoes Papayas Peas, Green String Beans Tomatoes
Group 4	Apricots Blueberries Cantaloupes&oth Melons Currants Eggplants Figs Lettuce Mushrooms Peaches and Nectarines Plums Raspberries Spinach Strawberries Watermelons