Economic integration and the two margins of trade: the impact of the Barcelona Process on North African countries' exports

Bensassi, Sami and Márquez-Ramos, Laura and Martínez-Zarzoso, Inmaculada

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Sami Bensassi

Department of Economics and Institute of International Economics,
Universitat Jaume I
Campus del Riu Sec, 12071
Castellón,
Spain
Phone: 0034-964-72 85 90
Fax: 0034-964-72 85 91
Email: bensassi@eco.uji.es.

Laura Márquez-Ramos

Department of Economics and Institute of International Economics,
Universitat Jaume I
Campus del Riu Sec, 12071
Castellón,
Spain.
Phone: 0034-964-72 85 90
Fax: 0034-964-72 85 91
Email: lmarquez@eco.uji.es.

Inmaculada Martínez-Zarzoso

Department of Economics and Institute of International Economics,
Universitat Jaume I
Campus del Riu Sec, 12071
Castellón, Spain
and
Institute for Statistics and Econometrics,
University of Goettingen,
Germany.
Phone: 0049-551-39 7350
Fax: 0049-551-39 7279
Email: martinei@eco.uji.es.

Abstract

According to recently developed models of trade with imperfect competition and heterogeneous firms, lower trade costs increase bilateral trade not only through a rise in the mean value of individual shipments (the intensive margin of trade), but also through an increase in the number of exporting firms (the extensive margin of trade). The main aim of this paper is to provide new empirical evidence of the effects of the Euro-Mediterranean (EuroMed) agreements on both margins of trade. Using highly disaggregated export data for four North African countries (Algeria, Egypt, Morocco and Tunisia) and two Middle East countries (Jordan, Lebanon) over the period from 1995 to 2008, we estimate the impact of the EuroMed agreements on both trade margins and we provide empirical evidence of the validity of the theoretical predictions. Results indicate that only the North African countries enjoyed a positive and significant effect of the Barcelona process on their exports to the four biggest countries in the European Union.

KEYWORDS: Euro-Mediterranean agreements, trade integration, intensive and extensive margins.

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1. INTRODUCTION

A growing economic literature has recently underlined the importance of export diversification as part of an export led growth strategy. For many developing countries export diversification is conceived as the progression from traditional to non-traditional exports. By providing a broader base of exports, diversification can lower instability in export earnings, expand export revenues and enhance economic growth through many channels (Acemoglu and Zilibotti, 1997; Gutiérrez de Piñeres and Ferrantino, 1997). In light of the success of the Asian "Tigers", it is now widely recognized that a successful development strategy involves adopting a number of selective measures aimed at reducing transaction costs, improving local business conditions and improving market access. Trade negotiations at the bilateral or regional level could help reduce market access constraints and open opportunities to tap into regional and global production and distribution chains.

The recent emphasis that trade theories based on heterogeneous firms put on the differentiation between the extensive (the number of variety exported) and the intensive margin (the quantity of every variety exported) offer a new way to determine the microeconomic foundation of trade diversification. Along that line we explore these foundations and particularly the role played by preferential trade agreements on the diversification of exports. The main aim of this paper is to provide new empirical evidence of the effects of the Euro-Mediterranean (EuroMed) agreements on both margins of trade. With this aim a theoretically-justified gravity model is estimated with data on exports from four North African countries (Algeria, Egypt, Morocco and Tunisia) to the four biggest continental European Countries, Germany, France, Italy and Spain from the years 1995 to 2008. In order to offer a point of comparison with Euro-North African trade, the model is also estimated for two Middle East countries, Jordan and Lebanon[1], also participating into the EuroMed agreements. With respect to the existing literature our main contribution is to disentangle the effects of the Euro-Mediterranean agreements on the intensive and extensive margins of trade (Chaney, 2008). The related empirical evidence shows that some European Union (EU) trade preference regimes for developing countries, including the EuroMed agreements, have a positive effect on developing countries' exports (Persson and Wilhelmsson, 2006; Blanes-Cristóbal and Milgram-Baleix, 2010). Indeed, Blanes-Cristóbal and Milgram-Baleix (2010) show that the EuroMed trade liberalization process has a positive effect on trade between Spain and Morocco. However, other preference regimes, such as the Everything But Arms (EBA) regime, appear to have a non-significant or even negative effect on developing countries' exports (Gradeva and Martínez-Zarzoso, 2009; Gamberoni, 2007). One of the explanations given is that the Rules of Origin (RoO) are more restrictive than those of

[1] We have excluded from our work Israel, the Palestinian Authority, Libya and Mauritania. Israel is excluded due to the differences between this economy compared to the other MENA countries, and the Palestinian Authority, Libya and Mauritania due to lack of data.

previous preference regimes applied to the eligible countries and therefore the regime is underutilized.

Most of the abovementioned studies, with the only exception of Gamberoni (2007), rely on trade theories that assume that all products are exported to all destinations. They do not take into account the new-new trade theories which consider firm heterogeneity and productivity differences among firms to determine what firms are exporters. Based on these theories Gamberoni (2007) decomposes the total value of trade into the extensive margin and the intensive margin and then estimates the effects of trade preferences on each margin. Interestingly, the main findings indicate that the ACP and the EBA regimes decrease trade (conditional on trade being present) by 11% and 19% respectively and also that both regimes decrease the number of products traded. This later effect implies an anti-diversification bias effect of these preferences. Our paper is closely related to the work of Amurgo-Pacheco (2006), Gamberoni (2007) and Amurgo-Pacheco and Pierola (2008). However, our empirical model is estimated using more recent data. It is built on a more recent and comprehensive methodology which follows the decomposition of trade proposed by Hillberry and Hummels (2008) and is based on the theoretical model of Chaney (2008).

Our main hypothesis is that tight rules of origin can be considered as a hidden fixed cost to trade. They can limit the use of intermediary goods from countries outside bilateral agreements and hence put a fixed and sometimes overwhelming price premium on these goods. According to the new-new trade theory a decrease in the fixed cost associated with trade allows new firms (less productive than the one already present on the export market) to enter in exporting activities. A growth of the extensive margin of trade should follow.

The rest of the paper is organized as follows. Section 2 describes the two phases of the EuroMed agreements and the related stylized facts. Section 3 presents the theoretical framework and Section 4 presents the main hypotheses of the study. Section 5 presents the data, the estimated model and the main results. Section 6 concludes.

2. THE EURO-MEDITERRANEAN AGREEMENTS

In 1995 the European Union (EU) and fourteen countries of the Mediterranean basin decided to commit to a deeper economic integration by signing “new generation” integration agreements. This commitment was named the Barcelona Process. Fourteen years later seven of the signing countries have already enforced the agreement (Table 1), two of them have already joined the EU (Malta and Cyprus), two are candidates (Croatia and Turkey), and a new country, Libya, has joined the process in 2000. Table 1 presents a summary of the trade integration process between the EU and the Euro-Mediterranean countries.

Table 1. Evolution of trade integration in the Euro-Mediterranean region

The first cooperation agreement including a preferential trade agreement (PTA) between the EU and the Middle East and North Africa (MENA) countries dates from the end of the 1970's. The PTA signed was asymmetric since the EU removed the taxes charged on the industrial products originating from the signing countries, whilst the signing countries maintained trade barriers in order to protect their developing industries and to keep revenues from customs duties. Trade relations between Mauritania, Libya and Syria and the EU are today still regulated by the agreements signed 30 years ago. For the rest of the countries the new agreements add two important novelties. Firstly, the agreements open MENA markets to EU's products. The signing countries have to relax all tariffs paid on industrial products imported from the EU over a period of twelve years[2]. The agreement specifically stipulates the schedule for each type of product. Secondly, rules of origin that apply to the signing countries have been modified. In the preceding(or previous) agreements these rules were particularly narrow (Hoekman, 1998, Francois et al., 2005), since only products entirely made in the signing country or incorporating spare parts from the EU could enter free of duty into the EU.

To understand the impact of the EuroMed process on exports from the Mediterranean countries to the EU we have to focus first on the evolution over time of the signed agreements. We differentiate between the effects resulting from an increase of the EU openness to the Mediterranean products inherent to the process (first stage) and the effects that result from an increase in openness of the Mediterranean countries to European products (second stage).

Industrial products originating from the Mediterranean countries are authorized to enter free of customs duties into the European Union since 1978. Only marginal changes have occurred since then. For example, some provisions concerning the United Kingdom and Ireland in 1978 have disappeared). It is mainly in agricultural products that the EU opens its frontiers within the framework of the Barcelona Process.

The first evaluations of the economic effects of the Euro-Mediterranean agreements were particularly controversial. Deardorff et al (1996), Deardorff (1999) and Hoekman and Konan (1999, 2005) stated that the outcome of these agreements could be negative for the MENA countries in terms of trade, growth and revenue, at least in the short term. The authors based this statement on the loss of revenue from import duties that the MENA countries will suffer following the agreements and on the diversion of consumption induced by increasing imports from the EU. It is worth noting that these authors disregarded the effects of the new and more flexible rules of origin included in the agreements. Since exports of industrial goods to the EU were already free of tariffs before 1995, we pay particular attention to the effects of changes in the RoO adopted in the new agreements. The determination of the geographic origin of the products is crucial and could hinder all attempts of real integration. In this sense, the RoO

[2] At the exception of Israel, which has opened its market to EU's industrial products in 1989.

adopted during the Barcelona process have changed in comparison to the previous post-1978 agreements. According to these, a product that is wholly obtained or completely produced within one country the product originates from that country. For a product which has been produced in more than one country the product is assumed to have origin in the country where the last substantial transformation took place. The EU's most commonly used rule is that a substantial transformation takes place when there is a change in the product tariff classification line. An alternative criterion is that the value of the intermediate good originated from outside the PTA has to stay under a certain percentage (often between 40 and 50%) of the value of the final good, or that a particular production process is used to transform the product. The main novelty introduced by the new agreements is the so-called diagonal cumulation, which is one of the three main types of cumulation. The other two forms are bilateral and full cumulation. Bilateral cumulation means that two countries within the agreement can use each other's materials without any limitation. All PTAs allow for bilateral cumulation. Diagonal cumulation means that materials originated from a third country also linked by an agreement to one of the signing countries could be used without any limits by the other signing country. If Spain for example has a PTA with Iceland and signs a PTA with Morocco which includes the possibility of diagonal cumulation between Iceland and Morocco, intermediate products from Iceland used as intermediates in a Moroccan good are considered as originating from Morocco. Finally, full cumulation allows intermediate processing to be split in any way between the parties of the PTA provided that, when added together all inputs used are sufficient to fulfill the RoO (Augier et al. 2005; Karray 2003). Full cumulation is currently operated by the European Economic Area (EEA) and between the EU and Algeria, Morocco and Tunisia. Table A.4 shows how the rules concerning the cumulation possibilities have evolved over time for the Mediterranean countries (Protocol 3, 4 and 6 of the Euro-Mediterranean agreements).

Moreover, the Barcelona Process encourages the Mediterranean countries to further integrate the service sectors (transport and finance sector for example) and to homogenize their procedures (standardization, metrology, quality controls, and conformity assessment) with the EU members. These measures should decrease the transaction costs between the EU and its partners. Except for the signing of the open sky agreement between the EU and Morocco in 2007, little progress has been made in this area (European Commission Country Reports on Neighborhood Policy 2004, 2005, 2008). Finally, the European products will have duty free access to the South and East Mediterranean markets after the negotiated transition period, a twelve year period during which the customs duties are progressively abolished.

3. HETEROGENEOUS FIRMS AND THE TWO MARGINS OF TRADE

A major concern in the traditional literature on the formation of preferential trade agreements has been whether these areas generate welfare gains for the individual countries that engage in

these processes. Since the 1950s (Viner 1950) many authors have contributed to this debate, especially in the 1990s when studies based on the gravity model proliferated (Frankel et al. 1995, 1996, 1998; Soloaga and Winters, 2001). Indeed, the effect of PTAs on trade has been commonly analysed using the gravity model of trade, with the dependent variable being the aggregate value of trade between two countries and modelling the agreements with dummy variables. Some recent studies for aggregated trade are Carrère (2006), Magee (2008) and Martínez-Zarzoso et al. (2009). Most of these recent papers rely on a model that assumes iceberg trade costs[3] and symmetric firms. In this setting, consumers buy positive quantities of all varieties and aggregated trade values react to trade cost reductions in exactly the same way as firm-level quantities and values.

The theoretical models used to generate the gravity equation usually assume homogeneous firms within a country and consumer love of variety. These two assumptions imply that all products are traded to all destinations. However, empirical observation indicates that few firms export and exporting firms commonly sell in a limited number of countries. This empirical fact has led to the development of the so-called new-new trade theories based on firm heterogeneity in productivity and fixed costs of exporting (Melitz, 2003). These newer theories predict the existence of a productivity threshold for each country that firms have to exceed in order to become exporters. As a result two margins of trade emerge: the extensive margin and the intensive margin the size of its exports. Chaney (2008) shows that a higher elasticity of substitution makes the intensive margin more sensitive to changes in trade barriers, whereas it makes the extensive margin less sensitive. The reasoning is as follows: when goods are highly differentiated (the elasticity of substitution is low), the demand for each individual variety is relatively insensitive to changes in trade costs and so, trade barriers have little impact on the intensive margin of trade. On the contrary, as trade barriers decrease firms with a lower productivity level are also able to enter into the markets. The extensive margin is therefore strongly affected by trade barriers when the elasticity of substitution is low. The reverse holds when the elasticity of substitution is high.

In this context we can express the quantity of a variety from origin country i to destination country j (q_{ij}) as

$$q_{ij} = E_j \left(\frac{\left(p_i t_{ij} \right)^{-\sigma}}{\tilde{P}_j} \right) \qquad (1)$$

[3] Iceberg trade costs mean that for each good that is exported a certain fraction melts away during the trip as if an iceberg were shipped across the ocean.

where E_j denotes country j's total expenditure on the differentiated product, ($p_i t_{ij}$) is the price of product i at destination j, p_i varies across destinations due to positive iceberg transport costs, t_{ij}. $\tilde{P}_j = \sum_i \left(p_i t_{ij}\right)^{(1-\sigma)}$ is a price index and σ is the elasticity of substitution, which is constant across varieties[4] (CES).[5]

Since the quantity traded of each variety is in most cases not observable, adding the two assumptions that, a) all varieties in the origin are symmetric and b) the destinations will consume all the varieties in equal quantity, allows multiplying the quantity per variety (q_{ij}) by prices (p_i) and by the number of varieties (n_i) to obtain total trade values. The outcome is

$$T_{ij} = n_i p_i q_{ij} = E_j n_i \left(\frac{p_i \left(p_i t_{ij}\right)^{-\sigma}}{\tilde{P}_j} \right) \tag{2}$$

In equation (2) the quantity per variety is the only component of T_{ij} that has bilateral variation. Following Hillberry and Hummels (2008), we are able to examine each of the components of total trade values in a more flexible way since not only data on quantities are available, but also prices and the range of products vary across origin and destinations. Therefore we need to relax some of the assumptions made above. Prices may vary across destinations if the elasticity of substitution is not constant or if transport costs are not iceberg costs (Hummels and Skiba, 2004). Consequently for a given year t, we can assume:

$$T_{ij} = n_{ij} p_{ij} q_{ij} \tag{3}$$

At least three reasons have been suggested in the literature to explain why the range of trade products might vary with trade cost. First, goods produced in different locations (origin and destination) can be homogeneous. In this case, if production costs in origin and destination are very similar or the trade costs are sufficiently large, these goods will not be traded. Additionally, the higher transport costs are, the more likely products are to be non-traded goods. Second, if goods are differentiated by country of origin, each country producing a different variety has to incur a fixed cost to sell the product in each destination country. Therefore, not all the varieties will be shipped to each destination and the number of varieties traded will depend negatively on the magnitude of trade costs. Finally, not all varieties are consumer goods. Intermediate inputs that are used in the production of final goods would only be exported to destination j if country j produces the final good. Due to "just in time" production processes intermediates are more likely to be traded over short distances. We focus on the first and second explanations and

[4] Varieties refer to different products that are substitutes in consumption.
[5] The constant elasticity of substitution (CES) assumption is made in order to obtain a simple model that is easily derived and with testable implications.

assume that both, the number of varieties and the quantity traded are negatively affected by trade costs.

The methodology we use to decompose aggregate value of trade into its various components is based on Hillberry and Hummels (2008). Unique shipments are indexed by s and the total value of shipments from country i to country j is given by

$$T_{ij} = \sum_{s=1}^{N_{ij}} P_{ij}^{s} Q_{ij}^{s} \tag{4}$$

where N_{ij} is the number of unique shipments (extensive margin of trade) and $\overline{PQ}_{ij}$ is the average value per shipment (the intensive margin). Hence, total trade value is decomposed first into extensive and intensive margin

$$T_{ij} = N_{ij} \overline{PQ}_{ij} \tag{5}$$

where $\overline{PQ}_{ij} = \frac{\left(\sum_{s=1}^{N_{ij}} P_{ij}^{s} Q_{ij}^{s}\right)}{N_{ij}}$

Since there can be multiple unique shipments within an origin-destination country pair, the number of shipments can be further decomposed into the number of distinct SITC products shipped, N_{ij}^{k}, and the number of average shipments between a country of origin and a destination country, N_{ij}^{F}. $N_{ij}^{F}>1$ means that we observe more than 1 unique shipment per commodity travelling from country i to country j.

$$N_{ij} = N_{ij}^{k} N_{ij}^{F} \tag{6}$$

The average value per shipment can also be further decomposed into average price and average quantity per shipment:

$$\overline{PQ}_{ij} = \frac{\left(\sum_{s=1}^{N_{ij}} P_{ij}^{s} Q_{ij}^{s}\right)}{\sum_{s=1}^{N_{ij}} Q_{ij}} \frac{\left(\sum_{s=1}^{N_{ij}} Q_{ij}\right)}{N_{ij}} = \overline{P}_{ij} \overline{Q}_{ij} \tag{7}$$

By substituting equations (6) and (7) into (5) we can decompose total trade between two countries into four different components:

$$T_{ij} = N_{ij}^{k} N_{ij}^{F} \overline{P}_{ij} \overline{Q}_{ij} \tag{8}$$

The quantity measure is tons for all commodities. Using a common unit allows us to aggregate over different products and compare prices (import unit values) across all commodities.

We now have two decomposition levels. The first is given by equation (5) and decomposes total trade value into the range of products traded and the average value per product. The second, given by equation (8), decomposes these two components into another two each: the number of distinct SITC goods shipped, the number of average shipments between a country of origin and a destination country, and average price and average quantity, respectively. Taking logs for the first and second level decompositions and adding the time dimension, t we obtain:

$$\ln T_{ijt} = \ln N_{ijt} + \ln \overline{PQ}_{ijt} \tag{9}$$

$$\ln T_{ijt} = \ln N^{k}_{ijt} + \ln N^{F}_{ijt} + \ln \overline{P}_{ijt} + \ln \overline{Q}_{ijt} \tag{10}$$

In the empirical analysis, we analyze how each of the components of equation (10) co-varies with distance and with other trade-related costs. The variable of interest is trade cost reductions induced by trade liberalisation between the European Union and the Maghreb countries considered. Before specifying the empirical model, in the next section we state a number of hypotheses that are based on recent theories of international trade under imperfect competition and heterogeneous firms.

4. MAIN HYPOTHESES

The first hypothesis to be tested is that the EuroMed process has positive effects on the extensive and intensive margins of trade. Melitz (2003) introduced firm heterogeneity in a general equilibrium model of international trade. Chaney (2008) extended Melitz's model to multiple countries with asymmetric trade barriers. This model predicts that, for aggregated bilateral trade flows, the elasticity of exports with respect to trade barriers is larger than in the absence of firm heterogeneity and larger than the elasticity for each individual firm. A reduction of variable cost has two effects. First, it increases the size of exports of each exporter and second, it allows new firms to enter the market. Therefore, the extensive margin amplifies the impact of a reduction of variable costs on trade. The results obtained in the present paper support this first hypothesis and show that the EuroMed process has a positive effect on both, the extensive and intensive margins of trade.

The second hypothesis is that the effect of the EuroMed agreements may differ for different sectors. In more homogeneous sectors, exports are very sensitive to changes in transportation costs because many firms enter and exit when variable costs change. The elasticity of exports with respect to variable costs does not depend on the elasticity of substitution between goods. However, the elasticity of exports with respect to fixed costs is negatively related to the

elasticity of substitution. This is in contrast with models with a representative firm, according to which the elasticity of exports with respect to transport costs equals the elasticity of substitution minus one. Further, with respect to the two margins of trade, Chaney (2008) shows that in the presence of firm heterogeneity, the extensive margin and the intensive margin are affected in different directions by the elasticity of substitution. The impact of trade barriers is strong in the intensive margin for high elasticities of substitution (homogeneous products), whereas the impact is mild on the extensive margin. The author proves that the dampening effect on the extensive margin dominates the magnifying effect on the intensive margin. The results obtained in the present paper support this second hypothesis since the effect on the intensive margin is stronger for product categories for which the elasticity of substitution is higher.

The third hypothesis predicts that the effect of the EuroMed agreements differs across countries. The production structure and specialization pattern differs across Mediterranean countries. If one country is specialized in homogeneous or referenced goods, then it should be more dependent on price competition and the new agreements should have an effect on the quantity exported. Otherwise, a country which is specialized in more sophisticated products may find more opportunities to diversify with the new agreements.[6]

The fourth hypothesis predicts that the RoO adopted with the Barcelona process could have a positive effect on trade of final goods or could induce an effect on trade on intermediated goods and promote the creation of a production network. Augier et al. (2005) point out that moving to a system of diagonal cumulation of origin widens the possible source of intermediate suppliers to all those countries which are part of that system. Therefore, exporters of the Mediterranean countries could use intermediate goods from more efficient partners inside the agreement or from the rest of the world (RoW).[7] Consequently, if RoO adopted with the first phase of the Barcelona process are more flexible than the previously existent, exports from the Mediterranean countries to EU should increase. Furthermore, the new RoO adopted may also have consequences on the imports of intermediate products from the RoW. Results in Table 8 support this hypothesis. In relation to this, the fifth hypothesis states that the effect of the EuroMed trade liberalization process may differ across sectors (Table 9).

With regard to the second phase of the Barcelona Process, the fact that PTA agreements between the EU and the Mediterranean countries entered into force implies that the European products will have duty free access to the South and East Mediterranean markets after the negotiated transition periods. If trade barriers applied to intermediate goods imported from the EU into these countries are reduced and eventually eliminated, those intermediates became less

[6] See Table A.1 in the Appendix for specialization patterns.

[7] As one of the Mediterranean countries could use intermediate goods from one of his partner in the agreement as it is its own goods it let more "space" for using intermediate goods from the rest of the world.

expensive and final goods produced by Maghreb and Mashrek exporters could be sold at more competitive prices. Consequently, the end of customs duties at the frontier of the South and East Mediterranean markets could imply an increase in exports of these countries due to the lower costs of imported inputs. The seventh hypothesis analyses the effect of the second phase of the Barcelona Process and states that an increase in intermediate imports from the EU has a positive effect on Mediterranean countries' exports.

Figure 1 summarizes the main expected effects of the Barcelona Process on trade between the EU and the South and East Mediterranean countries.

Figure 1. The effect of the Barcelona Process on EuroMed trade

In the next section we first estimate the overall impact of the Barcelona Process. Since we are particularly interested in the way the Barcelona Process could create trade, we investigate whether the process impact exports through the creation of new trade (more varieties exported) or through the exploitation of previously existent comparative advantages (increase in the average quantity exported of the existing flows) or both. Next, we aim to specifically disentangle whether those liberalization effects are due to a change in the RoO or to the liberalization of imported inputs from the EU. These results will contribute to the understanding of the literature on the potential effect of the new series of bilateral Euro-Mediterranean agreements.

5. EMPIRICAL ANALYSIS

5.1. Data, sources and variables

The main data source is Eurostat. We use the external trade detailed database which covers both extra- and intra-EU trade. In particular, extra-EU trade statistics provide data for the trade in goods between the MENA countries and four Member States (France, Italy, Germany and Spain). The products are classified according to the Standard International Trade Classification (SITC) codes at the SITC 5-digit level. Only manufactured products are taken into consideration (categories 5 to 8, see Table A.2 in the Appendix). Income and population data are taken from the World Development Indicators Database 2008 and distance and colonial links from CEPII. Table A.3 in the Appendix provides a summary of the data and sources used in this paper.

The extensive and intensive margin, average price and average quantity of products exported from the MENA to France, Italy, Germany and Spain over the period 1995-2008 are calculated by using export values and export quantities. We count the number of products (5-digits SITC) exported within each 2-digits SITC sector from each exporter to each importer yearly. To give an example, out of a total of 2678 products categories listed in 1999, Algeria exported only 23 different products to Germany. This number increased to 40 in 2008. Therefore, only a 1.5

percent of the existent products were traded. The total number of products exported to Spain rose from 79 to 90, representing a 3 percent of the products listed.

The variables Input_EU and Input_RoW are used as proxies for intermediate inputs imported from the main countries of the European Union (France, Germany, Italy, Spain and the United Kingdom) or alternatively, from the main producers of the RoW (Japan, South Korea, Honk Kong, USA). The source for these two variables is the OECD database on exports and, in particular, we use exports from the main countries of the European Union and the RoW to each Mediterranean country of Machinery and Equipment (Sector 84 of the harmonized system commodity classification). Summary statistics of the variables are presented in Table 2.

Table 2. Summary statistics

5.2. The estimated model

We are interested in knowing whether the stated hypotheses hold for trade flows in the Mediterranean region. In order to test some of the abovementioned predictions, the estimating equation takes the following form:

$$\ln X_{ijkt} = \alpha_0 + \alpha_1 \ln GDP_{it} + \alpha_2 \ln GPD_{jt} + \alpha_3 \ln POP_{it} + \alpha_4 \ln POP_{jt} + \alpha_5 \ln D_{ij}$$
$$+ \alpha_6 FTA_{ijt} + \alpha_7 Colony + \gamma_k + \lambda_t + \varepsilon_{ijkt}$$
$$where \quad \varepsilon_{ijkt} = \mu_{ijk} + \nu_{ijkt} \qquad (11)$$

where γ_k and λ_t are industry (at two digit level) and year fixed effects ε_{ijkt} is a two-component error term and $\ln(X_{ijkt})$ is in turn the log of the average value per shipment (intensive margin), and the log of the range of shipments (extensive margin), as described in equation (9). GDP_{it} and GDP_{jt} denote Gross Domestic Product of the importer and the exporter country in year t, respectively and POP_{ij} and POP_{jt} denote the respective populations. D_{ij} is the geographical distance between the trading-countries' capitals and PTA_{ijt} denote Free Trade Agreements dummies that take the value of one when both countries have implemented a cooperation agreement in year t, zero otherwise. Finally, colony is a dummy that takes the value of one when the trading partner had a colonial relationship in the past, zero otherwise. Since OLS is linear, the coefficient on total imports will be equal to the sum of the coefficients on the two margins. A further decomposition can be done, using each of the components in equation (10) as dependent variable in equation (11).

To take into account particular aspects of the agreement, an extended model is specified in which the PTA variable in equation (11) is replaced by two variables that describe the type of

cumulation rule and that incorporates imports of intermediate products from the EU and from the rest of the world The extended model is given by,

$$\ln X_{ijkt} = \alpha_0 + \alpha_1 \ln GDP_{it} + \alpha_2 \ln GPD_{jt} + \alpha_4 \ln D_{ij} + \alpha_{51} D\_Cumulation_{ijt} + \alpha_{52} PanE\_Cumulation + \\ + \alpha_6 Colony + \alpha_7 MIEU_{it} + \alpha_8 MIRoW_{it} + \gamma_k + \lambda_t + \varepsilon_{ijkt} \\ where\, \varepsilon_{ijkt} = \mu_{ijk} + \nu_{ijkt} \qquad (12)$$

, where D_Cumulation takes the value of one when the RoO allow diagonal cumulation with the other MENA countries, zero otherwise; Pan-EuroMed_RoO takes the value of one when a country has full cumulation RoO, zero otherwise; $MIEU_{it}$ denotes importer machinery from the EU and $MIRoW_{it}$ denotes importer machinery from the RoW. Next, we estimate an extended model for all countries and for each sector. We are not able to estimate the extended model for each country since our variables imported inputs from the EU and from RoW are country specific.

5.3. Main results

The integration effects are jointly estimated for the six Mediterranean countries considered. The three-dimensional structure of our data allows us to control for unobservable heterogeneity in several ways. After testing a number of competing specifications, the selected specification includes exporter, importer and sectoral effects jointly considered as random, and year and industry effects specified as fixed effects. In order to control for the remaining unobserved heterogeneity we add the averages of the time variant variables as additional explanatory variables, as suggested by Mundlak (1978). We also considered adding population variables or GDP per capita for exporters and importers, and the result concerning the effect of our target variable remain unchanged. The estimated model is also corrected for autocorrelation of first order by adding a first order autoregressive term. The fixed effects results are also shown in the appendix (Table A.4). In addition, in the spirit of Baldwin and Taglioni (2006) we also estimated the model with country-and-time fixed effects in addition to the dyadic bilateral effects, the results show positive and significant coefficients that are higher in magnitude (Table A.6).

Table 3 shows the results for total trade and for each margin of trade. The dependent variable in Column (1) is the logarithm of the total value exported from the MENA to the four importing European countries. In Column (2) and (3) the dependent variable is each of the components of Equation (9) respectively, that is, the extensive and the intensive margin of trade. In Column (4) and (5) the dependent variables are the two last components of equation (10) that represent the decomposition of the intensive margin into average quantity and average price respectively.

For the whole set of Mediterranean countries, Table 3 show that the coefficient of our variable of interest, the implementation of a PTA between the MENA countries and the EU, is positive and statistically significant for total trade (column 1) and also for the intensive margin (column 3), whereas it is positive but not significant for the extensive margin. Turning to the second level decomposition of equation (10), the first component of average value per shipment (column 4 - Table 3), average quantities shipped are higher after the PTA entered into force, whereas the PTA variable is not significant when the average price component is used as dependent variable (column 5 - Table 3). These results show a weak but insignificant diversification effect (Hypothesis 1), especially if we rely on the fixed effects' results shown in Table A.5. Such diversification involves shipping existing exports to new foreign destinations or shipping a good abroad for the first time. With respect to the additional explanatory variables, we obtained the expected positive and statistically significant effect of the GDP of the importing countries on total trade. Geographical distance presents a negative and significant coefficient, except for the average price, which shows a positive distance coefficient (this result has also been obtained in results for a sample of Latin American countries, see Martínez-Zarzoso and Wilmsmeier, 2010; Hillberry and Hummels, 2008). The decomposition of the influence of distance on trade shows a greater effect on the intensive margin (column 3 – Table 3), for all industrial products. About 33% of the distance effect on trade works through the extensive margin (i.e. 0.382/(0.382+0.774); 67% of the increase in disaggregate trade flows comes from larger average shipments. Previous research finds the opposite picture, with the extensive margin being more important than the intensive margin (Hillberry and Hummels, 2008; Mayer and Ottaviano, 2008). Our results are very different to Mayer and Ottaviano (2008), who analyze French and Belgian individual export flows and show that 75% of the distance effect on trade comes from the extensive margin. Finally, sharing colonial links and language fosters exports from MENA countries to the EU; 37% of the increase in disaggregate trade flows comes from the extensive margin (a wider variety of products traded), whereas 63% of the increase in disaggregate trade flows comes from larger average shipments (row 5, Table 3).

Table 3. Main results for all countries and sectors

Summarizing, these results consistently show that the new PTA agreements signed between the MENA countries and the European Union have fostered exports from these countries to some of their main European partners. Furthermore, we find that this increase in exports has been mainly channeled by an increase of the intensive margin of trade. The MENA countries export more of the products they already exported in the past. This fact is in line with what we know of the industrial structure of these countries and with the explanation proposed by Chaney (2008) concerning how reductions in trade costs influence the two margins of trade. MENA are mainly producers of goods with low technological content, which are highly substitutable on the

international market. In this case, Chaney (2008) states that the main impact of a decrease in trade barriers will be through the intensive margin.

In order to test the second hypothesis, the effect of the bilateral PTAs on trade is also estimated for each sector (at one digit-level SITC). Table 4 shows the main results for the PTA variable for each sector of the SITC[8]. The different sectors are not equally impacted by the agreements. Concerning the effect on total trade (column 1), the coefficient of the PTA variable is significant and positive signed for sectors 5 and 6 (chemicals and manufactured goods classified chiefly by material), whereas it is positive signed and non-significant for the sectors 7 and 8 (machinery and transport equipment and miscellaneous manufactured articles). The effect on the extensive margin is only positive and significant for sector 5; it is positive and significant for the intensive margin for sectors 5 and 6. The results are in line with the idea that the main changes induce by the PTA come through the intensive margin of trade.

Table 4. Main results for each product category

These results seem consistent with the explanation proposed by trade theorists: for more homogeneous products (Sectors 5 and 6) a greater impact of a reduction of trade costs through the intensive margin is expected. In fact two of the exporters considered, Tunisia and Morocco, are important exporters of fertilizers (SITC 56) and also of textile and leather products (SITC 61, and 65) and Algeria of organic chemical derived from petroleum (SITC 51). All these products are not highly differentiated products. With respect to the extensive margin, we observe negative but no significant effects for sectors 6, 7 and 8, showing perhaps some sort of industry restructuration that follows trade liberalization and lead to an exit of the market to the less competitive firms.

In order to test the third hypothesis, which predicts that the effect of the EuroMed differs across countries, we estimate equation (11) for every MENA country as exporter. Table 5 shows our main results. The effect of the PTA is positive and significant for total exports for four countries with the exceptions of Jordan and Lebanon for which the coefficient is positive but small and not significant. For Egypt and Morocco the total effect seems to occur through both margins of trade, whereas for Algeria and Tunisia most of the effect goes through the intensive margin. Interestingly, for Egypt and Tunisia the second level decomposition shows a negative effect of the agreement on the average prices which could be showing the effect of more competition in the local markets.

Table 5. Main results for each country

[8] Full results are available upon request from the authors.

5.4. Disentangling PTA effects

In this section the results of estimating the extended model given by equation (12) are presented and discussed. With this model we aim to test for our fourth hypothesis which states that RoO adopted in the first phase of the Barcelona process could have had a positive effect on exports of final goods due to an increase in imports of intermediate goods. Table 6 shows that the effect of diagonal cumulation on total trade is significant and positive and most part of this effect works through the intensive margin of trade. The coefficients for the Pan Euro Med RoO are significant and positively signed for the extensive margin of trade, but no significant effect is found on the intensive margin.

With respect to the variables related to a possible "production network" effect, the coefficient of the variable inputs from the EU has a positive effect on total trade, but this effect is not statistically significant at conventional levels. Our hypothesis that a higher level of exports could be a consequence of a more integrated production network cannot be confirmed. However, looking at the second level decomposition of the intensive margin this variable has a positive and significant effect on average prices which is compensated by a negative and significant effect on average quantities exported. This neutralizes the non-statistically significant effect on the intensive margin of trade. The coefficient of inputs imported from the RoW is negative for total trade and also for the number and the quantity of goods exported. This could possibly indicate that a displacement of third-countries imports in favor of EU imported inputs has generated an anti-diversification effect on total exports to the EU.

Table 6. Results extended model

As a further refinement of our estimation we also considered a model that controls for possible unobserved heterogeneity that is sector-specific. We added fixed effects for each exporter-time-sector and importer-time-sector, at 1-digit level. In this way we control for possible misspecification due to the exclusion of sector and country specific variables that are time variant and could be correlated with the error term. Such as, sectoral value added in case of the exporter-time-sector effects or consumer biases in case of the importer-time-sector effects. The results of the extended model are presented in Table 7. The results are even more promising, showing a higher effect on trade that mainly comes through the intensive margin, but that in case of the change in rules of origin also affects positively the extensive margin. In addition, the variable imported inputs from the EU shows now a positive and significant effect on the extensive margin, pointing towards the existence of a "network" effect.

Table 7. Extended model with dyadic fixed effect and country-sector-and-time effects

The fifth hypothesis states that the effect of the change in RoO may differ across sectors. Results shown in Table 8 show that the coefficients for diagonal cumulation are significant and positive when total trade and the intensive margin are the dependent variables for exports of sectors 5 and 6, whereas the coefficients of the Pan Euro Med RoO are significant and positive when the extensive margin of trade is estimated for sector 7, and when the intensive margin of trade is estimated for sector 8. Coefficients are also significant for inputs imported from the European Union for the same sectors. The coefficients for inputs imported from the RoW are significant and negative mainly for sector 8. These results indicate that the adoption of diagonal cumulation between the MENA countries have an impact on their exports to Europe mainly through the intensive margin of trade, more specifically through the average quantity exported. Different are the results for entering in the unified regime of RoO of the European Union (Pan Euro Med RoO), for which the main effect on exports comes through the extensive margin. The effect of an increase in European imported inputs has an interesting effect for the sectors with lower technological content (sectors 5 and 6). It has a negative effect on the average quantity of exports but a positive effect on average prices. These results could be interpreted as an increase in the quality of the goods produced by MENA countries. Additionally, for sector 7, which has the highest technological content, an increase in European imported inputs has a positive and significant effect on the extensive margin of trade. With respect to the results for inputs imported from the RoW, the abovementioned anti-diversification bias is found for sectors 6, 7 and 8, meaning perhaps that a decrease in imported inputs form the rest of the world has a negative effect on the extensive margin of trade and also contributes to reduce total exports to the EU.

Table 8. Sectoral results extended model

6. CONCLUSIONS

In this paper the effect of Euro-Mediterranean agreements on international trade is evaluated by using disaggregated trade data. These agreements should contribute to modify trade patterns between the two shores of the Mediterranean Sea. We apply some of the recently developed models of trade (Chaney, 2008) to depict the impact of PTA on the extensive and intensive margins of trade. We focus on exports from MENA countries to the four biggest continental European economies, Germany, France, Italy and Spain.

Our first results seem to confirm a positive and significant effect of the new PTAs on exports of MENA countries to their main European partners. Moreover, strong differences across countries in the effect of the new PTAs are found. Indeed, empirical evidence indicates that only the North African countries enjoy a significant increase in exports associated to the PTA that

mainly works through the intensive margin for Algeria, Egypt, and Tunisia and through the extensive margin for Morocco. Diversity of trade patterns between North African and Middle East countries could be at the origin of the observed differences. Whereas North African countries trade mainly with the European Union, Lebanon and Jordan trade is more oriented towards other Middle East countries. Both groups of countries have intensified their participation into PTAs, not only with the European Union, but also with the large economies of the Gulf region (through the Pan-Arab Free Trade Agreement). In further research, we aim to analyze whether PTAs are effective in diversifying the production structure of their members and whether this is only the case for countries having strong commercial links before the agreement.

This positive effect of the news PTAs on trade could be due to the new RoO agreed. A plausible explanation of the reason why the adoption of new RoO has resulted in the increase of trade is that the new rules have allowed the integration of better quality/less expensive intermediate goods in production in MENA countries consequently enhancing the demand for these goods in European markets. The sectoral result partially confirms this hypothesis, since the effect of an increase in the inputs imported from the EU has a positive effect on MENA's exports of sophisticated manufactured products, with the only exception of chemicals and related products. This effect is channeled by an increase of the extensive and intensive margins of trade of machinery and transport equipment, by an increase of the extensive margin of manufactured goods classified chiefly by material and by an increase of the intensive margin of miscellaneous manufactured articles. Further research on more disaggregated products is desirable to know whether export diversification is actually a consequence of the change in RoO.

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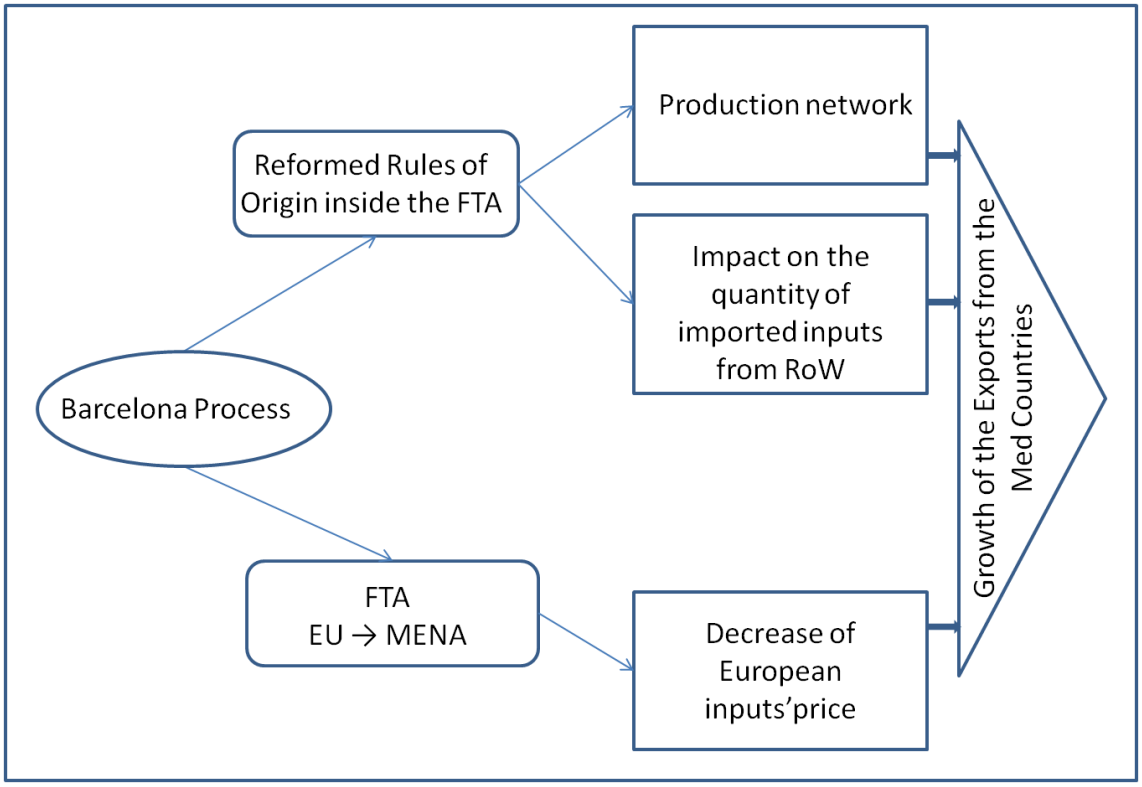
Figure 1. The effect of the Barcelona Process on EuroMed trade



Note: RoW stands for Rest of the World (meaning all the countries outside the Barcelona Process)

Table 1. Evolution of trade integration in the Euro-Mediterranean region

Country	PTA Med to EU	Commitment to the Barcelona Process	Enforcement of the new Cooperation Agreement	PTA EU to Med
Algeria	1978	1995	2005	2017
Egypt	1978	1995	2004	2016
Israel	-	1995	2000	1989
Jordan	1978	1995	2002	2014
Lebanon	1978	1995	2006	2018
Libya	1978	2000	no	no
Mauritania	1978	1995	no	no
Morocco	1978	1995	2000	2012
PalestinianTerritories	-	1995*	1997*	2001*
Syria	1978	1995	no	no
Tunisia	1978	1995	1998	2008

*The agreement with the Palestinian Authority is a transitory agreement which due to the political situation has not been applied.

Table 2. Summary statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Export Value (€)	14896	8585796	5.84E+07	0	2.29E+09
Number of Products	14896	8.125	14.494	0	155
Average Quantity (Tons)	11496	15084.97	87749.84	0	2122389
Average Value (€/Ton)	11496	734197.9	3181336	0	1.53E+08
Average Price (€)	10917	5831.422	43973.53	1.860	1698425
GDP Exporter (€)	14896	1.41E+12	5.46E+11	4.56E+11	2.48E+12
GDP Importer (€)	14896	3.63E+10	2.84E+10	5.14E+09	1.18E+11
GDP per capita Exporter (€)	14896	22651.61	4758.021	11582.06	31243.37
GDP per capita Importer (€)	14896	1982.827	1084.564	596.2997	5115.409
Distance	14896	2321.992	962.5492	595.3532	3651.507
Inputs Imported from EU	14896	8.07E+08	5.71E+08	1.66E+08	2.56E+09
Inputs imported from ROW	14896	2.05E+08	2.32E+08	3.97E+07	1.21E+09

Table 3. Main results for all countries and sectors

	X_{ij}	N_{ij}	AV_{ij}	AQ_{ij}	AP_{ij}
$lgdp_i$	-0.017	0.036	-0.074	-0.293	0.261*
	(-0.11)	(0.776)	(-0.521)	(-1.712)	(2.362)
$lgdp_j$	1.931***	0.163*	1.791***	1.460***	0.088
	(7.731)	(2.371)	(8.034)	(5.329)	(0.515)
Distance	-1.158***	-0.382***	-0.774***	-0.990***	0.244***
	(-8.987)	(-8.968)	(-7.99)	(-9.145)	(4.828)
Barcelona process	0.187***	0.017	0.182***	0.192***	0.018
	(3.532)	(1.037)	(3.812)	(3.377)	(0.473)
Colony	1.450***	0.542***	0.907***	0.775***	0.053
	(8.84)	(9.988)	(7.381)	(5.647)	(0.839)
$Avly_i$	0.776***	0.212***	0.589***	1.003***	-0.483***
	(4.277)	(3.884)	(3.755)	(5.382)	(-4.177)
$Avly_j$	-1.563***	0.289***	-1.864***	-1.980***	0.384*
	(-5.275)	(3.339)	(-7.377)	(-6.513)	(2.118)
Constant term	-9.245	-15.251***	5.65	9.416*	-3.856*
	(-1.869)	(-9.329)	(1.52)	(2.253)	(-1.974)
R-squared	0.36	0.526	0.355	0.542	0.629
Number of observations	11480	11496	11480	10917	10917
LBI	1.471	1.728	1.503	1.488	1.696
d1	1.112	1.465	1.14	1.116	1.346

Notes: ***, **, *, indicate significance at 1%, 5% and 10%, respectively. T-statistics are in brackets. The dependent variable is the natural logarithm of exports in value (current €). Income (Y) and distance (Dist) are also in natural logarithms. The estimation uses White's heteroscedasticity-consistent standard errors. LBI and d1 denote respectively the Baltagi and Wu and the Bhargava et al tests for autocorrelation, both tests reject the null of no first order autocorrelation.

Table 4. Main results for each product category

Sector	Xij	Nij	AVij	AQij	APij
5 - Chemicals and related products	0.287*	0.065*	0.241*	0.274*	-0.115
	(2.258)	(1.676)	(2.039)	(1.927)	(-1.28)
6 - Manufactured goods classified chiefly by material	0.157*	-0.025	0.156*	0.145	0.06
	(1.542)	(-0.749)	(1.712)	(1.251)	(0.876)
7 - Machinery and transport equipment	0.104	-0.021	0.121	0.095	-0.032
	(1.03)	(-0.728)	(1.341)	(0.923)	(-0.407)
8 - Miscellaneous manufactured articles	0.089	-0.001	0.077	0.071	0.053
	(0.984)	(-0.045)	(0.97)	(0.76)	(0.726)

Notes: ***, **, *, indicate significance at 1%, 5% and 10%, respectively. T-statistics are in brackets. The dependent variable is the natural logarithm of exports in value (current €). Income, population and distance are also in natural logarithms. The estimation uses White's heteroscedasticity-consistent standard errors.

Table 5. Main results for each country.

Countries	X_{ij}	N_{ij}	AV_{ij}	AQ_{ij}	AP_{ij}
Algeria	0.280*	0.066*	0.213*	0.232	-0.084
	(2.296)	(1.957)	(1.953)	(1.649)	(-0.969)
Egypt	0.249**	0.175***	0.143*	0.519***	-0.430***
	(2.972)	(7.877)	(1.862)	(5.724)	(-8.057)
Jordan	0.025	0.05	-0.009	-0.291*	0.131
	(0.19)	(1.371)	(-0.082)	(-2.039)	(1.274)
Lebanon	0.055	0.000	0.075	0.020	0.076
	(0.545)	(0.000)	(0.837)	(0.160)	(0.922)
Morocco	0.281***	0.156***	0.188*	0.281**	-0.064
	(3.354)	(6.749)	(2.407)	(3.083)	(-1.117)
Tunisia	0.545***	0.167***	0.444***	0.501***	-0.152*
	(5.312)	(5.332)	(4.798)	(4.806)	(-2.159)

Notes: ***, **, *, indicate significance at 1%, 5% and 10%, respectively. T-statistics are in brackets. The dependent variable is the natural logarithm of exports in value (current €). Income, population and distance are also in natural logarithms. The estimation uses White's heteroscedasticity-consistent standard errors.

Table 6. Results extended model

	X_{ij}	N_{ij}	AV_{ij}	AQ_{ij}	AP_{ij}
lgdp$_i$	-0.104	0.026	-0.158	-0.286	0.127
	(-0.641)	(0.544)	(-1.083)	(-1.637)	(1.104)
lgdp$_j$	1.950***	0.168*	1.809***	1.529***	0.045
	(7.818)	(2.458)	(8.124)	(5.585)	(0.259)
Distance	-1.033***	-0.307***	-0.715***	-1.019***	0.316**
	(-6.347)	(-4.618)	(-5.615)	(-5.724)	(2.74)
D_cumulation	0.107*	0.008	0.096*	0.148*	-0.077*
	(1.942)	(0.459)	(1.93)	(2.483)	(-1.886)
Pan_EuroMed_RoO	0.054	0.053*	0.028	-0.008	-0.004
	(0.811)	(2.469)	(0.473)	(-0.105)	(-0.074)
linput_eu	0.074	0.027	0.068	-0.134	0.168*
	(0.723)	(0.818)	(0.746)	(-1.197)	(2.199)
linput_row	-0.210***	-0.107***	-0.111*	-0.096	-0.021
	(-3.311)	(-5.103)	(-1.986)	(-1.374)	(-0.435)
Colony	1.395***	0.502***	0.893***	0.788***	0.03
	(7.069)	(6.131)	(5.878)	(3.651)	(0.219)
Avly$_i$	0.984***	0.286***	0.716***	1.211***	-0.495***
	(4.851)	(4.303)	(4.096)	(5.502)	(-3.494)
Avly$_j$	-1.651***	0.269*	-1.946***	-2.147***	0.453*
	(-5.253)	(2.561)	(-7.299)	(-6.237)	(2.078)
Constant term	-7.672	-14.691***	6.896	11.095	-3.818
	(-1.3)	(-6)	(1.517)	(1.712)	(-0.917)
R-squared	0.159	0.121	0.129	0.115	0.046
Number of observations	11480	11496	11480	10917	10917

Notes: ***, **, *, indicate significance at 1%, 5% and 10%, respectively. T-statistics are in brackets. The dependent variable is the natural logarithm of exports in value (current €). Income (Y) and distance (Dist) are also in natural logarithms. The estimation uses White's heteroscedasticity-consistent standard errors.

Table 7. Extended model with dyadic fixed effect and country-sector-and-time effects

	X_{ij}	N_{ij}	AV_{ij}	AQ_{ij}	AP_{ij}
D_cumulation	0.490*	-0.008	0.369	0.115	0.107
	(1.815)	(-0.064)	(1.451)	(0.43)	(0.588)
Pan_EuroMed_RoO	1.031***	0.192*	1.060***	0.666	-0.083
	(2.839)	(1.786)	(3.273)	(1.19)	(-0.205)
linput_eu	0.687	0.548***	0.586	-0.439	0.235
	(1.104)	(3.054)	(1.003)	(-0.555)	(0.506)
linput_row	-0.332	-0.261*	-0.278	-0.701	0.02
	(-0.779)	(-1.898)	(-0.688)	(-1.545)	(0.078)
Constant term	4.349	-4.648	3.8	26.289**	1.263
	(0.393)	(-1.052)	(0.361)	(2.363)	(0.171)
R-squared	0.166	0.162	0.135	0.117	0.076
r2_o	0.108	0.062	0.084	0.000	0.018
Number of observations	11480	11496	11480	10917	10917
Log likelihood	-18382.37	-4994.024	-17230.73	-18097.89	-13746.04
RMSE	1.228183	0.3823821	1.110954	1.301194	0.8734121
AIC	37804.74	11028.05	35501.47	37235.77	28532.08
BIC	41625.89	14849.92	39322.62	41030.77	32327.08

Notes: ***, **, *, indicate significance at 1%, 5% and 10%, respectively. T-statistics are in brackets. The dependent variable is the natural logarithm of exports in value (current €). Income (Y) and distance (Dist) are also in natural logarithms. The estimation uses White's heteroscedasticity-consistent standard errors

Table 8. Sectoral results extended model

		X_{ij}	N_{ij}	AV_{ij}	AQ_{ij}	AP_{ij}
Sector 5	**D_cumulation**	0.251*	0.068*	0.196*	0.290*	-0.145
		(1.904)	(1.685)	(1.598)	(1.975)	(-1.551)
	Pan_EuroMed_RoO	-0.159	0.074*	-0.185	-0.296	0.107
		(-1.015)	(1.459)	(-1.267)	(-1.714)	(0.949)
	linput_eu	-0.235	-0.022	-0.176	-0.367	0.201
		(-0.926)	(-0.279)	(-0.747)	(-1.28)	(1.112)
	linput_row	-0.101	-0.013	-0.109	-0.258	-0.001
		(-0.64)	(-0.29)	(-0.749)	(-1.406)	(-0.006)
Sector 6	**D_cumulation**	0.176*	0.023	0.152*	0.146	0.004
		(1.678)	(0.657)	(1.622)	(1.224)	(0.05)
	Pan_EuroMed_RoO	-0.073	0.034	-0.072	-0.069	-0.024
		(-0.588)	(0.811)	(-0.654)	(-0.492)	(-0.277)
	linput_eu	0.101	0.056	0.038	-0.095	0.177
		(0.524)	(0.856)	(0.224)	(-0.437)	(0.39)
	linput_row	-0.226*	-0.171***	-0.061	0.037	-0.112
		(-1.897)	(-4.161)	(-0.591)	(0.283)	(-1.504)
Sector 7	**D_cumulation**	0.005	-0.016	0.015	0.097	-0.114
		(0.049)	(-0.516)	(0.152)	(0.896)	(-1.394)
	Pan_EuroMed_RoO	0.189	0.064*	0.141	0.167	-0.072
		(1.44)	(1.652)	(1.195)	(1.255)	(-0.701)
	linput_eu	0.221	0.103*	0.181	-0.105	0.277
		(1.131)	(1.772)	(1.046)	(-0.522)	(1.804)
	linput_row	-0.149	-0.093*	-0.068	-0.075	-0.01
		(-1.265)	(-2.536)	(-0.669)	(-0.619)	(-0.103)
Sector 8	**D_cumulation**	0.014	0	0.028	0.113	-0.045
		(0.145)	(0.013)	(0.332)	(1.156)	(-0.591)
	Pan_EuroMed_RoO	0.207*	0.058	0.181*	0.152	0.019
		(1.841)	(1.438)	(1.817)	(1.305)	(0.203)
	linput_eu	0.246	-0.018	0.344*	0.241	0.01
		(1.453)	(-0.301)	(2.301)	(1.369)	(0.076)
	linput_row	-0.287**	-0.133***	-0.227*	-0.245*	0.05
		(-2.678)	(-3.435)	(-2.439)	(-2.229)	(0.592)

Notes: ***, **, *, indicate significance at 1%, 5% and 10%, respectively. T-statistics are in brackets. The dependent variable is the natural logarithm of exports in value (current €). Income (Y) and distance (Dist) are also in natural logarithms. The estimation uses White's heteroscedasticity-consistent standard errors.

Appendix

Table A.1. Main exports commodities and main partners

Algeria	
Commodities:	Petroleum, natural gas, and petroleum products 97%
Partners:	US 23.9%, Italy 14.9%, Spain 11.1%, Canada 9.6%, France 8.6%, Netherlands 4.5% (2008)
Morocco	
Commodities:	Clothing and textiles, electric components, inorganic chemicals, transistors, crude minerals, fertilizers (including phosphates), petroleum products, citrus fruits, vegetables, fish
Partners:	Spain 18.7%, France 17.1%, Brazil 6.9%, US 4.4%, Belgium 4.3%, Italy 4.2% (2008)
Tunisia	
Commodities:	Clothing, semi-finished goods and textiles, agricultural products, mechanical goods, phosphates and chemicals, hydrocarbons, electrical equipment
Partners:	France 28.4%, Italy 18%, Germany 9.6%, Libya 5.8%, Spain 5% (2008)
Egypt	
Commodities:	Crude oil and petroleum products, cotton, textiles, metal products, chemicals, processed food
Partners:	Italy 9.5%, US 7.1%, Spain 6.2%, India 6%, Syria 4.7%, Saudi Arabia 4.6%, Japan 4.5%, Germany 4.5% (2008)
Jordan	
Commodities:	Clothing, fertilizers, potash, phosphates, vegetables, pharmaceuticals
Partners:	India 16.2%, Iraq 16.1%, US 13.1%, Saudi Arabia 6.9%, United Arab Emirates 4.6% (2008)
Lebanon	
Commodities:	Jewelry, base metals, chemicals, miscellaneous consumer goods, fruit and vegetables, tobacco, construction minerals, electric power machinery and switchgear, textile fibers, paper
Partners:	Switzerland 22%, United Arab Emirates 10%, Iraq 8%, Saudi Arabia 7%, Syria 6% (2009 est.)

Table A.2. SITC 2 Classification

5 - Chemicals and related products, n.e.s.
51 - Organic chemicals
52 - Inorganic chemicals
53 - Dyeing, tanning and colouring materials
54 - Medicinal and pharmaceutical products
55 - Essential oils and resinoids and perfume materials; toilet, polishing and cleansing preparations
56 - Fertilizers (other than those of group 272)
57 - Plastics in primary forms
58 - Plastics in non-primary forms
59 - Chemical materials and products, n.e.s.
6 - Manufactured goods classified chiefly by material
61 - Leather, leather manufactures, n.e.s., and dressed furskins
62 - Rubber manufactures, n.e.s.
63 - Cork and wood manufactures (excluding furniture)
64 - Paper, paperboard and articles of paper pulp, of paper or of paperboard
65 - Textile yarn, fabrics, made-up articles, n.e.s., and related products
66 - Non-metallic mineral manufactures, n.e.s.
67 - Iron and steel
68 - Non-ferrous metals
69 - Manufactures of metals, n.e.s.
7 - Machinery and transport equipment
71 - Power-generating machinery and equipment
72 - Machinery specialized for particular industries
73 - Metalworking machinery
74 - General industrial machinery and equipment, n.e.s., and machine parts, n.e.s.
75 - Office machines and automatic data-processing machines
76 - Telecommunications and sound-recording and reproducing apparatus and equipment
77 - Electrical machinery, apparatus and appliances, n.e.s., and electrical parts thereof (including non-electrical counterparts, n.e.s., of electrical household-type equipment)
78 - Road vehicles (including air-cushion vehicles)
79 - Other transport equipment
8 - Miscellaneous manufactured articles
81 - Prefabricated buildings; sanitary, plumbing, heating and lighting fixtures and fittings, n.e.s.
82 - Furniture, and parts thereof; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings
83 - Travel goods, handbags and similar containers
84 - Articles of apparel and clothing accessories
85 – Footwear
87 - Professional, scientific and controlling instruments and apparatus, n.e.s.
88 - Photographic apparatus, equipment and supplies and optical goods, n.e.s.; watches and clocks
89 - Miscellaneous manufactured articles, n.e.s.

Source: United Nations, 2009.

Table A.3. Variable descriptions and sources of data.

Dependent Variables	**Description**	**Source**
X_{ij} : Exports from i to j	Nominal X	Eurostat
N_{ij} : Extensive Margin	Number of type of products exported from i t j	Eurostat
AV_{ij} : Intensive Margin	Average Value of the products exported from i to j	Eurostat
AQ_{ij} : Average Quantity	Average Quantity of the products exported from i to j	Eurostat
AP_{ij} : Average Price	Average Price of the products exported from i to j	Eurostat
Independent Variables	Description	Source
GDP_i : Exporter's income	Exporter's GDP, PPP (current $)	WDI
GDP_j : Importer's income	Importer's GDP, PPP (current $)	WDI
PTA dummy	Dummy variable = 1 if the trading partners have an PTA, 0 otherwise	European Commission
D_cumulation	Dummy variable = 1 if the RoO allow diagonal cumulation with the other MENA countries	European Commission
Pan_EuroMed_RoO	Dummy variable = 1 if the countries has adopted Pan EuroMed RoO	European Commission
$Input\_EU_i$	Import value of machinery from four European Economies (current $)	OECD
$Input\_RoW_i$	Import value of machinery from the Rest of the World (current $)	OECD
$Dist_{ij}$: Distance	Distances between country capitals of trading partners (km)	CEPII
$Colony_{ij}$:	Dummy variable = 1 if the trading partners had colonial links in the past, 0 otherwise	CEPII

Table A.4. Cumulation Rules

Mediterranean Countries

Preferential arrangement	Rules of origin/cumulation
Algeria (01.09.2005) Euro-Mediterranean Association Agreement, OJ L 265, 10.10.2005	Protocol No 6 OJ L 297 of 15.11.2007 *Bilateral, diagonal and full cumulation*
Tunisia (01.03.1998) Euro-Mediterranean Association Agreement , OJ L 97, 30.03.1998, p.2.	Protocol No 4 OJ L 260 of 21.9.2006 *Bilateral, diagonal and full cumulation*
Morocco (01.03.2000) Euro-Mediterranean Association Agreement, OJ L 70, 18.03.2000, p.2	Protocol No 4 OJ L 336 of 21.12.2005 *Bilateral, diagonal and full cumulation*
Israel (01.06.2000) Euro-Mediterranean Association Agreement , OJ L 147, 21.06.2000, p.3	Protocol No 4 OJ L 20 of 24.1.2006 *Bilateral and diagonal cumulation*
Palestinian Authority of the West Bank and the Gaza Strip (01.07.1997) Euro-Mediterranean Interim Association Agreement , OJ L 187, 16.07.1997, p.3.	Protocol No 3 OJ L 187 of 16.07.1997 *Bilateral cumulation*
Egypt (01.06.2004) Mediterranean Association Agreement, OJ L304 of 30.09.2004, p.39	Protocol No 4 OJ L 73 of 13.3.2006 *Bilateral and diagonal cumulation*
Jordan (01.05.2002) Euro-Mediterranean Association Agreement, OJ L 129, 15.05.2002, p.3.	Protocol No 3 OJ L 209 of 31.7.2006 *Bilateral and diagonal cumulation*
Lebanon (01.03.2003 Interim Agreement) Euro-Mediterranean Association Agreement, OJ L 143, 30.05.2006, p.2.	Protocol No 4 OJ L 143, 30.05.2006, p. 73 *Bilateral cumulation*
Syria (01.07.1977) Cooperation Agreement, OJ L 269, 27.09.1978, p.2.	Protocol No 2 *Bilateral cumulation*

Source:
http://ec.europa.eu/taxation_customs/customs/customs_duties/rules_origin/preferential/article_779_en.htm#paneuro.

Table A.5: Results for all countries and sectors with dyadic-sectoral fixed effects

	X_{ij}	N_{ij}	AV_{ij}	AQ_{ij}	AP_{ij}
Barcelona process	0.226***	**0.102*** **	**0.159*** **	0.233***	-0.113***
	5.416	8.318	4.247	5.088	-3.764
lgdp$_i$	0.184	0.130***	0.076	-0.211	0.166*
	(1.674)	(4.042)	(0.771)	(-1.752)	(2.112)
lgdp$_j$	0.134	-0.112***	0.223**	0.244*	0.111
	(1.406)	(-4.024)	(2.619)	(2.344)	(1.632)
Constant term	4.507***	1.662***	2.924***	2.902***	-0.596***
	(32.083)	(22.868)	(22.281)	(19.916)	(-4.665)
R-squared	0.092	0.009	0.105	0.008	0.118
Number of observations	10507	10523	10507	9951	9951
Log likelihood	-16218.33	-4884.70	-15202.79	-15976.40	-12562.47
RMSE	1.13	0.38	1.03	1.21	0.86
AIC	32444.67	9777.40	30413.57	31960.79	25132.94
BIC	32473.71	9806.45	30442.61	31989.62	25161.76

Notes: ***, **, *, indicate significance at 1%, 5% and 10%, respectively. T-statistics are in brackets. The dependent variable is the natural logarithm of exports in value (current €). Income (Y) and distance (Dist) are also in natural logarithms. The estimation uses White's heteroscedasticity-consistent standard errors.

Table A.6: Results for all countries and sectors with exporter-year and importer-year and dyadic fixed effects

	X_{ij}	N_{ij}	AV_{ij}	AQ_{ij}	AP_{ij}
Barcelona process	0.960**	0.012	0.741*	-0.068	-0.085
	(3)	(0.157)	(2.496)	(-0.201)	(-0.335)
Constant term	12.298***	1.552***	10.805***	4.180***	6.442***
	(129.25)	(42.904)	(126.712)	(30.824)	(65.695)
R-squared	0.122	0.11	0.091	0.073	0.027
Number of observations	11480	11496	11480	10917	10917
Log likelihood	-18676.33	-5340.53	-17511.75	-18361.22	-14028.99
RMSE	1.24	0.39	1.12	1.31	0.88
AIC	37612.66	10941.06	35283.51	36982.43	28317.99
BIC	38567.94	11896.52	36238.79	37931.18	29266.74

Notes: ***, **, *, indicate significance at 1%, 5% and 10%, respectively. T-statistics are in brackets. The dependent variable is the natural logarithm of exports in value (current €). Income (Y) and distance (Dist) are also in natural logarithms. The estimation uses White's heteroscedasticity-consistent standard errors.