

Export performance and access to intermediate inputs: the case of rules of origin liberalisation *

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Abstract

Internationally fragmented production processes have highlighted the need of efficient sourcing from foreign suppliers. This paper aims to investigate how exports of final goods are affected by better access to foreign intermediate inputs. In particular, the paper empirically tests if expanding the set of available intermediate input suppliers through preferential rules of origin liberalisation affects exports of final goods. We exploit the introduction of the southern Mediterranean countries into the Pan-Euro-Med zone of diagonal cumulation which meant that foreign intermediate inputs could be used from more countries than before without jeopardising the preferential access to the EU. By using a fixed effects specification that controls for detailed levels of unobserved heterogeneity and multilateral resistance we examine the effect of the new diagonal cumulation possibilities on southern Mediterranean exports to EU15. We find a positive effect on export intensity, the value of exports, but no robust effect on export diversification, the number of exported products. Being part of the Pan-Euro-Med zone of diagonal cumulation is associated with a 17% increase in export intensity.

Keywords: Rules of origin, the Euro-Med partnership, intermediate inputs, export performance

JEL: F13, F14, F15

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1 Introduction

Fragmented production processes with global supply chains have made sourcing strategies more complex. Today, most goods consist of intermediate inputs produced in many different places. Efficient sourcing of intermediate inputs has therefore become increasingly important for competitiveness. Limited access to efficient suppliers reduces firms' possibilities to compete both on the domestic and the international market. It has for example been shown that input tariff cuts promote firm productivity (Amiti and Konings, 2007), the range of products produced by domestic firms (Goldberg et al., 2010), the probability of entering the export market (Bas, 2012) and export performance among productive firms (Chevassus-Lozza et al., 2013). Tariffs on intermediate inputs is only one way to limit the access to efficient foreign suppliers. This paper focuses on a different trade policy instrument that also highly affects the possibility to source intermediate inputs from abroad, preferential rules of origin (ROO).

FTAs and PTAs aim to improve market access for signatory parties by offering bilateral (FTAs) or unilateral (PTAs) tariff cuts. Since the aim of the agreements is to give preferential market access to some countries but not to others, for whatever reason, rules are needed to make sure that only products produced in countries eligible for trade preferences are given tariff cuts. Preferential rules of origin (ROO) define what constitutes an originating product in a country that is granted preferential access, i.e. preferential ROO define which goods that are eligible for the tariff cuts offered in FTAs and PTAs.

ROO are necessary in FTAs and PTAs to prevent trade deflection but they may also substantially reduce the value of the preferences granted. ROO are often very complex and the administrative burden of compliance may be high. Most importantly, ROO limit which foreign intermediate inputs a final-good producer can use. For example, originating status may only be granted to a sweater if at least 50% of its value is added or if both the weaving of the fabric and the sewing takes place in the country. This restrictiveness of the ROO can be problematic in a world where cross-border production sharing is important to stay competitive. Producers may no longer be able to use the most efficient suppliers without losing the originating status of the final good.

This paper aims at investigating how ROO liberalisation which results in better access to foreign intermediate input suppliers affects exports of final goods. Better access to efficient suppliers and/or access to suppliers of previously unavailable intermediate goods should make exporters more competitive through a reduction of production costs. This can increase export volumes and make it profitable to export more products than before. The main aim is hence to empirically test if expanding the set of available suppliers through ROO liberalisation affects i) export intensity measured as the value of exports of final goods, and ii) export diversification measured as the number of exported final goods. To perform the empirical estimations we exploit the introduction of the southern Mediterranean countries (Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, the

Palestinian Authority, Syria and Tunisia) into the Pan-European System of Cumulation (PECS).¹ The analysis gives new insights into how intermediate input trade liberalisation affects export possibilities in several ways. First, compared to previous studies we clearly differentiate between intermediate and final good trade which allows us to capture the impact of efficient sourcing on final good trade instead of total trade. Second, by not only analysing export intensity but also export diversification we are able to give a more complete picture of how access to intermediate inputs affects export patterns. Third, we provide a complement to the studies that focus on input tariff liberalisation and trade by looking at another way to improve the access to foreign intermediate inputs, ROO liberalisation. Fourth, we also add to the ROO literature by using different measures of cumulation to better capture the differences in cumulation possibilities between countries. Lastly, the detailed dataset used allows us to control for very detailed levels of unobserved heterogeneity in form of product-level fixed effects.

The introduction of the southern Mediterranean countries into the Pan-European System of Cumulation (PECS) meant, in short, that the ROO were liberalised in the trade agreements between the southern Mediterranean countries and the European countries in such a way that it became easier to use imported intermediate inputs in final-good production. In technical terms, this meant that the southern Mediterranean countries were introduced into a European system of diagonal cumulation.² PECS was originally introduced in 1997 between the EU, EFTA and 10 EU applicant countries.³ The countries substituted the existing ROO in all different European FTAs with a common set of rules that allowed for diagonal cumulation. Diagonal cumulation made it possible for the participating countries to use originating intermediate inputs, to cumulate value, from each other without risking the preferential access of the final good to any of the participating markets of which the most important market naturally was the EU market.

The southern Mediterranean countries were introduced into the European cumulation system in the middle of the 2000s as a part of the Barcelona process.⁴ The cooperation between the EU and the southern Mediterranean countries has a long history and industrial products from these countries have had preferential access to the EU market since

¹When the term southern Mediterranean countries is used below it always refers to Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, the Palestinian Authority, Syria and Tunisia.

²Integration of the southern Mediterranean countries into the PECS is an ongoing process meaning that some countries are still outside the cumulation system, see below.

³In 1997 the EU had 15 member states: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, the UK. EFTA had 4 members: Iceland, Lichtenstein, Norway and Switzerland. The EU applicants were: Bulgaria, Estonia, Hungary, Latvia, Lithuania, the Czech Republic, Poland, Romania, Slovakia and Slovenia. Turkey joined the PECS in 1999.

⁴The Barcelona process was launched in 1995 between the EU and 14 southern Mediterranean countries. It aims to strengthen the Euro-Med partnership through among other things deeper economic integration. See for example <http://ec.europa.eu/trade/policy/countries-and-regions/regions/euro-mediterranean-partnership/> for more information.

the 1970s through the Cooperation Agreements. The rules of origin had previously only allowed for bilateral cumulation between the EU and the signatory country which made them rather restrictive. If for example Egypt used intermediate inputs from the EU in the production of a final good it did not affect the preferential access of the Egyptian final good to the EU market but imported intermediate inputs from any other source country could potentially jeopardise the preferential access. When the more liberal cumulation rules were introduced, southern Mediterranean countries could use imported intermediates from all countries in the Pan-Euro-Med zone (the original PECS area plus the southern Mediterranean countries) given that an FTA with the common set of ROO was in place between the importer and exporter. It hence became easier to utilise cross-border production sharing in the region.

Access to more efficient suppliers is likely to have a positive effect on the southern Mediterranean countries' possibilities to expand exports to the EU and to diversify production structures. This could be of great importance for the future development process of the region. Brenton et al. (2006) have shown that the southern Mediterranean countries have yet not fully utilised the trade potential of being located close to the EU and that these countries tend to be dependent on few export industries. The southern Mediterranean countries have for example the lowest share of non-oil exports to GDP of all development regions. Intra-regional trade has also been very low in an international perspective.⁵ More liberal cumulation rules which allow for intra-regional production sharing could hence be especially important for the southern Mediterranean countries' export performance.

To estimate the effect of introducing the southern Mediterranean countries into the diagonal cumulation system we use a fixed effects specification that controls for detailed levels of unobserved heterogeneity. We focus our attention on export flows of final goods between the southern Mediterranean countries and the EU15 during the period 2000-2010. Our results indicate that introducing the southern Mediterranean countries into the Pan-Euro-Med zone of diagonal cumulation and thereby expanding the set of available suppliers had a positive effect on export intensity measured as the value of exports of final goods from the southern Mediterranean countries to EU15. The relationship is robust to very detailed controls for unobserved heterogeneity in the form of importer-exporter-product fixed effects as well as to controls for multilateral resistance and zero trade flows. Moreover it is found that there is a positive and highly statistically significant relationship not only between export intensity and being a part of the Pan-Euro-Med diagonal cumulation zone but also between export intensity and the number of countries you can cumulate diagonally from. Thirdly, importing more intermediate inputs from countries one can cumulate diagonally from in the Pan-Euro-Med zone is also found to be positively related to export intensity. No robust statistically significant relationship can on the other hand be found between the more liberal cumulation rules and export diversification.

⁵<http://ec.europa.eu/trade/policy/countries-and-regions/regions/euro-mediterranean-partnership/>

The paper is structured as follows. Section 2 describes previous research on trade effects of ROO. Section 3 digs deeper into the complexity of ROO and explains what effects ROO are likely to have on trade. Section 4 presents the empirical framework and the data used while section 5 presents the results of the empirical estimations. Finally, section 6 concludes.

2 Literature review

A slowly growing literature on ROO has attempted to measure the restrictiveness of ROO and their impact on trade. One strand of this literature has focused on measuring utilisation of preferences of different FTAs and PTAs. To not utilise the preferences given means that the costs of requesting preferential status are seen as higher than the benefit of using the preferential tariff rate. Low utilisation rates, i.e. that a relatively large share of exports within the preferential area pays the non-preferential tariff, is therefore often claimed to be due to restrictive ROO.

Utilisation of preferences has been examined for example in the seminal paper by Herin (1986) which shows that a surprisingly large share of exports from EFTA to the EC paid the non-preferential tariff despite that they should have been able to enter the EC tariff free. That strict rules of origin lead to an underutilisation of preferences has also been suggested by, among others, Brenton and Manchin (2003), Brenton and Ikezuki (2006) and Manchin (2006). Manchin (2006), for example, compares the utilisation of different EU preferential schemes, Cotonou and GSP. It is shown that countries tend to request Cotonou preferences over GSP preferences when exporting to the EU. Differences in ROO, and especially differences in the possibilities for cumulation, is mentioned as a reason why Cotonou preferences are preferred.

Besides looking at utilisation of preferences, previous papers have tried to measure the restrictiveness of ROO by constructing indices of restrictiveness based on cost-raising effects of different types of ROO (Estevadeordal, 2000) or of facilitation based on mechanisms that add flexibility to ROO, for example cumulation (Estevadeordal and Suominen, 2006). The restrictiveness index has been used in regression analysis in for example Anson et al. (2005) who find that restrictive ROO are negatively related to trade. The same authors also calculate the average compliance costs of the NAFTA ROO to 6% in ad valorem equivalent which is higher than the average tariff preference granted of 4%. That NAFTA ROO risk negating much of the preferences given to final-good producers is a result that is confirmed by Carrère and de Melo (2006). Estevadeordal and Suominen (2008) have conducted a panel study where they estimate the trade effect of ROO of major preferential trade agreements. It is shown that restrictive ROO and high degrees of sectoral selectivity in ROO have a negative impact on trade flows and that restrictive ROO create trade diversion in intermediate inputs. However, exporters also tend to learn to comply

with strict ROO over time.

Sectoral studies and ROO is another branch of literature where the studies of Portugal-Perez (2008) and Bureau et al. (2007) can be mentioned. They look at two sectors that according to Estevadeordal and Suominen (2006) have relatively strict ROO: textiles and apparel, and agriculture. Portugal-Perez (2008) studies the differences in EU and US trade preferences for African apparel exporters. He finds a significant increase of apparel exports to the US due to a ROO liberalisation which in practice meant that inputs could be sourced from anywhere in the world.

Bureau et al. (2007) examine the agrifood sector and the utilisation of trade preferences for developing countries. They find that utilisation is generally high except for the poorest countries that tend to export small volumes. Interestingly it is found that ROO have a minor role in explaining the small export flows from the poorest countries. Explanations are instead found in the technical and sanitary standards required by developed countries and private standards required by importers and retailers. It is further possible that fragmentation of production is more important in the textile sector which makes access to efficient producers more relevant in the textile sector than the agrifood sector. This result shows the importance of taking sectoral differences into account when analysing ROO and their effects on trade.

Work on ROO more closely related to the current paper is Augier et al. (2005), Gasiorek et al. (2009) and Bombarda and Gamberoni (2013). These papers assess the trade impact of the introduction of the PECS in 1997, i.e. before the inclusion of the southern Mediterranean countries. Augier et al. (2005) provide empirical evidence that shows that switching from bilateral to diagonal cumulation with the introduction of PECS had a positive effect on trade between non-EU PECS participants. Gasiorek et al. (2009) confirm these results also on a sector level. Bombarda and Gamberoni (2013) use a different methodology that addresses zero trade flows and heterogeneous firms but still find a positive trade effect of diagonal cumulation. Benassi et al. (2011) examine trade effects of the Barcelona process on North African countries. In doing so they take the change of cumulation rules into account and find a positive effect of diagonal cumulation on total trade.

By providing a first evidence of a positive trade effect of introducing the southern Mediterranean countries into the European system of diagonal cumulation, Benassi et al. (2011) highlight the importance of cross-border production sharing for these countries and open up to further research on the issue. This paper extends the analysis in Benassi et al. (2011) in several ways in an attempt to get a wider picture of the importance of efficient intermediate input sourcing. First, we specifically focus on effects of cumulation liberalisation on trade in final goods and not effects on total trade. Second, we use a substantially larger sample that includes the entire Pan-Euro-Med zone and all southern Mediterranean countries in the analysis. Lastly, different estimation strategies are used to examine the trade effect of cumulation. We use a detailed fixed-effects specification that takes multilateral

resistance into account and control for zero trade flows. Differences in possibilities to use the diagonal cumulation rules are also taken into consideration.

3 Rules of origin and their effects on trade

Preferential ROO are used as instruments to prevent trade deflection. Trade deflection occurs when goods from non-FTA members are shipped through an FTA-member with a low tariff to a member country with a higher tariff. It is hence a way to avoid paying higher tariffs.⁶ ROO hinder trade deflection by making sure that only products originating in countries eligible for trade preferences are given tariff cuts. Without ROO much of the idea behind preferential market access would be lost. That being said ROO have at times also been criticised of being unnecessarily strict and a way to export protection of high-cost domestic industries through supply-switching effects (Krueger, 1993).

ROO determine origin using different criteria. Goods containing foreign intermediate inputs generally have to go through substantial transformation to achieve originating status. The definition of substantial transformation can be more or less strict but often means a change in tariff classification, that a certain percentage of value is added to the good, that the good undergoes a specific production process or a combination of these. Complementary rules used in combination with the requirement on substantial transformation can make ROO less restrictive. One example of such a complementary rule is cumulation. Cumulation rules allow producers to cumulate value, i.e. to use intermediate inputs, from certain countries without losing originating status of the final good. Bilateral cumulation is standard in most trade agreements and is applied between two FTA (or PTA) members. The two partners can use originating intermediate inputs from each other as if they were their own without affecting the originating status of the final good. Diagonal cumulation means that countries tied together by the same preferential rules can use originating intermediate inputs from each other and maintain preferential access for the final good. Full cumulation extends diagonal cumulation and allows countries in the same preferential area to use intermediate inputs produced in the area whether they are classified as originating or not.

In order to meet the ROO, producers tend to switch suppliers from outside the preferential area to suppliers inside the area. This supply-switching leads to an extra element of trade diversion. In the ordinary trade diversion case which occurs when preferential trade is introduced, producers switch to partner country suppliers because it becomes cheaper when preferential tariffs between partners are introduced. In the case of complying with ROO,

⁶Imagine for example, that a free trade agreement is signed between country A and B that makes it possible to ship all goods tariff free between the two countries. Country C must however pay a tariff for accessing the markets in both A and B. The tariff country C has to pay to country A is substantially smaller than the tariff country C has to pay to country B. If the free trade agreement does not have ROO it would be possible for country C to ship goods to country B through country A to reduce the tariffs paid.

producers switch to suppliers inside the preferential area even if it means switching to more expensive suppliers. To restrict access to efficient suppliers increase production costs of final-good producers and reduces the preferential area's potential for welfare enhancing trade creation.

The impact of ROO tend be larger in industries where cross-border production sharing is important and for small countries lacking domestic suppliers. The trade distorting effects of the ROO are however limited by the size of the non-preferential tariff. Producers can always choose to disregard the ROO and pay the non-preferential tariff. In our case the southern Mediterranean countries should generally benefit from the preferential access since there tends to be a clear difference between the preferential tariff rate and the most favoured nation (MFN) tariff rate. The minimum value of preferences needed for exporters to request preferences has been calculated to 4% by Manchin (2006). Tariffs on consumption goods tend to be higher than that. For example in 2007 Egypt faced an average EU preferential tariff of 0.6% on consumer goods while the average MFN tariff was 6.43%.⁷ Taking an example from the apparel sector, the most important export sector in the sample used for the empirical estimations, the differences between preferential tariffs and MFN tariffs are even bigger. Apparel (HS sector 62) from Tunisia could for example enter the EU tariff free in 2007 while the MFN tariff was more than 11%. Nilsson (2011) has also shown that the southern Mediterranean countries are relatively good at using their EU preferences, preference utilisation is about 90% for all trade flows from the southern Mediterranean countries to the EU.

3.1 Trade effects of cumulation

Allowing for diagonal cumulation instead of standard bilateral cumulation means a liberalisation of the ROO. Producers are given a larger choice of suppliers which could reduce the trade distorting effects of the ROO. Several trade effects are expected from more liberal cumulation rules. The focus of this paper is on how export performance is affected when intermediate goods become more easily available.

To be able to use intermediate inputs from more different foreign suppliers without affecting the final good's originating status potentially means better access to efficient suppliers who produce cheaper inputs or inputs that were not previously available. Better access to cheaper inputs thanks to more liberal cumulation rules reduces production costs and makes final-good producers more competitive which in turn could make them expand their foreign market shares.⁸ Existing exporters would then be able to export larger volumes due to the introduction of diagonal cumulation.

In a Melitz (2003) style setting with heterogeneous firms and fixed export costs one can

⁷Tariff rates are gathered from the TRAINS database

⁸Amiti and Konings (2007) have for example found a positive relationship between access to foreign inputs and firm competitiveness through improvements in productivity.

think that cheaper inputs not only make it possible for existing exporters to export more but also increase the probability of firms to enter the export market. If more efficient input sourcing reduces firm marginal cost more firms could be able to afford the fixed cost of exporting. This has previously been argued by Bas (2012) who also found a positive relationship between input tariff reductions and firm export decisions. If more firms become exporters it is further likely that the number of exported products increases. Input trade liberalisation such as introduction of diagonal cumulation would then have a positive effect on export diversification.

Moreover, as shown by Goldberg et al. (2010), input trade liberalisation can affect the product scope of final-good producers which in turn would affect the potential to export more different kinds of products. Product scope is affected both by cheaper inputs and newly available inputs. Firms can start producing previously unprofitable products when intermediate inputs become cheaper. Newly available intermediate inputs can also give firms new opportunities to produce other products than before. According to Goldberg et al. (2010) newly available inputs are more important than a lower input price for expanding product scope. Thus, more liberal cumulation rules could affect both export intensity, i.e. how much you export, and export diversification, i.e. how many products you export.

Both export intensity and export diversification are, according to above reasoning, expected to be positively affected when the southern Mediterranean countries were introduced into the European system of diagonal cumulation. Whether the effect on export intensity or export diversification is most prevalent is mainly an empirical question. It should however be noted that diagonal cumulation expands the set of available suppliers but does not make the administrative burden of proving originating status lighter. This could in turn mean that the effect of cumulation rule liberalisation can be expected to be larger on export intensity than export diversification since fixed costs (such as administrative costs) should be more important for how many products you export than how much you export.

An alternative effect on the number of exported products of diagonal cumulation has been mentioned by Bombarda and Gamberoni (2013). They show theoretically that diagonal cumulation may have a negative impact on the number of exported products given certain conditions. The main condition needed for this negative impact is to introduce diagonal cumulation in a strict hub-and-spokes system. Since we do not consider a situation with a strict hub-and-spokes system a negative impact on export diversification is here seen as unlikely. You could see the EU as the "hub" of the Pan-Euro-Med zone and the other countries as "spokes". In a strict hub-and-spokes system the spokes are however not connected by FTAs. Diagonal cumulation in the Pan-Euro-Med zone requires an FTA not only between the exporter and importer of final-goods but also between the exporter and importer of intermediate goods. The spokes are hence connected with FTAs as well which disqualifies the Pan-Euro-Med zone as a strict hub-and-spokes system.

3.2 Cumulation in the Pan-Euro-Med zone

Diagonal cumulation was introduced at different points in time for different southern Mediterranean countries but mainly during 2005-2007. Yet diagonal cumulation is not possible between all countries in the Pan-Euro-Med zone since diagonal cumulation possibilities is based on what is called a variable geometry rule.⁹ Cumulation of originating status is only possible between countries of an FTA with a Pan-Euro-Med origin protocol. A country in the zone not linked to the others by such an FTA is therefore outside the cumulation system. Syria and the Palestinian Authority are for example basically outside the diagonal cumulation system while Lebanon only has diagonal cumulation possibilities with the EFTA countries. Algeria, Morocco and Tunisia can on the other hand apply full cumulation rules between themselves and the EU. This is a special rule that is outside the PECS. In practice the variable geometry rule and the special full cumulation rule create big differences in countries' possibilities to cumulate value from each other. Diagonal cumulation benefits in the Pan-Euro-Med zone can be found in Table 1 below. Note that the Faroe Islands and the participants in the EU's stabilisation and association process are excluded from the table since they do not have any diagonal cumulation possibilities with the southern Mediterranean countries. The differences in cumulation possibilities should be taken into account when estimating the effect of cumulation on exports to the EU. To get an accurate picture of the effect of diagonal cumulation it is not enough to only account for whether or not a certain southern Mediterranean country has diagonal cumulation possibilities with the EU, you also have to see to what extent the cumulation possibilities can be used.

⁹Countries included in the Pan-Euro-Med zone are: the EU, Switzerland, Iceland, Norway, Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, the Palestinian Authority, Syria, Tunisia, Turkey, The Faroe Islands, Albania, Bosnia and Herzegovina, Kosovo, Montenegro, Macedonia and Serbia.

Table 1: Entry into force of diagonal cumulation possibilities in the Pan-Euro-Med zone

	EU	DZ	EG	IL	JO	LB	MA	PS	SY	TN	CH	IS	NO	TR
EU		2007	2006	2006	2006		2005	2009		2006	2006	2006	2006	2006 ^a
DZ	2007													
EG	2006			2006	2006		2006			2006	2007	2007	2007	2007
IL	2006			2006	2006						2005	2005	2005	2006
JO	2006		2006	2006		2006				2006	2007	2007	2007	2011
LB											2007	2007	2007	
MA	2005		2006		2006						2005	2005	2005	2006
PS	2009													
SY														2007
TN	2006		2006		2006		2006				2005	2006	2005	2005
CH	2006		2007	2005	2007	2007	2005			2005		2005	2005	2007
IS	2006		2007	2005	2007	2007	2005			2006	2005		2005	2007
NO	2006		2007	2005	2007	2007	2005			2005	2005	2005		2007
TR	2006		2007	2006	2011		2006		2007	2005	2007	2007	2007	

Source: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2013:205:0003:0006:EN:PDF>

DZ: Algeria, EG: Egypt, IL: Israel, JO: Jordan, LB: Lebanon, MA: Morocco, PS: the Palestinian Authority, SY: Syria, TN: Tunisia, CH: Switzerland, IS: Iceland, NO: Norway, TR: Turkey

^aFor goods covered by the EU-Turkey customs union.

4 Empirical framework

The paper aims to empirically assess the effects of the introduction of diagonal cumulation possibilities on the southern Mediterranean countries' export performance. When the southern Mediterranean countries were introduced into the Pan-Euro-Med zone of diagonal cumulation they went from only being able to cumulate value bilaterally with the EU to diagonal cumulation possibilities among the southern Mediterranean countries themselves and with EFTA. This section uses a fixed effects model to examine if more liberal cumulation rules have affected export performance from the southern Mediterranean countries to the EU. The main aim is to see if export intensity and export diversification have been influenced by the new cumulation possibilities.

4.1 Data

The study examines exports from the southern Mediterranean countries (Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, the Palestinian Authority, Syria and Tunisia) to the EU during the period 2000-2010. Since the EU has grown considerably during this time the focus is on exports to EU15, the countries that have been EU members during the entire examined period.¹⁰ Excluding the new EU countries helps us to isolate the effect of diagonal cumulation. Ideally we want to examine a situation where the only change in market access is the change of cumulation rules during the examined period. The southern Mediterranean countries did not have preferential access to the new EU countries before the examined period which could make it harder to isolate the effect of diagonal cumulation. Only trade between the southern Mediterranean countries and EU15 is included in the sample since there is both cross-sectional variation and variation over time when it comes to the introduction of the new cumulation rules. By limiting the control group we are able to work with relatively similar countries when it comes to export patterns and preferential access to the EU market which should allow us to better capture a possible diagonal cumulation effect.

Data on trade between the southern Mediterranean countries and EU15 are gathered from UN Comtrade. We use data at the Harmonised System (HS) 6-digit level. During the examined period, countries report trade flows at different versions of the HS (HS96, HS02 and HS07 are used). All product codes are converted to HS96 using correspondence tables from the United Nations Statistics Division to get consistent HS codes over time. Information on GDP is collected from World Development Indicators and Eurostat. Data on entry costs, the number of days and procedures to start a business, come from the World Bank Doing Business database.

The effects on export performance are estimated on industrial final goods since these

¹⁰EU15 is Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the UK.

commodities are considered to be the most interesting ones when it comes to dependence on access to intermediate inputs and cross-border production sharing. Agricultural products are furthermore inappropriate to include in the analysis since many of them are excluded from the Euro-Med agreements and are therefore not affected by preferential rules of origin.

Final goods are identified with the aid of the Broad Economic Categories (BEC) classification. This study considers goods that BEC classifies as consumption goods to be final goods. The BEC categories 51, 522 and 6 are hence considered to be final goods.¹¹ The BEC classifies goods according to their main end-use. There is hence no guarantee that products classified as consumption goods are only used as consumption goods. Using a product classification scheme as the BEC to identify final and intermediate goods is therefore not unproblematic since some goods can have multiple end-uses. However, since no better data is available to classify goods according to their end-use, for example firm-level data, the BEC classification is the best option in this case despite its limitations. The BEC classification is also used to identify intermediate goods to construct one of the independent variables, see below. BEC codes 2, and 53 are used to identify intermediate goods used for production of consumption goods.¹²

4.2 Definition of variables of interest

Exports of final goods from the southern Mediterranean countries to EU15 are used to construct the two dimensions of export performance investigated: export intensity and export diversification. Export intensity is here defined as the value of exported final goods. This is a straightforward definition that does not need further explanation. For the definition of export diversification we choose to follow Dennis and Shepherd (2011) among others who define export diversification as an increase in the range of exported products. An intuitive approach to measure export diversification is thus to count the number of products exported.¹³ The number of exported products is here calculated in two ways. The first measure, `LINES`, counts the number of exported 6-digit HS lines. The second measure, `LINES_HS2`, counts the number of exported 6-digit HS lines by each 2-digit HS industry. Both measures are bilateral meaning that the first measure, `LINES`, gives one observation for every importer-exporter-year triad. The second measure, `LINES_HS2`, gives one observation for every importer-exporter-industry-year group. The second measure is perhaps more interesting since it makes it possible to use more observations and to control for sectoral fixed effects.

¹¹Category 51 is passenger motor cars, category 522 is non-industrial transport equipment and category 6 is consumer goods not elsewhere specified.

¹²Category 2 is industrial supplies not elsewhere specified, and category 53 is parts and accessories for transport equipment.

¹³Export diversification is commonly measured either as the number of products exported or as an export specialisation or concentration index in the empirical literature. As Dennis and Shepherd (2011) argues, the number of exported products is a more intuitive measure and more in line with the theoretical explanation of the range of countries' export bundles.

Independent variables of special interest are variables that should capture the differences in diagonal cumulation possibilities between the southern Mediterranean countries. The first variable used to capture diagonal cumulation possibilities is a dummy variable, CUM, which takes the value 1 if the southern Mediterranean country in question has a trade agreement with the EU that allows for diagonal cumulation in the Pan-Euro-Med zone and zero otherwise. This variable is based on the information in row 1 in Table 1. The second variable used to capture diagonal cumulation possibilities, CUM2, is a variable that counts the number of non-EU countries a southern Mediterranean country can cumulate diagonally from when the country in question has a trade agreement with the EU that allows for diagonal cumulation in the Pan-Euro-Med zone. This variable is also based on the information found in Table 1 but on a combination of the information on the southern Mediterranean countries rather than only row 1. Since the effect on export performance of diagonal cumulation should go through imports of intermediate goods from new suppliers the third variable that tries to capture diagonal cumulation, CUM3, measures the value of imported intermediate goods from non-EU countries in the Pan-Euro-Med zone with which diagonal cumulation possibilities exist. Note that if no trade agreement with diagonal cumulation possibilities exist between the southern Mediterranean country and the EU both CUM2 and CUM3 take the value 0.

The first measure, CUM, is the most general one and tries to examine if having diagonal cumulation possibilities at all has an effect on export performance. CUM2, on the other hand, tries to take the differences between the Mediterranean countries' possibilities to take advantage of diagonal cumulation into account. Here, we try to see if being able to cumulate diagonally from more countries in the Pan-Euro-Med zone affects export performance. Lastly, CUM3, also tries to take different countries cumulation possibilities into account but the focus is now on if it is possible to see a relationship between more imported intermediate inputs from countries one can cumulate diagonally from and export performance.

4.3 Model specification

The empirical estimations of the effect of more liberal cumulation rules on export intensity and export diversification is based on a gravity model. Being founded in both traditional and modern trade theory the gravity model has become immensely popular for analysing bilateral trade flows.¹⁴ In order to control for unobserved heterogeneity and possible endogeneity bias the main estimation strategy used is fixed effects. This means that many of the traditional non-time varying gravity variables are dropped from the estimated model since they are controlled for by the fixed effects.

¹⁴See Anderson (1979), Deardorff (1998), Feenstra (2002), Anderson and van Wincoop (2003) and Helpman et al. (2008).

4.3.1 Export intensity

To estimate the effects of the introduction of diagonal cumulation possibilities on export intensity, the following specification is used as the baseline specification:

$$\ln X_{ijkt} = \beta_0 + \beta_1 \ln(\text{GDP}_{it} \text{GDP}_{jt}) + \beta_2 \text{FTA}_{it} + \beta_3 \text{CUM}_{it} + \delta_{ijk} + \lambda_t + \epsilon_{ijkt} \quad (1)$$

where $\ln X_{ijkt}$ measures the value of exports of good k from country i to country j in year t . $\text{GDP}_{it} \text{GDP}_{jt}$ is the product of country i 's and country j 's GDPs in year t . The product of GDPs is a proxy for economic mass and measures the trade potential between two countries. A larger economic mass is expected to be associated with higher levels of trade since larger economies can be expected to both have higher supply of and demand for traded products. FTA_{it} is a dummy variable that takes the value 1 if country i has an association agreement with the EU in time t and zero otherwise. Even if the Mediterranean countries have had preferential access to the EU market through PTAs since the 1970s the association agreements of the Barcelona process took the economic partnership deeper. The association agreements are progressively making trade preferences bilateral rather than unilateral as a step on the way to a Euro-Mediterranean free trade area. As the association agreements have deepened economic integration the FTA variable is expected to have a positive effect on trade volumes.¹⁵ By controlling for the association agreements the effect of the different trade policy changes (association agreements and cumulation rules) are separated. CUM_{it} is the main variable of interest in the baseline specification and is the cumulation dummy variable described above that takes the value 1 if country i in time t has a trade agreement with the EU that allows for diagonal cumulation in the Pan-Euro-Med zone. The other cumulation variables, CUM2 and $\ln(\text{CUM3}+1)$, are later also used as alternative ways to capture diagonal cumulation possibilities. Note that 1 is added to CUM3 before the term is logged. This is done in order to avoid truncation. Lastly, δ_{ijk} and λ_t are exporter-importer-product fixed effects and time fixed effects respectively and ϵ_{ijkt} is a random error term.

As can be seen, the baseline specification misses many of the traditional gravity variables that measure bilateral trade costs. This is because the inclusion of bilateral fixed effects controls for all non-time varying bilateral characteristics such as bilateral distance or a common colonial past. The inclusion of the bilateral fixed effect is here important since it is likely that unobservable factors are correlated with the regressors. Some of this unobserved heterogeneity can further influence the likelihood of implementing trade policies such as cumulation rule changes. Trade policy has traditionally been treated as an exogenous variable but it is hard to argue that that actually is the case. Trade policy changes require an active political decision and countries only implement liberalising trade policy they believe will increase welfare through trade creation effects. Baier and Bergstrand (2007)

¹⁵ Association agreements were implemented before the change in cumulation rules. Some were implemented already in the 1990s while others in the beginning of the 2000s. See appendix for the implementation dates of the association agreements.

argue that unobserved heterogeneity, for example in the form of domestic policy-related barriers, is associated with the likelihood of implementing trade policy.

The bilateral fixed effect helps us to come to terms with this source of endogeneity since it controls for unobserved heterogeneity among country pairs. The main option to adjust for endogeneity of trade policy is to find a suitable instrument for the trade policy in question that is not correlated with trade flows. Since no such suitable instrument is available in this case we choose to follow the recommendation of Baier and Bergstrand (2007) and introduce bilateral fixed effects to refine our model specification. Since the data set used contains information on product level, a further refinement of the fixed effects can be done. Instead of only introducing exporter-importer fixed effects, we will introduce exporter-importer-product fixed effects. These detailed controls make it possible to focus on within exporter-importer-product variation since all time-invariant exporter-importer-product characteristics are held constant. Time fixed effects are also introduced to control for time specific events.

As highlighted by Anderson and van Wincoop (2003), bilateral trade does not only depend on bilateral trade barriers but also on barriers to the rest of the world, or the multilateral resistance. We will therefore estimate an alternative specification that includes multilateral resistance controls. In practice multilateral resistance is controlled for by importer-and-time and exporter-and-time fixed effects when using panel data.¹⁶ Exporter-and-time fixed effects are unfortunately not suitable to use in this case since they would wipe out our variables of interest, the cumulation variables, that are time-varying exporter specific variables. We therefore choose to construct three terms as in Baier and Bergstrand (2009) to capture multilateral resistance. The terms constructed are $MRDIST_{ijt}$, $MRLANG_{ijt}$ and $MRCOLONY_{ijt}$ and they control for trade costs between the importer and the exporter relative to both countries' trade barriers to other partners over time. The multilateral resistance terms are calculated as follows:

$$MRTC_{ijt} = \sum_{m=1}^M \theta_{mt} TC_{im} + \sum_{m'=1}^M \theta_{m't} TC_{jm'} - \sum_{m=1}^M \sum_{m'=1}^M \theta_{mt} \theta_{m't} TC_{mm'} \quad (2)$$

where m and m' are country indices and θ_{mt} is country m 's share in world GDP. TC stands for trade costs and is the log of bilateral distance or dummy variables for common language and a common colonial past.

The alternative specification to be estimated which includes the multilateral resistance terms then becomes:

$$\ln X_{ijkt} = \beta_0 + \beta_1 \ln(\text{GDP}_{it} \text{GDP}_{jt}) + \beta_2 \text{FTA}_{it} + \beta_3 \text{CUM}_{it} + \beta_4 \text{MRDIST}_{ijt} + \beta_5 \text{MRLANG}_{ijt} + \beta_6 \text{MRCOLONY}_{ijt} + \delta_{ijk} + \lambda_t + \epsilon_{ijkt} \quad (3)$$

¹⁶ Anderson and van Wincoop (2003) originally derived price indices to account for multilateral resistance. These are however computationally difficult to estimate which means that the inclusion of fixed effects is usually preferred in practice.

where all variables are defined as above.

If zero trade flows are present in the sample used the above model specifications may result in biased estimates. The main problem is that the dependent variable is logged which makes all the possible zero trade flows undefined. All zero trade flows would therefore be dropped from the estimations which could create selection problems. Zero trade flows are common in reality and become increasingly frequent when more disaggregated data are used. To use data on the 6-digit HS level as is done here results in a relatively large share of zero trade flows. Taking into account all the industrial final goods at the 6-digit HS96-level that have the potential to be traded between the southern Mediterranean countries and EU15, the sample consists of 88.5% zeros.

To address the zero trade flows in the sample we use a Heckman two-step selection model adjusted to panel data that controls for unobserved heterogeneity as described in Wooldridge (2008). In short the panel Heckman method entails first estimating separate selection probit equations for each year which predict the probability to export and second estimating the intensity of exports given that exports actually takes place. Correcting for bias due to unobserved heterogeneity when estimating the probit equations is done by introducing the Mundlak-Chamberlain device, i.e. by adding group means of all time-varying explanatory variables to the existing set of explanatory variables, to avoid the incidental parameters problem.¹⁷ The selection variable used to capture selection into trade is a bilateral binary variable that measures entry costs in the export and import country. If entry costs, measured as the sum of the number of days and procedures to start a business, are greater than the median for both the exporter and importer the selection variable equals 1, otherwise it takes the value zero. As previously highlighted by Helpman et al. (2008) entry costs reflect regulatory fixed costs. These costs are likely to be related to the choice of exporting or not but unlikely to be related to export volumes. The entry cost variable therefore satisfies the exclusion restriction in the two-step Heckman model. When testing if entry costs actually are a suitable selection variable for the data used here it is found that they indeed affect selection into trade but not export intensity.

4.3.2 Export diversification

We measure export diversification as the number of exported products per country. The dependent variable hence consists of non-negative count data. Using a linear model as above would therefore be inappropriate for estimating export diversification. We will instead opt for a Poisson model since it, unlike a linear model, takes into account that the dependent variable can take on only non-negative integer values. We will assume that the

¹⁷Including standard fixed effects in a probit model yields biased estimates due to the incidental parameters problem.

expected value of Y_{ijt} given z_{ijt} is:

$$E(Y_{ijt}|z_{ijt}) = \exp(z'_{ijt}\beta) \quad (4)$$

where Y_{ijt} is the number of exported products from country i to country j at time t and z'_{ijt} is a vector of explanatory variables. As described above, we use two different ways to count the number of exported products, LINES_{ijt} and LINES_HS2_{ijst} . LINES_{ijt} counts the number of exported 6-digit HS lines from country i to country j in times t while LINES_HS2_{ijst} counts the number of exported 6-digit lines by each 2-digit industry.

The number of traded products and the trade value are generally expected to be affected by the same set of variables. The selection of explanatory variables is therefore again based on the gravity model but, as above, all bilateral non-time varying variables are controlled for by using a fixed effects specification to come to terms with possible unobserved heterogeneity and endogeneity issues. The following two models will be estimated:

$$\text{LINES}_{ijt} = \exp(\beta_0 + \beta_1 \ln(\text{GDP}_{it} \text{GDP}_{jt}) + \beta_2 \text{FTA}_{it} + \beta_3 \text{CUM}_{it} + \delta_{ij} + \lambda_t + \epsilon_{ijt}) \quad (5)$$

$$\text{LINES_HS2}_{ijst} = \exp(\beta_0 + \beta_1 \ln(\text{GDP}_{it} \text{GDP}_{jt}) + \beta_2 \text{FTA}_{it} + \beta_3 \text{CUM}_{it} + \delta_{ijs} + \lambda_t + \epsilon_{ijst}) \quad (6)$$

where all variables are defined as above except for the bilateral fixed effect. In equation 5 the bilateral effect δ_{ij} is a simple importer-exporter fixed effect since the definition of the dependent variable does not allow for any product or sector controls. LINES_HS2_{ijst} has a sector dimension which makes it possible to control for sector-specific characteristics, δ_{ijs} in equations 6 is hence an importer-exporter-sector fixed effect. As above the product of GDPs, FTA and diagonal cumulation are expected to have a positive relationship to export diversification. Multilateral resistance is expected to influence export diversification as well as export intensity. The multilateral resistance terms MRDIST_{ijt} , MRLANG_{ijt} and MRCOLONY_{ijt} , are included in $z'_{ijt}\beta$ in alternative specifications of both equation 5 and equation 6.

4.4 Descriptive statistics

The dataset used for the estimations on export intensity contains 138,181 observations. Note that only positive trade flows are considered here since the baseline estimations for export intensity exclude zero trade flows.¹⁸ When the focus of the estimations is export diversification the number of observations is naturally reduced to 1,485 when LINES_{ijt} is the dependent variable and to 80,190 when LINES_HS2_{ijst} is the dependent variable. Table 2 shows descriptive statistics of the variables used.

¹⁸If zero trade are included the number of observations reaches 1,208,049.

Table 2: Descriptive statistics

	Observations	Mean	Standard deviation	Min	Max
$\ln(\text{GDP}_{it}\text{GDP}_{jt})$	138181	52.2	1.3	46.6	55.0
FTA_{it}	138181	0.8	0.4	0	1
CUM_{it}	138181	0.4	0.5	0	1
CUM2_{it}	138181	2.6	3.1	0	7
$\ln(\text{CUM3} + 1)_{it}$	138181	8.4	9.9	0	21.4
$\ln X_{ijt}$	138181	9.6	2.9	0	20.2
LINES_{ijt}	1485	99.7	104.7	0	494
LINES_HS2_{ijt}	80190	1.8	6.9	0	118

A first look at the data reveals quite interesting patterns. First, Figure 1a depicts imports of intermediate goods to the southern Mediterranean countries from non-EU countries in the Pan-Euro-Med zone. The figure shows a clear and substantial increase in imported intermediates from 2000 to 2010. It is also possible to see that the increase in imports becomes faster around 2006, hence around the time when more liberal cumulation rules were introduced. Figure 1b presents the development of exports of final goods from the southern Mediterranean countries to EU15. The general message of the figure is positive, exports of final goods have increased in the 2000s both in terms of exported value and the number of exported products. The increase in the number of exported products is somewhat smaller than the increase in exported value but the number of exported products has had a more stable development, especially in the end of 2000s. The decline in exported final goods in 2009 around the time of the financial crisis is for example much sharper for exported value than for the number of exported products. Although positive, the development of exports of final goods is more modest than the development of intra-regional trade in intermediate inputs. This difference is perhaps not that strange since the introduction of diagonal cumulation possibilities coincides with the establishment of FTAs between southern Mediterranean countries.¹⁹ Trade preferences hence changed between many of the Southern Mediterranean countries at the same time as cumulation rules were liberalised. Trade preferences between EU15 and the southern Mediterranean countries did on the other hand not change when cumulation rules changed since preferences were already in place.²⁰ We would not expect that the introduction of diagonal cumulation had an equally large effect on trade as the introduction of free trade.

¹⁹The Agadir Agreement between Jordan, Tunisia, Morocco and Egypt which entered into force in 2006 is perhaps the most important FTA between non-EU countries in the Pan-Euro-Med zone.

²⁰The fact that cumulation rules changed but preferences did not is key for the empirical estimations. This will make it possible to separate a cumulation effect from an FTA effect on trade.

Figure 1: Southern Mediterranean imports of intermediate goods and exports of final goods in 2000-2010



Note: The figures are indexed and the base year is 2000. Source: UN Comtrade

In sum, Figure 1 presents a positive picture of the Mediterranean countries' trade development during the 2000s. More intermediate goods have been imported from non-EU countries in the Pan-Euro-Med zone and export performance has experienced a positive trend. It is hard to conclude that the liberalisation of cumulation rules in the mid-2000s has had an impact on exports of final goods just by looking at figure 1b. Further study of the issue is needed to see if the better cumulation possibilities and clear increase in intra-regional intermediate goods trade have contributed to the growth in exports. It is especially interesting to investigate if the change in cumulation rules has affected export intensity and export diversification in different ways. The next section will therefore present results from empirical estimations.

5 Results

Diagonal cumulation effects are estimated for export intensity and export diversification. Table 3 presents the results for export intensity measured as the value of exported final goods from the Mediterranean countries to EU15. The structure of the data makes it possible to control for detailed levels of unobserved heterogeneity. Fixed effects for importer-exporter-product and time are therefore included in the regressions. The estimations are done with and without controls for multilateral resistance (MR). Columns 1-3 in Table 3 show the baseline results for export intensity when no MR controls are included while columns 4-6 show the results when MR controls are included. Column 1 presents the results from estimating the model given by Equation 1. The variable of interest is

CUM, a dummy variable that takes the value 1 if diagonal cumulation is allowed between the Mediterranean country in question and the EU. It can be seen that the coefficient of diagonal cumulation (CUM) is positive and highly statistically significant. If we calculate the percentage effect of CUM on export intensity ($\exp(0.1606)-1$)*100) we see that diagonal cumulation possibilities increase exports by 17.5%. Interestingly, this means that the effect of diagonal cumulation is not only statistically significant but also economically significant. The other coefficients in column 1 behave as expected. Both economic mass (the product of GDPs) and the association agreements (FTA) are found to be statistically significant and positively related to export intensity.

Columns 2 and 3 of Table 3 show the results when CUM is replaced by the alternative diagonal cumulation variables CUM2 and $\ln(\text{CUM3}+1)$. These variables try to capture the difference in diagonal cumulation possibilities between the southern Mediterranean countries which the CUM variable did not. CUM2 counts the number of non-EU countries that a southern Mediterranean country can cumulate diagonally from while $\ln(\text{CUM3}+1)$ is the logged value of imports of intermediate goods from non-EU Pan-Euro-Med countries that a southern Mediterranean country can cumulate diagonally from. Column 2 shows that an increase in the number of countries one can cumulate diagonally from is associated with an increase in export intensity since the coefficient of CUM2 is positive and statistically significant. To be able to cumulate diagonally from one more country is associated with a 3% increase in exports. The coefficient on the third cumulation variable $\ln(\text{CUM3}+1)$ is also statistically significant. Importing more intermediate goods from non-EU countries in the Pan-Euro-Med zone is related to exports of final goods to EU15. The magnitude of the coefficient must however be considered to be relatively small making it less economically significant than the other cumulation variables. To increase imports of intermediate goods by 10% is associated with a 0.08% increase in export intensity. The other coefficients (the product of GDPs and FTA) are stable and remain positive and significant in columns 2 and 3.

Columns 4-6 in Table 3 show the results when MR terms are included.²¹ We include these terms since it is likely that bilateral trade is affected both by bilateral and multilateral trade resistance. Overall the MR terms do not have a major effect on the different cumulation variables. All coefficients of diagonal cumulation are still positive and highly significant. The size of the cumulation coefficients is larger when multilateral resistance is taken into account but the size difference is small. That diagonal cumulation is found to be positively related to export intensity is hence robust to controls for multilateral resistance. Including MR terms affects the other variables included in the regressions more than the cumulation variables. That the product of GDPs is highly affected is expected since the MR terms incorporate GDP changes. We can also note that the association agreements are found to have a smaller impact on exports of final goods when multilateral resistance is taken into consideration.

²¹Column 4 presents the results from estimating the model given by Equation 3.

Table 3: Export intensity - Fixed effects estimations

	1	2	3	4	5	6
$\ln(\text{GDP}_{it}\text{GDP}_{jt})$	0.3467*** (0.0579)	0.3337*** (0.0579)	0.3293*** (0.0578)	0.1183* (0.0672)	0.1242* (0.0672)	0.0988 (0.0631)
FTA_{it}	0.2496*** (0.0323)	0.2615*** (0.0328)	0.2509*** (0.0325)	0.1750*** (0.0336)	0.1938*** (0.0340)	0.1769*** (0.0337)
CUM_{it}	0.1606*** (0.0262)			0.1877*** (0.0265)		
CUM2_{it}		0.0326*** (0.0048)			0.0392*** (0.0048)	
$\ln(\text{CUM3} + 1)_{it}$			0.0078*** (0.0013)			0.0089*** (0.0013)
Constant	-8.4900*** (2.9826)	-7.8254*** (2.9824)	-7.5948** (2.9755)	22.2955*** (5.5148)	24.8494*** (5.5188)	22.3554*** (5.5121)
MR	No	No	No	Yes	Yes	Yes
N	138181	138181	138181	138181	138181	138181

Note: The dependent variable is the log of export value. All regressions include fixed effects for importer-exporter-product and years. Standard errors in parentheses are clustered by importer-exporter-product.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

In order to take possible selection problems into account due to the exclusion of zero trade flows panel two-step Heckman estimations are performed. Table 4 shows the results of the Heckman estimations. Here we estimate the effect of diagonal cumulation on export intensity given that exports actually take place. As can be seen in Table 4, controlling for selection into trade does not change the main results. Diagonal cumulation is still positively related to export intensity. All three cumulation coefficients remain highly significant. It can be noted that the size of the cumulation coefficients is somewhat smaller in general. The coefficient on CUM in column 1 is for example about 0.13 which can be compared to the coefficient on CUM in column 1 in Table 3 which is 0.16. Note however that the number of observations is smaller in Table 4 than in Table 3 which makes it hard to compare Table 3 and 4 outright. The reduction in the number of observations used is due to data unavailability. Data on the selection variable, entry costs, is only available from 2003 and onwards which means that the first years, 2000-2002, must be dropped for the Heckman estimations.

As an additional robustness test we examine the timing of the effect of diagonal cumulation on export intensity. We run a regression based on equation 3 which includes lags and leads of the CUM variable. We are interested in whether or not the effect of diagonal cumulation

Table 4: Export intensity - Panel Heckman estimations

	1	2	3	4	5	6
$\ln(\text{GDP}_{it}/\text{GDP}_{jt})$	0.4062*** (0.0824)	0.3631*** (0.0807)	0.3196*** (0.0795)	-0.0615 (0.1024)	-0.1093 (0.1011)	-0.1532 (0.1006)
FTA_{it}	0.5728*** (0.0901)	0.6252*** (0.0910)	0.5517*** (0.0921)	0.4623*** (0.0862)	0.3904*** (0.0806)	0.2752*** (0.0778)
CUM_{it}	0.1286*** (0.0267)			0.1385*** (0.0269)		
CUM2_{it}		0.0288*** (0.0051)			0.0318*** (0.0051)	
$\ln(\text{CUM3} + 1)_{it}$			0.0055*** (0.0014)			0.0068*** (0.0014)
Mills ratio	0.2558*** (0.0557)	0.2674*** (0.0549)	0.2374*** (0.0565)	0.2558*** (0.0549)	0.1909*** (0.0516)	0.1286*** (0.0491)
Constant	-12.6624*** (4.3898)	-10.4865** (4.2921)	-8.0477* (4.2195)	35.3044*** (8.1162)	41.1651*** (7.9997)	41.6355*** (8.0164)
MR	No	No	No	Yes	Yes	Yes
N	102609	102609	102609	102609	102609	102609

Note: The dependent variable is the value of exports. All regressions include fixed effects for importer-exporter-product and years. Bootstrapped standard errors in parentheses are clustered by country pairs. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

materialised immediately when the new rules were introduced, if exporters had adjusted to the new rules already before the introduction or if we mainly see an effect after the new rules were introduced. The variables of interest in this exercise are CUM_{t-2} , CUM_{t-1} , CUM , CUM_{t+1} and CUM_{t+2} .²² The results can be found in Table A4 in Appendix. We find that the effect of diagonal cumulation is concentrated around the introduction of the new rules. Neither the coefficient on CUM_{t-2} or CUM_{t+2} are statistically significant but all the remaining coefficients on cumulation variables are. However the coefficient on CUM_{t-1} is the one with the highest significance level and the largest one size wise. This means that the largest effect of diagonal cumulation is found one year after the new regulations were introduced.

Table 5 presents the estimation results for export diversification. The dependent variable is LINES which counts the number of exported products from the southern Mediterranean countries to EU15. The organisation of Table 5 is similar to that of Table 3. Columns

²²Note that t-2 here means that we lag the diagonal cumulation variable by 2 years, t-1 means that we lag it by 1 year and so on.

Table 5: Export diversification - Poisson estimations

	1	2	3	4	5	6
$\ln(\text{GDP}_{it}\text{GDP}_{jt})$	0.1892** (0.0765)	0.1925** (0.0768)	0.1895** (0.0763)	0.3347*** (0.1041)	0.3352*** (0.1042)	0.3368*** (0.1044)
FTA_{it}	0.1748*** (0.0437)	0.1792*** (0.0444)	0.1733*** (0.0443)	0.2202*** (0.0441)	0.2231*** (0.0453)	0.2190*** (0.0446)
CUM_{it}	-0.0107 (0.0409)			-0.0257 (0.0386)		
CUM2_{it}		0.0013 (0.0074)			-0.0011 (0.0071)	
$\ln(\text{CUM3} + 1)_{it}$			-0.0007 (0.0021)			-0.0013 (0.0020)
Constant	-7.5243* (3.9037)	-7.6920** (3.9192)	-7.5450* (3.8929)	-25.8581*** (9.9530)	-25.6564** (9.9643)	-25.8468*** (9.9747)
MR	No	No	No	Yes	Yes	Yes
N	1485	1485	1485	1485	1485	1485

Note: The dependent variable is the number of exported product lines (LINES). All regressions include fixed effects for country pairs and years. Standard errors in parentheses clustered by country pairs.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

1-3 show the baseline results without controls for multilateral resistance while columns 4-6 show the results when MR terms are included. Estimations are based on the model given by equation 5. All regressions include fixed effects for country pairs and time. Focusing on the variables of interest, we here find that none of the different coefficients of diagonal cumulation is statistically significant in any column in Table 5. Better cumulation possibilities for the southern Mediterranean countries is found to not be related to export diversification measured as the number of exported products. As expected both economic mass and the economic association agreements are positively related to export diversification.

The lack of significant cumulation effects in Table 5 could make one draw the conclusion that diagonal cumulation has different impacts on export intensity and export diversification. This is an interesting result but some further investigation is warranted before we are ready to draw such a conclusion. A possible problem with the estimations that give the results in Table 5 is that the dependent variable, LINES, does not allow us to control for product or sector fixed effects. Since it is likely that there are sectoral characteristics that affect the impact of rules of origin (see for example the diverging results in Bureau et al. (2007) and Portugal-Perez (2008)) including product or sector fixed effects could be

Table 6: Export diversification with sector-level controls - Poisson estimations

	1	2	3	4	5	6
$\ln(\text{GDP}_{it}\text{GDP}_{jt})$	0.5435*** (0.1067)	0.5239*** (0.1088)	0.5277*** (0.1061)	1.0581*** (0.1618)	1.0547*** (0.1612)	1.0464*** (0.1644)
FTA_{it}	1.1700*** (0.1157)	1.1745*** (0.1188)	1.1734*** (0.1174)	1.2710*** (0.1040)	1.2805*** (0.1077)	1.2741*** (0.1050)
CUM_{it}	0.1643** (0.0764)			0.0926 (0.0717)		
CUM2_{it}		0.0301** (0.0141)			0.0231 (0.0141)	
$\ln(\text{CUM3} + 1)_{it}$			0.0085** (0.0038)			0.0052 (0.0036)
Constant	-30.7152*** (5.4405)	-29.6273*** (5.5517)	-29.8193*** (5.4128)	-90.3106*** (14.5399)	-88.1226*** (14.8063)	-89.9660*** (14.6379)
MR	No	No	No	Yes	Yes	Yes
N	80190	80190	80190	80190	80190	80190

Note: The dependent variable is the number of exported product lines per sector (LINES_HS2). All regressions include fixed effects for country pairs, sectors and years. Standard errors in parentheses are clustered by country pairs. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

important if we want reliable results. Estimations of the effect of diagonal cumulation on export diversification is therefore also based on the model given by equation 6. This model specification uses LINES_H2, the number of exported products per sector, as the dependent variable which allows us to include more observations than above and to introduce fixed effects for sectors at the 2-digit HS level.²³

Table 6 shows the results of the estimations that include sector fixed effects. The different coefficients of diagonal cumulation (CUM, CUM2 and $\ln(\text{CUM3}+1)$) are all positive and statistically significant at the 5% level in columns 1-3. Using the alternative dependent variable LINES_H2 and including sector fixed effects hence make a difference for the results. The number of observations could however make one question if a significance level of 5% is enough in this case. Once the controls for multilateral resistance are included none

²³Another potential problem with above estimations for export diversification is that the Poisson model does not take into account that the dependent variable has an upper bound. The exported products are defined according to 6-digit HS lines which means that LINES_{ijt} is bounded from above by the number of product categories in the HS. As shown by Santos Silva et al. (2013) ignoring the upper bound can give misleading results. They suggest using a flexible pseudo-maximum likelihood estimator to get more reliable results. This flexible estimation strategy has been tried but it still produces an insignificant relationship between export diversification and diagonal cumulation.

of the cumulation coefficients remain significant, see columns 4-6. This means that it is hard to say that there is a robust positive relationship between export diversification and diagonal cumulation possibilities. There are nonetheless indications of such a relationship when sectoral characteristics are taken into consideration.

6 Conclusion

This paper has investigated how exports of final goods are affected by the access to intermediate inputs. The main aim has been to empirically test if expanding the set of available suppliers through the introduction of diagonal cumulation affect i) export intensity measured as the value of exports of final goods, and ii) export diversification measured as the number of exported final goods.

To examine the relationship between diagonal cumulation and export performance we took advantage of the recent introduction of the southern Mediterranean countries into the Pan-Euro-Med zone of diagonal cumulation. We found that introducing diagonal cumulation possibilities for the southern Mediterranean countries has had a positive effect on how much final goods they export to EU15. To be a part of the Pan-Euro-Med zone of diagonal cumulation increases southern Mediterranean exports of final goods to EU15 by about 17%. There is hence a positive relationship between export intensity and expanding the set of available suppliers through an introduction of diagonal cumulation rules. We also found that an increase in the number of countries you can cumulate value diagonally from and that an increase in imports of intermediate goods from countries you can cumulate diagonally from in the Pan-Euro-Med zone have positive effects on export intensity.

A relationship between diagonal cumulation possibilities and export diversification, i.e. the number of exported products, was on the other hand harder to find. That there is a difference between the effects of diagonal cumulation on export intensity and export diversification may have several reasons. First, as a positive and significant effect is found on export intensity there appears to be an effect on production costs when the set of available suppliers is expanded due to a liberalisation of cumulation rules. When cheaper suppliers become available production costs are reduced which boosts export volumes. This effect on production costs may however not be large enough for non-exporting firms to be able to afford the fixed costs of exporting.

Second, the lack of an effect on export diversification may be related to the level of differentiation of the exported products. As Chaney (2008) argues, effects of trade barriers are related to the elasticity of substitution of the traded goods. The impact of trade barriers is expected to be large (small) on the intensive (extensive) margin for goods with high elasticity of substitution. A reduction of trade barriers, such as liberalisation of cumulation rules, makes new less productive firms enter the export market. The lower productivity is however an important drawback when consumers easily substitute from

one good to another meaning that the new firms only are able to capture a small share of the market. The effect on trade of these new firms will therefore be small. If the southern Mediterranean countries mainly trade relatively homogeneous products, i.e. products with a high elasticity of substitution, we would expect to find an effect of trade policy changes on export intensity rather than export diversification. According to the Rauch (1999) definition of differentiated and homogeneous goods the sample used here consists almost solely of differentiated goods. Looking closer at what type of goods that are important export goods for the southern Mediterranean countries we however find that these goods tend to be simpler low-technological content goods such as textiles that are easy to substitute even if they are defined as differentiated. This could help us understand why we found an effect on export intensity but not on export diversification.

Third, export diversification is likely to be more reliant on access to new types or varieties of intermediate inputs than export intensity. As mentioned above, expanding product scope has been found to mainly be related to newly available inputs instead of cheaper inputs (Goldberg et al., 2010). If the newly available suppliers produce similar products as the old suppliers, diagonal cumulation will not lead to an increase in the number of available intermediate inputs. One possible explanation to why export intensity but not export diversification is found to be positively related to diagonal cumulation is then that the newly available non-EU suppliers in the Pan-Euro-Med zone are not different enough from the old suppliers. The effect on product scope could therefore be limited which in turn would mean that the possibility to export new products is reduced. Since we do not have access to firm-level production data we are unfortunately not able to further examine the relationship between a liberalisation of cumulation rules and product scope. This would be interesting to investigate in future research.

Lastly, it may take more time for the effect on export diversification to materialise. Even if access to cheaper inputs or new inputs make it profitable for firms to export new products there are still sunk costs related to exporting such as finding buyers or perhaps adjusting products to local tastes. This is a process that is likely to take some time. The effect on export diversification may therefore need to be re-examined with a longer panel.

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Appendix

Table A1: Variable description and data sources

Variable	Description	Source
X	Nominal exports of final goods	UN Comtrade
LINES	The number of exported final goods	UN Comtrade
LINES_HS2	The number of exported final goods by each 2-digit HS industry	UN Comtrade
GDP	The product of the trading partners' GDP	World Development Indicators and Eurostat
FTA	Dummy variable that equals 1 if the trading partners have an association agreement, 0 otherwise	European Commission
CUM	Dummy variable that equals 1 if the Mediterranean exporter has a trade agreement with the EU that allows for diagonal cumulation, 0 otherwise	European Commission
CUM2	The number of non-EU countries the Mediterranean exporter can cumulate diagonally from	European Commission
CUM3	The value of imported intermediate inputs from non-EU countries in the Pan-Euro-Med zone with which diagonal cumulation is possible	UN Comtrade

Table A2: Countries

Exporters	Importers
Algeria	Austria
Egypt	Belgium
Israel	Denmark
Jordan	Finland
Lebanon	France
Morocco	Germany
The Palestinian Authority	Greece
Syria	Ireland
Tunisia	Italy
	Luxembourg
	Netherlands
	Portugal
	Spain
	Sweden
	United Kingdom

Table A3: Entry into force of active Euro-Med trade agreements and cumulation rules

Country	Preferential agreement		Cumulation rules
Algeria	Euro-Mediterranean Agreement, 2005	Association	Bilateral, diagonal and full cumulation 2007
Egypt	Euro-Mediterranean Agreement, 2004	Association	Bilateral and diagonal cumulation 2006
Israel	Euro-Mediterranean Agreement, 2000	Association	Bilateral and diagonal cumulation 2006
Jordan	Euro-Mediterranean Agreement, 2002	Association	Bilateral and diagonal cumulation 2006
Lebanon	Euro-Mediterranean Agreement, 2006	Association	Bilateral cumulation 2006
Morocco	Euro-Mediterranean Agreement, 2000	Association	Bilateral, diagonal and full cumulation 2005
The Palestinian Authority	Euro-Mediterranean Interim Association Agreement, 1997		Bilateral and diagonal cumulation 2009
Syria	Cooperation agreement OJ L 269, 1978		Bilateral cumulation 1978
Tunisia	Euro-Mediterranean Agreement, 1998	Association	Bilateral, diagonal and full cumulation 2006

Source: <http://ec.europa.eu/trade/policy/countries-and-regions/regions/euro-mediterranean-partnership/> and

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2013:205:0003:0006:EN:PDF>

Table A4: Export intensity - when does the effect of diagonal cumulation materialise?

	1
$\ln(\text{GDP}_{it}\text{GDP}_{jt})$	0.0669 (0.1074)
FTA_{it}	0.1691*** (0.0398)
CUM_{it-2}	0.0292 (0.0296)
CUM_{it-1}	0.0674*** (0.0257)
CUM_{it}	0.0590** (0.0248)
CUM_{it+1}	0.0544** (0.0244)
CUM_{it+2}	0.0361 (0.0270)
Constant	36.7072*** (28.7950)
MR	Yes
N	89855

Note: The dependent variable is the log of export value. Fixed effects for importer-exporter-product and years are included. Standard errors in parentheses are clustered by importer-exporter-product.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$