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ROMA TRE UNIVERSITÀ DEGLI STUDI

Preferential trade agreements granted by the European Union: an application of the gravity model using monthly data*

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Abstract

The goal of this paper is to assess the impact of preferential trade agreements on European imports of fresh grapes, pears, apples, oranges and mandarins over the period 2001-2004. Monthly rather than yearly data are used in order to take into account the fact that both imports and protection vary seasonally. Furthermore, we determine a measure of preferential margins which explicitly takes into account quotas and the entry price system. Finally, in the econometric estimations we control for heterogeneity, endogeneity and zero-trade flows. The results show that the impact of preferential policies granted by the European Union (EU) varies depending on the specific commodity considered. In particular, the GSP scheme seems to be effective in increasing exports to the EU of apples and mandarins, while the Cotonou agreement is successful in making EU imports of fresh grapes and mandarins grow. Furthermore, regional trade agreements seem to be effective in expanding EU imports of all fruits but oranges from eligible countries.

Keywords: gravity model; preferential trade agreements; panel data.

Jel Codes: F10; C33.

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1. Introduction

This paper analyses the impact on trade of Preferential Trade Agreements (PTAs) granted by the European Union (EU) to developing countries over the period 2001-2004 for specific agricultural products.

We focus on the fruit and vegetable (F&V) market since this sector is among the most important ones for the EU in terms of both production and trade.[1]

We analyse five products: fresh grapes, apples, pears, oranges and mandarins (including clementines). There are several reasons for considering only a subgroup of products. First of all, the use of disaggregated data involves a very high number of observations, which tends to make the estimations and empirical tests unwieldy. Indeed, each product at the HS8 level implies 137,520 observations. Secondly, we focus on fresh grapes, apples, pears, oranges and mandarins because EU imports of these commodities are relatively high.[2] Finally, these five fruits are subject not only to tariffs and quotas but also to the "entry price" system (Cioffi and Dell'Aquila, 2004; Goetz and Grethe, 2009; Grethe and Tangermann, 1999; Swinbank and Ritson, 1995) so that by analysing these products we can take into consideration the main elements of the PTAs granted by the EU in the F&V sector.

In order to assess the impact of PTAs on European F&V imports we use a gravity model, which, in its basic form, predicts trade flows as a function of the size of the trade partners and the distance between them.

The literature on the use of gravity models to analyse the EU trade in F&V is quite scant.[3] To the best of our knowledge, only Garcia-Álvarez-Coque and Martì-Selva (2006) and Emlinger *et al.* (2008) have investigated the effect of European PTAs granted to LDCs for F&V using a gravity model, while Cipollina and Salvatici (2007) analyse EU imports of vegetable products. In more detail, Garcia-Álvarez-Coque and Martì-Selva (2006) and Emlinger *et al.* (2008) discuss the influence of Association Agreements on F&V trade

[1] Based on data from FAO, fruit and vegetables produced in the EU represented 8% of world production in 2004. Furthermore, the share of EU production of fruit and vegetables in value was 20% of total EU agricultural production. This sector is particularly relevant in certain European countries: considering only Mediterranean countries (Greece, Italy, Portugal and Spain) F&V account for 43% of agricultural production. As regards trade, the EU is the largest world importer of F&V. Based on data from the COMTRADE database and excluding tropical fruits, the EU absorbed 20% of world imports in 2005, while import shares of the US and Japan, the next largest importers, were 12% and 4.5%, respectively.

[2] In 2004 the share of EU imports of grapes, apples, pears, oranges and mandarins in total EU imports of F&V was 21%.

[3] For a comprehensive review of the papers assessing the impact of preferential trade policies (reciprocal and non reciprocal) using gravity models see Cardamone (2007).

between Mediterranean Countries and the EU only, while Cipollina and Salvatici (2007) consider preferences granted to developing countries, without distinguishing between different preferential arrangements.[4] All these contributions use annual data, except Emlinger *et al.* (2008) which use four-month periods, disregarding the seasonality of F&V production and protection. Furthermore, Emlinger *et al.* (2008) use applied duties partially taking into account entry prices and quotas but do not measure preferential margins; Cipollina and Salvatici (2007) determine a proxy of the preferential variable based only on tariffs, while Garcia-Álvarez-Coque and Martì-Selva (2006) use the dummy approach. From an econometric point of view, they all disregard heterogeneity and, with the exception of Emlinger *et al.* (2008), the endogeneity issue.

Unlike previous works this paper intends to analyse the impact of all preferential schemes granted by the EU over the period 2001-2004 for imports of specific F&V commodities from developing countries. Furthermore, it aims to improve the reliability of the results obtained by modifying the empirical and analytical setting in a number of ways, including the use of monthly data disaggregated at HS8 level, the measure of the preferential margins and the econometric estimators.

We employ monthly data on imports and preferences: seasonality of F&V imports vary according to the harvest time of different exporters, which in turn is subject to climatic conditions. Tariffs, quotas and entry prices vary seasonally according to the EU production of F&V, as a result of domestic protection. We use data disaggregated at HS8 level. In analysing the impact of preferential treatments most contributions have considered more aggregated trade flows between countries; however, the decision to consider aggregated data on exports is questionable if the goal is to evaluate the impact of a specific policy – trade preferences – which is applied at the product level.[5] Furthermore, by using data at the HS8 level we can

[4] Garcia-Álvarez-Coque and Martì-Selva (2006) measure the preferential treatment enjoyed by developed countries using a dummy variable equal to one if the two trading partners belong to an Euro-Mediterranean agreement and zero otherwise. They find that Euro-Mediterranean agreements foster F&V trade between members. Emlinger *et al.* (2008) consider actual tariffs applied by the EU to its trading partners to measure the preferences granted. The results obtained show that the sensitivity of Israel, Morocco and Tunisia to the preferential tariffs is very high, while Turkish exports to the EU do not seem to be sensitive to tariffs, the estimated coefficients not being significant. Measuring the preferential margin as the difference between the highest applied duty and the applied duty, Cipollina and Salvatici (2007) find that PTAs granted by the EU significantly increase the probability of exporting vegetables to the EU. Garcia-Álvarez-Coque and Martì-Selva (2006) use OLS, while Emlinger *et al.* (2008) and Cipollina and Salvatici (2007) employ the Heckman (1978) estimator in order to take into account zero-trade flows.

[5] Specifically, the objective of PTAs is not to affect total trade of the beneficiaries, but to alter the incentives for developing countries to export more in specific sectors (those in which preferences are granted). Hence, evidence based on disaggregated data is needed to assess the impact of PTAs.

overcome the need to determine an aggregate PTA variable, which is often given by a weighted sum of tariffs at commodity level (Cipollina and Salvatici, 2008; Anderson and Neary, 2005).

As far as preferential margins are concerned, we determine a quantitative preferential variable by taking into account the entry price system and quotas. Due to data constraints regarding tariffs, the period analysed covers the years from 2001 to 2004.

Finally, the econometric method which we employ controls for heterogeneity, endogeneity and sample selection. The heterogeneity bias is due to the likely correlation between country pair specific effects and regressors; endogeneity could arise because of the simultaneity between the dependent variable (EU imports) and regressors, in particular PTA variables;[6] the sample selection could be the result of excluding zero-trade observations. In more detail, we first perform a Durbin-Wu-Hausman endogeneity test and, since we reject the hypothesis of endogeneity of regressors, we adopt the Wooldridge (1995) procedure which controls for heterogeneity and sample selection bias simultaneously. Finally, we estimate a Poisson model in order to take into account country-pairs not trading and heteroskedasticity of the error term of the multiplicative gravity specification (Santos Silva and Tenreyro, 2006).

Overall, the results show that the GSP scheme is effective in increasing exports to the EU of apples and mandarins, while the Cotonou agreement is successful in enhancing EU imports of fresh grapes and mandarins. Furthermore, RTAs seem to achieve the goal of improving EU imports of all fruit but oranges from eligible countries.

The paper is organized as follows. Section 2 presents descriptive statistics of a number of key variables. Section 3 introduces the gravity model and the econometric method used in the empirical analysis. Section 4 discusses the estimation results. Finally, section 5 concludes.

2. The European market of fresh grapes, apples, pears, oranges and mandarins

In this section we present a number of descriptive features of trade flows and applied tariffs concerning EU imports of fresh grapes, pears, apples, mandarins and oranges.

[6] The issue of endogeneity of PTA variables arises because there could be a problem of simultaneity between trade flows and PTA variables, since it has not been univocally determined whether countries trade more because they are in a PTA or they belong to a PTA because they already traded relatively more with each other than they did with third countries. Moreover, the relationship between imports of the preference-giving country and the margin of preference granted to preferred countries could also be negative. As Özden and Reinhardt (2005: 19) point out "GSP eligibility has been shown to be negatively affected by export volume". In brief, it is likely that trade flows between two countries may affect positively or negatively the probability of signing a PTA and the level of trade protection as well.

Table 1 presents the monthly simple average of imports and ad-valorem duties for each group of exporters. First of all, it can be noted that import flows from countries which benefit from Ordinary GSP and other RTAs are relatively high. This is also the case for mandarin exports to the EU from exporters benefitting from EuroMed agreements. Furthermore, EU imports of apples are scant from participants in the Drugs Regime and the Euro-Mediterranean agreements (EuroMed), while EBA and ACP countries export to the EU only a small amount of fresh grapes, pears and mandarins. As far as tariffs are concerned, excluding the MFN arrangement, the ad-valorem duty is higher for Ordinary GSP, except in the case of pears for which tariffs on ACP exporters are relatively high. Moreover, from table 1 it emerges that, except in the case of imports of fresh grapes and mandarins, the differences in EU preferential margins in favour of the different groups of countries are not substantial. This may imply that exporting countries benefitting from more than one preferential scheme prefer to export under one preferential regime rather than another on the basis of the non tariff barriers involved, rather than the tariffs. Some recent contributions have focused on the importance of rules of origin and sanitary and phytosanitary standards in explaining trade (Bureau *et al.*, 2007; De Maria *et al.*, 2008). In more detail, Bureau *et al.* (2007) show that countries which benefit from two or more preferential arrangements in general prefer to export under one specific regime (i.e., the Cotonou agreement) rather than others (i.e., EBA). This could be due to the fact that the rules of origin for GSP in general, and EBA in particular, are more restrictive than those requested by the Cotonou agreement. The Cotonou agreement requires fewer administrative constraints and is more flexible on the origin of the inputs used.

In figures 1 to 5 the share of imports and the preferential margins, given by the differences between the MFN and the preferential duties, are plotted for the period 2001-2004.[7] What emerges first is that the EU does not import fresh grapes, apples, pears, oranges and mandarins from countries eligible for EBA only. Analysing preferential margins and import shares by product, we observe that in the case of fresh grapes (figure 1), even though the preferential margins granted under Ordinary GSP and Drugs Regime slightly increase from one year to the next, import shares over the same period do not always present an increasing trend, although in 2004 import shares slightly increased with respect to 2001. Furthermore, preferential margins granted under the Cotonou were constant over the period

[7] In figs. 1-5 we assume that if a country is at the same time eligible for both GSP and ACP or GSP and a RTA it exports under ACP or the RTA, respectively. Exports from countries eligible for EBA only are scant.

analysed, while those granted under EuroMed and other RTAs increased. Export shares from countries eligible for EuroMed and other RTAs show an increase over the period under scrutiny. If we consider pear import shares (figure 2) we note that even though the preferential margins generally increase, except in the case of EBA and the Cotonou agreement for which the relative preferential margin remains essentially constant, only import shares from countries benefitting from other RTAs clearly show an increasing trend over the period 2001-2004. In the case of apple imports (figure 3), even though the preferential margins are mainly constant albeit not significantly high (aside from EBA), only import shares from EuroMed and other RTA countries clearly increased between 2001-2004.[8] In the case of orange imports (figure 4), preferential margins are mainly constant and low, apart from EBA, EuroMed and Cotonou agreement. However, only import shares from countries benefitting from EuroMed, Drugs Regime and other RTAs slightly increased over the period of interest. Similarly, although preferential margins granted for mandarin imports (figure 5) only slightly changed, only import shares from countries eligible for Drugs Regime, EuroMed and other RTAs increased in the period between 2001-2004. It should be noted that in the latter case percent preferential margins of Drugs Regime, ACP and EuroMed are higher than for the other fruits analysed.

To sum up, it could be observed that EU import shares from the GSP countries decreased over the period 2001-2004, except for fresh grapes, while in 2004 import shares from countries belonging to the EuroMed or other RTAs always increased with respect to 2001. As regards preferential schemes, preferential margins granted under Ordinary GSP and Drugs Regime slightly increased over 2001-2004, except for oranges and in the case of Drugs Regime for mandarins too. Preferential margins set for EBA and ACP countries generally remain constant while those for EuroMed and RTAs increased over 2001-2004, except in the case of oranges and mandarins. Only in few cases it emerges a relationship between trade and preferential margins. In more detail in the case of other RTAs both preferential margins and import shares show an increasing trend for fresh grapes, pears and apples. In the case of fresh grapes an increasing trend for both preferential margins and import shares is also observed for Ordinary GSP, Drugs Regime and EuroMed.

[8] The high relative import shares observed in 2002 for pears and apples (figures 2 and 3) from ACP countries is due to the high exports from very few countries eligible to both Ordinary GSP and Cotonou agreements (i.e., Antigua and Barbuda, Belize, Djibouti, Dominican Rep., Ghana, Madagascar, Niger, Nigeria and Swaziland). Thus, the particular trend of the ACP exports could be the result of an overlapping of preferences.

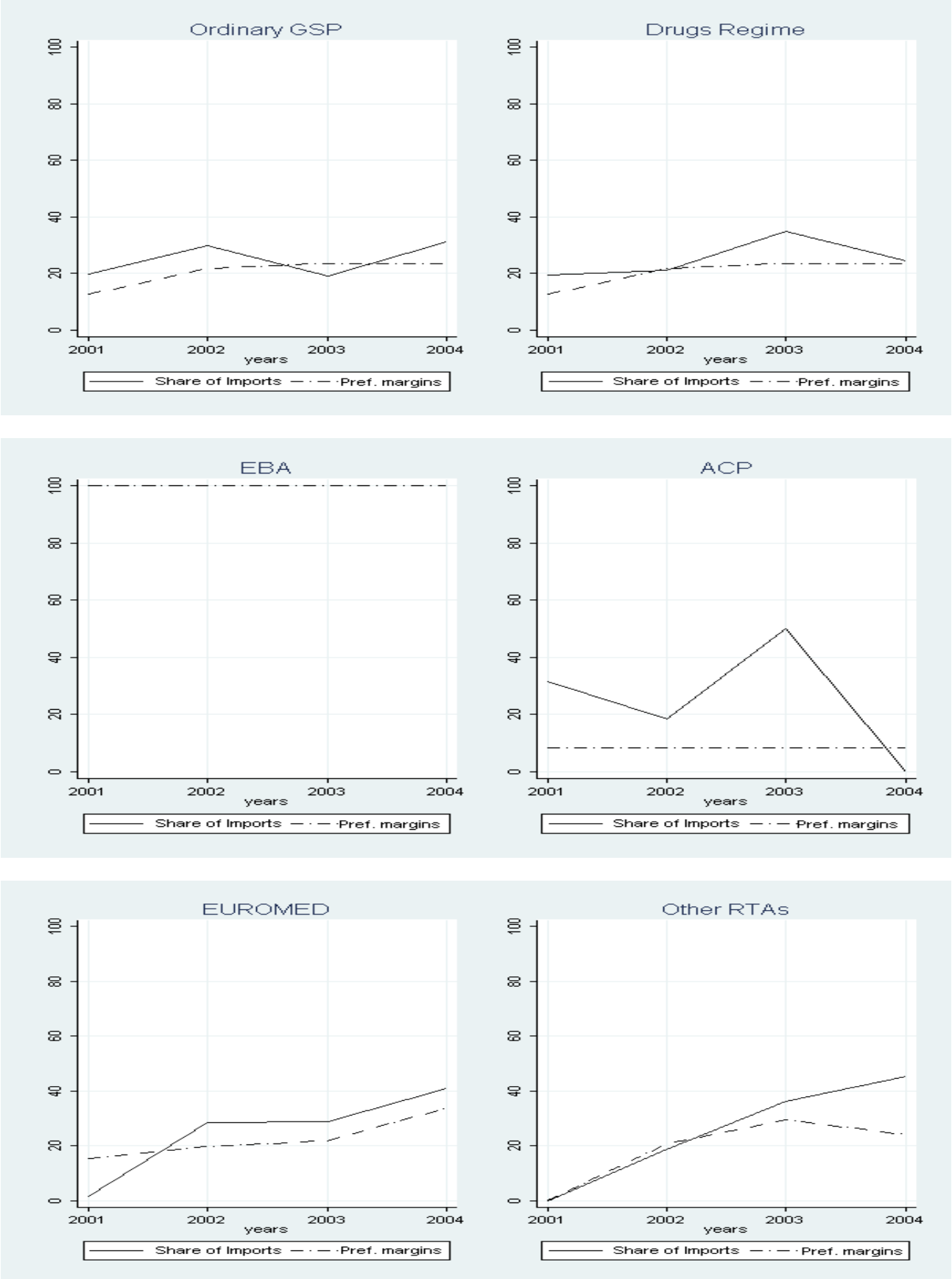
Table 1 – Average EU imports (in thousand Euro) and ad-valorem duties by country group over the period 2001-2004, based on monthly data and tariff lines at HS8 level.

	FRESH GRAPES		PEARS		APPLES		ORANGES		MANDARINS	
	Average imports	**Average ad-valorem duty**	**Average imports**	**Average ad-valorem duty**	**Average imports**	**Average ad-valorem duty**	**Average imports**	**Average ad-valorem duty**	**Average imports**	**Average ad-valorem duty**
GSP	1164.49	10.38	476.52	3.90	370.65	4.30	356.09	.	220.24	12.78
	(3904.78)	*(2.23)*	*(1422.26)*	*(1.55)*	*(905.57)*	*(1.04)*	*(817.43)*	.	*(581.52)*	*(.48)*
EBA	16.92	0.00	7.47	0.00	18.40	0.00	3.09	0.29	.	0.23
	(21.11)	*(.)*	*(8.95)*	*(.)*	*(9.72)*	*(.)*	*(1.62)*	*(1.24)*	.	*(1.12)*
DRUGS	516.18	10.30	11.50	3.76	8.55	4.15	17.96	.	125.46	5.75
	(975.85)	*(2.23)*	.	*(1.48)*	*(7.49)*	*(.94)*	*(23.32)*	.	*(210.59)*	*(5.86)*
ACP	83.70	0.00	3.85	6.00	21.09	.	36.71	1.58	21.73	1.90
	(145.49)	*(.)*	*(5.15)*	*(.)*	*(19.04)*	.	*(68.)*	*(1.5)*	*(24.08)*	*(1.49)*
EUROMED	397.66	0.26	51.64	0.36	10.46	0.54	283.66	2.07	301.59	2.63
	(935.76)	*(1.03)*	*(96.2)*	*(1.08)*	*(18.02)*	*(1.18)*	*(581.37)*	*(2.35)*	*(761.16)*	*(3.04)*
OTHER RTAs	1497.84	5.99	393.44	2.61	369.93	2.14	510.38	.	179.76	.
	(4134.46)	*(5.89)*	*(874.54)*	*(2.98)*	*(1032.81)*	*(3.24)*	*(1157.83)*	.	*(509.43)*	.
MFN	986.53	13.64	308.44	7.22	397.29	5.40	298.76	9.82	201.84	16.00
	(3470.43)	*(2.22)*	*(1108.95)*	*(2.13)*	*(1246.88)*	*(3.63)*	*(727.7)*	*(5.73)*	*(535.4)*	*(.)*

Note: Standard deviations are reported in parenthesis

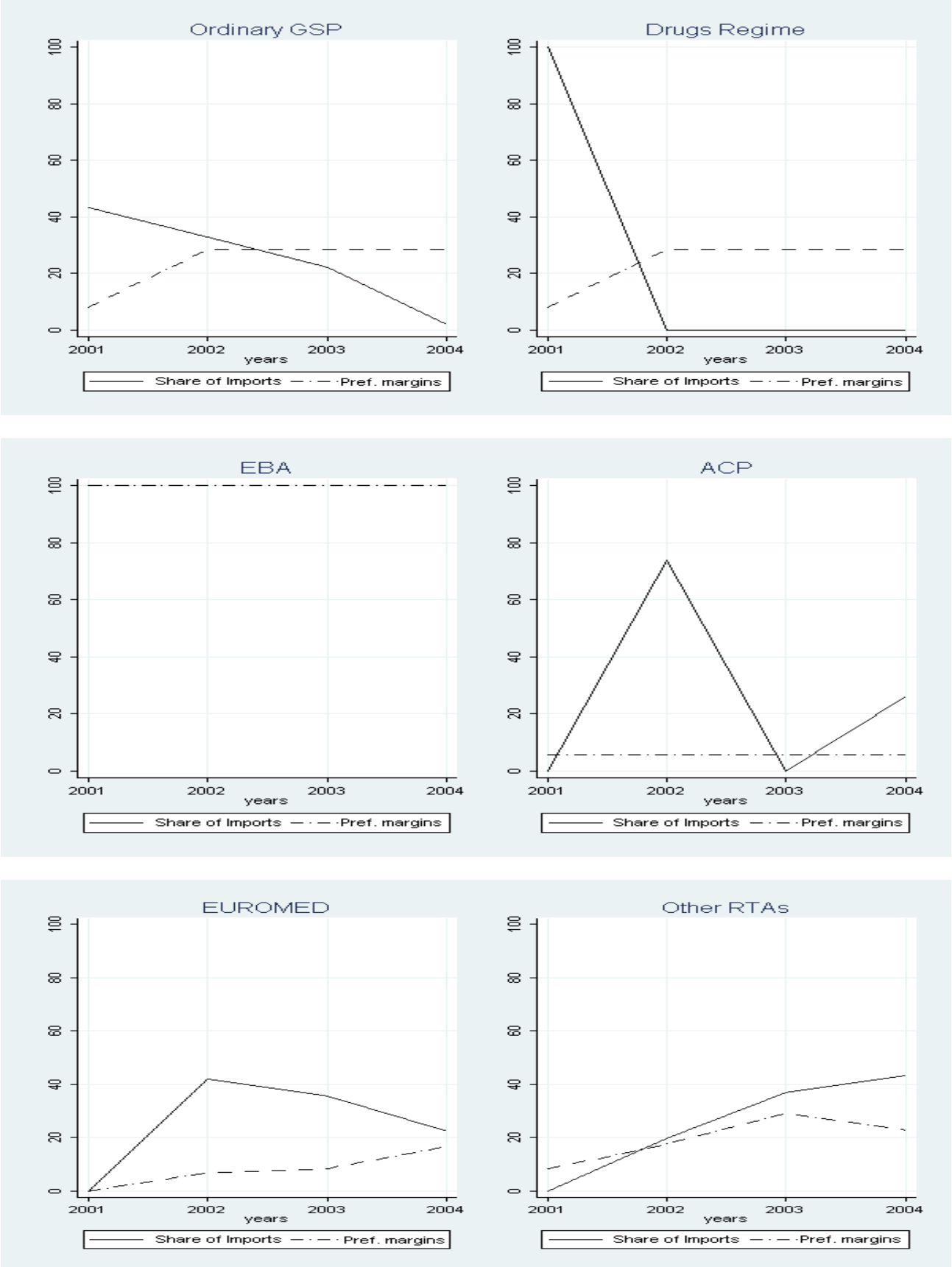
Source: own computations.

Figure 1 – Average share of EU imports and preferential margins of fresh grapes by country groups, 2001-2004.



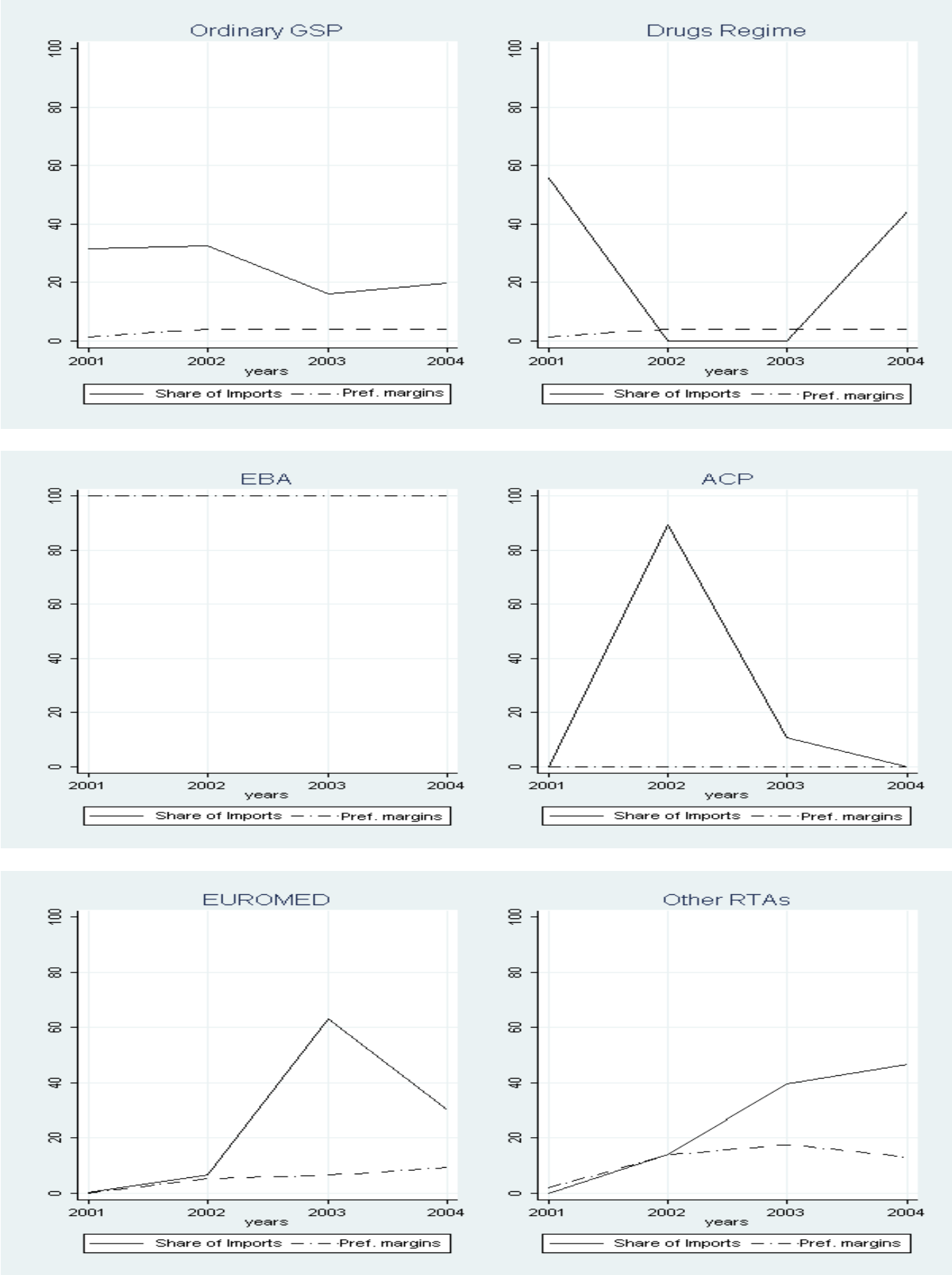
Source: own computations.

Figure 2 – Average share of EU imports and preferential margins of pears by country groups, 2001-2004.



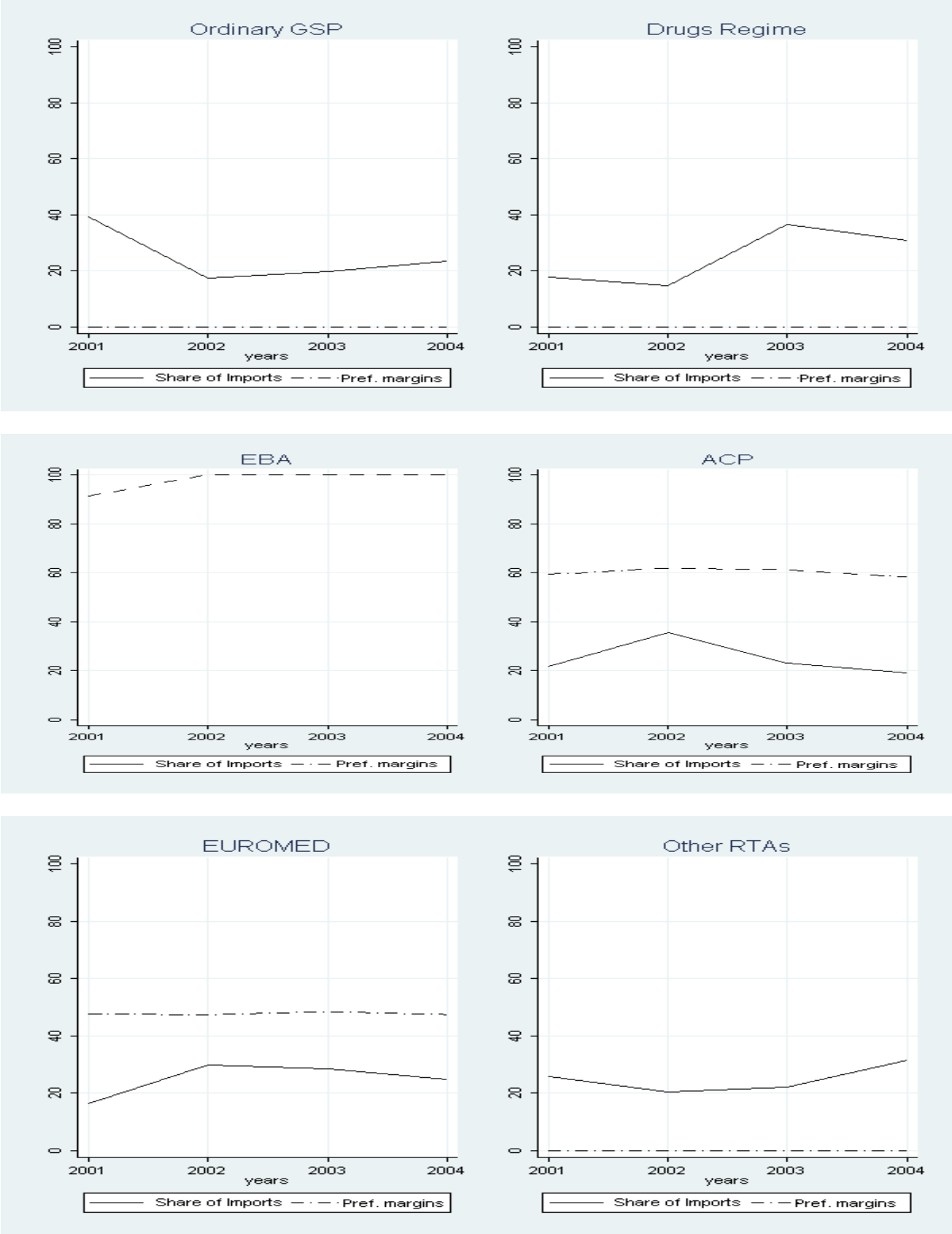
Source: own computations.

Figure 3 – Average share of EU imports and preferential margins of apples by country groups, 2001-2004.



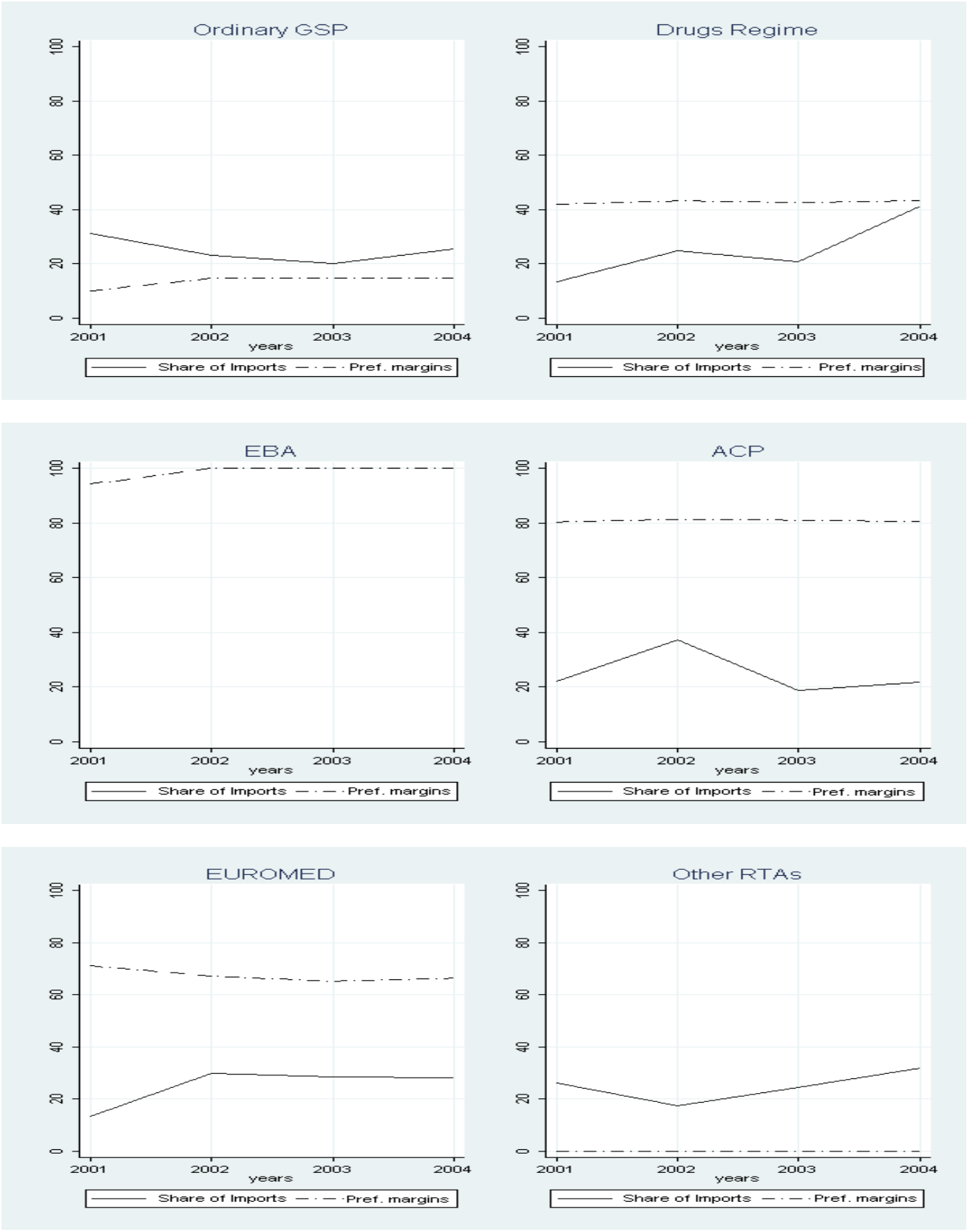
Source: own computations.

Figure 4 – Average share of EU imports and preferential margins of oranges by country groups, 2001-2004.



Source: own computations.

Figure 5 – Average share of EU imports and preferential margins of mandarins by country groups, 2001-2004.



Source: own computations.

3. The gravity model and data used

Gravity models of international trade were first developed by Tinbergen (1962) and Pöyhonen (1963). In its basic formulation and in analogy to Isaac Newton's law of gravity, the gravity model explains bilateral trade flows by the attraction of two countries' "masses" (the size of the countries) mitigated by the "distance" (a proxy of transport costs) between them. The original specification did not have any theoretical foundation in economics. However, as empirical applications of the gravity model have grown, different theoretical bases of the model have been proposed (Anderson, 1979; Bergstrand, 1989; Deardoff, 1995; Anderson and van Wincoop, 2003).

The specification of the gravity model adopted in this study is that proposed by Anderson and van Wincoop (2003)**.** The log-linearized gravity specification[1,2] which we consider is expressed as follows:

$$\begin{aligned}\ln(X^{s}_{ijtm}) = {} & \alpha + \alpha_1 \ln(GDP/POP)_{itm} + \alpha_2 \ln(GDP/POP)_{jtm} + \alpha_3 \ln(POP_{itm}) + \alpha_4 \ln(POP_{jtm}) \\ & + \alpha_5 \ln(PROD^{s}_{itm}) + \alpha_6 \ln(PROD^{s}_{jtm}) + \alpha_7 \ln(EXP\_CAP^{s}_{jtm}) \\ & + \beta_1 GSP^{s}_{jtm} + \beta_2 ACP^{s}_{jtm} + \beta_3 RTA^{s}_{jtm} + \beta_4 GSP^{s}_{jtm} \cdot ACP^{s}_{jtm} + \beta_5 GSP^{s}_{jtm} \cdot RTA^{s}_{jtm} + \\ & + \alpha^{s}_{ij} + u^{s}_{ijtm}\end{aligned} \qquad [1]$$

where subscript *i* refers to the EU importers (i=1,...,15), *j* to the exporters (j=1,...191), t to the year (t=2001,...,2004), m to the month (m=1,...,12), and s indicates the agricultural commodities at the 8-digit level (s=1,2,…,S).[3] α^{S}_{ij} is the country pair-commodity fixed

[1] Using the semi-logarithmic specification for preferential variables allows us to avoid dropping observations with zero preferential margins. Indeed, if we put the preferential schemes together and consider that when a country does not benefit from a preferential scheme the corresponding preferential margin is zero, then a double-log specification would imply working with very few observations. An alternative solution could be to add a small number, such as 1 or 0.1, to each preferential margin. However, it could be easily shown that this approach yields biased estimates. Finally, the original multiplicative gravity specification is that adopted so far by all contributions which used dummy variables to measure preferential schemes.

[2] We do not consider multilateral trade resistance. Indeed, the issue of multilateral resistance terms in a gravity specification with panel data should be addressed considering time-varying country specific effects, that is specific effects for importing and exporting countries which vary over time. However, including these terms implies that the effects of the variables of interest, in particular the PTA effects, are absorbed by these specific time-varying effects.

[3] We have two commodities (table grapes, other fresh grapes) at HS8-digit level in the fresh grape sector, three commodities in the pear sector (Perry pears, other pears, quince), four commodities (Cider apples, Golden Delicious, Granny Smith, other apples) in the apple sector, five commodities for oranges (blood oranges, sweet oranges, Navels and similar, other sweet oranges, other oranges), and five commodities for mandarins (Clementines, Monreales and Satsumas, Mandarins and Wilkings, Tangerines, other mandarins).

effects while u^{S}_{ijtm} is the error term.[4] Moreover, X is the import flow,[5] GDP is the Gross Domestic Product, POP is the population and PROD is the production. EXP_CAP is a proxy of the export capacity, indicating the competitive capacity on the EU market and should measure impediments, such as the limited capacity to satisfy private quality standards, which each exporting country faces in selling commodity s on the EU market.

The GSP variable is the preferential margin granted by the EU GSP (including the Drugs regime and the Everything But Arms initiative).[6] The ACP variable represents the margin of preference observed for the Cotonou agreement in favour of African, Caribbean and Pacific (ACP) countries.[7] The RTA variable indicates the margin of preference associated to EU bilateral trade agreements for apples, pears, fresh grapes, oranges and mandarins, such as agreements with Mediterranean Countries,[8] Andorra, Switzerland, Romania, Bulgaria, South Africa, Mexico, Macedonia, Croatia, Chile (from 2003). In order to take into account the overlapping of preferences, we include in the standard gravity specification interaction preferential variables, that is GSP*ACP and GSP*RTA. Indicating with $\overline{GSP}$, $\overline{ACP}$ and $\overline{RTA}$ the mean value of preferential margins of GSP, Cotonou and RTA agreements, respectively, the average impact of GSP on EU imports is given by

[4] Fixed effects absorb all effects which are country-pair specific. Since distance, language and common border (two binary variables equal to one if the trade partners share a common language or border, respectively), colony (a binary variable which is equal to one if country j was a colony of country i) and landlocked (the number of landlocked countries in the pair) are country-pair specific, they are absorbed by fixed effects. This is why in equation (1) these country-pair specific variables do not appear.

[5] The Comext dataset provides data expressed in CIF value. Thus, we transformed data from CIF to FOB computing the CIF/FOB ratio using data on trade flows from the Comtrade database, following the IMF Direction of Trade Statistics (DOTS) procedure. As Comtrade provides yearly data at HS6 level, we assume that CIF/FOB ratios are constant within each year and do not differ if we move from HS6 to HS8 commodity lines.

[6] The Everything But Arms (EBA) initiative was introduced in 2001 and gives tariff free and quota free access to all EU imports from the 49 Least Developed Countries. The "drugs regime" is a special arrangement signed in 1991with additional benefits for countries affected by the production and trafficking of illegal drugs.

[7] EEC and ACP countries signed their first agreements in 1969 at the Yaoundé Convention. In 1975, the Yaoundé agreements were replaced by those signed at the Lomé Convention, followed in 2000 by the Cotonou Partnership Agreements, which have been replaced in 2008 by the Economic Partnership Agreements (EPA).

[8] Euro-Mediterranean Partnership (Barcelona Process) started in 1995. This partnership involved 15 EU members and 12 Mediterranean countries (Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, Palestinian Territories, Syria, Tunisia, Turkey, Malta and Cyprus), with Libya granted observer status in 1999. The Euro-Mediterranean Partnership comprises two complementary dimensions: a) a bilateral dimension: the EU carries out a number of activities bilaterally with each country; b) a regional dimension: regional dialogue represents one of the most innovative aspects of the Partnership, covering at the same time the political, economic and cultural areas.

$\frac{\partial \ln X}{\partial GSP} = \beta_1 + \beta_4 \overline{ACP} + \beta_5 \overline{RTA}$ while the effect of the Cotonou Agreement and RTAs on EU imports should be computed as $\frac{\partial \ln X}{\partial ACP} = \beta_2 + \beta_4 \overline{GSP}$ and $\frac{\partial \ln X}{\partial RTA} = \beta_3 + \beta_5 \overline{GSP}$, respectively.[9]

Monthly data on imports are from COMEXT. Inward processing imports are subtracted from total imports in order to take into account imports entering the EU for processing which are then re-exported with the benefit of tariff exemption. The set of importing countries comprises the EU-15 member states, while there are 191 exporters, that is all the countries for which trade statistics are available. [10]

As far as the explanatory variables are concerned, annual data on GDP and population are from the World Development Indicators 2005. In order to obtain monthly data the generation of GDP is assumed constant throughout the year, and hence GDP at year t and month m is given by $GDP_{t,m}=GDP_t/12$. With respect to population, we assume that the growth/reduction of population is constant within each year. Hence, POP at year t and month m is given by $POP_{t,m}=POP_{t,m-1}+m*(POP_t- POP_{t-1})/12$, where m=1,2,…,12 indicates the month, that is m=1 stands for January, m=2 for February, and so on.

The preferential variables are determined from data on tariffs provided by the dataset DBTAR (Gallezot, 2005), while data on quotas are drawn with reference to the specific EU Regulations.

PTA variables can be measured in different ways. In the literature on the impact of PTAs on trade, trade preferences are more often represented by a dummy variable equal to one if the importer grants a preference to the exporter and zero otherwise. This dummy is used to estimate the trade creation effect of a PTA. It is expected that its coefficient is positive because beneficiary countries will be induced to export to the preference-giving country more than they would without the specific trade preference. However, the use of dummy variables to represent PTAs in a gravity model is problematic because they capture a range of other

[9] If we consider the anti-logarithm we find that an increase by one percentage point in the GSP preferential margins determines that imports vary by $\frac{\partial X}{\partial GSP} = \left[\exp\left(\beta_1 + \beta_4 \overline{ACP} + \beta_5 \overline{RTA}\right) - 1\right] * 100$ per cent. Similarly, if preferential margins of the ACP and RTA increase by one percentage point, imports vary by $\frac{\partial X}{\partial ACP} = \left[\exp\left(\beta_2 + \beta_4 \overline{GSP}\right) - 1\right] * 100$ per cent and $\frac{\partial X}{\partial RTA} = \left[\exp\left(\beta_3 + \beta_5 \overline{GSP}\right) - 1\right] * 100$ per cent, respectively

[10] The list of exporting countries by latitude is reported in the Appendix.

country-pair specific effects contemporaneous with PTA implementation. Furthermore, a dummy does not discriminate among the different preferential trade policy *instruments* (preferential tariff margins, preferential quotas, reduced "entry prices") nor does it discern the *level* of trade preferences (i.e., the use of dummies implicitly assumes that the level of preferential margins under GSP is the same as those under the Euro-Mediterranean Agreements). A more appropriate indicator is the actual preferential margin, that is the difference between the MFN and the PTA tariff. Moreover, the entry price system included in EU F&V import regime should be taken into account. European protection for F&V is based on a threshold or "trigger price". When a product enters the European market above this trigger price then the exporter has only to pay the ad-valorem duty. If the entry price is below this trigger price, then the exporter will pay a specific duty in addition to the ad-valorem duty. This specific duty is calculated as the difference between the trigger price and the entry price. However, if the entry price is below 92% of the trigger price, then the specific duty is equal to the "maximum specific duty" fixed by the EU. In formulae, the entry price system works as follows:

$$\text{Applied duty} = \begin{cases} \textit{ad - valorem duty only} & \text{if Trigger Price} < \text{Price} \\ \textit{ad - valorem} \text{ duty} + \textit{specific - duty} & \text{if } 92\%\text{Trigger Price} < \text{Price} < \text{Trigger Price} \\ \textit{ad - valorem} \text{ duty} + \max \textit{specific - duty} & \text{if } 92\%\text{Trigger Price} > \text{Price} \end{cases} \quad [2]$$

where *Price* indicates the entry price of EU imports for that specific shipment.

Preferential entry prices are taken into account by including in equation (1) a dummy variable d_EP equal to one if the exporting country benefits from a preferential entry price and zero otherwise. [11] It is worth mentioning that no country benefits from preferential entry price for EU imports of fresh grapes, pears and apples. Under the EuroMed agreements, Morocco, Egypt, Israel and Cyprus could take advantage of reduced entry prices for orange exports to the EU, and Morocco for clementine exports as well.

Another characteristic of the protection system of the EU F&V sector is that tariffs vary within each year. This seasonal protection is related to the EU production calendar;

[11] We do not include the entry price explicitly in the computation of the preferential duties because the entry price system is administered per shipment, and we do not have available shipment data. Thus, we should use monthly data; however, the fact that the monthly import price is below the trigger price does not mean that the relevant specific tariff is charged on all shipments. Therefore, the effect of the entry price may be sometimes measured incorrectly. Furthermore, the system may be effective even in the case of no supplementary tariff being charged, as a trader would gain nothing from selling at a lower price (Swinbank and Ritson, 1995; Cioffi and dell'Aquila, 2004; Goetz and Grethe, 2009).

custom duties are higher during the European harvest period in order to protect domestic production from foreign competition. To address this issue and assess the effectiveness of PTAs more accurately monthly data on preferential policies are used.

The preferential margin for PTA *l=GSP, ACP, RTA*, product s=1,2,…,S, month m=1,2,…,12 and year t=2001,…2004, is then determined as follows:

$$\text{Pref Marg}^{s}_{ltm} = \text{MFN } \textit{ad-valorem } \text{duty}^{s}_{tm} - \text{Preferential } \textit{ad-valorem } \text{duty}^{s}_{ltm} \quad [3]$$

As ad-valorem duty concessions can either be extended to all imports of the specific product from the partner country or limited in volume by a tariff quota, we checked for all country-pairs and products to find out whether imports were higher or lower than the quota, if any. Quotas are defined over a certain number of months or by calendar year. If, in a given month, cumulative imports exceed the quota, then from that month *out-of-quota* duties are used.[12]

The data on production, which are from FAO, are on an annual basis at HS6 level. In order to obtain monthly data, we first determine the monthly share of imports from eight groups of European partners by splitting the sample of exporting countries into eight clusters on the basis of latitude. The monthly production of an exporter is thus given by annual production multiplied by the EU monthly import share from countries belonging to the same latitude group. In other words, the percentage distribution of a country's production of each product by month and commodity-level in a given year is assumed equal to the analogous distribution of the EU imports of the same product from the countries belonging to the same latitude group. In order to move from HS6 to HS8 level we used the same procedure considered for converting yearly into monthly data. In particular, the percentage distribution of a country's production of each product at HS8 level with respect to that at HS6 level in a given year is assumed equal to the analogous distribution of EU imports of the same product from the countries belonging to the same latitude group. Similarly, in order to determine monthly production at HS8 level of importing countries, we assume that the monthly share of production in a given year is equal to the monthly share of intra-European imports at HS8 level.

Finally, the index of the export capacity of each exporter is determined by using export data from COMTRADE. For each country this is derived from the share of product *k* exports with respect to world exports of product *k* divided by the share of the commodity *k*

[12] The few cases of exports exceeding the quota over the period 2001-2004 refer to Israel and Chile (2003 and 2004) for fresh grapes, Romania for apples, Tunisia and Egypt for oranges, Morocco and Israel (2001) for mandarins**.**

production divided by world production of product *k*. The monthly distribution of exports is then determined in the same way as for production.

All variables are valued in constant 2000 Euros.

With respect to the econometric methods, the use of a gravity equation for explaining trade flows suffers from three main potential sources of bias: country-pair heterogeneity, endogeneity and sample selection.

Heterogeneity is due to observable and non-observable factors specific for each country-pair. From an econometric perspective, the omission of such factors leads to a mis-specification of the gravity equation, and is bound to produce biased and/or inconsistent estimates. To take account of country-pair individual effects we include in the gravity equation country-pair specific effects α_{ij}^{s}. Moreover, since we use seasonally unadjusted import data we augment the gravity equation (1) with monthly dummies: "just as including a time trend in a regression has the interpretation of initially detrending the data, including seasonal dummies in a regression can be interpreted as deseasonalizing the data" (Wooldridge 2006: 373).

As for the endogeneity of regressors, PTA variables could be simultaneously determined with trade flows. Thus, we perform a Durbin-Wu-Hausman (DWH) endogeneity test, which compares Ordinary Least Squares (OLS) and Instrumental Variable (IV) estimations. The instruments considered are: the logarithm of the ratio of physical capital and labour, as proxy of factor endowments, the logarithm of aid received by the exporting country, and a polity indicator, which is drawn from the POLITY IV database (available at http://www.cidcm.umd.edu/inscr/polity/) and goes from -10 (high autocracy) to +10 (high democracy).[13] As can be seen in table 2, the p-values of the DWH test allow us to reject the hypothesis of endogeneity of the preferential variables in all estimations.

As regards the sample selection, the most common approach is to treat zero-trade flows as missing values, in other words sweeping them under the carpet. However, ignoring zero trade flows could lead to biased estimates. Indeed, there could be a sample selection due to the fact that the process underlying the decision not to export might be correlated with the variables used in the gravity equation to model export flows: estimates which disregard this correlation are biased (Heckman, 1978; Wooldridge, 2002). Thus we perform the test suggested by Wooldridge (1995) in order to verify the presence of non-random selection bias.

[13] We checked if the endogenous variables are strongly correlated with the instruments, even after sifting out the other exogenous variables in the equation, in order to meet the "order conditions" (Wooldridge, 2006).

This procedure "can be viewed as an extension of Heckman's (1979) procedure to an unobserved effects framework" (Wooldridge, 1995: 124) and controls for unobserved heterogeneity by adopting a fixed effects (FE) model. Thus, it is possible for the unobserved components to be correlated with the explanatory variables. Moreover, idiosyncratic errors may have serial dependence of unspecified form. The Wooldridge (1995) procedure requires the modelling of two different, but potentially correlated, processes. As a first step, we model the selection process, which determines the decision on whether to export or not, through a probit equation, where the dependent variable is equal to one if country *j* exports to country *i,* and zero otherwise.[14] As a second step, in the primary process (that is the gravity equation), we augment the regressions by the Inverse Mills Ratio (IMR or lambda) retrieved from the probit estimates and test the significance of the IMR coefficient.[15] As the latter is significant only in the estimations for fresh grapes and apples, the estimates that should be considered for imports of pears, oranges and mandarins are obtained by the Least Square Dummy Variable (LSDV) model, while the estimates for fresh grapes and apples are obtained by using the Wooldridge (1995) procedure. However, in the latter case we also report fixed effect estimates to provide a comparison.

Successively, we estimate the gravity equation by considering the Poisson model. In so doing, we accept the argument put forward by Santos Silva and Tenreyro (2006) that a multiplicative gravity specification estimated by the Pseudo-Maximum Likelihood is more appropriate. These authors show that, because of the heteroskedasticity of the error term of the originally multiplicative specification, the log-linearization of the gravity equation changes the "properties of the error term in a nontrivial way" (Santos Silva and Tenreyro, 2006: 644) and, as a result, the statistical independence between the error term and the independent variables is violated leading to inconsistent estimates. Their conclusion is also supported by Westerlund and Wilhelmsson (2006). However, Martin and Pham (2008) using

[14] Results obtained from the probit model mainly show that the GSP scheme increases the probability of mandarin exports from eligible countries to the EU, ACP preferential margins are positively correlated with the decision to export fresh grapes, pears and mandarins, while preferential margins granted under RTAs enhance the probability to exports all the five fruits analysed in this paper. Estimates are reported in Appendix C.

[15] The augmented regressions are estimated on the sample of positive export flows. It is worth mentioning that the regressors included in the probit equation are the variables of the gravity equation. In fact, we find that exclusion restrictions are difficult to justify either on theoretical or empirical grounds. Therefore, as the Inverse Mills ratio is a nonlinear function of regressors, the non-linearity of lambda is the sole source of identification in the procedure adopted to control for selection bias.

a Monte Carlo simulation show that the Poisson model could be unsuitable if there are too many zero trade observations.

We consider the Stavins and Jaffe (1990) goodness of fit for evaluating the forecasting performance of the different estimators (Martinez-Zarzoso *et al.*, 2007; Martinez-Zarzoso and Marquez-Ramos, 2007). It is equal to one minus the U-Theil statistics and is based on the difference between predicted and actual values of the dependent variable.

Finally, in order to compare our results with those obtained without using preferential margins and without considering monthly observations at the HS-8 level, we report in Appendix D estimates obtained with dummies rather than preferential margins as proxies of preferential schemes and aggregated data of the five products rather than disaggregated observations. Aggregated preferential margins are based on the simple average of tariffs at the relevant commodity level. The same procedure is adopted for converting monthly to yearly observations, i.e., we computed the simple average of monthly tariffs.

4. Assessment of the impact of PTAs on European imports of fresh grapes, apples, pears, oranges and mandarins

In this section we present the econometric results obtained by estimating the log-linear gravity specification (table 2).

First of all, it should be observed that, while the coefficient of production for the exporters, when significant, is always positive, other standard gravity variables such as importer production, population and per capita GDP have different impacts depending on the different commodities considered. In more detail, importer production and population for the exporters, when significant, generally have a negative impact, except in the case of apples and mandarins. On the contrary, importer population is mainly positive except for apples and mandarins. As a matter of fact, it is worth mentioning that the signs expected for populations are ambiguous. Indeed, in most papers the coefficients related to population are expected to be positive because it is believed that larger countries trade more. However, it has been shown (Oguledo and Macphee, 1994) that if an exporter is large in terms of population it may either need its production to satisfy domestic demand, so that it exports less, or it may export more than a small country, as is the case when large firms achieve economies of scale. The same reasoning can be applied to the case of the importing country: if large, it may either import less because it is likely that the domestic sector finds it profitable to develop and make the country self-sufficient, or it may import more because it cannot satisfy all domestic demand with its own production (Pusterla, 2007). Per capita GDP for the exporters, when significant,

has a positive effect on EU imports of all products but mandarins, while the impact of importer per capita GDP is significantly positive only in the case of orange imports.

Furthermore, the export capacity of exporting countries exerts a positive effect on all EU imports, even though it is not significantly different from zero in the case of pears and mandarins.[16]

As far as preferential variables are concerned, it is worth mentioning that some estimates of preferential variables do not appear in table 2 because they are always equal to zero when import values are positive.[17] As regards estimates, the impact of the preferential margins of GSP is significant only for fresh grape imports when using the Wooldridge (1995) procedure, but negative.[18] The negative impact of the GSP on fresh grape exports is lower, equal to -5.5 per cent, if countries benefit simultaneously from Cotonou agreement or a RTA.

The Cotonou agreement seems to be very profitable for ACP countries only for fresh grapes. In more detail, an increase of the ACP preferential margins by one percentage point determines an average increase of fresh grape imports by 6.9 per cent.

Moreover RTAs seem to be very effective in enhancing EU imports of fresh grapes and apples, the relative coefficients being significantly positive and relatively high. Furthermore, it is worth mentioning that countries which export apples to the EU find it profitable to benefit from both RTAs and GSP schemes at the same time.[19]

Finally, the coefficient of the entry price dummy[20] is not significant for EU imports of oranges. This outcome confirms the results obtained by Cioffi and dell'Aquila (2004) and Goetz and Grethe (2009) and those discussed in the GEIE Agrosynergie (2008) that the entry-price is of little relevance for orange and mandarin exports from Mediterranean countries.

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[16] This means that if the relative export capacity of pears or mandarins from a given country increases, the exports to the EU do not rise. In the case of pears this result could be due to the behaviour of some important exporter countries which trade with the EU. For example, there are several Latin-American countries within the group of dominant exporters which may prefer to ship their exports towards nearer countries, such as the USA and/or Canada. The same could happen in the case of mandarins, for which, in addition, there could be a problem of a binding quota for some Mediterranean exporting countries.

[17] The same holds for interaction variables: in some cases multiplying two preferential margins gives a variable always equal to zero and this is why sometimes the coefficients of interaction variables do not appear in estimations.

[18] Negative impact of GSP on trade is obtained in other contributions, such as Agostino *et al.* (2008), Rose (2004), Lederman and Özden (2004), Oguledo and MacPhee (1994).

[19] Estimates of the impact of the GSP on apple exports are not reported because the GSP preferential variable is eliminated since when trade flows are positive there are only six observations for which GSP preferential margins are positive and not overlapping with the RTA preferences.

[20] The coefficient of the entry price dummy for mandarins does not appear because when import values are positive the entry price variable is always equal to zero.

Table 2 - Estimates of gravity model. Dependent Variable: imports in logs (2001-2004).

	Fresh Grapes						Pears			Apples						Oranges			Mandarins		
	Fixed Effects			*Wooldridge (1995)*			*Fixed Effects*			*Fixed Effects*			*Wooldridge (1995)*			*Fixed Effects*			*Fixed Effects*		
GSP	0.034	*(.08)*		-0.064	*(.09)*	***	0.061	*(.11)*											-0.167	*(.41)*	
ACP	-0.084	*(.1)*		0.048	*(.1)*	***										-0.016	*(.03)*		0.080	*(.21)*	
RTA	0.162	*(.04)*	***	0.224	*(.07)*	***	0.026	*(.03)*		-0.004	*(.05)*		0.218	*(.02)*	***	-0.014	*(.03)*		0.020	*(.13)*	
GSP*ACP	0.009	*(.02)*		0.004	*(.02)*	***	0.009	*(.31)*											0.000	*(.02)*	
GSP*RTA	-0.012	*(.01)*		0.012	*(.02)*	***	-0.004	*(.04)*		0.115	*(.03)*	***	0.163	*(.01)*	***				-0.022	*(.02)*	
d_EP																0.544	*(.38)*				
log(PROD_exporter)	0.634	*(.04)*	***	1.514	*(.33)*	***	0.651	*(.04)*	***	0.520	*(.03)*	***	1.446	*(.08)*	***	0.437	*(.05)*	***	0.082	*(.08)*	
log(PROD_importer)	-0.129	*(.17)*		-0.343	*(.16)*	***	-0.004	*(.08)*		-0.194	*(.12)*		0.097	*(.)*	***	0.294	*(.24)*		0.366	*(.13)*	***
log(POP_exporter)	-35.25	*(13.41)*	***	-32.43	*(11.29)*	***	-45.33	*(9.9)*	***	41.123	*(11.59)*	***	25.95	*(.08)*	***	-4.459	*(10.12)*		15.141	*(13.4)*	
log(POP_importer)	23.113	*(13.13)*	*	25.52	*(12.8)*	***	-9.973	*(8.88)*		14.747	*(5.26)*	***	-5.370	*(.57)*	***	-1.260	*(8.94)*		-32.642	*(11.51)*	***
log(GDP/POP_exporter)	2.334	*(2.07)*		2.706	*(2.23)*	***	1.002	*(.93)*		4.512	*(.8)*	***	1.823	*(.02)*	***	0.775	*(1.39)*		-3.163	*(1.79)*	*
log(GDP/POP_importer)	-2.738	*(3.08)*		-5.046	*(3.23)*	***	-1.287	*(1.75)*		-2.544	*(1.43)*	*	-6.472	*(.02)*	***	6.295	*(2.47)*	**	5.180	*(3.86)*	
log(export capacity)	0.381	*(.13)*	***	1.056	*(.31)*	***	0.078	*(.06)*		0.143	*(.05)*	***	0.928	*(.07)*	***	0.105	*(.04)*	***	0.018	*(.04)*	
trend	0.198	*(.35)*		0.514	*(.47)*	***	0.415	*(.21)*	**	-0.668	*(.17)*	***	0.654	*(.02)*	***	-0.983	*(.24)*	***	-0.357	*(.42)*	
constant	226.34	*(356.5)*		-23.93	*(13.4)*	***	983.51	*(241.6)*	***	-980.2	*(222.5)*	***	-32.69	*(2.68)*	***	47.38	*(230.7)*		294.58	*(331.5)*	
Observations	1231			1231			1426			2713			2713			890			530		
R-squared	0.6489			0.4112			0.72			0.6643			0.2075			0.6963			0.5603		
Wu-Hausman test	1.227						0.403			1.516						0.272			2.611		
p-value	*(.3)*						*(.75)*			*(.21)*						*(.85)*			*(.05)*		
Stavins and Jaffe (1990) index	0.095			0.879			0.064			0.067			0.883			0.465			0.089		
Sample selection Test *Lambda significance*				3.994	*(1.71)*	**	1.420	*(1.8)*					4.091	*(1.25)*	***	2.024	*(1.97)*		8.851	*(5.59)*	

Note: all regressions include monthly dummies; standard errors in parenthesis (robust to heteroskedasticity). (*), (**), (***) denote statistical significance at the 10%, 5% and 1% level, respectively.

Moreover, it should be mentioned that entry-prices can be easily circumvented both legally and illegally (Garcia-Alvarez Coque, 2002; Goetz and Grethe, 2009).

4.1 Poisson Pseudo-Maximum Likelihood estimation of the gravity model

In this section we report the results obtained with the Pseudo-Maximum Likelihood estimator (table 3). In these estimates, as in the previous ones, we also control for commodity- country pair heterogeneity α_{ij}^{s} and we include monthly dummies.

First of all, it should be noted that the exporter production always has a positive and significant effect on EU imports, while the importer production has positive impact in the case of oranges and mandarins only.[1] Moreover, importer per capita GDP has a positive impact on EU imports of oranges only, while the effect of exporter per capita GDP is always positive. Furthermore, exporter population has a positive effect only for imports of apples and mandarins, and importer population for apples and fresh grapes.

The export capacity always has a positive and significant impact on EU imports, confirming that *ceteris paribus* the ability to place domestic products on the international market matters when considering the volume of exports to the EU.

The preferential entry price has a significant impact on orange imports only with a positive sign indicating, in contrast to that obtained in the previous section, that a reduced entry price could enhance exports of oranges.

As for preferential variables, it can be observed that estimates of the Poisson model are substantially different from those obtained adopting the LSDV model and the Wooldridge (1995) procedure. Indeed, we find that GSP has a positive and marked effect in enhancing trade of EU imports of apples. The positive impact of GSP is also obtained in the case of mandarin imports: considering the interaction variables, if the preferential margin of GSP rises by one percentage point, the EU imports of mandarins increase by about 10.5 per cent. The gain of incrementing the Cotonou preferential margin by one percentage point will be 16.4 per cent and 57.4 per cent for exports from ACP countries of fresh grapes and mandarins, respectively. Furthermore, RTAs are very effective in enhancing EU imports of fresh grapes, mandarins and pears. Moreover, it should be noted that eligibility for both GSP and ACP schemes at the same time has a negative impact on exports of fresh grapes, pears

[1] The positive impact of importer production on EU imports is positive and relatively high in the case of oranges and mandarins only. This might be due to a competition in the European citrus market between domestic and foreign producers, stronger than in other sectors.

and mandarins, while eligibility for both GSP and RTAs increases the amount of all exports but oranges.

Last but not least, the Stavins and Jaffe (1990) index shows that, overall, the Wooldridge (1995) procedure should be preferred to the Poisson model and the latter is more suitable than the LSDV model, except in the case of oranges where the Fixed Effect model seems more appropriate than the Poisson model. Thus, on the basis of Stavins and Jaffe (1990) criterion, the estimates that we should consider are those obtained through the Wooldridge (1995) procedure for fresh grapes and apples, the Poisson model for pears and mandarins and, finally, the LSDV estimator for oranges.

To sum up, the results show that the impact of preferential margins on trade is highly varied depending on the specific fruit considered, as expected. In more detail, the GSP scheme is effective in increasing exports to the EU of apples and mandarins. The Cotonou agreement is effective in enhancing EU imports of fresh grapes and mandarins, while RTAs are successful in improving EU imports from eligible countries for all fruits but oranges. Moreover, we find no effect for preferential import regimes granted by the EU for oranges, and the preferential entry price has not a significant impact on imports of citrus fruits.

The negative impact of GSP preferential margin on exports of fresh grapes and pears is somewhat surprising. Indeed, from figure 1 it seems that even though preferential margins of ordinary GSP and Drugs Regime slightly increased over 2001-2004 EU imports of fresh grapes from countries benefitting from Ordinary GSP and Drugs Scheme did not substantially increase nor decrease. However, the result obtained in the estimations could be affected by the bad performance of the EBA exporters, as their exports went to zero even though they were eligible for duty free access. Moreover, the negative impact of the GSP margin on pear exports is in line with the facts shown in figure 2, where it emerges that pear imports from GSP and Drugs Regime eligible countries significantly decreased over the period under scrutiny even though preferential margins increased.

The relative magnitude of the coefficients changes for the five commodities: RTAs seem to be more effective in increasing EU imports of fresh grapes, pears and apples. The Cotonou agreement is more successful in enhancing exports of mandarins to the EU, while in the case of oranges no preferential scheme has a positive impact on EU imports. In the latter case from figure 4 it can be seen that preferential margins did not substantially vary over the period under scrutiny, while imports did to a certain extent, indicating an unclear relationship between imports and preferences. Furthermore, from table 1 it can be observed that

preferential duties were granted for EBA, ACP and EuroMed countries, but imports from the first two groups of countries were scant, while for the third group the average import value was relatively high but less than the average value observed for GSP, other RTAs and MFN countries. Thus, also from these details it seems that exporters were not able to gain from preferences as regards orange exports. Other two aspects deserve attention. The first is that from the Comtrade database it appears that intra-EU trade increased over 2001-2004 for all the five fruits analysed, especially in the case of oranges. The second concerns the fact that only a small amount of fresh oranges is exported, as most of the orange production went to the processing sector for the production of frozen concentrated or fresh orange juice.

As for the other fruits, the results show that ACP exporters were able to significantly increase the amount of exports to the EU of fresh grapes and mandarins, catching up leading GSP and RTA exporters (see Appendix B). On the other hand, RTA countries, above all South Africa and Chile, were able to consolidate their dominant position in the EU markets for fresh grapes, pears and apples.

Furthermore, the estimates concerning the different impact of preferential schemes on EU imports could be closely connected to the relatively lower duties which some preferential schemes grant with respect to other arrangements. For example, with the exception of EBA, from table 1 it emerges that RTAs (including EuroMed) provide lower duties for apples and pears, and lower duties are also granted under the Cotonou agreement for fresh grapes, oranges and mandarins.

Finally, if we consider dummies rather than preferential margins the Stavins and Jaffe (1990) criterion indicates that estimates based on the Heckman (1979) procedure are more suitable than those obtained by the LSDV and Poisson models (tables D-1 and D-2, appendix D). The Heckman (1979) outcome indicates less heterogeneity, as estimates show that the GSP exerts a positive role on EU imports of all products but mandarins. ACP has no effect on trade while RTA has a positive impact on EU imports except in the case of oranges and mandarins; on the other hand the overlapping of GSP and RTA has a negative effect on trade. However, it should be noted that fixed effects are not taken into account because if they were the effect of the preferential dummy variables could not be estimated as it is absorbed by specific effects. Thus, estimates suffer from heterogeneity bias, and perhaps this is the reason for the anomalous estimate of the distance variable: when the relative coefficient is significant it is positive. This result confirms doubts on the validity of the estimation obtained using preferential dummies. If we consider results obtained using aggregated data (table D-3, appendix D) we note that the estimates change significantly if we move from monthly to

yearly data. These differences are more relevant when considering estimates of the log-linear gravity equation, as the Stavins and Jaffe (1990) index suggests. In more detail, if monthly data are considered all preferential margins have a significant but negative impact on EU imports except for RTAs, while results obtained using yearly observations show that only RTAs exert a significant role on EU imports with a positive effect. Overall, considering aggregated data we find that only RTA preferential margin has a positive effect on European imports. This result confirms the fact that using aggregated data could lead to misleading conclusions as it does not allow us to identify the effect of preferential trade schemes on EU imports of each specific product.

5. Conclusions

In this paper we assess the impact of PTAs on the EU imports of fresh grapes, apples, pears, oranges and mandarins using a gravity model. With respect to other contributions which use a gravity model to evaluate the effectiveness of PTAs on trade, we have introduced a number of innovations. First of all, we take into account not only tariffs but also the entry price system and quotas. Secondly, we use monthly data in order to take account of the fact that imports and protection vary seasonally, and consider disaggregated data at HS8 level. Thirdly, we control for country heterogeneity, endogeneity and sample selection by adopting the LSDV model and the Wooldridge (1995) approach and we also include monthly dummies for seasonally unadjusted data in the gravity equation (Wooldridge, 2006). Finally, we control for non-trading countries as well as heteroskedasticity of the multiplicative gravity specification by employing the Poisson model, as suggested by Santos-Silva and Tenereyro (2006).

We also report the Stavins and Jaffe (1990) goodness of fit and, on the basis of this criterion, the estimates that we considered are those obtained through the Wooldridge (1995) procedure for fresh grapes and apples, the Poisson model for pears and mandarins and, finally, the LSDV estimator for oranges.

The results show that the impact of preferential margins on trade differs depending on the commodity line considered. In more detail, exporters of mandarins to the EU seem to benefit from both the GSP scheme and the Cotonou agreement. The GSP scheme seems to be also effective in increasing apple exports to the EU, while exporters of fresh grapes seem to gain from eligibility for the Cotonou agreement. Furthermore, RTAs seem to reach the goal of improving EU imports from eligible countries of all fruits but oranges. We find no effect of preferential import regimes granted by the EU for oranges, and the preferential entry price has no significant impact on imports of the two citrus fruits analysed. We also observe a

Table 3 - Poisson Pseudo-Maximum Likelihood estimates of gravity model. Dependent Variable: imports in levels (2001-2004).

	FRESH GRAPES			PEARS			APPLES			ORANGES			MANDARINS		
GSP	-0.079	*(.)*	***	-0.011	*(.01)*	**	0.764	*(.05)*	***	-0.621	*(.73)*		0.278	*(.04)*	***
ACP	0.229	*(.02)*	***							-0.028	*(.)*	***	0.526	*(.02)*	***
RTA	0.153	*(.)*	***	0.106	*(.)*	***	-0.039	*(.)*	***	0.000	*(.)*		0.079	*(.)*	***
GSP*ACP	-0.015	*(.)*	***	-0.394	*(.03)*	***				0.040	*(.04)*		-0.017	*(.)*	***
GSP*RTA	0.002	*(.)*	***	0.046	*(.)*	***	0.047	*(.02)*	***				0.004	*(.)*	***
d_EP										2.496	*(.03)*	***	18.153	*(626.52)*	
log(PROD_exporter)	0.990	*(.)*	***	0.974	*(.)*	***	0.998	*(.)*	***	0.976	*(.)*	***	0.823	*(.01)*	***
log(PROD_importer)	-0.187	*(.)*	***	-0.016	*(.01)*	***	-0.080	*(.)*	***	0.517	*(.01)*	***	1.440	*(.02)*	***
log(POP_exporter)	-27.703	*(.22)*	***	-29.405	*(.66)*	***	40.596	*(.35)*	***	-27.074	*(.49)*	***	2.790	*(.7)*	***
log(POP_importer)	9.503	*(.31)*	***	-13.007	*(.52)*	***	9.270	*(.24)*	***	-8.084	*(.36)*	***	-24.136	*(.98)*	***
log(GDP/POP_exporter)	0.165	*(.05)*	***	0.878	*(.05)*	***	4.499	*(.04)*	***	2.544	*(.06)*	***	0.482	*(.17)*	***
log(GDP/POP_importer)	-1.174	*(.06)*	***	-0.433	*(.11)*	***	-3.375	*(.05)*	***	2.213	*(.11)*	***	-0.713	*(.29)*	**
log(export capacity)	0.253	*(.)*	***	0.162	*(.)*	***	0.170	*(.)*	***	0.093	*(.)*	***	0.045	*(.)*	***
trend	0.365	*(.01)*	***	0.175	*(.01)*	***	-0.538	*(.01)*	***	-0.282	*(.01)*	***	0.067	*(.03)*	**
Observations	4298			4704			10243			4747			3637		
Wald Chi-square	720369.88			304964.5			530158			138044.2			56203.86		
Log-Likelihood	-574287.9			-103297			-388522			-101901			-42117		
Stavins and Jaffe (1990) index	0.203			0.257			0.276			0.138			0.174		

Note: all regressions include monthly dummies; standard errors in parenthesis (robust to heteroskedasticity). (*), (**), (***) denote statistical significance at the 10%, 5% and 1% level, respectively.

positive impact on European imports of the export capacity indicator, indicating that *ceteris paribus* the European imports are significantly affected by the capacity of exporting countries to place their products on the international market.

If dummy variables rather than preferential margins and aggregated rather than disaggregated data were used, very different results would have been obtained.

Further investigation could verify whether the results obtained in this paper are robust to the use of other gravity specifications, such as that proposed by Romalis (2007), where instead of bilateral trade flows, ratios of ratios of bilateral trade flows across partners are considered. This model has the advantage of substantially reducing the number of independent variables used in the empirical analysis. However, it has the disadvantage of needing to identify a control group of importing countries whose trade policy did not change over the period under study with respect to the exporters considered and also requiring trade data between exporters and this control market, which could not be available on a monthly basis.

The limited effectiveness of some PTAs granted by the EU in fostering trade found in this study could be due to the fact that developing countries underutilize trade preferences and the low rate of utilization could be "largely explained by the eligibility of a given product for alternative regimes" (Bureau *et al.*, 2007: 185). In particular, when exporters have a choice, they seem to prefer certain regimes, such as the agreement in favour of ACP countries (Bureau and Gallezot; 2004; Bureau *et al.*, 2007). As tariffs granted under the EU-GSP scheme, especially under EBA and Drugs Regime, are generally lower than those observed for RTA and ACP agreements, it seems that there are non-tariff determinants which drive the choice of a specific preferential scheme. These concerns are also empirically verified for some fruits through the estimated model. Non-tariff barriers could be determined by transaction costs associated with the rules of origin, administrative compliance and sanitary and phytosanitary standards which could lessen the effectiveness of preferential margins, especially for the smallest or poorest countries (De Maria *et al.*, 2008). In particular, as Bureau *et al.* (2007: 196) highlighted, the main motivation of the low utilization of preferences is that developing countries are unable to "match the technical, sanitary, phytosanitary and traceability requirements imposed by developed countries, and in particular the private standards imposed by importers and retailers". Indeed, producers in developed countries can take advantage of technology whereas producers in developing or less

developed countries are often unable to satisfy the standards required by the EU private retail sector.

However Maertens and Swinnen (2008 and 2009) and Minten *et al.* (2006) claim that demanding standards in agricultural trade could as well stimulate the development of competitive capacity in export markets. Anyway, there is no doubt that international institutions should gear their policies in this direction in order to facilitate the attainment of quality standards by developing countries, by stimulating foreign investments and increasing aid to develop and speed up the use of appropriate agricultural technologies. Moreover, a further reduction of tariff levels in favour of developing countries within the GSP scheme could produce poor results if it is not matched with a revision of the requirements regarding the rules of origin.

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Appendix A

List of exporting countries by latitude (in degrees)

Latitude lower than -30: Argentina, Australia, Chile, New Zealand, Uruguay.

Latitude higher than -30 and lower than -15: Bolivia, Botswana, Brazil, Fiji, French Polynesia, Lesotho, Madagascar, Mauritius, Mozambique, Namibia, New Caledonia, Paraguay, South Africa, Swaziland, Tonga, Vanuatu, Zambia, Zimbabwe.

Latitude higher than -15 and lower than 0: Angola, Burundi, Comoros, Congo, Dem. Rep. of the Congo, Ecuador, Indonesia, Kenya, Malawi, Papua New Guinea, Peru, Rwanda, Samoa, Seychelles, Solomon Islands, Tanzania.

Latitude higher than 0 and lower than 15: American Samoa, Aruba, Barbados, Benin, Brunei-Darussalam, Burkina Faso, Cambodia, Cameroon, Cape Verde, Central African Rep., Chad, Colombia, Costa Rica, Côte d'Ivoire, Djibouti, El Salvador, Equatorial Guinea, Ethiopia, FS Micronesia, Gabon, Gambia, Ghana, Grenada, Guam, Guatemala, Guinea, Guinea-Bissau, Guyana, Honduras, Kiribati, Liberia, Malaysia, Maldives, Mali, Marshall Islands, Mayotte, Neth. Antilles, Nicaragua, Niger, Nigeria, Palau, Panama, Philippines, Saint Lucia, Saint Vincent and the Grenadines, Sao Tome and Principe, Senegal, Sierra Leone, Singapore, Somalia, Sri Lanka, Suriname, Thailand, Timor-Leste, Togo, Trinidad and Tobago, Uganda, Venezuela.

Latitude higher than 15 and lower than 30: Antigua and Barbuda, Bahamas, Bahrain, Bangladesh, Belize, Bhutan, Cayman Islands, China Hong Kong SAR, China Macao SAR, Cuba, Dominica, Dominican Rep., Eritrea, Haiti, India, Jamaica, Kuwait, Lao People's Dem. Rep., Mauritania, Mexico, Myanmar, Nepal, Oman, Puerto Rico, Qatar, Saint Kitts and Nevis, Saudi Arabia, Sudan, United Arab Emirates, Viet Nam, Virgin Islands, Yemen.

Latitude higher than 30 and lower than 45: Albania, Algeria, Andorra, Armenia, Azerbaijan, Bermuda, Bosnia Herzegovina, Bulgaria, Canada, China, Cyprus, Egypt, Georgia, Iran, Iraq, Israel, Japan, Jordan, Kazakhstan, Kyrgyzstan, Libya, Lebanon, Malta, Morocco, Pakistan, Rep. of Korea, Romania, San Marino, Serbia and Montenegro, Syria, Tajikistan, TFYR of Macedonia, Tunisia, Turkey, Turkmenistan, USA, West Bank and Gaza, Uzbekistan.

Latitude higher than 45 and lower than 60: Belarus, Channel Islands, Croatia, Czech Rep., Dem. People's Rep. of Korea, Estonia, Hungary, Isle of Man, Latvia, Liechtenstein, Lithuania, Monaco, Mongolia, Norway, Poland, Rep. of Moldova, Russian Federation, Slovakia, Slovenia, Switzerland, Ukraine.

Latitude higher than 60: Faeroe Islands, Greenland, Iceland.

Appendix B – Most important exporting countries to the EU by product in descending order of importance, 2001-2004.

	FRESH GRAPES		PEARS		APPLES		ORANGES		MANDARINS	
	Exporters	**Import value 2001-2004**	**Exporters**	**Import value 2001-2004**	**Exporters**	**Import value 2001-2004**	**Exporters**	**Import value 2001-2004**	**Exporters**	**Import value 2001-2004**
1	South Africa	442621.200	Argentina	206048.800	New Zealand	264428.000	South Africa	296524.300	Morocco	140721.000
2	Chile	347154.300	South Africa	110698.400	Chile	250371.400	Morocco	137525.000	Turkey	73801.910
3	Brazil	333110.300	Chile	82837.770	South Africa	212948.200	Argentina	77433.340	South Africa	71192.450
4	Argentina	86696.900	Turkey	17530.090	Argentina	121986.300	Uruguay	63385.810	Uruguay	57060.470
5	USA	75896.320	USA	14830.840	Brazil	95958.590	Brazil	56893.030	Argentina	50363.410
6	Turkey	63264.840	China	10947.590	USA	64655.800	Israel	53536.200	Israel	25242.590
7	Egypt	54564.190	New Zealand	7639.288	China	47797.260	Tunisia	33022.450	Peru	21037.520
8	India	31705.270	Rep. of Korea	2765.643	Australia	13104.850	Turkey	26623.620	Chile	14567.010
9	Israel	25609.030	Uruguay	1381.320	Canada	12590.230	Cuba	18409.820	Brazil	5145.142
10	Peru	22144.870	Australia	1256.148	Uruguay	7167.882	USA	3925.856	Pakistan	1669.533
11	Morocco	14245.240	Switzerland	522.441	Switzerland	1967.121	Australia	3394.298	Australia	1381.575
12	Australia	3914.748	Brazil	502.401	Turkey	654.609	Chile	2988.105	Jamaica	1263.532
13	Namibia	3451.737	Morocco	326.087	Serbia and Montenegro	527.114	Jamaica	2717.143	USA	980.635
14	Mexico	1305.603	Canada	97.145	Ukraine	264.818	Zimbabwe	2087.689	Zimbabwe	539.848
15	Switzerland	495.704	Japan	81.644	Rep. of Korea	221.439	Swaziland	1990.277	Switzerland	362.734
16	Saudi Arabia	177.080	Serbia and Montenegro	40.568	Romania	187.122	Belize	1979.117	Croatia	142.151
17	China	145.353	China Hong Kong SAR	34.240	Japan	155.746	Dominica	530.404	Norway	114.218
18	Uruguay	128.777	Norway	32.467	Croatia	153.037	Colombia	502.002	China	28.203
19	Jordan	125.664	Bulgaria	28.132	Iran	144.139	Dominican Rep.	365.310	Paraguay	23.759
20	Norway	98.748	Romania	20.391	Singapore	133.029	Venezuela	329.177	Colombia	0.869

Source: own computations.

Appendix C – Probit estimates on the decision to export to the EU (2001-2004).

	FRESH GRAPES			PEARS			APPLES			ORANGES			MANDARINS		
GSP	-0.0164	*(.02)*		-0.0464	*(.03)*	*				-0.1257	*(.12)*		0.1937	*(.08)*	**
ACP	0.0527	*(.03)*	*	1.0803	*(.16)*	***				-0.0174	*(.01)*	*	0.2281	*(.07)*	***
RTA	0.0383	*(.01)*	***	0.0920	*(.01)*	***	0.0613	*(.01)*	***	0.0541	*(.01)*	***	0.0724	*(.01)*	***
GSP*ACP	-0.0016	*(.01)*		-0.3954	*(.05)*	***				0.0057	*(.02)*		-0.0138	*(.)*	***
GSP*RTA	0.0021	*(.)*		0.0431	*(.)*	***	0.0308	*(.01)*	***	0.1133	*(.06)*	**	-0.0133	*(.)*	***
d_EP													0.4836	*(.13)*	***
log(PROD_exporter)	0.2825	*(.01)*	***	0.3266	*(.01)*	***	0.3039	*(.01)*	***	0.2641	*(.01)*	***	0.2333	*(.01)*	***
log(PROD_importer)	-0.0947	*(.01)*	***	0.0559	*(.01)*	***	0.0109	*(.01)*		-0.0584	*(.01)*	***	0.0342	*(.02)*	**
log(POP_exporter)	0.0250	*(.01)*	**	-0.0330	*(.01)*	**	-0.0062	*(.01)*		-0.0998	*(.01)*	***	-0.1357	*(.02)*	***
log(POP_importer)	0.4050	*(.02)*	***	0.2102	*(.02)*	***	0.3122	*(.01)*	***	0.3126	*(.11)*	***	0.0706	*(.12)*	
log(GDP/POP_exporter)	-0.0143	*(.02)*		-0.0341	*(.02)*	**	0.0431	*(.01)*	***	0.0931	*(.02)*	***	0.0988	*(.02)*	***
log(GDP/POP_importer)	0.1614	*(.08)*	**	0.4767	*(.06)*	***	0.1285	*(.04)*	***	-0.1238	*(.31)*		0.4858	*(.3)*	
log(export capacity)	0.2622	*(.01)*	***	0.2031	*(.01)*	***	0.2656	*(.01)*	***	0.1319	*(.01)*	***	0.1315	*(.01)*	***
trend	0.0060	*(.02)*		-0.0774	*(.02)*	***	0.0647	*(.01)*	***	0.0031	*(.04)*		0.0097	*(.04)*	
constant	-10.1173	*(.66)*	***	-8.3886	*(.6)*	***	-9.3399	*(.39)*	***	-7.3269	*(.68)*	***	-10.8983	*(1.13)*	***
Observations	24772			38181			80535			37470			25985		
LR-chi squared	4568.66			5478.98			9109.72			2887.65			1349.62		
Pseudo R-squared	0.4666			0.4501			0.3839			0.3431			0.2608		
Log-Likelihood	-2610.89			-3347.5			-7310.7			-2764.2			-1912.7		

Note: all regressions include monthly dummies; standard errors in parenthesis (robust to heteroskedasticity). (*), (**), (***) denote statistical significance at the 10%, 5% and 1% level, respectively.

Appendix D

Table D.1 - Estimates of gravity model using dummy variables as proxies of the preferential margins. Dependent Variable: imports in logs (2001-2004).

	Fresh Grapes						Pears						Apples						Oranges			Mandarins		
	Pooled OLS			*Heckman (1979)*			*Pooled OLS*			*Heckman (1979)*			*Pooled OLS*			*Heckman (1979)*			*Pooled OLS*			*Pooled OLS*		
GSP	-0.412	*(.92)*		3.243	*(1.18)*	***	0.488	*(.61)*		4.604	*(1.1)*	***	0.654	*(.55)*		2.907	*(.53)*	***	1.660	*(.53)*	***	-0.306	*(.88)*	
ACP	-1.633	*(.95)*	*	-0.069	*(.77)*		-2.975	*(1.2)*	**	0.778	*(2.48)*		-3.097	*(1.41)*	**	-2.382	*(1.92)*		0.393	*(.67)*				
RTA	-0.809	*(.93)*		3.653	*(1.44)*	**	-0.772	*(.96)*		9.228	*(2.55)*	***	-0.756	*(1.14)*		2.226	*(.8)*	***	0.543	*(.69)*		-1.414	*(.97)*	
GSP*RTA	0.918	*(.95)*		-3.652	*(1.46)*	**	0.562	*(.96)*		-7.646	*(2.11)*	***	0.641	*(1.13)*		-1.644	*(.69)*	**	0.276	*(.64)*		0.841	*(.96)*	
d_EP																			0.094	*(.62)*		1.641	*(.62)*	**
log(PROD exporter)	0.620	*(.05)*	***	1.207	*(.18)*	***	0.508	*(.05)*	***	1.375	*(.22)*	***	0.344	*(.07)*	***	0.782	*(.1)*	***	0.330	*(.06)*	***	0.182	*(.08)*	**
log(PROD importer)	-0.341	*(.05)*	***	-0.496	*(.05)*	***	0.089	*(.07)*		0.218	*(.06)*	***	0.226	*(.09)*	**	0.358	*(.05)*	***	0.204	*(.05)*	***	-0.109	*(.08)*	
log(POP exporter)	-0.524	*(.23)*	**	-0.229	*(.13)*	*	-0.082	*(.2)*		-0.069	*(.12)*		-0.075	*(.14)*		-0.067	*(.05)*		-0.358	*(.14)*	**	-0.461	*(.16)*	***
log(POP importer)	0.529	*(.31)*	*	1.099	*(.22)*	***	-0.180	*(.18)*		-0.022	*(.12)*		-0.306	*(.19)*		-0.015	*(.1)*		-0.092	*(.61)*		0.857	*(.64)*	
log(GDP/POP exporter)	-0.759	*(.37)*	**	-0.195	*(.23)*		-0.035	*(.33)*		0.882	*(.31)*	***	-0.060	*(.37)*		0.578	*(.19)*	***	0.774	*(.41)*	*	-0.143	*(.31)*	
log(GDP/POP importer)	-1.540	*(.83)*	*	-0.732	*(.5)*		-0.254	*(.54)*		0.990	*(.48)*	**	1.005	*(.38)*	***	1.484	*(.21)*	***	1.765	*(1.68)*		-1.732	*(1.64)*	
log(export capacity)	0.225	*(.11)*	*	0.619	*(.13)*	***	0.094	*(.05)*	*	0.467	*(.11)*	***	0.075	*(.09)*		0.360	*(.07)*	***	0.106	*(.04)*	**	0.027	*(.05)*	
log(distance)	0.024	*(.43)*		0.719	*(.35)*	**	0.351	*(.36)*		3.187	*(.75)*	***	0.233	*(.38)*		1.571	*(.34)*	***	-0.880	*(.61)*		-0.096	*(.42)*	
common language	-0.302	*(.43)*		0.357	*(.41)*		-0.650	*(.51)*		-0.402	*(.41)*		-0.233	*(.3)*		0.275	*(.22)*		0.975	*(.6)*		0.450	*(.43)*	
colonial ties	1.192	*(.37)*	***	1.316	*(.33)*	***	1.639	*(.39)*	***	3.347	*(.56)*	***	2.465	*(.29)*	***	3.031	*(.23)*	***	0.275	*(.6)*		0.226	*(.46)*	
landlocked in the pair	1.933	*(1.45)*		0.646	*(.6)*		1.362	*(.72)*	*	-0.653	*(.62)*		-0.535	*(.59)*		-1.839	*(.44)*	***	1.442	*(.86)*	*			
common border	-0.407	*(1.22)*		2.496	*(1.07)*	**	0.908	*(.53)*	*	6.093	*(1.39)*	***	2.182	*(.79)*	***	5.834	*(.87)*	***	-0.885	*(.8)*		-1.025	*(.67)*	
trend	0.314	*(.16)*	*	0.223	*(.11)*	**	-0.081	*(.11)*		-0.562	*(.17)*	***	-0.082	*(.1)*		-0.148	*(.06)*	**	-0.505	*(.21)*	**	0.095	*(.22)*	
constant	16.247	*(7.15)*	**	-22.628	*(12.04)*	*	5.950	*(6.37)*		-47.615	*(13.92)*	***	-1.398	*(6.76)*		-32.472	*(7.08)*	***	-4.010	*(5.59)*		10.391	*(6.43)*	
Observations	1163			1163			1111			1111			2257			2257			873			530		
R-squared	0.4154						0.4332						0.3114						0.4676			0.3671		
Wald - Chi2				2272						2369						4370								
Stavins and Jaffe (1990)	0.777			0.923			0.805			0.937			0.783			0.929			0.815			0.769		
Sample selection Test				2.698	*(.78)*	***				3.925	*(.93)*	***				2.161	*(.44)*	***	1.147	0.982		0.068	*(2.18)*	

Note: all regressions include monthly dummies; standard errors in parenthesis (robust to heteroskedasticity) adjusted by clustering observations at the commodity-country pair level.
(*), (**), (***) denote statistical significance at the 10%, 5% and 1% level, respectively.

Table D.2 - Poisson Pseudo-Maximum Likelihood estimates of gravity model using dummy variables as proxies of the preferential margins. Dependent Variable: imports in levels (2001-2004).

	FRESH GRAPES			PEARS			APPLES			ORANGES			MANDARINS		
GSP	4.9967	*(.85)*	***	2.4970	*(.94)*	***	0.8561	*(.58)*		4.2834	*(.86)*	***	1.9770	*(1.11)*	*
ACP	1.4213	*(1.1)*		-2.0799	*(1.84)*		-4.0680	*(1.24)*	***	-1.7760	*(1.05)*	*			
RTA	4.4959	*(1.)*	***	6.2720	*(1.68)*	***	1.4528	*(1.54)*		2.4523	*(.98)*	**	3.8116	*(1.41)*	***
GSP*RTA	-5.1037	*(1.11)*	***	-5.7845	*(1.61)*	***	-1.6238	*(1.53)*		-1.4035	*(1.)*		-2.5446	*(1.31)*	**
d_EP										-0.3234	*(.57)*		2.9579	*(.71)*	***
log(PROD_exporter)	0.9028	*(.13)*	***	0.973	*(.09)*	***	0.752	*(.09)*	***	1.087	*(.1)*	***	0.677	*(.11)*	***
log(PROD_importer)	-0.437	*(.07)*	***	0.671	*(.15)*	***	0.346	*(.15)*	**	-0.084	*(.08)*		0.016	*(.09)*	
log(POP_exporter)	0.370	*(.27)*		0.286	*(.39)*		0.000	*(.18)*		-0.748	*(.2)*	***	-0.927	*(.25)*	***
log(POP_importer)	0.633	*(.22)*	***	-0.453	*(.26)*	*	-0.222	*(.3)*		2.317	*(1.06)*	**	0.374	*(.74)*	
log(GDP/POP_exporter)	0.587	*(.39)*		-0.151	*(.62)*		-0.233	*(.29)*		1.542	*(.33)*	***	0.311	*(.32)*	
log(GDP/POP_importer)	-1.154	*(.73)*		2.636	*(.87)*	***	2.290	*(.52)*	***	-3.944	*(2.69)*		2.234	*(1.54)*	
log(export capacity)	0.476	*(.12)*	***	0.394	*(.08)*	***	0.343	*(.1)*	***	0.521	*(.09)*	***	0.313	*(.08)*	***
log(distance)	0.520	*(.49)*		3.599	*(1.8)*	**	3.053	*(1.03)*	***	-1.649	*(.34)*	***	0.755	*(.58)*	
common language	-0.200	*(.34)*		-0.721	*(.98)*		-0.069	*(.46)*		0.255	*(1.)*		1.864	*(.63)*	***
colonial ties	1.239	*(.36)*	***	1.421	*(.27)*	***	2.411	*(.43)*	***	1.438	*(.97)*		0.963	*(.57)*	*
landlocked in the pair	1.273	*(1.15)*		-2.869	*(1.01)*	***	-4.699	*(.95)*	***	-0.195	*(.94)*				
common border	0.950	*(1.44)*		5.908	*(2.37)*	**	2.255	*(1.4)*		-1.384	*(.91)*		0.727	*(.75)*	
trend	0.268	*(.11)*	**	-0.506	*(.15)*	***	-0.050	*(.16)*		0.306	*(.35)*		-0.439	*(.19)*	**
costant	-21.774	*(8.34)*	***	-47.917	*(22.93)*	**	-39.214	*(10.64)*	***	-8.298	*(5.09)*		-22.437	*(7.37)*	***
Observations	20440			30882			65000			30934			20005		
Wald Chi-square	3873.57			3054.5			1594.35			2232.71			5598.7		
Log-Likelihood	-1410989.5			-382121			-1295905			-305808			-92037.2		
Stavins and Jaffe (1990)	0.026			0.044			0.043			0.066			0.040		

Note: all regressions include monthly dummies; standard errors in parenthesis (robust to heteroskedasticity) adjusted by clustering observations at the commodity-country pair level. (*), (**), (***) denote statistical significance at the 10%, 5% and 1% level, respectively.

Table D.3 - Estimates of gravity model using aggregated data.

	Monthly data									Yearly data				
	Fixed Effects			*Wooldridge (1995)*			*Poisson*			*Fixed Effects*			*Poisson*		
GSP	-0.187	*(.22)*		-0.102	*(.03)*	***	-0.168	*(.)*	***	-0.440	*(1.78)*		-0.104	*(.01)*	***
ACP	-0.248	*(.07)*	***	-0.052	*(.02)*	***	-0.158	*(.)*	***	-0.200	*(.43)*		-0.092	*(.)*	***
RTA	0.385	*(.06)*	***	0.123	*(.)*	***	0.247	*(.)*	***	0.354	*(.17)*	**	0.694	*(.01)*	***
GSP*ACP	0.092	*(.05)*	**	0.023	*(.)*	***	0.023	*(.)*	***	0.045	*(.41)*		-0.179	*(.)*	***
GSP*RTA	-0.005	*(.03)*		-0.021	*(.01)*	***	-0.066	*(.)*	***	-0.002	*(.12)*		-0.422	*(.)*	***
d_EP	-1.039	*(.37)*	***	-0.596	*(.14)*	***	0.167	*(.01)*	***	-0.089	*(.67)*		2.428	*(.02)*	***
log(PROD_exporter)	0.517	*(.03)*	***	0.738	*(.09)*	***	0.889	*(.)*	***	0.168	*(.47)*		0.546	*(.01)*	***
log(PROD_importer)	-0.006	*(.01)*		-0.094	*(.01)*	***	-0.009	*(.)*	***	-0.009	*(.03)*		-0.043	*(.)*	***
log(POP_exporter)	-0.650	*(.21)*	***	-0.400	*(.03)*	***	-0.299	*(.)*	***	-2.565	*(2.66)*		0.310	*(.01)*	***
log(POP_importer)	0.826	*(.49)*	*	0.771	*(.19)*	***	0.749	*(.)*	***	-4.020	*(7.02)*		0.242	*(.01)*	***
log(GDP/POP_exporter)	0.960	*(.28)*	***	-0.069	*(.03)*	**	0.365	*(.)*	***	0.322	*(1.43)*		0.270	*(.01)*	***
log(GDP/POP_importer)	0.530	*(1.1)*		0.150	*(.13)*		1.334	*(.01)*	***	-1.568	*(2.57)*		-1.550	*(.03)*	***
log(export capacity)	0.226	*(.09)*	**	0.662	*(.11)*	***	0.566	*(.)*	***	0.331	*(.17)*	*	0.825	*(.)*	***
trend	-0.274	*(.15)*	*	0.027	*(.01)*	***	-0.221	*(.)*	***	0.259	*(.42)*		0.366	*(.)*	***
constant	-13.424	*(14.39)*		-2.742	*(6.69)*					127.527	*(174.41)*				
Observations	2990			2990			9168			700			991		
R-squared	0.6604			0.2434						0.8811					
Wald Chi-square							1660000						588688		
Log-Likelihood							-1583154						-678242		
U-Theil	0.268			0.138			0.973			0.450			0.995		
Stavins & Jaffe (1990) index	0.732			0.862			0.027			0.550			0.005		
Sample selection Test *Lambda significance*				3.791	*(1.63)*	**				1.434	*(2.13)*				

Note: all regressions include monthly dummies; standard errors in parenthesis (robust to heteroskedasticity). (*), (**), (***) denote statistical significance at the 10%, 5% and 1% level, respectively.