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DIPARTIMENTO DI ECONOMIA

THE TIDE THAT DOES NOT RAISE ALL BOATS: AN ASSESSMENT OF EU PREFERENTIAL TRADE POLICIES

Maria Cipollina - David Laborde - Luca Salvatici

The Tide That Does Not Raise All Boats: An Assessment of EU Preferential Trade Policies[1]

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Abstract

The aim of this article is to assess of the impact of the European Union's trade preferences on global trade, focusing on several methodological issues that are relevant to these preferences' trade-creating impact. Using highly disaggregated 8-digit data in a theoretically grounded gravity model framework, we define an explicit measure of preferential tariff margins computed on alternative definitions based on a comparison between bilateral applied tariffs and two different reference levels: the Most Favoured Nation duty and a Constant Elasticity of Substitution price aggregator. From the methodological point of view, we show that the assessment of these policies' impacts can be very sensitive to the definition of the preferential tariff margin. From a policy perspective, such preferential schemes have an actual impact on trade volumes, although with significant differences across sectors.

Keywords: Theoretical gravity model, Preferential trade agreements, Trade cost elasticity, Sectoral trade flows

JEL Classification: F130; F140

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1. Introduction

The European Union (EU) is the largest trading partner for many of the world's developing countries, and trade preferences make up one of the central policies aimed at improving integration between the EU and these countries. Non-reciprocal trade preferences for low- and middle-income countries have been used by the EU since at least the 1960s and have in a broader sense been at the heart of the North-South trade policy debate for the last half century. The EU was the first developed importer to introduce preferential policies, and since the 1971 Generalized System of Preferences (GSP), the tide of preferential schemes has continued to rise, significantly widening the number of countries and products covered.

Experts are of two minds regarding the success of these schemes, however. On the one hand, increased trade is widely believed to be key to alleviating poverty and improving standards of living in developing countries; on the other hand, many decry trade preferences as a failed policy. Some critics claim that non-reciprocal preferences have perverse effects in terms of allocative efficiency (Borchert, 2009), while others criticize preferential trade policies as being ineffective (Brenton and Manchin, 2003).

This paper does not contribute to the normative discussion at the heart of the North-South trade policy debate; rather, we aim to provide a positive assessment of the impact of EU preferences on global trade, discussing several methodological issues that are relevant when determining preferences' trade-creating impacts. We use a gravity equation approach in order to single out the contribution of preferential policies to the deviation from 'normal' trade levels (Anderson and van Wincoop, 2003; 2004) and to derive a theoretical grounded empirical model that includes a variety of goods. Our results clearly find that trade preferences by their very nature have a discriminatory impact: when some exporters get a competitive edge, others are necessarily disadvantaged.

Many studies examine the impact of preferential trade agreements (PTAs) using aggregated trade data. However, this does not seem to accurately capture the impact of PTAs because such analysis is inherently unable to fully capture the complex structure of these agreements, which do not provide the same benefits for each good since preferential margins differ among goods with very uneven initial levels of protection.

Since the treatment of tariff reduction/elimination differs substantially by product, an appropriate analysis must therefore examine the impacts at the product level. Accordingly, the present analysis uses the most detailed information available regarding preference utilization, i.e., distinguishing preferential and Most Favored Nation (MFN) trade flows. In this respect, our work is part of an increasing effort to assess the various determinants of bilateral trade at the sectoral level using the gravity model with highly disaggregated data (Baldwin et al., 2005; De Benedictis and Salvatici, 2011).

The use of highly disaggregated data does raise two types of problems: (i) the elevated percentage of 'zero trade flows' and (ii) the impossibility to get information for some variables at the level of detail at which tariff lines are specified. As far as the latter problem is concerned, in order to control for unobservable country and product heterogeneity, we introduce product- and country-specific fixed effects at the HS6 digit.

Regarding the former problem, the presence of zero values creates obvious problems in the log-linear form of the gravity equation. There has been extensive debate concerning the best econometric approach to avoid the bias that would be implied by the drop of the observations with zero flows. Because of the presence of heteroskedasticity, estimates of the log-linear form of the gravity equation are biased and inconsistent; this may lead one to prefer the Poisson specification of the trade gravity model (Silverstovs and Schumacher, 2007; Santos-Silva and Tenreyro, 2003, 2006, 2011; Burger et al., 2009). Accordingly, we estimate the gravity model in multiplicative form, using a Poisson pseudo-maximum-likelihood (PPML) estimator commonly used in recent empirical analyses (Anderson and Yotov, 2011 and 2012).

The first contribution of our paper is to present a general framework to structurally estimate the magnitude of trade preferences' impacts on trade, using very detailed data and up-to-date methodologies. Our methodology exploits a robust theoretical mechanism that shapes the association between the substitution elasticity at a more disaggregated sectoral level and the preference margin computation.

Our second contribution is the development of a new empirical strategy to define the actual preferential margin(s). Our model offers a very intuitive way to reconcile empirics and theory without assuming arbitrary reference tariffs for the computation of the preference margins. This also allows us to point out two possible sources of bias regarding the reference tariff calculation:

'definition bias', regarding the choice of the most appropriate tariff(s) to be compared with the preferential ones, and 'aggregation bias', arising when the reference is exporter-dependent (i.e., we deal with the vector of bilateral applied tariffs rather than with a scalar, as in the case of the MFN or the maximum applied tariff) and when a theoretically consistent weighting scheme is not used.

The aggregation bias arises from the reference tariff to be averaged across exporters. In this case, in order to avoid an overestimation of the margin, one should take into account the competitive advantage with respect to other exporters/competitors. Preferential policies present a 'multilateral nature', and the intensity of the preferential treatment depends both on the highest paid rate and on the share of exporters paying that rate. Following the basic intuition underlying 'multilateral trade resistance' in gravity models – namely, that bilateral trade is influenced by the trade policies of all the partners – we argue that bilateral preferential trade depends on the entire structure of applied tariffs preferences as well as the country-pair specific margins.

The rest of the paper is structured as follows. Section 2 presents the most influential literature on preferential policies' impact on trade. Section 3 introduces the theoretical gravity model. Section 4 discusses data and estimation methods applied. In Section 5, we present and discuss the results. Finally, we conclude in Section 6.

2. Literature Review

Even if the positive impact of preferences on trade is by and large confirmed, international trade economists can actually claim little firm empirical support for reliable quantitative estimates. Over the past decade, the gravity equation has emerged as the empirical workhorse used to study the ex post effects of trade preferences on bilateral merchandise trade flows. However, studies report very different estimates because they differ greatly in terms of data sets, sample sizes, independent variables used in the analysis, and estimation methods.

Much of the early literature (Sapir, 1981; Oguledo and MacPhee, 1994; and Nilsson, 2002) estimates the impact of preferential agreements through a dummy variable for preferential policies. These studies typically use aggregate trade data and report positive coefficients ranging between 4% and 400%, but some specifications find significant negative coefficients between 3% and more than 50% (Caporale et al., 2009; Ruiz and Villarubia, 2007; Martìnez-Zarzoso et al., 2009). Regarding the impact of specific preference schemes, several studies find that the EU schemes do provide a significant boost to Least Developed Countries' (LDCs) exports (Aiello and Cardamone, 2011; Aiello and Demaria, 2012), as well as to exports from Mediterranean countries (Nilsson and Matsson, 2009) and African, Caribbean and Pacific (ACP) Group of States (Francois et al., 2006; Manchin, 2006), although some specifications report highly negative coefficients. There is also some evidence that the Everything but Arms (EBA) program, implemented in 2001, has not been effective in increasing LDCs' exports to the EU; the program has led to very minor changes in terms of applied protection faced by LDCs, while the previous GSP program came close to a duty-free regime (Pishbahar and Huchet-Bourdon, 2008; Gradeva and Martinez-Zarzoso, 2009).

However, the policy dummy cannot catch the variability of margins across countries and products. It is likely to lead to an overestimation of the impact of the preferential scheme and cannot provide an accurate assessment of policies that (by definition) often discriminate among products.

Several definitions have been employed in the literature using an explicit measure of the margin (Cipollina and Salvatici, 2011). Most previous work has compared the preferential rates for individual countries with MFN rates alone; this has led to an apparent overstatement of the margin since the value of a preference to one country will in practice depend on how many other countries are competing in the same market with a preferential margin. The exceptions to this build on the work of Low et al. (2008), who propose a competition-adjusted preference margin calculated as the percentage point difference between the weighted average tariff rate applied to the rest of the world and the preferential rate applied to the beneficiary country, where weights are represented by trade shares in the preference-granting market. A similar approach is followed by Carrère et al. (2010) and Fugazza and Nicita (2013), while Hoekman and Nicita (2011) refine the margin computation by taking into account the product composition. All of these papers compute the margins at the country level (i.e., by aggregating across products), while only that of Low et al. takes into account preference utilization considering the volume of trade that actually benefits from the preference.

Drawing on information in the 2004 MAcMap-HS6 database (Bouët et al., 2008), Cipollina and Salvatici (2010) perform estimates based on the size of each product's preferential margin. In the more specific framework of European fruits and vegetables, Emlinger et al. (2008) explicitly incorporate tariff levels into their estimations. Cardamone (2011) uses disaggregated trade data to find large differences in the preference impact across sectors. Finally, Cirera et al. (2011) uses a unique dataset at CN-10 digits to estimate a small positive impact at the intensive margin and a negligible or possibly even negative impact at the extensive margin (i.e., when we consider the scope for trade diversification).

The responsiveness of trade volumes to changes in relative prices, or elasticity of substitution, plays a central role in determining the effects of preferential trade agreements. It is no exaggeration to say that the elasticity of substitution is one of the most important parameters in modern trade theory since it captures both the own-price elasticity of demand and the cross-price elasticity of demand by measuring how 'close' goods are in product space (Hillberry and Hummels, 2012). Measurement of the elasticity of substitution has been an intensely researched and hotly debated topic since the Second World War (Tinbergen, 1946), and there are many studies that estimate import demand functions in one form or another, including the macroeconomic Real Business Cycle literature as well as the extensive literature estimating gravity models. The former, focusing on the 'macro' elasticity between domestic and imported goods, usually provides smaller estimates than the 'micro' elasticity between foreign sources of imports (Feenstra et al., 2012). Substitution across multiple foreign sources is especially important for modern multi-country models, and it is absolutely crucial for the consideration of policy shocks such as preferential trade agreements that favor one partner over another. Accordingly, this paper relates to the more recent literature aimed at estimating the elasticity of substitution at a more disaggregated sectoral level, using updated econometric methods (Imbs and M´ejean, 2009; Corbo and Osbat, 2013).

3. Structural Gravity Model

In this paper, the term 'sector' refers to a group of goods which can be assimilated in the same product category. We use the terms 'product' and 'good' interchangeably. The tariff line determines the definition of a good, and a good, in turn, comprises a number of varieties. By a variety, we refer to a good originating from one country and consumed in another one. Hence, the definition of good is based on characteristics other than the product's origin and destination, and variety refers to products of a specific origin within a category of goods. There will thus be as many varieties of each good as there are trading partners. The exact empirical definitions of goods and varieties will depend on the disaggregation level and availability of the data and will be discussed further in the following section. We denote the exporting country by *i*, and the good (or tariff line) by *k*.

Modern multi-country, multi-product CGE trade models typically contain several nested utility functions. The top tier aggregates over sectors, the lower tier aggregates over products within a given sector, and the following tier aggregates domestic versus foreign sources of each product. Finally, the bottom tier aggregates quantities over multiple sources of foreign goods.

The upper-level nests are commonly aggregated using the Cobb-Douglas functional form, while the lower nests are treated as constant elasticity of substitution (CES). Note that the homothetic nature of these functions makes it possible to estimate the impact of price changes at a given level without worrying about the function for the expenditure allocations in the upper nest.

The economic theory of gravity (Anderson and van Wincoop, 2004) is based on trade separability. In our case, the upper level determines the level of expenditure on each good in the EU, while the lower level gravity equilibrium determines the allocation of demand across countries for each class of goods, conditional on the values of expenditure. Our choice to work at the highest possible level of disaggregation implies that we cannot impose market clearance at the world level because EU product nomenclature is EU-specific.

We impose CES preferences on the sub-expenditure regarding imported varieties, consistent with the structural gravity model (Anderson, 2009), simplifying the model to assume that upper-level preferences over sectors, products, and domestic versus foreign goods are Cobb-Douglas. This implies fixed shares and, given a fixed income, a fixed amount spent on imports. Admittedly, the lack of substitutability between domestic and imported varieties is a strong assumption, leading to an underestimation of the impact of trade policies since preferences do not lead to trade replacing less efficient domestic producers. Accordingly, it may be argued that our estimates provide a lower bound for the true impact of preferences.[2] However, our methodology is necessary given the lack of detailed domestic data.

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[2] More generally, Head and Mayer (2013) point out that the elasticity estimate may not give a reliable estimate of the full impact on trade since it holds production and expenditure constant.

The representative consumer maximizes a CES sub-utility function subject to the expenditure constraint M^k. We consider that each product k can be imported from *n* countries. A product originating in country i is associated with a quality μ_i^k. Therefore, the quality-adjusted consumption of q_i^k physical units is im_i^k and we select units of measurement in such a way that one unit of a (quality-adjusted) good is worth one unit of value:

$$im_i^k = q_i^k \times \mu_i^k. \qquad (1).$$

The import demand at global prices for product *k* originating in country *i* is:

$$im_i^k = \alpha_i^k M^k \frac{\left(PIM_i^k\right)^{-\sigma}}{\left(PM^k\right)^{(1-\sigma)}} \qquad (2),$$

where □ is the elasticity of substitution between varieties (□ > 1) (i.e., the origin of the product,[3]) α_i^k is the consumer preference parameter, M^k is the expenditure on import *k*, PM^k is the product *k* import price index computed across all exporters *I*, and PIM_i^k is the domestic price of quality normalized imported good *k* from country *i*.

Prices differ due to trade costs and tariffs. The domestic price of a physical unit is given by $PEX_i^k c_i^k \left(1 + t_i^k\right)$, where $c_i^k > 1$ captures the transport costs defined as[4]

$$c_i^k = \beta_i \times \gamma^k. \qquad (3).$$

Transport costs differ by product (γ^k) and by exporter (β_i), while t_i^k is the bilateral tariff. PEX_i^k is the competitively fixed free-on-board (FOB) export price of a physical unit. Based on previous assumptions, the relationship between the prices of the quality-adjusted and physical units is straightforward:

[3] Therefore, □ can be interpreted as the Armington assumption defined at the product – i.e., tariff line – level.

[4] In general equilibrium modeling of international trade, the fact of treating trade costs as an additive usually leads to severe impediments in computation. Hence, they are generally assumed to act multiplicatively, as in Samuelson (1952).

$$PIM_i^k = \frac{PEX_i^k}{\mu_i^k} \beta_i \gamma^k \left(1 + t_i^k\right). \quad (4)$$

Accordingly, the tariff component applies multiplicatively to the value of merchandise, as calculated at the time of the delivery at the EU's frontier. This value already embeds insurance and freight charges incurred up to that moment, assuming all these charges to be proportional to the FOB price. In this specification, any possible non-tariff barriers include all charges that generate a spread between the FOB and cost-insurance-freight (CIF) prices by acting multiplicatively with respect to the FOB value.

We want the supply side to include the possibility of quality differences across suppliers. Accordingly, we assume that to produce quality μ_i^k, exporters face a marginal cost $\left(\mu_i^k\right)^{\varepsilon}$, where ε is the cost elasticity to quality. Therefore, the export price is given by

$$PEX_i^k = \left(\mu_i^k\right)^{\varepsilon} \quad (5).$$

We assume that the export supply is not affected by other product variables (i.e., tariffs on other products or in other markets). In addition, we assume infinitely elastic export supplies. This assumption enables identification and hence is necessary given that our cross-section database does not allow us to estimate thousands of supply elasticities. However, the EU is certainly not a 'small country', and developing countries are likely to face relevant supply constraints; in this respect, our estimates are likely to represent an upper bound for the impact of preferences since they do not take into account the supply response. The μ_i^k parameters are scaled so that import quantities are such that all the CIF prices (i.e., including transport costs) are equal to 1; this assumption separates tariffs from other components of the landed price. Accordingly, the price index can be written as

$$PM^k = \left[\sum_i \alpha_i^k \left(PEX_i^{k^{\left(1-\frac{1}{\varepsilon}\right)}} \beta_i \gamma^k \left(1 + t_i^k\right)\right)^{(1-\sigma)}\right]^{\frac{1}{1-\sigma}} = \left(1 + T^k\right) \quad (6).$$

T^k is a weighted average tariff applied on product k computed (consistently with the import demand structure) as a CES price index. Equation (6) plays a crucial role here because it measures the overall (i.e., aggregated across exporters) incidence of the EU's trade policies for a given product and hence provides an explicit representation for the inward multilateral resistance term. It is worth noting that when dealing with a single importer, there is not an analogous expression for the outward multilateral resistance term.

Using the previous results, we can rewrite Eq. (2) as:

$$im_i^k = \alpha_i^k M^k \frac{\left(PIM_i^k\right)^{-\sigma}}{\left(PM^k\right)^{(1-\sigma)}} = \alpha_i^k M^k \frac{\left(PEX_i^{k\left(\frac{\varepsilon-1}{\varepsilon}\right)}\beta_i\gamma^k\left(1+t_i^k\right)\right)^{-\sigma}}{\left(1+T^k\right)^{(1-\sigma)}} \qquad (7).$$

Taking the log, we get:

$$\ln im_i^k = ln\alpha_i^k + ln\, M^k - \sigma\frac{(\varepsilon-1)}{\epsilon} ln\left(PEX_i^k\right) - \sigma(ln\beta_i + ln\gamma^k) - \sigma ln\left(1+ \quad t_i^k\right) + \sigma ln(1+ T^k) - ln(1+T^k) \qquad (8).$$

The previous expression is the gravity equation we will estimate and it includes the following variables:

- $ln\, im_i^k$ is the export by country *i* (at world prices);
- $ln\alpha_i^k$ is the consumer preference parameter for the good *k* by country *I*;
- $ln\left(PEX_i^k\right)$ denotes the exporter's supply price, and the coefficient includes the quality effect's impact $(\varepsilon - 1)/\varepsilon$ on demand for commodity k. Such a coefficient can be either positive or negative;
- $ln\beta_i + ln\gamma^k$ denotes the trade cost impact; in the estimation, these variables are going to be captured by the exporter and product dummies;
- $ln\left(1+t_i^k\right)$ denotes the applied tariff factor impact;
- $ln(1+T^k)$ denotes the overall price of imports (common to all exporters);
- $ln\, M^k$ is the domestic market size for imports at domestic prices; deflating by $ln(1+T^k)$,

we get the market size at world prices.

The preferential margins ($pref_i^k$) are given by:

$$pref_i^k = \frac{(1+T^k)}{(1+t_i^k)} \quad (9),$$

the critical issue is the measurement of the reference tariff T^k with respect to whom the margin is determined. In the case of the preference margin based on the applied MFN duty, T^k represents an upper bound of the applied tariff distribution, implying that margins can never fall below the value of 1 and signalling the absence of a preferential treatment. This leads to an obvious overestimation of the competitive advantages enjoyed by exporting countries since bilateral trade depends on the entire structure of the tariff preferences as well as the country-pair specific margins. This is what we refer to as the 'definition bias' (of the reference tariff) in the computation of the margin.

From an exporter's perspective, market access depends on the relative advantages or disadvantages that exporters have versus competitors from other countries rather than with respect to the theoretical MFN rate. This reasoning is very much in line with the basic intuition underlying 'multilateral trade resistance' in gravity models since trade is influenced by trade policies *vis à vis* all partners in the same way that it is influenced by relative rather than absolute trade costs.

Any measure of preference margins should signal the possible disadvantage of one country with respect to other exporters. This is possible if the reference tariff is computed as a weighted average of the bilateral applied duties. Accordingly, T^k can be lower than t_i^k and margins between 0 and 1 signal the existence of negative preferences, i.e. exporters are at a disadvantage with respect to other competitors independently from the (nominal) existence of a preferential treatment.

The choice of the weights to be used in the computation of the reference tariff leads to possible 'aggregation bias'. Since T^k is a price index, we argue that the theoretically consistent choice is to compute it according to the assumed demand functional form. In our case, the reference tariff is computed according to equation (6), and the distance with respect to the MFN increases the likelihood of registering negative preferences due both to the lack of preferential treatments, as is the case for most developed countries, and to the failure to make use of those treatments, as it is the case for several developing countries. In this perspective, it is worth recalling that the value of the CES reference tariff is positively related to the value of the substitution elasticity ($\frac{\partial T}{\partial \sigma} > 0$); this implies that higher elasticities lead to CES preference margins closer to those of MFN.

In summary, $pref_i^k$ provides a measure of the tariff advantage (or disadvantage) provided to the actual exports from country i on product k, given the structure of the EU's tariff preferences . As $pref_i^k$ provides the relative advantage with respect to each trading partner rather than to the average, it also captures the discriminatory effects of the overall system of preferences.

4. Econometric Approach

4.1 Data

EU trade preferences take many different shapes depending on the beneficiary country. Since a system in which trade preferences are granted to developing countries but not to developed countries would normally violate the MFN obligation of General Agreement on Tariffs and Trade's Article I, a ten-year waiver was granted in 1971 to allow such a system – referred to as a Generalized System of Preferences (GSP) – to become operational[5].

All developing countries are eligible for the EU's GSP scheme; only ACP countries were eligible for the more far-reaching non-reciprocal preferences allowed under the Lomé Conventions and the Cotonou Agreement. These countries have since been negotiating for reciprocal preferences under the latter's successor, the Economic Partnership Agreements. In addition, non-reciprocal preferences have been introduced for countries in the EU's neighborhood, and the EU has concluded free trade agreements with several countries in the Mediterranean, as well as Chile, Mexico, and South Africa. Negotiations with other countries and/or regions are ongoing.

We estimate the impact of trade preferences for 21 sectors, following the EU sections of the Harmonized System (HS), listed in Table 1. All data refer to 2004. EU25 trade flows are taken

[5] In 1979, the waiver was replaced by the "Enabling Clause", which provides a legal basis for granting trade preferences in favor of developing countries and allows for special treatment of Least Developed Countries (Persson, 2012).

from the Eurostat database Comext[6], and data are Cost-Insurance-Freight (CIF) values. We work at a very high level of disaggregation (8 digit), and the structure of the dataset is conditioned by the difficulty in building time series for a consistent trade, tariff, and utilization rate of preferences.

Table 2 shows all preferential schemes included in our dataset for 2004. It should be noted that many factors in addition to preferences influence imports, including macroeconomic conditions such as income growth and exchange rates. In this sense, it may be difficult to identify a 'representative' year. Although an analysis based on data from more than a single year would enhance the results, the complexity in tariff schedules makes such an endeavor very difficult. In the case of preferential policies, panels do not necessarily add much in short horizons; using data from 2004 allows us to fully capture the effects of the important EBA program for LDCs (implemented in 2001 except for a very limited number of commodities). Moreover, the theoretically grounded gravity equation proposed by Anderson and van Wincoop (2003) under the assumption that all bilateral trade costs are symmetric and never vary only works with cross-section data (Baldwin and Taglioni, 2006).

Although we face a trade-off between high disaggregation and lack of time variability, the use of disaggregated data is desirable for several reasons. First, we wish to avoid the aggregation biases that occur whenever macro-level data are used for estimation since it is an established fact that non-negligible heterogeneity exists between different sectors of the economy. When this heterogeneity is neglected, it tends to bias the estimates of the aggregate elasticity of substitution. Secondly, we do not directly observe prices but rather use data on values and quantities to compute unit values, which are then used as a proxy for true prices. The higher the level of aggregation, the more probable it is that the unit value is a biased measure since we might be bunching together products with very different price levels and price movements

More importantly, the use of detailed product information distinguishing preferential from non-preferential trade flows allows us to take into account some of the most relevant features affecting the policy impact of these preferences. Preferences may fail to meet their expected outcome because of inadequate product coverage; an even bigger concern is the fact that even

[6] The Comext database (http://fd.comext.eurostat.cec.eu.int/xtweb/) contains detailed foreign trade data distinguished by tariff regimes as reported by EU member states.

when products are eligible, traders may not request preferential treatment[7]. Low utilization rates may be a strong indicator that preferences are very hard to use in practice or that the extra value they could transfer is not large enough to make it worthwhile. As a consequence, detailed information about actual trade regimes and preference margin intensities is necessary to assess the impact of preferential policies. In this respect, an additional difficulty is represented by the fact that most developing countries and products are eligible for several preferential regimes. Since data do not allow us to distinguish the specific scheme under which an import takes place, we assume that the lowest available duty is the one actually used.

As far as specific tariffs are concerned, they require the computation of ad valorem equivalents (AVE), which are computed using bilateral unit values as reference prices capping the extreme values using the same procedure adopted in MacMapHS6 (Boumelassa et al.,2009). It is worth noting that specific tariffs embed an implicit preferential component since each exporter faces a different AVE and since those exporting higher quality varieties benefit from lower equivalents. Accordingly, for these products, the reference tariff factor $\left(1+T_i^k\right)$ is exporter-specific.

We consider 234 exporters of 10,174 products at the 8-digit level of EU Combined Nomenclature classification to the EU (25 countries). Duties are taken from the *Tariff intégré de la Communauté Européenne* (TARIC). Starting with 1,861,842 potential couples of products/exporters, the database includes two observations for the same bilateral trade relationship each time both non-preferential and preferential trade flows are positive. In those cases in which there are not trade flows, the zeroes are associated with the lowest rate, implying that these observations are particularly meaningful from the point of view of the actual preference utilization.

The actual databases used in the analysis are created according to the following choices:

1. In the base case (Models 1-4), we keep exporters with at least one export flow at the world level at the HS6 level for the product concerned during the period 2001-2004, assuming that excluded commodities are not produced in the countries not exporting. In the same vein, we exclude products that are not imported at all into the EU and for which it is impossible to

[7] For example, Inama (2003) notes that preferential treatment under the Everything But Arms initiative was requested for less than 50 percent of exports from non-ACP LDCs in 2001, even though this offers duty-free access for practically all goods and is the best system available for these countries. Complicated and restrictive rules of origin are often pointed out as a major reason for the low utilization of preferences; Cadot et al. (2006) estimate that for the relevant EU rules of origin, these administrative costs represent 6.8 percent of the traded goods' value

compute a CES price index over imports. We also exclude products featuring tariff rate quotas (TRQs) as well as 'graduated' products, i.e. exports that lost their eligibility for preferences since a single exporter exceeded 15 percent (12.5 percent for textiles and clothing) of EU imports.[8]

In Model 5, we run estimates based on AVE computed as trade-weighted averages at the HS-6 digit level. These unit values are common at the product level since they include exports to all destinations.

As far as Models 1-4 are concerned, a distinction can be made among flows with exactly zero probability of positive trade, flows with a non-zero trade probability that still happen to be zero, and positive flows. All countries do not produce all possible goods, nor do they have an effective demand for each and every good. Accordingly, we distinguish between two different kinds of zero-valued trade flows: products that are never traded and products that are not traded, but could potentially be traded. Since preferential policies cannot possibly influence the first group, we exclude irrelevant information ('statistical zeroes') that may bias the estimate, greatly reducing the dimension of the dataset. In the case of TRQs, the quantity constraint interferes with the price signal provided by the preferences. Finally, graduated products raise serious endogeneity concerns since the policy depends on the trade flow intensity.

In the case of Model 5, we are concerned by the possibility that particularly high bilateral unit values could create 'unintended preferences' since the MFN ad valorem equivalent could be lower than the duties faced by competitors. Computing unit values at the product level rules this possibility out because all exporters face the same MFN AVE and bilateral AVE can never exceed this level.

Number of observations: 980,414.

2. We add to the base case the tariff lines corresponding to 'graduated' products (Model 6).

   These estimates provide an assessment of the endogeneity bias implied by the inclusion of graduated products.

   Number of observations: 999,359

[8] We run estimations for the sections including TRQs (I-IV, VI) using the in-quota tariff when imports are lower than the quota and the trade-weighted average of the two tariffs otherwise (Raimondi et al., 2011). The impact on trade flows turns out to be either insignificant or negative.

3. Starting from the base case, we create a database associating two observations with each positive trade flow; in other words, we add a zero trade flow associated with the MFN rate each time we register a preferential trade flow (Model 7).

   It may be argued that the lack of 'non-preferential' trade is the result of economic decision-making based on the potential profitability of engaging in bilateral trade under different conditions (namely, preferential vs. MFN). Accordingly, maintaining these zero trade flows prevents a possible selection bias.

   Number of observations: 1,048,578

With reference to the base case database, Table 3 shows the percentage of imports associated with positive trade, subject to MFN or preferential duties; in the case of MFN imports, we distinguish between duty-free and positive tariffs. To give an idea of the relevance of each sector in total trade, we provide the value of imports and their respective shares. More than 50 percent of total imports enter duty-free under MFN arrangements, while the residual is evenly divided between preferential imports and imports paying positive MFN duties.

The EU imports all products of section X (paper and paperboard and articles thereof) and XXI (works of art) under an MFN duty-free regime. These sections are obviously excluded from the sample, along with sections V (mineral products) and XIV (natural and precious metals) which feature trivial percentages of preferential trade flows. Finally, we exclude section XIX (arms and ammunition) due to the significantly lower number of observations and given that trade flows in this section are likely to be driven by political rather than economic motivations.

Table 4 presents the bilateral applied and the MFN tariffs for the sections included in our analysis. According to the MFN rates, the most protected sectors are the agricultural sectors (I-IV) as well as textiles and footwear (XI and XII). However, comparing these results with those in Table 3, it is worth recalling that, with the exception of textiles, these are not the most relevant sectors either in terms of trade flows and number of tariff lines. Bilateral applied tariffs are much lower on average, and the absolute margins are roughly proportional to the height of the MFN rates. This implies that looking at the difference between these averages as a first indication of the intensity of the preferential treatment, the sections' ranking does not change.

By looking at the existence of multiple trade flows associated with the same product and exporter, we are able to take into account preference utilization. Non-preferential trade flows are associated with the MFN rate, while preferential flows are associated with the lowest possible duty since the data do not allow us to distinguish the specific scheme under which imports take place. As a matter of fact, overlapping preferences imply that tariff lines may be eligible for several different treatments. Since information about the scheme under which imports actually take place is not available, we assume that preferential imports pay the lowest available rate. However, although this seems to be a reasonable assumption, it may also lead to an overestimation of the preferential margins; Bureau et al. (2007) show that some schemes are systematically preferred over others due to compliance costs, which include non-price variables such as the rules of origin attached to each agreement.

The average utilization rate - i.e. the share of actual preferential trade in total potentially preferential trade - is around 67 percent. This figure can be considered an upper bound since our potential preferential trade does not consider preference eligibility in those cases in which only MFN trade flows take place. Preference utilization rates vary substantially across sectors, ranging from 48 percent for chemical products (VI) to 98 percent in the case of animal and vegetable fats (III). Apparently, such variability is influenced by the benefits provided by the preference (i.e., the relevance of the margin) and the costs associated with its utilization (i.e., how demanding the treatment's eligibility requirements are). More importantly, preference utilization plays a crucial role in the computation of the margins since any eligible exporter that does not use the preference is at a competitive disadvantage (signaled by negative margins), as are non-eligible countries.

4.2 Estimation

As it was mentioned in the previous section, our database includes a large share (80 percent) of zero flows. These may be the result of rounding errors; for instance, products for which bilateral trade does not reach a minimum value have a value of trade registered as zero. If these rounded-down observations were partially compensated by rounded-up ones, the overall effect of these errors would be relatively minor. However, the rounding down is more likely to occur for small or distant countries and, therefore, the probability of rounding down will depend on the value of the covariates, leading to inconsistency in the estimators. The zeros can also be missing observations, and these missing observations could be wrongly recorded as zero. This problem is more likely to occur when small countries are considered; again, the measurement error will depend on the covariates. As a consequence, the most common strategies to circumvent the 'zero problem' in the analysis of trade flows (to omit all zero–valued trade flows or to arbitrarily add a small positive number to all flows in order to ensure that the logarithm is well-defined) leads to inconsistency.

When there are a large number of cases in which the observed and expected flows are tiny, small absolute differences prior to a logarithmic transformation of the dependent and independent variables may lead to large differences in the log-normal estimation of the model; in the presence of such heteroskedasticity, the efficiency as well as the consistency of the estimators is at stake. Accordingly, we tested for heteroskedasticity using a two-degrees-of-freedom RESET test, as suggested by Santos-Silva and Tenreryo (2011); we could not accept the null hypothesis of homoskedasticity. Santos-Silva and Tenreyro (2006) convincingly argue that the Poisson pseudo-maximum likelihood (PPML) estimator is generally well-behaved, even when the conditional variance is far from being proportional to the conditional mean. Moreover, the fact that the dependent variable has a large proportion of zeros does not affect the performance of the estimator. Finally, Fally (2012) shows that estimation of gravity with PPML and exporter and importer xed effects is consistent with a structural approach, as in Anderson and van Wincoop (2003).

In the following, we use the PPML errors to estimate for each section of the following specification:

$$im_i^k = \exp\left\{\alpha + ln\left(\frac{M^k}{1+T^k}\right) + \beta EXP_i + \gamma PROD_{HS6} - \sigma\frac{(\varepsilon-1)}{\epsilon} ln\left(PEX_i^k\right) + \sigma\, ln\left(pref_i^k\right)\right\} + v \quad (10)$$

with im_i^k as the export of product k by country i, and v as standard error.[9] In the estimation, the first term is captured by the constant since, given our focus on exporter-specific preferences, we cannot identify the α_i^k in a cross-section analysis. As a consequence, we impose symmetric preferences: $\alpha_i^k = \alpha^k\ \forall$i. The market potential for the EU's size is given by the sum of imports

[9] In the gravity model literature, it is customary to use expenditure shares rather than levels in order to control for heteroskedasticity in the error term. However, shares present lower and upper bounds, implying that the partial effects of the explanatory variables on the conditional mean of the dependent variable cannot be constant and must approach zero as the conditional mean approaches its bounds. Santos Silva et al. (2013) show that the majority of actual estimators used by the recent gravity literature, by ignoring these double-bounds, can lead to erroneous conclusions due to serious model misspecification.

(M^k) expressed in 'real' terms since it is deflated by the domestic price index $(1 + T^k)$. The exporter's supply price impact and the quality effect's impact are proxied by the unit value by exporter (PEX_i^k). These unit values are computed as trade-weighted averages at the HS-6 digit level since they include exports to all destinations. In our framework, then, quality differences across exporters are captured by the $(\sigma \frac{(\varepsilon-1)}{\epsilon})$ coefficient and do not bias the preference margin coefficient.

Exporter (EXP_i) and product ($PROD_{HS6}$) fixed effects in the estimation are widely used in the gravity literature, since they are a computationally easier way to account for multilateral resistance terms in cross-section analysis. We use an explicit price index to represent the inward multilateral resistance term (see equation (6)), but we still introduce fixed effects defined for exporter (*EXP*) and product (*PROD*) at the HS-6 level as proxies for the trade cost and the consumer preferences components.

Since the coefficient associated with the preference margin is going to be estimated at the tariff line level, we assess the impact of the preference on the substitutability across exporters only, ignoring any possible substitution between imports and domestic production. The tariff line level elasticity estimates are based on shifts in relative prices and relative market shares for each exporter. While it seems plausible to assume that we can easily substitute from one supplier to another (or several others) in response to a relative price decrease, as assumed in our estimation, substituting away from all of our importers to a different product does prove more difficult. In this respect, our results are significantly different than those in the literature using aggregated data at the country level.[10]

Still focusing on the second-level import demand function, we could also have estimated the elasticity of substitution at a higher level of aggregation, assuming that consumers substitute across both exporters and products within a given section. However, this choice leads to paradoxical results in terms of margin computation, since the elasticity parameter estimated on a sample mixing different exporters and tariff lines is a mix of cross-price elasticity across different products and origins. It would also lead to an underestimation of the impact of the preferences

[10] Ossa (2012) argues that "accounting for cross-industry variation in trade elasticities greatly magnifies the estimated gains from trade" (p. 10).

since two products such as eggs and honey, even though both are ‘animal products’ belonging to the same section, are imperfect substitutes, while eggs from two suppliers can be very similar.

To estimate the effects of preferential margins, then, we focus on the substitution between suppliers at the tariff line level but not across products. We group products into sections to estimate Eq. (10) and get an estimation of each parameter, including σ.[11] Although σ is assumed to be constant across products, elasticities are allowed to differ across sections. More importantly, the same elasticity assumption allows for trade effects that vary across exporters as well as across products within each section since these effects depend both on the elasticity and the preference margin.

Another crucial issue is the value of the elasticity of substitution σ needed to compute the value of $pref_i^k$ as defined in Eq. (9) when we consider the CES aggregated tariff. In this paper, we rely on an iterative approach in the spirit of what has been done by Head and Mayer (2013) to estimate the multilateral resistance indexes. The computation of CES preference margins is initially done according to the elasticity estimates obtained using the MFN margins. A new set of elasticities is obtained using the CES margins, and we iterate the process until the parameter estimates stop changing at the second-decimal digit.[12] This method exploits the structural relationship between $pref_i^k$ and $\square_k$ to estimate ‘theoretically consistent’ margins.

A final issue in estimating equation (10) resides with the standard errors of the coefficient of interest (□) since it has to take into account the fact that the elasticity used in the computation of the margins is also an estimate. To this end, a common practice is to implement a bootstrap procedure (Fugazza and Nicita, 2013). However, this is not possible in our case since the elasticities are estimated by the same model in the iterative procedure, which violates the independence assumption upon which the bootstrap is based.

In order to highlight the relevance of the reference tariff definition in the assessment of the preference impact, we compare our preferred Model 1 with Model 2, which is calculated

[11] We also run estimates at the HS-2 chapter levels. Estimates vary a lot, as could be expected given the differences across chapters in terms of number of observations, preference distribution, and homogeneity of product definitions. Results are available from the authors upon request.

[12] If the estimated coefficient was not significant, we decreased the assumed elasticity value to the lowest possible bound (i.e., 1). In all these cases, we never get significant estimates. The number of iterations required to achieve convergence never exceeded four.

replacing the CES index with the MFN tariff.[13] Moreover, in order to highlight the relevance of the aggregation problem when we use the exporter-specific bilateral duties, we use two additional margin definitions:

- Model 3 replaces the CES index by the simple average applied tariff.
- Model 4 replaces the CES index by the trade weighted applied tariff.

Using the measure of the preferential margin as defined in Eq. (9) would introduce an obvious element of endogeneity since the value of preferential imports form part of the calculation of the actual preferential margin on the right-hand side of the equation. Consequently, we compute the CES index of the duties paid for the given product by the exporter (Eq. (6)), excluding in each case the actual exporter. Accordingly, both the applied tariff and the reference tariff we use to compute the margin enjoyed by exporter i on product k is exporter-specific and is computed as a CES index of the duties paid for the given product by all actual competitors. [14] The same approach is adopted for the computation of the market size variable.

It should be acknowledged that our estimation set-up might be prone to more general endogeneity problems because of the potential two-way feedback between the exports of a country and its preferential status. Exports and tariffs faced by each exporter/product are likely to be determined simultaneously since countries are likely to grant preferential treatments (and thus reduce tariffs) to less competitive partners and/or products when trade flows are smaller. In cross-section models, such endogeneity is generally treated with the use of instrumental variables. However, instrumental variable estimation may not be fully satisfactory for treating policy variables, in large part because it is more difficult to find instruments with an incidence of likely preferential treatment without affecting the intensity of bilateral trade (Baier and Bergstrand, 2007).[15] Such a difficulty, which would also affect methods based on Heckman control functions, is magnified by the fact that our unit of analysis is the export trade flow defined at the tariff line level; we are not aware of any compelling instruments at this level of detail.[16]

[13] Using the applied rather than bound tariff, we avoid the risk of including 'water' (i.e. binding overhang) in the preference margin.

[14] This is a shortcoming of the CES functional form that does not take into account the potential competition coming from exporters facing prohibitive tariffs. In this respect, our preference margins may be understated; this would lead to an overestimation of the preference impact.

[15] For a review about the (mis)use of instrumental variables in the literature, see Deaton (2010).

[16] Other possible solutions to the endogeneity problem may be provided by matching (i.e., comparing an exporter that benefits from preferences with another that does not, despite the same ex ante probability of receiving the

Potential sources of endogeneity bias of right-hand side variables' coefficient estimates generally fall into three categories: omitted variables, simultaneity, and measurement error (Baier and Bergstrand, 2007). As far as the first two categories are concerned, fixed effects can control for these sources since these effects account for any unobservable characteristics that may shift the overall level of a country's exports and replace variables potentially affected by simultaneity. On the other hand, our results are not affected by the third possible bias since we use a continuous variable that accurately measures the degree of trade liberalization associated with each and every preference. Nonetheless, one has to keep in mind these endogeneity-related caveats when interpreting the results.

Finally, we compute the percentage change due to the hypothetical elimination of existing preferences as follows (Lai and Zhu, 2004):

$$Preference\ effect = \sum_{ijk}\left(E\left[m_{ijk}|pref_{ijk} > 0\right] - E\left[m_{ijk}|pref_{ijk} = 0\right]\right) \quad (11).$$

In calculating these results, we estimate the counterfactual change in the dependent variable (total EU imports) that would follow from the removal of the preferential policies. This calculation may overestimate the total sum of the export changes since indirect effects are not captured via changes in world prices. Since margins can be both positive and negative, the results highlight both trade flows that would not have taken place at all in the absence of preferences and trade flows that would take place if preferences were removed. It is worth recalling that especially in those cases in which there is no actual impact on trade, preferences are likely to have nonetheless an impact on rents (potentially) accruing to exporters.

5. Results

We will first discuss the results of the estimations from the gravity model. Then we will illustrate the preference margins calculated according to the estimated elasticities. Finally, we will

preference according to the observable explanatory variables) or difference-in-difference methods. In both cases, though, it is necessary to define an exporter control group; this is difficult to envisage in our case. More importantly, in these approaches, the nature of the policy shock is quite different from ours since we exploit data in cross-section without a time series trade response to changing preferences.

compute the change in trade flows implied by the interaction of preference margins with the estimated elasticities.

We estimate several specifications of the gravity model, testing the robustness of our results to the computations of the preference margin. Table 5 reports the estimated coefficients for the preference margin in the 17 sections under investigation based on equation (10). Results for the CES reference tariff (Model 1) indicate that trade preferences have very different impacts across sectors; the intensity of those impacts is not related to the size of the margins as they appear in Table 4. As a matter of fact, the sectors most sensitive to preferential treatment are precision mechanics (XVIII), wood products (IX), and ceramic and glassware (XIII), with elasticities ranging between 14 and 31. In the case of the (seemingly) most preferred sectors (I, XI and XII), the elasticity is around 6.

However, using an 'average' reference tariff, the preference structure is much different from that resulting from the conventional definitions. We get both positive and negative margins depending on whether the margins are above or below 1 according to the definition provided in (9). Looking at Table 6, it turns out that not all preferential flows actually enjoy a preferential treatment: 6 percent, corresponding to 6,958 million €, actually face bilateral duties that, even though lower than MFN duties, are still higher than the ones faced 'on average' by the competitors. Our computation of the margin makes clear that almost one-fourth (143,270 million €) of non-preferential trade flows are negatively affected by the existence of preferential schemes. On the other hand, there are cases (corresponding to 576 million €) in which the bilateral ad valorem equivalent MFN tariff could be lower than those faced by the competitors; this happens when particularly high bilateral unit values lower the value of the bilateral ad valorem equivalent. Accordingly, high quality exports could enjoy a preferential treatment even in the absence of an explicit preferential policy; these instances are obviously limited to the sections featuring specific tariffs (I, II, IV, and VI). Overall, the share of EU imports enjoying preferential treatment (16.8 percent) is lower than the share of trade facing duties higher than the CES reference tariff duties (22.9 percent). It must be kept in mind, however, that in several sections, the opposite is true; the the average outcome is driven by the sections featuring the largest trade flows, such as XVI and XVII.

By and large, agricultural preferences do not appear to be very effective. There is no significant impact in the case of vegetable products (Section II), where a large share (58 percent) of imports do not pay any duties, and Sections III (animal and vegetable fats) and IV (foodstuffs and beverages) present significant shares of 'apparent preferences', i.e., preferential trade flows facing bilateral duties higher than the reference tariff. It may be argued that most of the observations excluded from the sample (TRQs and graduated products) come from these sections, but the results hardly change when these observations are included (see Model 6). As a matter of fact, non-tariff barriers in general, and sanitary and phytosanitary measures in particular, play a major role in these sectors; in the case of perishable products, tariff preferences cannot compensate for structural issues such as the lack of transport and logistics infrastructure.

Models 2, 3, and 4 in Table 5 reports the estimated coefficients for different definitions of the reference tariff used in the computation of the preference margins. We start by replacing the CES index with the traditional reference provided by the MFN tariff (Model 2). By construction, MFN margins always exceed CES margins, which leads to an underestimation of the trade impact, although there are a couple of cases (Sections XI and XX) in which the MFN estimate is larger than in the CES estimate. Indeed, in the case of textiles (XI), the estimated CES impact is likely to be negatively affected by the largest share of preferential trade associated with negative margins (10 percent).

Models 3 and 4 allow us to assess the relevance of the aggregation bias. It appears that the trade-weighted average turns out to be a much better reference than the simple one since estimates are always closer to our benchmark (CES), with the exceptions of Sections XIII and XX.

Looking at the estimates, it is not possible to conclude whether the definition bias is more relevant than the aggregation bias since in several cases (Sections VII, XI, XIII, XVI, and XX), the estimates associated with the MFN margins are closer to the benchmark than those associated with the trade-weighted margins. The picture is quite different once we compute the change in imports due to the hypothetical elimination of existing preferences according to equation (11).

Tables 7, 8, and 9 present the results for sections with significant preference impacts corresponding to the CES, MFN, and trade-weighted reference tariff margins, respectively. In all cases, the relative impact on trade depends both on estimated elasticity and on margin size, while absolute figures are obviously influenced by the sections' shares of total imports.

Using an ‘average’ of the duties paid by different exporters as a reference tariff implies that some of these exporters face a negative preference. As a consequence, trade preferences also reduce trade, as could be expected given that providing preferential access to one exporter implies discriminating against all others. Indeed, given the structure of our model, which focuses on substitution among exporters, it is not surprising that additional and missing flows tend to balance out.

Looking at Table 7, overall additional trade flows (23,825 million euros) exceed missing flows (20,633 million euros), although in two cases, Section I, animals, and Section XVIII, precision mechanics), the opposite is true. In these cases, the missing trade flows represent around 10 percent of predicted trade and preferences negatively affect some exporters more than they benefit the others. Section XVIII, in particular, is characterized by a very low percentage of preferential trade (12 percent).

Overall, more than a quarter of actual preferential trade flows would not exist without preferences. The largest impact both in relative and absolute terms would take place in the textiles sector (Section XI), but it is worth noting that 66 percent of preferential exports would also be wiped out in the precision mechanics sector (Section XVIII).

Looking at Table 8 and 9, the policy implications are completely different. Using the MFN margins would completely ignore the trade diversion implied by the negative margins and would lead to a significant overestimation of the positive trade impact (32 rather than 26 percent of actual preferential flows). On the contrary, the trade-weighted reference tariff margins lead to an assessment that is broadly consistent with the benchmark results, although there are instances (e.g., Sections VII and XVI) in which differences are quite significant. The message for practitioners here is that the trade-weighted reference tariff should be used to compute the preference margin when they are not willing to go through the hassle of computing the theoretically consistent indexes.

We now turn to the sensitivity analysis of our results (Table 10). In Model 5, we compute the AVEs using common (at the product level) rather than bilateral unit values (UVs). Specific tariffs are to be found in only a few sectors, which explains why only estimates for Sections I, II, III, IV, and VI differ with respect to Model 1. All new estimates are larger, suggesting that using average UVs leads to lower margins. A likely explanation for this result is that lower quality preferred exports are imputed higher prices, leading to lower AVEs that overstate the intensity of the preferential treatment.

Model 6 provides an assessment of the bias caused by the introduction of graduated products. There is a clear underestimation pattern; in a couple of instances, the impact turns out to be (significantly) negative. The political economy of trade policies suggests that preferences are likely to be withdrawn when imports increase. Indeed, this is the purpose of the graduation procedure. If large import flows lead to the reduction or elimination of the preference margins, this reduces the impact of the preference itself and may even lead to negative results.

Finally, in Model 7, we add notional zero trade flows to each bilateral preferential trade flow, associating them with the MFN tariffs considered as an option available by default to each exporter. This greatly increases the number of (zero) observations in the sample and leads to an apparent overstatement of the preference impact for all sectors.

Even if we cannot compute bootstrapped standard errors, we are still able to show that our estimates are robust with respect to the elasticity value used for the computation of the preference margins. To this end, we performed a systematic sensitivity analysis with values of sigma ranging from 1.1 to 16; the results are presented in Table 11. The relationship between the assumed and estimated elasticity values does not present a clear pattern, which is consistent with expectations. A higher (assumed) substitutability implies higher reference tariffs; this leads to higher positive margins associated with lower (estimated) elasticities, but lower negative margins associated with higher (estimated) elasticities. In any case, the most important result is that only in one case (Section IV) do the estimates become insignificant as the value of the elasticity increases. In most cases, the changes in the estimates are lower than 5 percent.

6. Conclusions

After decades of gravity equation estimates of the (treatment) effect of preferential policies on trade flows, there seems no clear and convincing empirical evidence. This is surprising in light of the proliferation of these policies in recent years and of widespread expectations that such treatments should increase trade. Our goal in this paper has been to provide a thorough empirical analysis of the EU's preferential trade policies, utilizing prevailing knowledge on the theoretical foundations for the trade gravity equation and modern econometric techniques. Our study contributes to a better understanding of the determinants of EU imports by focusing on the role of tariffs. In this regard, we show that the system of trade preferences is an important determinant of exports because it creates both favorable and unfavorable conditions for developing country exporters.

Estimating the impact of preferential policies on trade involves complex issues, owing to the difficulty in correctly specifying the gravity equation that underlies the estimations and to problems of endogeneity arising from the fact that countries prioritize preferences with partners with whom they have other reasons to desire strong commercial ties. We address these difficulties by running estimations at the disaggregated level of individual products, identifying relationships on the basis of cross-sectional comparisons of trade flow intensities.

More specifically, we make use of the extensive variation available in bilateral trade data, controlling for exporters' supply characteristics and using bilaterally varying trade costs instead of prices to identify the substitution elasticity of import demand. That is, variation in trade costs across exporters provides the price variation necessary to trace the slope of the import demand curve. This approach assumes that we know trade costs fully, or at least that unmeasured costs are uncorrelated with included costs.

We separately estimate the impact at the tariff line level for different sectors; our estimates confirm that preferential policies have a significant impact on trade, although with significant differences across sectors, through the substitutability across different varieties.

We derive a reduced form in which preference margins are used to directly infer, tariff line by tariff line, the trade elasticities with respect to any variable used in modeling trade costs. The elasticity of substitution between goods from different countries is a crucial parameter for many questions in international economics, but its magnitude is subject to debate. We compute structural estimates allowing for heterogeneity at the sectoral level. Our results confirm that differences across sectors are such that the response of aggregate quantities may not be indicative of the average elasticity of substitution.

The most important finding here is the fact that the results depend critically on how the advantage provided by the preference is measured. More importantly, the margin definition must take into account not only absolute changes in bilateral duties, but also relative changes in relation to those duties paid by other exporters. This feature should be acknowledged, just as the international trade literature recognized years ago the existence of a multilateral resistance component, capturing the fact that exports from country i to country j depend on trade costs across all possible suppliers. In other terms, focusing on the absolute preference margins means that other important general equilibrium effects operating through the price index are often missed.

We compute the preference margins in relative rather than absolute terms, as the ratio between a reference tariff and the applied rates faced by each exporter. Such a choice is consistent with the observation that bilateral trade depends not only on direct market conditions, but also on the market conditions applied to third-party countries. The greater the relative advantage provided by the system of preferences, the larger the expected trade flows. However, some countries see part of their benefits eroded, sometimes substantially, by the deterioration in their relative market access.

With respect to the reference tariff definition, the appropriate choice is the duties paid by the countries competing with the one benefitting from the preference (Carrère et al., 2010; Fugazza and Nicita, 2013). The tariff vector of the applied bilateral duties needs to be aggregated in order to get a single reference tariff; this raises the issue of the proper weights to be used in the aggregation process. We compute the reference tariff at the product level as a CES price index and compare the corresponding preference margins with the ones obtained using a 'traditional' reference choice, such as the MFN applied duty. This provides an assessment of the definition bias. The comparison with a-theoretic average reference tariffs, such as the simple or the trade-weighted mean of bilateral applied duties, provides an assessment of the aggregation bias.

Our overall results suggest that preferences have a relatively minor impact on trade. The additional flows generated by preferences represent around 3 percent of EU imports, and most of these flows crowds out other exporters. Even if our estimates represent a lower bound for the true impact since they do not take into account for expanded trade replacing less efficient domestic producers, our results may be quoted by those who regard trade preferences as a failed policy. We would emphasize, though, that the picture is much more nuanced at the sectoral level and that preferences do have a significant impact in some sectors and for some exporters.

Although we have focused solely on trying to provide policymakers with a reliable estimate of the average effect of EU trade policies across exporters, we must be careful not to overstate what we have accomplished. By assuming a Cobb-Douglas upper-tier utility structure, we have not allowed for trade creation due to substitution from domestic to imported goods. More generally, there are production effects that cannot be captured in a CES monopolistic competition model; this suggests the dominance of the pure preference effect over core general equilibrium effects. Moreover, our preference margins are calculated only with respect to tariffs and do not take into account any restrictive effects of non-tariff barriers (e.g. quotas, administered pricing, contingent protection measures, standards, etc.). Another caveat is that we do not discuss the impact of the rents generated by preferential policies and, more generally, we have not addressed preferential policies' welfare impacts. These are topics left for future research.

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TABLES

Table 1: *Commodity Classification*

Sectors according to the EU Sections of the Harmonized Commodity Description And Coding System
Sections
I: Live Animals; Animal Products (Chapters 1-5)
II: Vegetable Products (Chapters 6-14)
III: Animal or Vegetable Fats and Oils and Their Cleavage Products; Prepared Edible Fats; Animal or Vegetable Waxes (Chapter 15)
IV: Prepared Foodstuffs; Beverages, Spirits, and Vinegar; Tobacco and Manufactured Tobacco Substitutes (Chapters 16-24)
V: Mineral Products (Chapters 25-27)
VI: Products of the Chemical or Allied Industries (Chapters 28-38)
VII: Plastics and Articles Thereof; Rubber and Articles Thereof (Chapters 39-40)
VIII: Raw Hides and Skins, Leather, Furskins and Articles Thereof; Saddlery and Harness; Travel Goods, Handbags, and Similar Containers; Articles of Animal Gut (Other Than Silkworm Gut) (Chapters 41-43)
IX: Wood and Articles of Wood; Wood Charcoal; Cork and Articles of Cork; Manufactures of Straw, of Esparto or

of Other Plaiting Materials; Basketware and Wickerwork (Chapters 44-46)

X: Pulp of Wood or of other Fibrous Cellulosic Material; Waste and Scrap of Paper or Paperboard; Paper and Paperboard and Articles Thereof (Chapters 47-49)

XI: Textiles and Textile Articles (Chapters 50-63)

XII: Footwear, Headgear, Umbrellas, Sun Umbrellas, Walking-Sticks, Seat-Sticks, Whips, Riding-Crops and Parts Thereof; Prepared Feathers and Articles Made Therewith; Artificial Flowers; Articles of Human Hair (Chapters 64-67)

XIII: Articles of Stone, Plaster, Cement, Asbestos, Mica or Similar Materials; Ceramic Products; Glass and Glassware (Chapters 68-70)

XIV: Natural or Cultured Pearls, Precious or Semiprecious Stones, Precious Metals, Metals Clad with Precious Metal, and Articles Thereof; Imitation Jewellery; Coin (Chapter 71)

XV: Base Metals and Articles of Base Metal (Chapters 72-83)

XVI: Machinery and Mechanical Appliances; Electrical Equipment; Parts Thereof; Sound Recorders and Reproducers, Television Image and Sound Recorders and Reproducers, and Parts and Accessories of Such Articles (Chapters 84-85)

XVII: Vehicles, Aircraft, Vessels and Associated Transport Equipment (Chapters 86-89)

XVIII: Optical, Photographic, Cinematographic, Measuring, Checking, Precision, Medical or Surgical Instruments and Apparatus; Clocks and Watches; Musical Instruments; Parts and Accessories Thereof (Chapters 90-92)

XIX: Arms and Ammunition; Parts and Accessories Thereof (Chapter 93)

XX: Miscellaneous Manufactured Articles (Chapters 94-96)

XXI: Works of Art, Collectors' Pieces and Antiques (Chapter 97)

Table 2: *EU Preferential schemes in 2004*

Generalized System of Preferences (GSP), including Everything But Arms (EBA), GSP-Drugs, GSP-Labor Rights schemes
Cotonou Agreement
EU-Chile Association Agreement
EU-Mexico Free Trade Agreement
Euro-Mediterranean partnership
European Economic Area (EEA) Agreement
EU-Turkey Custom Union
Trade, Development and Co-operation Agreement (TDCA) [South Africa]

Table 3: EU25 imports, MFN duty-free and positive tariffs trade flows, and number of observations by section (2004)

Sections	Total trade (Ml of €)	Share in total imports (%)	MFN duty-free flows (%)	Positive MFN tariffs flows(%)	# observations (non-zero flows)
Overall	626,035	100.0	56	26	980,414 (257,144)
I	10,991	1.8	14	39	54,464 (6,015)
II	17,389	2.8	58	24	36,810 (8,341)
III	1,057	0.2	17	20	8,712 (1,063)
IV	13,829	2.2	43	23	67,616 (10,379)
V	94,047	15.0	97	1	14,712 (3,188)

VI	65,972	10.5	55	35	92,678 (19,196)
VII	18,131	2.9	11	56	42,683 (11,385)
VIII	3,561	0.6	34	33	17,389 (5,467)
IX	8,630	1.4	76	8	21,449 (5,471)
X	10,557	1.7	100	0	22,832 (5,635)
XI	44,819	7.2	4	41	129,429 (46,865)
XII	6,519	1.0	0	35	14,903 (5,706)
XIII	4,853	0.8	14	42	28,466 (8,889)
XIV	26,860	4.3	89	6	5,578 (2,424)
XV	48,301	7.7	55	21	97,427 (26,181)
XVI	151,831	24.3	57	28	211,597 (55,937)
XVII	52,303	8.4	31	53	35,170 (8,064)
XVIII	32,497	5.2	63	24	44,505 (14,553)
XIX	232	0.04	16	68	2,045 (520)
XX	11,324	1.8	47	27	30,952 (11,236)
XXI	2,332	0.4	100	0	986 (629)

NOTE: data exclude TRQ and graduated products

Table 4: *Preferential trade: applied and MFN tariffs, share in total trade, utilization rates, and number of preferential tariff lines by sections (2004)*

Sections	Bilateral applied tariffs (%): simple average	MFN tariff (%): simple average	Share of preferential trade (%)	Preference utilization rates (%)*	# preferential tariff lines
Overall	1.19	8.61	18	67.3	524,552
I	2.18	15.8	47	94.2	25,692
II	3.07	10.2	18	67.6	15,228
III	2.28	9.7	63	98.0	5,720
IV	6.15	45.0	34	89.1	34,680
VI	0.30	5.4	10	47.8	51,007
VII	0.21	5.7	33	70.8	27,216
VIII	0.35	4.6	33	65.8	9,437
IX	0.32	4.6	16	78.9	9,749
XI	2.18	9.0	55	65.4	93,374
XII	0.86	7.7	65	73.4	10,834
XIII	0.50	4.7	44	77.0	19,123
XV	0.22	3.8	24	79.1	41,270
XVI	0.13	3.2	15	73.5	114,936
XVII	0.71	6.1	16	66.3	24,664
XVIII	0.06	3.3	12	75.6	20,686
XX	0.06	3.5	25	78.2	16,137

NOTE: data exclude TRQ and graduated products

*Shares of actual preferential trade flows in total potentially preferential trade

Table 5: *Preference margin impact by sector: different reference tariffs*

Sections	Model 1 (CES reference tariff)	Model 2 (MFN reference tariff)	Model 3 (Simple average reference tariff)	Model 4 (Trade-weighted reference average tariff)
I	5.89*** (4.58)	5.27*** (3.63)	7.01*** (4.23)	5.93*** (3.91)
II	0.28 (0.12)	2.88 (0.81)	0.76 (0.29)	0.12 (0.05)
III	6.79* (3.10)	4.64 (1.46)	6.50 (1.27)	8.53* (2.47)
IV	1.19* (2.46)	1.06 (1.93)	1.81* (2.56)	1.42** (2.67)
VI	-0.33 (-0.11)	-3.16 (-1.00)	-5.67 (-1.81)	1.51 (0.48)
VII	11.90*** (5.29)	11.48*** (5.01)	9.03*** (3.82)	13.58 *** (5.65)
VIII	4.60 (1.28)	2.89 (0.83)	9.03* (2.16)	7.23 (1.88)
IX	16.13** (3.10)	9.90* (2.22)	18.09*** (3.61)	17.89** (2.93)
XI	6.71*** (7.81)	6.72*** (7.79)	7.09*** (8.06)	7.04*** (7.78)
XII	6.23*** (3.78)	6.07*** (3.91)	6.59*** (4.23)	6.34*** (3.77)
XIII	14.05*** (6.73)	13.10*** (6.22)	14.13*** (6.51)	15.17*** (7.00)
XV	12.00* (2.10)	12.89* (2.13)	13.83* (2.31)	13.97* (2.16)
XVI	12.15*** (4.70)	11.64*** (4.45)	14.40*** (5.14)	14.22*** (5.40)
XVII	-5.33 (-1.04)	-0.67 (-0.17)	4.12 (0.85)	-8.26 (-1.22)
XVIII	30.67*** (3.62)	24.56** (3.10)	23.87** (2.89)	30.27*** (3.82)
XX	11.34* (2.34)	12.61** (2.62)	11.34* (2.48)	15.05** (2.60)

NOTE: *t* statistics in parentheses: *significant at 10 percent level; **significant at 5 percent level; ***significant at 1 percent level. Number of Obs (table 3)

Table 6: *Trade flows according to CES preference margins, preferential status, and shares with respect to total EU imports (2004)*

Sections	Preferential trade flows (Ml of □)			MFN flows (Ml of □)		
	Margin > 1 (%)	Margin = 1 (%)	Margin < 1 (%)	Margin < 1 (%)	Margin = 1 (%)	Margin > 1 (%)
Total	105,133 (16.8)	43 (0)	6,958 (1.1)	143,270 (22.9)	370,096 (59.1)	576 (0.1)
I	4,945 (45.0)	6 (0.1)	238 (2.2)	3,387 (30.8)	2,398 (21.8)	17 (0.2)
II	2,801 (16.1)	0	339 (1.9)	3,695 (21.3)	10,091 (58.0)	456 (2.6)
III	597 (56.5)	0	64 (6.1)	201 (19.0)	194 (18.4)	0
IV	4,219 (30.5)	0	476 (3.4)	2,993 (21.6)	6,055 (43.8)	86 (0.6)
VI	6,230 (9.4)	33 (0.1)	332 (0.5)	9,394 (14.2)	49,998 (75.8)	12 (0)
VII	5,965 (32.9)	0	9 (0.1)	8,428 (46.5)	3,729 (20.6)	0
VIII	1,188 (33.4)	0	4 (0.1)	943 (26.5)	1,427 (40.1)	0
IX	1,363 (15.8)	0	14 (0.2)	702 (8.1)	6,551 (75.9)	0
XI	20,337 (45.4)	3 (0)	4,501 (10.0)	18,132 (40.5)	1,847 (4.1)	0
XII	4,115 (63.1)	0	107 (1.6)	2,292 (35.2)	4 (0.1)	0
XIII	2,127 (43.8)	0	19 (0.4)	2,031 (41.8)	677 (13.9)	0
XV	11,281 (23.4)	0	323 (0.7)	10,218 (21.2)	26,480 (54.8)	0
XVI	22,080 (14.5)	0	0	41,129 (27.1)	88,621 (58.4)	0
XVII	7,896 (15.1)	1 0	524 (1)	26,720 (51.1)	17,126 (32.8)	0
XVIII	4,003 (12.3)	0	0	7,494 (23.1)	21,000 (64.6)	0
XX	2,887 (25.5)	0	0	2,972 (26.2)	5,466 (48.3)	0

Table 7: *Trade effect: results for sectors with significant preference impacts (CES reference tariff)*

Sections	Additional flows at world prices (Ml of ◘)	Trade increase: % predicted trade (% actual preferential trade)	Missing flows at world prices (Ml of ◘)	Trade decrease: % predicted trade (% actual preferential trade)
I	971	8.8 (18.4)	1,314	11.9 (24.8)
III	88	8.3 (13.2)	45	4.3 (6.7)
IV	342	2.5 (7.1)	308	2.2 (6.4)
VII	2,222	12.3 (37.1)	1,859	10.3 (31.1)
IX	465	5.4 (33.5)	391	4.5 (28.2)
XI	6,968	15.5 (27.3)	5,191	11.6 (20.4)
XII	719	11.0 (16.4)	401	6.1 (9.1)
XIII	685	14.1 (31.3)	475	9.8 (21.7)
XV	2,934	6.1 (25.1)	2,421	5.0 (20.7)
XVI	5,134	3.4 (24.0)	4,527	3.0 (21.1)
XVIII	2,648	9.9 (67.3)	2,752	10.3 (69.9)
XX	649	2.4 (22.8)	349	1.3 (12.2)
Total	**23,825**	**6.6 (26.4)**	**20,033**	**5.5 (22.2)**

Table 8: *Trade effects, results for sectors with significant preference impacts (MFN reference tariff)*

Sections	Trade increase: % predicted trade (% actual preferential trade)	Additional flows at world prices (Ml of □)
I	15.6 (33.8)	1,790
VII	14.5 (45.5)	2,721
IX	5.8 (36.3)	503
XI	21.1 (39.1)	9,970
XII	14.9 (23.2)	1,018
XIII	17.4 (39.6)	866
XV	10.5 (43.7)	5,115
XVI	3.8 (27.4)	5,867
XVIII	7.2 (59.9)	2,358
XX	8.6 (34.3)	977
Total	**5.8 (32.4)**	30,907

Table 9: *Trade effect, results for sectors with significant preference impacts (trade-weighted reference tariffs)*

Sections	Additional flows at world prices (Ml of □)	Trade increase: % predicted trade (% actual preferential trade)	Missing flows at world prices (Ml of □)	Trade decrease: % predicted trade (% actual preferential trade)
I	913	8.3 (17.3)	1461	13.3 (27.6)
III	110	10.4 (16.4)	58	5.4 (8.5)
IV	396	2.9 (8.2)	392	2.8 (8.1)
VII	2456	13.5 (41.0)	2769	15.3 (46.3)
IX	473	5.5 (34.1)	502	5.8 (36.2)
XI	6823	15.2 (26.8)	6904	15.4 (27.1)
XII	745	11.4 (17.0)	467	7.2 (10.7)
XIII	695	14.3 (31.8)	653	13.5 (29.9)
XV	3263	6.7 (27.9)	3246	6.7 (27.7)
XVI	6077	4.0 (28.4)	6681	4.4 (31.2)
XVIII	2761	8.5 (70.1)	3395	10.4 (86.2)
XX	850	7.5 (29.8)	498	4.4 (17.5)
Total	**23272**	**4.5 (25.8)**	**23839**	**4.6 (26.5)**

Table 10: *Preference margin (CES reference tariffs) impact by sector using different datasets*

Sections	Model 5	Model 6		Model 7	
	UVs	Graduated products	Obs.	Zero trade flows	Obs.
I	6.01***	5.89***	54,464	10.75***	78,802
	4.48	(4.56)	(6,015)	(7.45)	(6,015)
II	3.50	0.26	36,810	3.69	50,097
	(1.40)	(0.11)	(8,341)	(1.30)	(8,343)
III	7.27**	-0.01	9,038	16.36**	14,126
	(2.99)	(0.00)	(1,138)	(3.13)	(1,063)
IV	1.09*	1.75**	68,782	2.69***	99,192
	(2.24)	(2.61)	(10,725)	(5.42)	(10,379)
VI	-0.35	-2.67	95,547	2.94	137,166
	(-0.11)	(-0.89)	(20,740)	(0.98)	(19,196)
VII	11.89***	9.17***	44,059	14.89***	64,882
	(5.29)	(3.78)	(12,218)	(7.07)	(11,385)
VIII	4.63	-21.60***	17,999	9.50**	24,600
	(1.28)	(-5.03)	(5,883)	(2.87)	(5,467)
IX	16.10**	6.52	22,092	21.17***	29,877
	(3.12)	(1.32)	(5,854)	(4.19)	(5,471)
XI	6.708***	4.54***	133,469	7.66***	201,209
	(7.81)	(5.93)	(49,911)	(8.78)	(46,865)
XII	6.227***	4.39**	15,347	6.95***	23,182
	(3.77)	(2.63)	(6,125)	(4.28)	(5,706)
XIII	14.04***	10.31***	29,095	16.84***	43,845
	(6.72)	(4.91)	(9,355)	(8.09)	(8,889)
XV	12.04*	6.60	98,632	17.99***	129,670
	(2.10)	(1.11)	(27,029)	(3.60)	(26,181)
XVI	12.14***	6.78**	215,277	13.25***	302,416
	(4.70)	(2.58)	(58,513)	(5.18)	(55,937)
XVII	-4.67	-4.67	35,170	-0.39	55,928
	(-0.96)	(-0.96)	(8,064)	(-0.10)	(8,064)
XVIII	30.53***	21.80*	45,150	31.23***	59,225
	(3.59)	(2.52)	(15,054)	(3.72)	(14,553)
XX	11.36*	-10.15*	31,189	14.42**	42,834
	(2.34)	(-1.98)	(11,473)	(3.10)	(11,236)

NOTE: *t* statistics in parentheses: *significant at 10 percent level; **significant at 5 percent level; ***significant at 1 percent level. Number of Obs for model 5 (table 3)

Table 11: *Preference margin impact by sector assuming different elasticities for the computation of the CES reference tariffs*

Sections	□ = 1.1	□ = 2	□ = 4	□ = 8	□ = 12	□ = 16
I	5.873***	5.882***	5.890***	5.902***	5.943***	5.997***
	(4.43)	(4.45)	(4.52)	(4.63)	(4.69)	(4.73)
II	0.275	0.273	0.236	-0.0138	-1.179	-2.445
	(0.12)	(0.12)	(0.10)	(-0.01)	(-0.62)	(-1.75)
III	7.619**	7.263**	6.948**	6.741**	6.675**	6.584**
	(3.09)	(3.13)	(3.12)	(3.09)	(2.98)	(2.64)
IV	1.189*	1.174*	1.152*	1.092*	1.018	0.959
	(2.47)	(2.42)	(2.33)	(2.12)	(1.94)	(1.79)
VI	-0.332	-0.333	-0.336	-0.348	-0.367	-0.404
	(-0.11)	(-0.11)	(-0.11)	(-0.11)	(-0.12)	(-0.13)
VII	11.48***	11.52***	11.61***	11.77***	11.90***	12.02***
	(5.17)	(5.19)	(5.21)	(5.26)	(5.29)	(5.32)
VIII	4.653	4.647	4.611	4.564	4.497	4.444
	(1.29)	(1.29)	(1.28)	(1.26)	(1.25)	(1.23)
IX	15.98**	16.00**	16.03**	16.07**	16.12**	16.17**
	(3.12)	(3.12)	(3.12)	(3.12)	(3.11)	(3.11)
XI	6.653***	6.662***	6.681***	6.718***	6.749***	6.770***
	(7.78)	(7.78)	(7.79)	(7.81)	(7.83)	(7.84)
XII	6.208***	6.216***	6.224***	6.231***	6.239***	6.251***
	(3.75)	(3.76)	(3.77)	(3.78)	(3.80)	(3.81)
XIII	13.89***	13.90***	13.93***	13.98***	14.03***	14.07***
	(6.67)	(6.68)	(6.69)	(6.71)	(6.72)	(6.73)
XV	11.80*	11.81*	11.85*	11.91*	12.00*	12.11*
	(2.08)	(2.08)	(2.09)	(2.09)	(2.10)	(2.10)
XVI	12.21***	12.21***	12.21***	12.18***	12.15***	12.11***
	(4.73)	(4.73)	(4.73)	(4.72)	(4.70)	(4.68)
XVII	-4.656	-4.541	-4.305	-3.805	-3.349	-2.953
	(-0.96)	(-0.95)	(-0.91)	(-0.83)	(-0.75)	(-0.68)
XVIII	29.50***	29.52***	29.66***	29.88***	30.07***	30.24***
	(3.42)	(3.43)	(3.45)	(3.48)	(3.51)	(3.54)
XX	11.09*	11.11*	11.16*	11.28*	11.35*	11.41*
	(2.32)	(2.32)	(2.32)	(2.34)	(2.34)	(2.35)

NOTE: *t* statistics in parentheses: *significant at 10 percent level; **significant at 5 percent level; ***significant at 1 percent level. Number of Obs (table 3)

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