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A New Measure of Tariff Preference Margins Adjusted for Import and Domestic Competition

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Abstract

This paper provides a new theoretically-derived measure of preference margins at the product level, that takes into account competition across exporters as well as competition with domestic producers on a given market. This indicator is derived for differentiated goods under imperfect competition, in a framework extended from Ottaviano, Tabuchi and Thisse (2002). We compute our theoretically-based preference margin measure for the European Union market access over 5,000 products (HS-6 digits) exported by an exhaustive sample of 222 countries in 2008. This new measure reveals very low preference margins once adjusted for domestic and import competition. We also provide econometric correlations validating the relevance of both our "preferred" preference margin indicator and the theoretical framework used to derive it.

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1. INTRODUCTION

With the current Doha round of multilateral negotiations and the increasing number of trade preferential schemes under negotiation (e.g. the future free trade area between the EU and the South Korea or with the ASEAN), there is renewed interest in measuring the "tariff preference margin" actually granted to developing countries by the main developed markets and then assessing the potential tariff erosion generated by the changes in existing multilateral and preferential schemes. This new interest is revealed by the increasing number of recent papers proposing "new" (and ad-hoc) preference margin measures (e.g. Low et al. 2009, Nicita and Hoekman 2008, Carrère et al. 2010, Fugazza and Nicita 2010).

The usual measure of the preference margin for a product *k* exported to country *j* by country *i* is computed as the difference between the third-country tariff imposed by country j on product k (i.e. the "Most Favored Nation" (MFN) tariff notified at the WTO) and the tariff applied on the export of product *k* by country *i*. Hence, according to this definition, the only possible source of preference erosion comes from multilateral negotiations leading to a reduction in the MFN tariff.

However, the last round of multilateral negotiations, the Uruguay Round, was signed in 1994. Since then, developed countries have only marginally reduced their MFN tariffs, the Doha round still under negotiation. Does it mean that there is no preference margin erosion for developing countries on these markets over the past 10 years? According to the usual definition of preference margin, the answer should be yes. But in doing so, we ignore the price effect of higher competition on the developed market resulting from the large extension of preferential tariffs granted by these developed countries to developing countries groups over the past 10 years. According to some estimates (e.g. Winters and Chang, 2000, for the European Community or Chang and Winters, 2002 and Schiff and Chang, 2003, for MERCOSUR), this "pro-competitive" effect on price following the implementation of regional preferential tariffs is far from negligible. Their estimates imply that firm's price depends not only on the tariff it faces on its own export product, but also on that charged on its rivals' product. This is the rationale behind the ad-hoc measures of "competition-adjusted" preference margin recently proposed by the papers cited above. This "competition-adjusted" preference margin is calculated as the percentage-point difference between the weighted average tariff rate applied to all competitors and the preferential rate applied to the beneficiary country (weights usually represented by trade shares in the preference granting market). While intuitive, these measures of adjusted preference margins lack microeconomic foundations.

The purpose of this paper is to theoretically derive a measure of preference margins under imperfect competition with differentiated goods in a framework based on the model proposed by Ottaviano, Tabuchi and Thisse (2002) and extended to N countries. This framework offers a main advantage

over the well-known Dixit-Stigliz-Krugman (DSK) framework as monopolistically competitive firms now face variable rather than constant demand elasticity. This allows us to take into account two direct competition effects: (i) local prices decrease with the number of domestic producers, in accordance with the theory of industrial organization and (ii) a lower tariff on imports from some partner countries also leads to lower prices (e.g. Chang and Winters, 2002). Both effects are due to falling mark-ups ("pro-competitive effect"), which vary with the number of firms and the structure and level of tariffs, whereas they would be fixed with the constant demand elasticity of the DSK framework.

We then compute our theoretically-based preference margin measure for the EU market access in 2008 of around 5048 products exported by 222 countries and territories. The EU is a good candidate to compute the new measure of tariff preferential margin as the EU is clearly the most prolific in terms of according trade preferences, resulting in a great heterogeneity between exporter countries to the EU. Moreover, for the EU, data for ad-valorem tariff as well as for ad-valorem equivalent proxy for specific tariff are available, which is clearly important to accurately measure preference erosion in some sensitive products such as agriculture. Finally, the specificity of the EU, with its well-reported intra-regional trade, allows us to have a good proxy (even if under-estimated) for domestic competition.

Our results reveal very low preference margin. Actually, when adjusted for import and domestic competition, the preference margin represents only 20% of the standard preference margin (i.e. the simple difference between the MFN and applied tariff). This loss is mostly due to competition with other countries also benefiting from preferential access to the EU market (80%) but also to European producers (20%). However, there is a great heterogeneity between products and between countries according to their export structure. Moreover, we find that the Domestic and Import Competition Adjusted (DICA) preference margin proposed in this paper is positively and significantly correlated, at the product level, with the share of total export that a country exports to the EU market. Neither the standard preference margin measures nor other ad-hoc measures proposed in recent empirical literature are significantly correlated with this share. Finally, as predicted by our theoretical framework, we find that goods with a higher degree of substitution are more sensitive to a given preference margin.

The rest of the paper is organized as follow. In section 2, the theoretical preference margin measure is derived first under perfect competition and homogenous goods, then under imperfect competition with homogenous but also differentiated goods. The EU's network of PTAs and the tariff and trade data used are presented in section 3. Computations of preference margin according to different measures are reported in section 4 for different groups of developing countries in 2008. This section

proposes some stylized facts on preferential margin as well as some econometric tests that validate our theoretical framework. Section 5 concludes.

2. A THEORETICALLY MOTIVATED PREFERENTIAL MARGIN MEASURE

This section discusses the potential short-term "price surplus" resulting from a preferential regime.[1] We will see that the usual measure of this "price surplus", i.e. the difference between the applied tariffs facing a country and the MFN tariffs that would apply on its exports in the absence of a preferential agreement, can be only justified in a perfect competitive framework with homogenous goods. We will then derive a more appropriate measure in the case of imperfect competition and differentiated goods.

In what follows, whatever the adopted framework, we denote by τ_{ijk} the *specific* tariff imposed by country *j* on its imports of good *k* from country *i*. We define the ***"price surplus"*** *generated by a preferential tariff granted by country j to country i on good k as the difference between* p^*_{ijk}, *the equilibrium price that a firm producing k and located in the foreign country i is setting in market j given the actual preferential scheme and* p_{ijk}, *the price that a firm producing k and located in country i would set in market j if all other foreign competitors h on that good (not located in i) had the same market access to j than i.* In what follows, we focus on the *comparative static*: $\left[p^*_{ijk} - p_{ijk} \right]$.

2.1 Preferential tariff on a homogenous good traded in perfect competition

Consider a *homogenous good k traded under perfect competition*, with a world price denoted p_{wk}. Assume that a country, denoted *j*, imposes a tariff τ_{MFNk} on imports of good *k* from third-countries and faces a perfectly elastic world supply of exports (denoted X_{Wk} in figure 1). Then, the domestic price faced by consumers in country *j* for good *k* is $p_{wk} + \tau_{MFNk}$. Assume now that country *j* offers a preferential tariff $0 \le \tau_{ijk} < \tau_{MFNk}$ on good *k* to a small developing country *i*, while still charging the MFN tariff τ_{MFNk} on imports of *k* from other countries. As country *i* is assumed to be relatively small (with an export supply denoted X_{ijk} in figure 1), its exports do not saturate the *j*'s market of good *k*. Thus, the price on country *j*'s market is still $p_{wk} + \tau_{MFNk}$. In the short-run, keeping country *i*'s export share

[1] Winters (1997) shows that in a competitive economy, marginal changes in quantity hardly matter, whereas changes in the prices of traded goods matter considerably to assess the welfare effect on countries when a new trade agreement is implemented.

constant, the "price surplus" generated by the preferential access to *j* and captured by country *i* is $\left[\tau_{MFNk} - \tau_{ijk}\right]$.

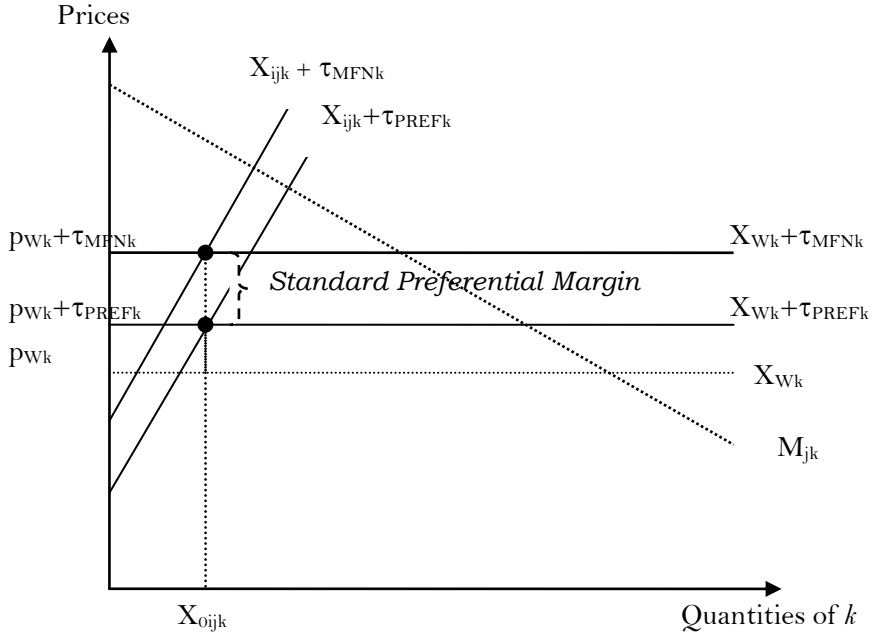
What happens for country *i* if *j* offers the same preferential access to another small developing country? There will be no variation in the *j*'s domestic price if the total exports of the 2 countries do not saturate the country *j*'s market. Each developing country receives the corresponding "price surplus" of $\left[\tau_{MFNk} - \tau_{ijk}\right]$. However, if country j continues to extend the same preferential scheme to others countries until the market is saturated with only preferential imports, then the domestic price in j will fall to $p_{wk} + \tau_{ijk}$ with no more rent for countries benefiting from the preferential access.

Hence, so long as the market is not saturated, in the case of a preferential tariff granted to a homogenous goods *k* exported by a small country *i* under perfect competition - and with an assumption of a perfectly elastic world export supply - the "price surplus" granted by country *j* to *i* can be written as follows:

$$p^{*}_{ijk} - \tilde{p}_{ijk} = \underbrace{\left[\tau_{MFNjk} - \tau_{ijk}\right]}_{\substack{standard \\ preferential\ margin}} \quad (1)$$

with τ_{ijk} being the specific tariff applied by country *j* on the imports of good *k* from country *i*, τ_{MFNjk} being the highest tariff applied by *j* on that good *k* with effective positive imports (which often corresponds to the MFN tariff as we will see in section 3).

Figure 1. Preference margin under perfect competition and homogenous good for small countries



This "standard preferential measure" is thus only relevant in the very restrictive case of both homogenous goods and a perfectly elastic world supply of exports. Assuming a homogenous good but with an increasing world export supply changes the conclusion: each extension of the preferential scheme to new countries decreases the world price, reducing the short-term price surplus of countries that were already in the scheme. More generally, assuming that goods are not *perfectly* homogeneous changes drastically the effect on price surplus of the expansion of a preferential scheme for countries in that scheme. It is then necessary to define a new measure of preferential margin in a differentiated goods framework, which is proposed in next section.

2.2 Preferential tariff on a differentiated good traded under imperfect competition

We use here a popular specification of the preference for variety, the quadratic utility model, often used in industrial organization (Dixit, 1979) and in international trade (Melitz and Ottaviano, 2008). With such a specification, equilibrium prices depend on key aspects of the market, such as own market access as well as market access of competitors or the degree of competition, instead of being given by a simple rule of constant markup as in the DSK framework[2]. In what follows we rely on the short-term model proposed by Ottaviano, Tabushi and Thisse (2002) that we extend to N countries.

We consider a world of N countries. This world is endowed with factor A, evenly distributed across countries (and immobile) and factor L (not mobile between countries but mobile betweens firms), with $\lambda_i \in [0,1]$, $\sum_{i=1}^{N} \lambda_i = 1$, denoting the share of this factor located in country i. For illustrative purposes, we follow Ottaviano et al. (2002) and call factor A "farmers" and factor L "workers". The total amount of factors (and then consumers) in country i is thus $A/N + \lambda_i L$.

There are 2 goods:

- "Agriculture" which is homogenous and produced using only "farmers" (factor A) under constant returns to scale and perfect competition, freely traded and chosen as the numèraire;
- "Manufacturing" which is horizontally differentiated and produced using "workers" (factor L) under increasing returns to scale and imperfect competition.

[2] In the model of monopolistic competition developed by Dixit and Stiglitz (1977) love of variety is captured by a CES utility function that yields a demand system in which the own-price elasticities of demands are constant (equal the elasticity of substitution). Thus, the equilibrium price of a variety is independent of the market access given to other competitors on the same goods and of the intensity of competition, which makes it irrelevant for our purpose and not compatible with some stylized facts (see Chang and Winters, 2000 and 2002 or Schiff and Chang, 2003).

We assume a large number Z of potential firms producing the differentiated good k, each firm producing its own variety z (in what follow, we omit the subscript k for the differentiated good). As Z is large, each firm is negligible and the interaction between any two firms is zero. However, the average price across firms will affect any single firm.

We also assume that Z>N, i.e. we model several firms (and thus varieties) by countries instead of using the more usual "Armington" differentiation hypothesis (one variety by origin country), the number of firms per country being exogenously determined in the short term by the world labor distribution (λ_i). This hypothesis allows us, without significantly complicating the model, to take into account asymmetry in exports flows across countries and then to explicitly introduce revealed market share weights in the final indicator (market share of domestic producers as market shares of different exporting countries for a given good in the EU market).

As already mentioned, we assume that each country imposes a specific tariff on the imports of the differentiated good. More precisely, firms located in country i pay τ_{ij} units of the numèraire per unit exported to country j (regardless of the variety).

Demand Side

Preferences are identical across individuals and countries and described by a quasi-linear utility with a quadratic subutility symmetric in all varieties:

$$U(q_0; q_z) = q_0 + \sum_{z=1}^{Z} q_z - (1-\gamma)\frac{1}{2}\sum_{z=1}^{Z}(q_z)^2 - \gamma\frac{1}{2}\left[\sum_{z=1}^{Z}(q_z)\right]^2, \quad z \in [1, Z] \qquad (2)$$

where q_z is the quantity of variety z, q_0 the quantity of the numèraire (consumers have a positive initial endowment of this good) and γ expresses the substitutability between varieties of the differentiated goods, $0 < \gamma < 1$. The higher γ, the closer substitutes the varieties and the condition $\gamma < 1$ means that consumers have a taste for varieties. [3]

Each consumer is endowed with one unit of labor, of type A or L, and $\bar{q}_0 > 0$ units of numèraire. Hence, the budget constraint can be written:

$$\sum_{z=1}^{Z} p_z q_z + q_0 = w + \bar{q}_0 \qquad (3)$$

[3] For γ=1, substitutability is perfect and equation (2) corresponds to a utility function of a homogeneous good, quadratic in total consumption.

where w is the individual's labor income (w^d or w^L), p_z is the price of variety z, and the price of the homogenous good is normalized to one.[4]

Once substituted q_0 in (2) by its expression in (3), any individual maximizes the following utility function:

$$\underset{q_z}{Max} \sum_{z=1}^{Z} q_z - (1-\gamma)\frac{1}{2}\sum_{z=1}^{Z}(q_z)^2 - \gamma\frac{1}{2}\left[\sum_{k=1}^{Z}(q_z)\right]^2 - \sum_{z=1}^{Z} p_z q_z + w + \bar{q}_0 \qquad (4)$$

Solving for the first-order conditions with respect to q_z yields:

$$p_z = 1-(1-\gamma)q_z - \gamma\sum_{j=1}^{Z} q_j, \qquad z \in [1, Z]$$

Then, demand for variety z is:

$$q_z = \alpha - \alpha p_z + \alpha\sigma\sum_{j=1}^{Z}(p_j - p_z), \quad z \in [1, Z] \qquad (5)$$

with $\alpha \equiv \frac{1}{1+(Z-1)\gamma}, \sigma \equiv \frac{\gamma}{(1-\gamma)}$

Let n_i be the number of firms in country i, with $\sum_{h=1}^{N} n_h = Z$, the total number of firms (i.e. of varieties) in the world. Since each country imposes a tariff τ_{ij} on its imports, markets are segmented and then each firm is able to set a price specific to the market in which the product is sold. We denote by p_{ij} the price of the variety produced by a representative firm in country i and sold in country j. Using the assumption of symmetry between varieties and equation (5), demand faced by a representative firm located in country i in country j's market (q_{ij}) is respectively given by:

$$q_{ij} = \alpha - (\alpha + \alpha\sigma Z)\, p_{ij} + \alpha\sigma\sum_{h=1}^{N}(n_h p_{hj})$$

which can be rewritten as:

$$q_{ij} = \alpha\left[1-(1+\sigma Z)\, p_{ij} + (\sigma Z) P_j\right] \qquad (6)$$

with $P_j = \sum_{h=1}^{N}(\theta_h p_{hj})$ being the average price prevailing in country j, and $\theta_h = n_h/Z$ being the exogenous market share of varieties produced in country h (relative to the total number of varieties

[4] The initial endowment of q_0 is supposed to be sufficiently large for the equilibrium consumption of the numèraire to be positive for each individual.

proposed to country *j*'s consumer, including domestic varieties). When *j*=*i*, expression (6) gives demand faced by a representative firm located in country *i* in its country market (q_{ii}).

Hence, demand for a variety in a given market depends negatively on the price of this variety but positively on the prices of all other varieties proposed on this market - i.e. on the average consumer price.

Supply Side

Remember that we have 2 goods in each economy. Technology in the "agricultural" homogenous good requires one unit of factor A ("farmers") in order to produce one unit of output. Technology in the "manufacturing" differentiated good requires Φ units of L ("workers") in order to produce any amount of a variety. This implies that the marginal cost of a variety is zero.

Labor L ("workers") market clearing for a country *i* implies $\lambda_i L = n_i \Phi$, λ_i being the share of factor L located in country *i*, n_i being the number of varieties produced in country *i* (number of firms located in *i*).

As already mentioned, we choose to model several firms (and thus varieties) by countries in order to take into account differences in country size and thus in export market shares across countries. The mass of firm in country *i* is:

$$n_i = \frac{\lambda_i L}{\Phi} = \lambda_i Z \qquad \text{with} \sum_{h=1}^{N} n_h = Z \tag{7}$$

Given that there are $A/N + \lambda_h L$ consumers in any country *h* (initial endowment), the profit made by a representative firm in country *i* is defined as:

$$\pi_i = p_{ii} q_{ii} \left(A/N + \lambda_i L \right) + \sum_{h=1, h \neq i}^{N} \left[\left(p_{ih} - \tau_{ih} \right) q_{ih} \left(A/N + \lambda_h L \right) \right] - \Phi w_i^L \tag{8}$$

where w_i^L is the wage of factor L prevailing in country *i*. It is determined by the zero-profit condition in country *i*.[5]

Hence, substituting quantities by expression (6) gives:

[5] The number of firms in a country, n_i, is exogenously determined in the short run by the country endowment in L, but any firms can compete to be one of the resulting n_i firms. To be in, a firm needs to have the minimum Φ units of L required to produce. Then, the equilibrium wages of factor L are determined by a local bidding process in which firms compete for workers by offering higher wages until no firm can profitably try to enter or exit the market. w_i is the resulting wage rate prevailing in country *i*.

$$\pi_i = p_{ii}\alpha\left[1-\left(1+\sigma Z\right)p_{ii}+\left(\sigma Z\right)P_i\right]\left(A/N+\lambda_i L\right) + \sum_{h=1,h\neq i}^{N}\left(p_{ih}-\tau_{ih}\right)\alpha\left[1-\left(1+\sigma Z\right)p_{ih}+\left(\sigma Z\right)P_h\right]\left(A/N+\lambda_h L\right)-\Phi w_i^L \quad (9)$$

Equilibrium

We now determine what Ottaviano et al. (2002) call the "short term" equilibrium as we assume all labor (factor L and A) immobile between countries. Hence, the market allocation of any given spatial distribution of factor L (λ_i) - and the resulting market share θ_i of varieties produced in country i - is given.

A firm located in country i maximizes profits given by (9) with respect to all N prices $p_{ih}, h\in[1,N]$ separately. Firms located in other countries solve symmetric maximization problems. Note that, because there is a large number of firms, each firm is negligible and chooses its optimal price taking aggregate market conditions, i.e. $P_h, h\in[1,N]$, as given.

Then, maximization of profits (9) yields the following equilibrium prices for a firm located in country i:[6]

- within country i price:

$$p_{ii}^{*} = \frac{2+\sigma Z\sum_{h=1}^{N}\left(\theta_h\tau_{hi}\right)}{4+2\sigma Z} \quad (10)$$

- price charged in country j, $j\neq i$

$$p_{ij}^{*} = \frac{2+\sigma Z\sum_{h=1}^{N}\left(\theta_h\tau_{hj}\right)}{4+2\sigma Z}+\frac{\tau_{ij}}{2} \quad (11)$$

As expected, the equilibrium price settled by a firm located in country i for its exports to market j decreases with higher competition (others things equal) due to:

- lower tariffs τ_{hj} set by country j on its imports of varieties produced in competing country h (with $h\neq i$), especially when h is a large country (i.e. large weight θ_h);

- a larger number of domestic firms located in the importing country j (large θ_j) as $\tau_{jj}=0$ and Z is fixed;

[6] see Annex A1 for the detailed derivation of equilibrium prices and for the conditions on τ_{ij} for trade to occur between countries i and j at these equilibrium prices.

"Price Surplus" under monopolistic competition

As defined above, to determine the "price surplus" generated by a preferential tariff granted to country *i* on good *k*, we define $\tilde{p}_{ijk}$, the price that a firm located in country *i* would set in market *j* for its variety of *k* if all other foreign competitors of the same good *k* had the same market access – i.e. $\tau_{hj} = \tau_{ij}, \forall h$.[7] The "price surplus" is given by:

$$p^{*}_{ijk} - \tilde{p}_{ijk} = \rho_k \left[\sum_{h=1}^{N} \left(\theta_{hk} \tau_{hjk} \right) - \left(\left(1 - \theta_{jk} \right) \tau_{ijk} \right) \right] \qquad (12)$$

with

$$\rho_k = \frac{\sigma_k Z_k}{4 + 2\sigma_k Z_k} \qquad (13)$$

$0 < \rho_k < \frac{1}{2}$ and θ_{hk} being the market share on the market *j* of varieties of good *k* produced in country *h* (including domestic production θ_{jk}).

Note that in a standard Dixit-Stiglitz framework, we would have $p^{*}_{ijk} - \tilde{p}_{ijk} = 0$ as the firm's markup is exogenous and the equilibrium price does not depend on the market access given to competitors: if there is no change on the tariff applied on that firm, no change would be observed on the consumer price.

Note also that in the short-run, θ_{hk} is *exogenously* determined by the country size (in terms of labor, see equation (7)). This assumption is quite realistic as we are interested in preferential margin given to small developing countries which are more likely to adjust prices in short-run than quantities. Moreover, it is quite convenient as it allows us to derive a simple measure of preferential margin that explicitly takes into acount the weight of different competitors. Assuming endogeneous market share will only change the term θ_{jk} in equation (12), i.e. the distribution of the market share between domestic producers and foreign exporters when preferential tariff τ_{ijk} is uniformly applied to all exporters. We can expect that applying a quite low tariff τ_{ijk} on all imports will reduce the market share of domestic producers, implying thus an even smaller "price surplus" than the one obtained with an exogenous market share. Hence, any attempt to endogeneize the market shares will drastically complexify the model, and then the measure of preferential market access, without being

[7] Except for $h = j$ as $\tau_{jj} = 0$.

much more realistic. We just need to be aware that equation (12) gives the short-run preferential margin, i.e. the price surplus for given market share.

To summarize:

RESULT 1. *Under imperfect competition, the relevant measure of preferential margin given by country j on imports of goods k from country i is what we call the "**domestic and import competition-adjusted (DICA) preferential margin**", i.e.:*

$$\left[\sum_{h=1}^{N}\left(\theta_{hk}\tau_{hjk}\right)-\left(\left(1-\theta_{jk}\right)\tau_{ijk}\right)\right]$$

RESULT 2. *Under imperfect competition, countries receiving a preferential market access will capture more rent ($\rho_k \to 1/2$ in equation(12)) if the elasticity of substitution among varieties is high ($\gamma_k \to 1$, i.e. $\sigma_k \to +\infty$).*

Actually, according to equation (11), a change in the average rate of protection will generate more variation in price for highly substitutable goods, i.e.

$$\frac{\partial p_{ijk}^{*}}{\partial\left[\sum_{h=1}^{N}\left(\theta_{hk}\tau_{hjk}\right)\right]}=\rho_k \text{ with } \rho_k \to 1/2 \text{ when } \gamma_k \to 1$$

Hence, a *given* preference margin provides more price surplus when varieties are close substitutes, compared to more differentiated good.

3. DATA AND COMPUTATION OF THE NEW MEASURE

According to equation (12), to compute the rent (or "price surplus") captured by a country we need to compute the 2 components: (i) the "import and domestic competition-adjusted" preference margin and (ii) ρ_k.

3.1. data and computation of "import and domestic competition-adjusted" preference margin

We use a sample of 222 countries and territories. On the 176 developing countries benefiting from the GSP, 171 are included in the sample.[8] Hence, we use a quite *exhaustive* sample included all

[8] data are not available for Mayotte, South Georgia and the South Sandwich Islands, Montenegro, Kosovo and Heard Island and McDonald Islands

competitors in the EU market. Tariff structure (MFN and all preferential tariffs) applied by the EU27 in 2008 on its imports is extracted from Trade Analysis Information System (TRAINS) database of the UNCTAD, at the HS-10 digit level. Note that when, for a given line, the tariff applied is not an *ad-valorem* but a specific (or complex) tariff, we use the *ad-valorem* equivalent as computed by the UNCTAD.[9] When a country belongs to several agreements, we apply the tariff of the most advantageous agreement (as defined in Annex A2). We also take into account in the tariff database of the "graduated" sections of the HS classification from the GSP program for some countries such as China or Indonesia (reported in Annex A2).[10] We then consolidate (simple average) the tariff data from the 10 to HS-6 digit level (approximately 5,000 products) to be compatible with trade data available in the Commodity Trade (COMTRADE) database of the UNSD. This averaging within the HS-6 level is not a problem because there is very little variation in tariffs within the HS-6 digit groups.

We need to include in the computation the EU domestic production at the product level. However, production data are not available at such a higher disaggregated level, the best available being the OECD STAN database which includes output data for approximately 30 primary and secondary industries until 2006.[11] For accuracy, preferential margin should be computed at the more disaggregated level available. Actually, within a same category, tariffs can be very different between goods.[12] As tariffs are generally defined at the HS-6 level, we choose to compute preferences at this level and, as proxy of the "EU domestic production", we use intra-EU trade flows. Hence, this allows us to take into account that, for instance, when computing the European market access of Morocco or Tunisia for "Parts of garments/clothing accessories", 82% of EU27 imports of this product are actually from other EU countries – essentially from Italy and Germany - and then also benefit from a zero tariff (while the MFN tariff is 12%). Of course, when doing so we ignore the part of the domestic production not traded within the EU (and then directly consumed in the origin country), underestimating the share of domestic production in total consumption. We then overestimate the preferential margin as defined in (12).

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[9] UNCTAD uses a three-step method for estimating unit values: (1) from tariff line import statistics of the market country available in TRAINS; then (if (1) is not available) (2) from the HS 6-digit import statistics of the market country from COMTRADE; then (if (1) and (2) are not available) (3) from the HS 6-digit import statistics of all OECD countries. Once a unit value is estimated, then it is used for all types of rates (MFN, preferential rates, etc).

[10] The state of play of the EU's network of PTAs is summarized in details in annex A2 (see also details in Carrère, 2011). We have tried to be as accurate as possible using several sources such as the European Commission, the WTO or the UNCTAD.

[11] Note also that in the OECD STAN database, output values are not available for 6 non-OECD European countries (Cyprus, Latvia, Lithuania, Malta, Romania and Bulgaria). Alternative production databases for the European countries includes (i) UNIDO – INDSTAT4 database with 151 categories but only for manufacturing products and (ii) EUROSTAT- ProdCom with 4500 industrial products until 2008 but with no possible correspondence with the trade Harmonized System Classification.

[12] for instance, within the "sugar category", "raw beet sugar" has a specific MFN tariff of 33.9€/100 kg which corresponds to an ad-valorem tariff of 106% while "maple sugar" has an ad-valorem tariff of 8%).

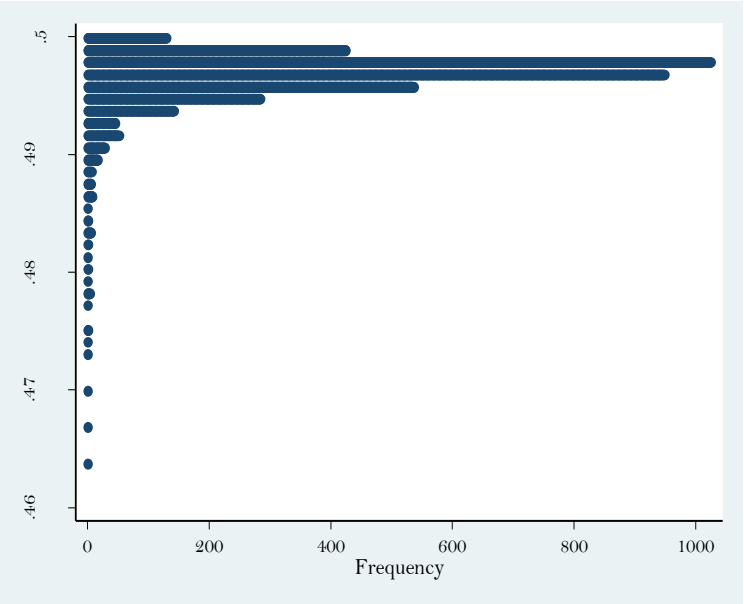
3.2. data and computation of the Parameter ρ_k

This parameter, defined in (13) depends, for a given differentiated good, on the elasticity of substitution among varieties, σ_k and on the total number of varieties produced, Z_k. The elasticity of substitution (σ_k) has been estimated by Broda, Greenfield and Weinstein (2006) at the HS-3 digits for several countries. We use the estimated elasticity for France over 1994-2003.[13] Concerning the approximation of the number of variety produced, we assume that at least each exporter country produces its own variety. Thus, we define $Z_k^{\min}$, the minimum number of varieties produced, as the number of countries that actually export this good k (towards the EU or not). Hence we compute the corresponding $\rho_k^{\min}$. Given the estimated values of σ_k and of $Z_k^{\min}$ (see some descriptive statistics in Annex A1 - table A1 over the 5048 products included in the sample), $\rho_k^{\min}$ is very close to $\rho_k^{\max} = 1/2$ for most products. The distribution of $\rho_k^{\min}$ over the products with a non-zero MFN tariff (and then with a potential positive preferential margin) is given in figure 2. Considering $\rho_k \approx 1/2$ appears to be a good approximation.[14] However, in the econometric analysis proposed in next section we will also use $\rho_k^{\min}$ as estimated here.

[13] Using the estimated elasticity for Germany does not change results.
http://faculty.chicagobooth.edu/christian.broda/website/research/unrestricted/TradeElasticities/TradeElasticities.html

[14] Some exception, with a $\rho_k^{\min} \in [0.46; 0.49]$, concerns products with both a low degree of differentiation and a small number of exporters such as specific meat (whales, primates, reptile), some organic chemicals (Aldrin), or some base metals (thallium).

Figure 2. Distribution of $\rho_k^{\min}$ over the products with a non-zero MFN tariff



Source: author's computation based on COMTRADE/TRAINS Database and Broda et al. (2006) elasticity database

4. Alternative Average Preferential Margin Measures

Three different measures of the preference margin granted by the EU27 to country *i* on good *k* are computed:

1. The "Standard" preferential margin usually computed in empirical literature, i.e. the difference between the MFN tariff applied by the EU on good *k* and the tariff applied on imports from country *i* of this good (see equation (1));

2. The "Import Competition-Adjusted" (ICA) preferential margin as proposed in Carrère and de Melo (2010) – adjusted for competition between non-EU countries but ignoring the intra-EU trade flows;

3. The "Domestic and Import Competition-Adjusted" (DICA) preferential margin corresponding to equation (12) in section 2.2.

We compute each of the 3 preference margin measures for each country/products. Given that we have 222 countries and territories and 5,048 products under the HS6 (2007) classification for the year 2008, we then compute 1,120,656 preference margins for each of the 3 measures.[15]

4.1. Some stylized facts at the country level

[15] These 3 preference margin measures, at the country and product levels for the year 2008, are available upon request and will be soon be freely available on line.

In figure 3, we report results for "an average" developing country belonging to one of the 6 main categories of the EU preferential network: (i) the Generalised System of Preferences (GSP), (ii) the GSP+, a special incentive arrangement for sustainable development and good governance, (iii) the Everything But Arms (EBA) arrangement for the 49 Least Developed Countries (LDCs), (iv) the Economic Partnership Agreements (EPAs) negotiated with the group of 79 African, Caribbean and Pacific (ACP) countries, (v) the Euro-med Agreements with 9 Mediterranean countries and (vi) the Overseas Association signed with Overseas Countries and Territories (OCT) - see details in Annex A2. We also add the group of 12 countries without any trade agreements with the EU for comparison purpose.

We first report the unweighted measures, using the whole 5,048 lines, to have a broad picture of the "*de jure*" - even if not used – preferential agreements. Among these 5,048 lines, 26% are imported by the EU with a zero MFN tariff (and then no possible preference margin), and an additional 23% with a MFN tariff lower than 3%.

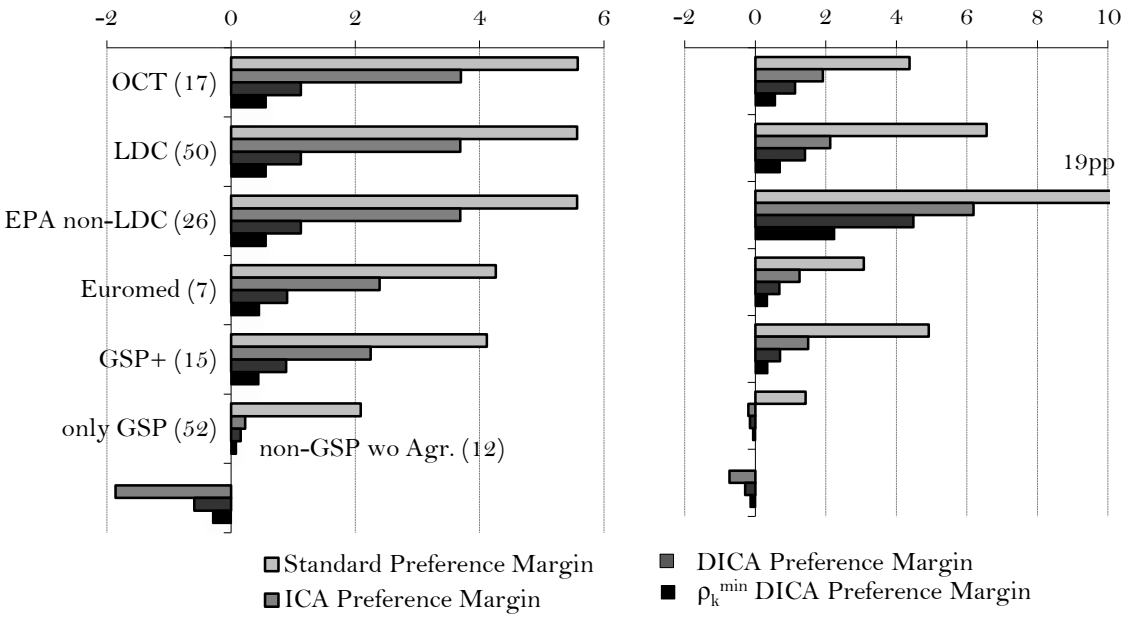
Whatever the measure used, when looking at the simple averaged preferential margin given by the EU market to all the 5048 tariff lines, the ranking of EU preferential schemes is the same: the most generous scheme is the one offered to the OCTs (5.58pp for the standard preference margin), followed by the EBA agreements for LDCs and interim or full EPA countries (5.57pp), the Euromed agreements (4.26pp), the GSP+ (4.11) and finally, the standard GSP (2.09).[16]

Figure 3. Preference margin to the EU27 market of an "average" country in each category (number of countries in parenthesis), 2008

3.a. Unweighted average
(5018 products – with or without positive exports)

3.b. Import weighted average

[16] The only difference between the preferential scheme offered to OCT and EBA/EPA countries in our sample concerns "arms and ammunitions" as we assume zero duty on rice and sugar.



Source: author's computation based on COMTRADE/TRAINS Database

However, even if the ranking is maintained, adjusting for the competition between importers on the EU market but also for competition with domestic producers (i.e. intra-EU imports) drastically reduces the preference margin granted by the EU to developing countries. On average, the DICA preference margin is around 20% of the Standard preference margin (only 8% for the countries under the standard GSP). Concerning the group of countries with no trade agreements with the EU (and then with zero standard preference margin), figure 3 reveals a negative DICA preference margin, given that they face a tariff larger than the average tariff applied by the EU on their competitors. More precisely, a negative DICA preference margin means that, on average, these countries would gain in terms of price (i.e. mark-up) if the EU applied the same tariff (MFN) to all countries (except on domestic producers). Finally, taking into account the competition between importer ignoring domestic production as done for instance by Carrère and de Melo (2010) systematically overestimate the (absolute value) of preference margin as this indicator underestimates the actual competition on the EU.

When, for each country, we aggregate preference margins on all products using the import value as weight (figure 3b)[17], picture changes for 2 groups: (i) EPA countries export a lot on lines with high standard preference margins and seems to be benefiting more from the preferential scheme than LDCs or OCTs. This result is heavily driven by some EPAs countries mainly exporting sugar to EU (see later); (ii) developing countries benefiting only from the standard GSP program mainly export products with high competition within the EU market, resulting in *negative* weighted DICA preference margin.

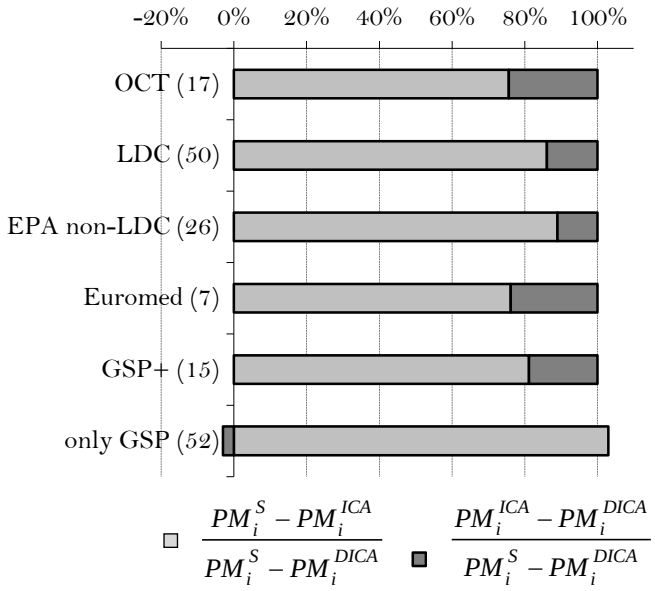
[17] Another interesting aggregation is proposed by Fugazza and Nicita (2010) using, in addition to the import share, the import demand elasticity estimated by Kee et al. (2008).

Finally, even in the best case for the exporter country, i.e. in the case in which it captures the maximum of the rent generated by the preference margin, it will only get half of the preference margin ($\rho_k^{\max} = 1/2$). We also report $\rho_k^{min}.PM_{ik}^{DICA}$ in figures 3. Given the distribution of $\rho_k^{\min}$ described in figure 2, the ranking between preferential groups according to the "price surplus" is identical to the DICA preference margins one.

To better understand the difference between the (import-weighted) standard and DICA measures of preference margin, we decompose this difference into change due to competition between non-EU exporters (i.e. difference between the standard and ICA measure) and change due to competition with EU domestic producers (i.e. difference between ICA and DICA measure). Results are reported in figure 4. Most of the competition comes from other exporters to the EU, the share of decrease in preference margin due to competition with EU domestic producers ranging from 11% for an average EPA country to 25% for an average Euromed country or OCT.[18]

[18] Note that in the case of GSP countries, adjusted for the domestic production *increases* the preference margin. Actually, for countries which face a tariff higher than the average tariff applied by the EU, the ICA measure overestimates the gain of imposing the same higher tariff to all competitors as EU producer will never pay any duty on the intra-EU trade.

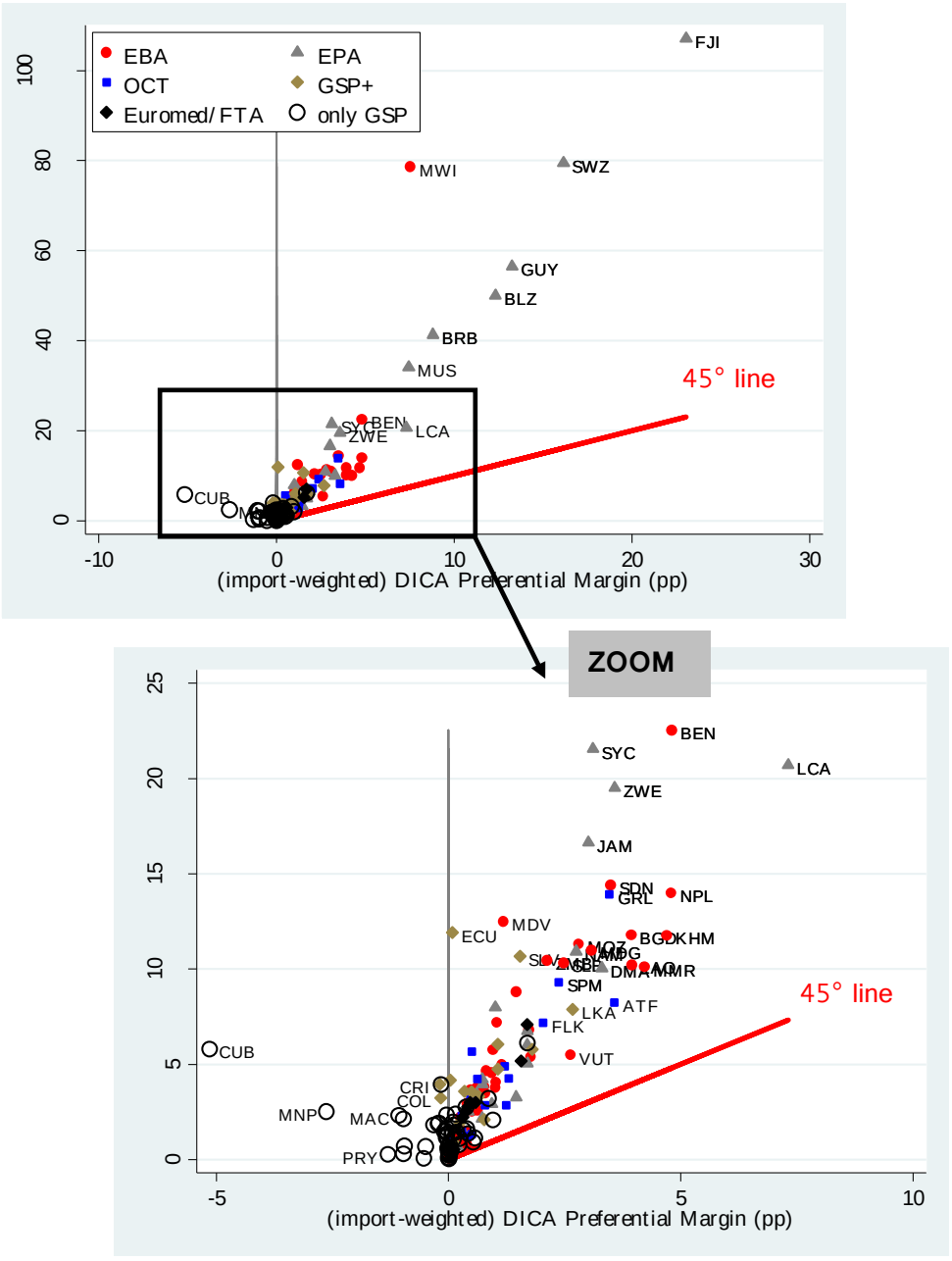
Figure 4. Share of the difference between the (weighted) Standard and DICA preference margins due to competition between non-EU exporters vs competition with EU domestic production, 2008.



Note: Preference Margins used are import-weighted (from figure 2b)
Source: author's computation based on COMTRADE/TRAINS Database

However, the "averages" reported in figures 3 and 4 hide much heterogeneity between countries within a same category. We report in Annex A3, for each of the 195 non-EU countries included in the sample, the simple and import-weighted average of the DICA preference margin. To give an idea, we plot in figure 5 the Standard preference margin average vs. the DICA preference margin one (one point per country, import-weighted average). We also report the 45 degree line: the higher the point above this line, the more the standard preference margin is reduced by preferential access given to competitors (both non-EU and EU).

Figure 5. Preference margin to the EU27 market of each GSP country, import-weighted average over exported products, 2008



Note: the country codes and simple / import-weighted average of DICA preference margins for each country are reported in Annex A3.
Source: author's computation based on COMTRADE/TRAINS Database

As mentioned above, a group of EPA countries (and one LDC) benefit from a high standard preference margin once weighted by import value. These countries mainly export raw cane or beet sugar: this product represents 90% of the total value of Fiji' exports to the EU, 65% for Swaziland, 44% for Guyana and 33% for Belize and Barbados, 25% for Malawi. All these countries are competing on the EU market with others developing having the same preferential access but also

with EU producers that largely provide the EU market (France, Germany, United Kingdom). This explains why the DICA preference margin is so far off the 45 degree line. However, the average preference margin for these countries is still very high when adjusted for competition due to the very high ad-valorem equivalent tariff paid by large exporters to EU which not benefit from preferential access such as Brazil, Australia, Thailand or Argentina.

When ignoring these "big hits" (see the zoom of figure 4), we can distinguish 3 main groups of countries:

1. Countries on the top right: (i) high standard preference margin thanks to sugar (Benin, Zimbabwe, Jamaica) but not as high as countries quoted above as their main exports face a zero or very small MFN tariffs (e.g. cotton for Benin, ferro-chromium for Zimbabwe and aluminium oxide for Jamaica); (ii) countries with good DICA preference margin thanks to particular products with quite high MFN tariff and competitors without any preferential margin (Bananas for St. Lucia, Tunas for Seychelles, pullovers for Cambodia, or Carpets for Nepal);
2. Countries with some standard preferences but a zero or even *negative* DICA preference margin; this is the case for instance for 3 GSP+ countries exporting Bananas (Ecuador, Colombia and Costa Rica) which face tariff higher than their main competitors;
3. Countries with significantly *negative* DICA preferences, all benefiting only from the standard GSP, and competing with other developing countries on products such as sugar (e.g. Cuba or Paraguay) or textile (e.g. Macao or Northern Mariana Islands).

4.3. Some correlations in panel (Country/Product)

In sum, the DICA preference margin generates a different estimate of preferential margin than the Standard one and this is synthetized in the correlation reported in table 1. While the correlation is around 0.88 between the 2 measures used in literature (Standard and ICA preference margins), it falls to around 0.57 with the new one.

Table 1. Correlation between the 3 measures of Preference Margins for 2008
(195 non EU countries, 5048 products, 977,925 observations)

	PM_{ik}^{S}	PM_{ik}^{ICA}	PM_{ik}^{DICA}
PM_{ik}^{S}	1		
PM_{ik}^{ICA}	**0.88**	1	
PM_{ik}^{DICA}	**0.57**	**0.59**	1

Source: author's computation based on COMTRADE/TRAINS Database.

How appropriate as indicator is the DICA preference margin? A simple test is to look at the correlation between preference margin measures and the share of total export values exported to the EU. The idea is that, the larger the *actual* preference margin, the higher the price that can be set on the EU market, and hence the larger the share of total export that a firm should choose to sell on the EU market. We then regress the share of export of a given country and product to the EU27 on the 3 alternative measures of the preference margins presented above, controlling for country fixed effects. Results are reported in table 2 for the whole sample of non-EU countries. Results are non-ambiguous: only the DICA preference margin is significantly correlated with the share of exports sent to the EU market. This conclusion also holds for the sub-sample of countries benefiting from the GSP.

For almost half of the observations the share of exports to the EU is zero, and for 10% of the observations this share equals 100%. Hence, simple OLS can be biased due to censored data. Then, we re-run in col. (5) to (10) the same set of regressions using a double censored tobit.[19]

The above result is confirmed: the new measure of preference margin derived in this paper and proposed as *result 1* in section 2 seems the most relevant to explain the geographical trade-off done by exporters for a given products (once controlled for country time-invariant characteristics such as distance to the EU market or historical links with some EU countries).

[19] The sample includes 2 dimensions: an exhaustive sample of 195 non-UE countries for 5048 products. Then, the "incidental parameters problem" than can arise when introducing fixed effects in a tobit estimation should be very limited here as the country dimension is much smaller than the product one.

Table 2. Regression of the share of total export exported to the EU on preference margin measures, 2008.

Dep. Var. (%) $X_{ik}^{EU} / X_{ik}^{World}$	all non-EU countries				GSP countries	All non-EU countries				GSP countries
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PM_{ik}^{S}	0.011	-	-	-0.071 *	-0.052	0.011	-	-	-0.192 *	-0.170
	(0.024)			*(0.035)*	*(0.038)*	*(0.055)*			*(0.076)*	*(0.099)*
PM_{ik}^{ICA}	-	0.047	-	-0.030	-0.051	-	0.101	-	-0.081	-0.211
		(0.031)		*(0.050)*	*(0.048)*		*(0.071)*		*(0.124)*	*(0.151)*
PM_{ik}^{DICA}	-	-	0.332 **	0.481 **	0.494 **	-	-	0.703 **	1.106 **	1.498 **
			(0.055)	*(0.085)*	*(0.076)*			*(0.116)*	*(0.214)*	*(0.249)*
Estimator	OLS col. (1)-(5)					Double Censored Tobit *b/* col.(6)-(10)				
Obs.	317431	317431	317431	317431	230791	317431	317431	317431	317431	230791
Country	195	195	195	195	169	195	195	195	195	169
Country FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
R-sq. *a/*	0	0	0.2	0.1	0.1	0.3	0.3	0.4	0.4	0.4

Note: estimation with OLS and country fixed effects; standard error in parenthesis: heteroscedasticity consistent and adjusted for country-level clustering; *: p=0.05; **: p=0.01.
a/ pseudo R-sq reported in columns (6)-(10)
b/for the sample of all non-EU countries, 47% of observations are left-censored (at 0), 10% are right-censored (at 100%); for the GSP countries, 51% and 10% respectively.
Source: author's computation based on COMTRADE/TRAINS Database.

Still looking at the share of total export of a country that is exported to the EU, we now turn to a more formal test of the theoretical measure proposed in equation (12). Actually, instead of introducing DICA preference margin (as done in column (1) of table 3), we introduced directly the potential rent or "price surplus", proxied by $\rho_k^{min}.PM_{ik}^{DICA}$, still controlling for country fixed effects. Given the distribution of $\rho_k^{\min}$ described in figure 2, very close to ½, we have an expected significant coefficient in column (2) twice the one reported in column (1).[20] Qualitative conclusions are similar in column (3) and (4) when product fixed effects are introduced. Note however that coefficients are lower as part of the variability specific to the new preference margin measure, such as the adjustment for EU domestic competition are now at least partly captured by the exporter-invariant product fixed effects.

Finally, an alternative test of the measure defined in equation (12) is proposed in the last column of Table 3. As showed in result 2, the higher the elasticity of substitution between varieties of a given good, the larger should be the markup associated with a given DICA preference margin (and then larger the corresponding export share). This is tested by introducing an interactive variable $\sigma_k.PM_{ik}^{DICA}$, using the elasticity of substitution (σ_k) estimated by Broda, Greenfield and Weinstein (2006) –see section 3.2. We control for both country and products fixed effects (the latter controlling

[20] The ratio between the two coefficients (col. 1 relative to col. 2) is equals to 0.496 which is exactly the mean of $\rho_k^{\min}$ reported in Table A1.

for σ_k among others) and the standard errors are bootstrapped as σ_k is an estimated variable. As shown in column (5), the interactive variable $\sigma_k.PM_{ik}^{DICA}$ is positively (and significantly at the 1% level) correlated with the share of product exported to the EU, corroborating the additional effect of a given preference margin for higher degree of substitution between varieties.

Table 3. Regression of the share of total export to the EU on preference margin measures, given the product characteristics, 2008.

Dep. Var. (%) $X_{ik}^{EU} / X_{ik}^{World}$	All non-EU countries				
	(1)	(2)	(3)	(4)	(5)
PM_{ik}^{DICA}	0.336 **		0.117 **		0.043
	(0.055)		*0.036*		*(0.042)*
$\rho_k^{\min}.PM_{ik}^{DICA}$		0.677 **		0.238 **	
		(0.122)		*0.062*	
$\sigma_k.PM_{ik}^{DICA}$					0.021 **
					(0.002)
Obs.	315006	315006	315006	315006	315006
Country	195	195	195	195	195
Country fixed effect	yes	yes	yes	yes	yes
Product fixed effect	no	no	yes	yes	yes
R-sq.	0.1	0.1	0.1	0.1	0.1

Note: estimation with OLS; standard error in parenthesis: heteroscedasticity consistent and adjusted for country-level clustering in columns (1) and (3), bootstrapped in columns (2), (4) and (5); *: p=0.05; **: p=0.01; $\rho_k^{\min}$ computed as defined in section 3.2; σ_k: elasticity of substitution among varieties of good k as estimated by Broda et al. (2006) for France over 1994-2003.
Source: author's computation based on COMTRADE/TRAINS Database.

5. CONCLUSIONS

In this paper we propose a new theoretically derived measure of preference margins, adjusted for competition on the EU market between different exporter countries of a given good as well as competition with European domestic producers of that good. We compute this new preference margin measure for the EU market access of 5048 products (HS-6 digits) exported by an exhaustive sample of 222 countries and territories in 2008.

2 main sets of results emerge. First, the DICA (Domestic and Import Competition Adjusted) preference margin proposed in this paper seems more economically meaningful than the standard one (simple difference between the MFN and applied tariff) or other ad-hoc measures proposed in recent empirical literature. Actually, the DICA preference margin measure is the only one to be positively and significantly correlated, at the product level, with the share of total export of a

country that is exported to the EU (controlling for country fixed effects). Moreover, as predicted by our theoretical framework, this correlation is significantly larger for goods with higher degree of substitution between varieties (as estimated by Broda, Greenfield and Weinstein, 2006).

Second, results show very low preference margins once adjusted for domestic and import competition. For instance, LDCs benefiting from the EBA initiative in 2008 face a "standard" preference margin (MFN tariff minus applied tariff on LDCs) on average around 5.6 percentage point (unweighted average on all products, actually exported or not) but only of 1.1 pp when using our measure, i.e. once taking into account not only the preferences given to other countries but also the European production (approximated by the duty-free intra-EU trade).

With the forthcoming conclusion of the DOHA round, one of the main concerns of developing countries (especially the least developed one) is the preference erosion generated by the new multilateral agreement on large market such as the EU one. However the new measure developed in this paper shows that whatever the outcome of the Doha negotiations, it should not have much effect on the existing preference margins as (i) preference margins are already very small once adjusted for market access given to other competitors and (ii) the remaining preference margins granted by the EU to developing countries should be drastically eroded in the forthcoming years mainly due to a further expansion of the EU network of trading agreements (e.g. Free Trade Agreements under negotiation with MERCOSUR, ASEAN or ANDEAN). Actually, simulations based on the new measure developed in this paper (see Carrère, 2011) show that enhancing competition between developing countries exporting similar products to the EU is clearly more harmful for their preference margins than the MFN tariff reduction currently under negotiation in the Doha Round.

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ANNEX 1. EQUILIBRIUM PRICES AND CONDITION FOR TRADE UNDER MONOPOLISTIC COMPETITION

Equilibrium Prices

Maximization of profits (9) yields the following profit-maximizing prices as a function of price aggregate:

- within country *i* price:

$$\frac{\partial \pi_i}{\partial p_{ii}} = \alpha\left[1-2\left(1+\sigma Z\right)p_{ii}+\left(\sigma Z\right)P_i\right]\left(A/N+\lambda_i L\right)=0$$

$$\Rightarrow p_{ii}=\frac{1+\left(\sigma Z\right)P_i}{2\left(1+\sigma Z\right)} \tag{14}$$

- price charged in country j, $j \neq i$

$$\frac{\partial \pi_i}{\partial p_{ij}} = \alpha\left[1-2\left(1+\sigma Z\right)p_{ij}+\left(\sigma Z\right)P_j+\left(1+\sigma Z\right)\tau_{ij}\right]\left(A/N+\lambda_i L\right)=0$$

$$\Rightarrow p_{ij}=\frac{1+\left(\sigma Z\right)P_j}{2\left(1+\sigma Z\right)}+\frac{1}{2}\tau_{ij}=p_{jj}+\frac{1}{2}\tau_{ij} \tag{15}$$

Agregate market condition must be consistent with firm's optimal pricing decisions, i.e. the equilibrium price aggregate P_i^* must satisfy the following condition:

$$P_i^* = \sum_{h=1}^{N}(\theta_h p_{hi}) = \sum_{h=1}^{N}\left(\theta_h\left(\frac{1+(\sigma Z)P_i^*}{2(1+\sigma Z)} + \frac{1}{2}\tau_{hi}\right)\right) \qquad (16)$$

with $\tau_{ii} = 0$

$$\Rightarrow P_i^* = \frac{Z + \sigma Z P_i^*}{2(1+\sigma Z)} + \frac{1}{2}\sum_{h=1}^{N}(\theta_h \tau_{hi})$$

$$\Rightarrow P_i^* = \frac{Z}{2+\sigma Z} + \frac{(1+\sigma Z)}{2+\sigma Z}\sum_{h=1}^{N}(\theta_h \tau_{hi}) \qquad (17)$$

Substituting (17) into (14) and (15) gives the following equilibrium price (corresponding to equations (10) and (11) in the main text):

$$p_{ii}^* = \frac{1}{2(1+\sigma Z)} + \frac{\sigma Z}{2(1+\sigma Z)}\left[\frac{Z}{2+\sigma Z} + \frac{(1+\sigma Z)}{2\sigma+\sigma Z}\sum_{h=1}^{N}(\theta_h \tau_{hi})\right]$$

Hence $$p_{ii}^* = \frac{2+\sigma Z\sum_{h=1}^{N}(\theta_h \tau_{hi})}{4+2\sigma Z}$$

and $$p_{ij}^* = \frac{2+\sigma Z\sum_{h=1}^{N}(\theta_h \tau_{hj})}{4+2\sigma Z} + \frac{\tau_{ij}}{2}$$

"Tariff absorption" under monopolistic competition

There is a "tariff absorption" since only a fraction of the tariff passed on to the consumers (i.e. incomplete "pass-through"). To see that we look at the differences in prices settled by a firm in country i in market j and in its own market. According to equations (10) and (11), we have:

$$p_{ij}^* - p_{ii}^* = \frac{\tau_{ij}}{2} - \frac{1}{2}\left[\frac{\sigma Z}{2+\sigma Z}\right]\left[\sum_{h=1}^{N}(\theta_h \tau_{hi}) - \sum_{h=1}^{N}(\theta_h \tau_{hj})\right]$$

If we assume that varieties are highly differentiated (γ, and thus σ, tends to zero), then the representative firm of country i absorbs exactly one half of the tariff (which corresponds to the well-known result of a monopolist facing a linear demand).[21] By contrast we see that monopolistic competition leads to a higher (lower) degree of tariff absorption than monopoly when: [22]

[21] We also get this result if we assume that, for a given degree of product differentiation, all countries have the same market share (θ_h) and the same trade policy ($\tau_{ij} = \tau, i \neq j$).

[22] The more the varieties are substituable the larger is the tariff absorption variation compared to the monopoly case(when γ tends to 1 $\lim_{\sigma \to +\infty}\left[\frac{\sigma Z}{1+\sigma Z}\right] = 1$)

- Countries have the same trade policy but the market j is a larger (smaller) market compared to domestic market i: in an attempt to penetrate the foreign market, competition leads firm to a price gap that varies with the relative size of the home and foreign markets.
- Countries i and j have the same size but the market j is on average less (more) protectionist than country i which implies more competition.

Condition for trade

To observe trade, the international equilibrium demands $q_{ij}\,(i \neq j)$ have to be positive:

$$q_{ij}^{*} = a - (b + cK)\, p_{ij}^{*} + cZP_j^{*} > 0$$

Hence, once substituting the equilibrium prices (10) and (11) into (6), we obtain:

$$\Rightarrow q_{ij}^{*} = \alpha - (\alpha + \alpha\sigma K)\left[\frac{2 + \sigma Z\sum_{h=1}^{N}(\theta_h \tau_{hj})}{4 + 2\sigma Z} + \frac{\tau_{ij}}{2}\right] + \sigma Z\left[\frac{Z}{2+\sigma Z} + \frac{(1+\sigma Z)}{2+\sigma Z}\sum_{h=1}^{N}(\theta_h \tau_{hj})\right] > 0$$

$$\Rightarrow q_{ij}^{*} = \alpha\left[\frac{1+\sigma Z}{2+\sigma Z}\right]\left[1 + \frac{\sigma Z}{2}\sum_{h=1}^{N}(\theta_h \tau_{hj}) - (2+\sigma Z)\frac{\tau_{ij}}{2}\right] > 0$$

$$\Rightarrow \tau_{ij} < \frac{2 + \sigma Z\sum_{h=1}^{N}(\theta_h \tau_{hj})}{2+\sigma Z}, \text{ for a given differentiated good k}$$

For each good, we look whether this condition is satisfied in our database. We first approximate the RHS term using (i) the Broda, Greenfield and Weinstein (2006)' estimated elasticity for proxying σ, and (ii) the minimum number of countries exporting the differentiated goods to proxy the number of varieties Z (which is a lower band for the total number of varieties produced in the world). Table A1 reports some descriptive statistics at the product level. In figure A1 we report the distribution of:

$$\varphi_{ijk} = \left[\frac{2 + \sigma_k Z_k\sum_{h=1}^{N}(\theta_{hk} \tau_{hjk})}{2 + \sigma_k Z_k}\right] - \tau_{ijk}, \quad i = EU,\ j = 1..195, k = 1..5048$$

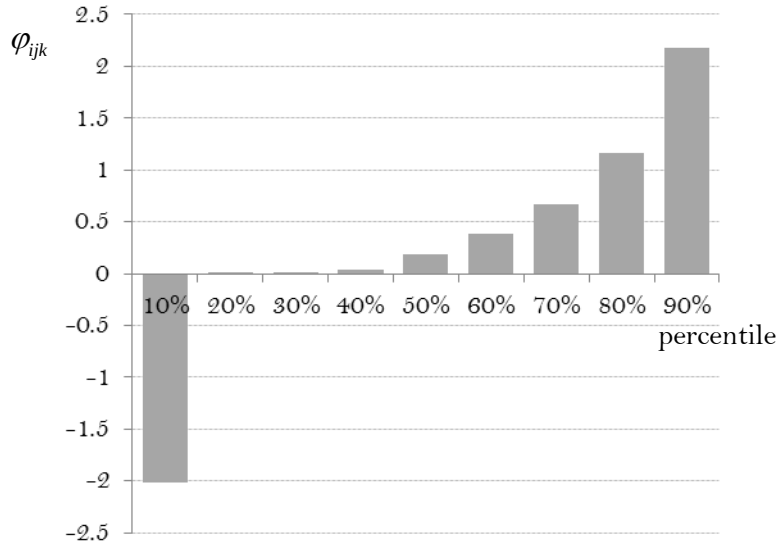
87% of the observations (at the country/product levels) satisfy the condition for trade, i .e. $\varphi_{ijk} > 0, \quad i = EU,\ j = 1..195, k = 1..5048$. Note also that the number of zero trade flows is significantly lower when the trade condition is satisfied, i.e. $\varphi_{ijk} > 0$ than when it is not, i.e. $\varphi_{ijk} \leq 0$ (1.2% versus 40% respectively).

Table A1. Descriptive statistics over the 5048 products, 2008

Variable	Obs	Mean	Std. Dev.	Min	Max

All products					
σ_k					
$Z_k^{\min}$	4990	5.61	9.72	1.06	131.50
$\rho_k^{\min}$	5048	86.7	36.4	5	215
	4990	0.496	0.003	0.465	0.500
Tmfn>0					
σ_k					
$Z_k^{\min}$	3688	5.75	10.74	1.06	131.50
$\rho_k^{\min}$	3739	89.1	35.7	5	215
	3688	0.497	0.003	0.465	0.500

Figure A1. Condition for trade: distribution of φ_{ijk} (195 exporters, 5048 products, 1,106,553 observations)



ANNEX 2. EU'S NETWORK OF PREFERENTIAL TRADE AGREEMENTS IN 2008

Generalised System of Preferences - "enabling clause"	
GSP - General regime	176 Developing Countries (171 included in the sample - 52 only GSP without any others agreements with the EU) - Exceptions/ Graduation from the GSP scheme (HS section in parenthesis): Myanmar (All), Belarus (All) ***a)***, Chile (All) ***b)***, Brazil (IV, IX), China (VI, VII, VIII, IX, X, XI, XII, XIII, XIV, XV, XVI, XVIII, XX), Algeria (V), Indonesia (III, IX), India (XIa, XIV), Malaysia (III), Russian Federation (VI, XV, X), Thailand (XIV, XVII), South Africa (XVII).***c)***
GSP "Everything but Arms"	50 Least Developed Countries (LDCs): Angola, Madagascar, Benin, Malawi, Burkina Faso, Mali, Burundi, Mauritania, Central African Republic, Mozambique, Chad, Niger, Comoros, Rwanda, Democratic Republic of the Congo, São Tomé and Príncipe, Djibouti, Senegal, Equatorial Guinea, Sierra Leone, Eritrea, Somalia, Ethiopia, Sudan, Gambia, Togo, Guinea, Uganda, Guinea-Bissau, United Republic of Tanzania, Lesotho, Zambia, Liberia, Afghanistan, Nepal, Bangladesh, Samoa, Bhutan, Solomon Islands, Cambodia, Timor-Leste, Kiribati, Tuvalu, Lao People's Democratic Republic, Vanuatu, Maldives, Myanmar, Yemen, Haiti, Cape Verde (until end of 2010 ***d)***)
GSP+ special incentive arrangement for sustainable development and good governance	15 Developing Countries: Bolivia, Colombia, Costa Rica, Ecuador, Georgia, Guatemala, Honduras, Sri Lanka, Republic of Moldova, Mongolia, Nicaragua, Panama, Peru, El Salvador, Venezuela ***e)***
Other Non-Reciprocal Scheme	
Overseas Association Decision (OAD) with Overseas Countries and Territories (OCT) ***f)***	19 OCT: Anguilla; Aruba, British Indian Ocean Territory; Cayman Islands; Falkland Islands (Islas Malvinas); French Polynesia; French Southern Territories; Greenland; Mayotte*; Montserrat; Netherlands Antilles; New Caledonia; Pitcairn; Saint Helena; Saint Pierre and Miquelon; South Georgia and the South Sandwich Islands*; Turks and Caicos Islands; Virgin Islands, British; Wallis and Futuna Islands
Free Trade Agreements	
Economic Partnership Agreements with some of the African, Caribbean and Pacific (ACP) States	35 Member-States (26 non-LDCs, 9 LDCs in italic): Antigua and Barbuda, Barbados, *Burundi*, Bahamas, Botswana, Belize, Ivory Coast, Cameroon, Dominica, Dominican Republic, Fiji, Grenada, Ghana, Guyana, *Haiti*, Jamaica, Kenya, *Comoros*, St Kitts and Nevis, St. Lucia, *Lesotho*, *Madagascar*, Mauritius, *Mozambique*, Namibia, Papua New Guinea, *Rwanda*, Seychelles, Surinam, Swaziland, Trinidad and Tobago, *Tanzania*, *Uganda*, St Vincent and the Grenadines, Zimbabwe.
Euro-Mediterranean agreements	9 countries: Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, Palestinian Authority*, Syria and Tunisia
EEA	Iceland, Norway and Liechtenstein
Switzerland	
Mexico	
Chile	
South Africa	
Faroe Islands	
Customs Unions	
Turkey	
Andorra*	
San Marino	
Autonomous Bilateral Trade Preferences	
Western Balkan states - Stabilisation and Association agreements	Albania, Bosnia and Herzegowina, Croatia, Macedonia, Montenegro*, Serbia, Kosovo*
Moldova	
Agreement on Basmati Rice *g)*	
India and Pakistan	

*Country not included in the sample.
a) Council Regulation (EC) No 1933/2006; b) Commission Regulation (EC) No 566/2007 ; c) Council Regulation (EC) No 980/2005; d) Commission Regulation (EC) No 1547/2007; e) Commission Regulation (EC) 2005/924/EC; f) Council Decision2001/822/EC of 27 November 2001; g) Commission Regulation (EC) No 972/2006 of 29 June 2006
Source: Authors compilation from WTO - Regional Trade Agreements Information System (http://rtais.wto.org/UI/PublicMaintainRTAHome.aspx), Integrated tariff of the European Communities (http://ec.europa.eu/taxation_customs/dds/tarhome_en.htm) and (http://ec.europa.eu/trade/creating-opportunities/bilateral-relations/)

ANNEX 3. DICA PREFERENCE MARGINS IN 195 NON-EU COUNTRIES, 2008

Table A3 Countries in each category, with corresponding unweighted [a] and import-weighted DICA preference margins respectively, 2008

GSP countries									
LDC (EBA) (50 countries)			EPA non-LDC (26 countries)			GSP+ (15 countries)		
Afghanistan	AFG	1.21 / 0.39	Antigua & Barbuda	ATG	1.33 / 0.61	Bolivia	BOL	1.30 / 1.06
Angola	AGO	1.13 / 0.01	Bahamas, The	BHS	1.21 / 0.35	Colombia	COL	0.94 / -0.17
Bangladesh	BGD	1.57 / 3.93	Barbados	BRB	1.24 / 8.81	Costa Rica	CRI	0.95 / -0.19
Benin	BEN	1.67 / 4.81	Belize	BLZ	1.25 / 12.33	Ecuador	ECU	1.08 / 0.09
Bhutan	BTN	1.67 / 0.93	Botswana	BWA	1.24 / 1.70	El Salvador	SLV	1.06 / 1.54
Burkina Faso	BFA	1.21 / 0.12	Cameroon	CMR	1.47 / 0.94	Georgia	GEO	0.84 / 0.25
Burundi	BDI	1.31 / 0.09	Cote d'Ivoire	CIV	1.12 / 0.73	Guatemala	GTM	1.01 / 1.06
Cambodia	KHM	1.89 / 4.70	Dominica	DMA	1.38 / 3.30	Honduras	HND	1.05 / 0.49
Cape Verde	CPV	1.41 / 1.15	Dominican Rep.	DOM	1.30 / 1.70	Moldova	MDA	1.37 / 1.80
Central African Rep.	CAF	0.98 / 0.09	Fiji	FJI	1.62 / 23.06	Mongolia	MNG	1.50 / 0.77
Chad	TCD	1.23 / 0.06	Ghana	GHA	1.25 / 0.73	Nicaragua	NIC	1.19 / 0.34
Comoros	COM	1.28 / 0.40	Grenada	GRD	0.73 / 0.18	Panama	PAN	1.08 / 0.04
Congo, Dem. Rep.	ZAR	1.23 / 0.18	Guyana	GUY	1.35 / 13.26	Peru	PER	1.01 / 0.65
Djibouti	DJI	0.86 / 0.62	Jamaica	JAM	1.24 / 3.01	Sri Lanka	LKA	1.04 / 2.68
East Timor	TMP	1.05 / 0.12	Kenya	KEN	1.16 / 1.01	Venezuela	VEN	1.00 / 0.12
Equatorial Guinea	GNQ	0.68 / 0.03	Mauritius	MUS	1.29 / 7.45	OCT		
Eritrea	ERI	1.01 / 1.77	Namibia	NAM	1.35 / 2.75	(17 countries)		
Ethiopia	ETH	1.58 / 0.95	Papua New Guinea	PNG	1.18 / 1.46	Anguila	AIA	1.30 / 0.79
Gambia, The	GMB	1.50 / 1.02	Seychelles	SYC	1.04 / 3.11	Aruba	ABW	1.12 / 0.28
Guinea	GIN	1.25 / 0.01	St. Kitts and Nevis	KNA	1.02 / 0.43	British Ind. Ocean Ter.	IOT	1.10 / 0.50
Guinea-Bissau	GNB	0.96 / 0.27	St. Lucia	LCA	0.92 / 7.31	British Virgin Islands	VGB	1.09 / 0.29
Haiti	HTI	1.67 / 1.73	St. Vincent & the Gren.	VCT	1.82 / 0.72	Cayman Islands	CYM	1.15 / 0.42
Kiribati	KIR	0.88 / 0.17	Suriname	SUR	1.48 / 1.70	Falkland Island	FLK	1.69 / 2.04
Lao PDR	LAO	1.55 / 3.94	Swaziland	SWZ	1.05 / 16.16	Fr. So. Ant. Tr	ATF	1.84 / 3.57
Lesotho	LSO	2.46 / 0.05	Trinidad & Tobago	TTO	1.07 / 0.18	French Polynesia	PYF	1.04 / 1.29
Liberia	LBR	1.14 / 0.40	Zimbabwe	ZWE	1.12 / 3.58	Greenland	GRL	1.49 / 3.46
Madagascar	MDG	1.74 / 3.08				Montserrat	MSR	0.88 / 0.50
Malawi	MWI	1.24 / 7.54				Netherlands Antilles	ANT	1.30 / 0.46
Maldives	MDV	1.27 / 1.18				New Caledonia	NCL	1.25 / 0.07
Mali	MLI	1.32 / 0.25				Pitcairn	PCN	1.59 / 0.62
Mauritania	MRT	1.43 / 0.15				Saint Helena	SHN	1.02 / 1.24
Mozambique	MOZ	1.14 / 2.80				Saint Pierre & Miqu.	SPM	0.91 / 2.38
Myanmar	MMR	1.80 / 4.22				Turks and Caicos Isl.	TCA	1.12 / 1.21
Nepal	NPL	1.66 / 4.80				Wallis and Futura Isl.	WLF	0.94 / 0.03
Niger	NER	0.95 / 0.10				Euromed		
Rwanda	RWA	1.26 / 0.04				(7 countries)		
Samoa	WSM	1.10 / 1.01				Algeria	DZA	0.89 / 0.04
Sao Tome & Principe	STP	1.15 / 0.23				Egypt, Arab Rep.	EGY	0.85 / 0.59
Senegal	SEN	1.42 / 1.04				Jordan	JOR	1.17 / 0.37
Sierra Leone	SLE	1.27 / 0.77				Lebanon	LBN	1.17 / 0.41
Solomon Islands	SLB	0.90 / 2.47				Morocco	MAR	1.04 / 1.69
Somalia	SOM	1.24 / 0.62				Syrian Arab Rep.	SYR	0.90 / 0.12
Sudan	SDN	1.23 / 3.49				Tunisia	TUN	1.04 / 1.56
Tanzania	TZA	1.27 / 1.45				FTA		
Togo	TGO	1.42 / 0.51				(2 countries)		
Tuvalu	TUV	1.00 / 0.79				Mexico	MEX	0.89 / 0.47
Uganda	UGA	0.99 / 0.47				South Africa	ZAF	1.03 / 0.31
Vanuatu	VUT	1.74 / 2.62						
Yemen	YEM	1.30 / 0.81						
Zambia	ZMB	1.13 / 2.12						

a) unweighted average is computed, for each countries, only on product lines with a positive export (towards EU or not)
Source: author's computation based on COMTRADE/TRAINS Database

Table A3 (continued)

GSP countries *(continued)*			**non-GSP countries**		
other GSP (52 countries)			non-GSP with an agreement with EU (14 countries)		
American Samoa	ASM	0.32 / -0.02	Albania	ALB	1.27 / 1.33
Argentina	ARG	0.19 / 1.70	Andorra	AND	1.20 / 0.76
Armenia	ARM	0.15 / 0.09	Bosnia and Herzegovina	BIH	1.02 / 0.98
Azerbaijan	AZE	0.10 / 0.01	Chile	CHL	0.95 / 0.32
Bahrain	BHR	0.21 / -0.22	Croatia	HRV	1.03 / 0.72
Bermuda	BMU	0.33 / 0.57	Faeroe Islands	FRO	0.84 / -0.30
Brazil	BRA	0.10 / -0.95	Iceland	ISL	1.00 / 1.04
Brunei	BRN	0.22 / 0.33	Israel	ISR	0.75 / 0.33
China	CHN	-0.43 / -0.53	Macedonia, FYR	MKD	1.19 / 1.43
Christmas Island	CXR	0.27 / 0.23	Norway	NOR	0.76 / 0.12
Cocos (Keeling) Islands	CCK	0.36 / 0.04	San Marino	SMR	1.11 / 0.76
Congo, Rep.	COG	0.30 / 0.02	Switzerland	CHE	0.71 / 0.29
Cook Islands	COK	-0.04 / 0.14	Turkey	TUR	0.89 / 1.34
Cuba	CUB	0.24 / -5.14	Yugoslavia	SER	1.06 / 0.58
Gabon	GAB	0.32 / 0.05	non-GSP w/o any agreement with EU (12 countries)		
Gibraltar	GIB	0.47 / 0.39			
Guam	GUM	0.03 / 0.42	Australia	AUS	-0.60 / -0.14
India	IND	0.13 / -0.21	Belarus	BLR	-0.54 / -0.50
Indonesia	IDN	0.15 / -0.06	Canada	CAN	-0.59 / -0.24
Iran, Islamic Rep.	IRN	0.20 / 0.01	Holy See	VAT	-0.65 / -0.39
Iraq	IRQ	0.24 / 0.00	Hong Kong, China	HKG	-0.56 / -0.49
Kazakhstan	KAZ	0.21 / 0.02	Japan	JPN	-0.60 / -0.21
Kuwait	KWT	0.19 / 0.12	Korea, Dem. Rep.	PRK	-0.49 / -0.29
Kyrgyz Republic	KGZ	0.19 / -0.04	Korea, Rep.	KOR	-0.60 / -0.24
Libya	LBY	0.25 / 0.01	New Zealand	NZL	-0.63 / -0.45
Macao	MAC	0.12 / -1.07	Singapore	SGP	-0.60 / -0.13
Malaysia	MYS	0.17 / 0.24	Taiwan, China	TWN	-0.60 / -0.21
Marshall Islands	MHL	0.04 / 0.53	United States	USA	-0.59 / -0.21
Micronesia, Fed. Sts.	FSM	0.13 / -0.04			
Nauru	NRU	0.09 / 0.10			
Nigeria	NGA	0.15 / -0.01			
Niue	NIU	0.20 / -0.16			
Norfolk Island	NFK	0.30 / 0.18			
Northern Mariana Islands	MNP	-0.21 / -2.63			
Oman	OMN	0.17 / 0.12			
Pakistan	PAK	0.16 / -0.97			
Palau	PLW	0.05 / 0.97			
Paraguay	PRY	0.01 / -1.30			
Philippines	PHL	0.17 / -0.05			
Qatar	QAT	0.23 / 0.01			
Russian Federation	RUS	0.00 / -0.01			
Saudi Arabia	SAU	0.18 / 0.03			
Tajikistan	TJK	0.14 / -0.97			
Thailand	THA	0.16 / -0.03			
Tokelau	TKL	-0.18 / -0.32			
Tonga	TON	0.03 / 0.87			
Turkmenistan	TKM	-0.14 / 0.07			
Ukraine	UKR	0.22 / 0.01			
United Arab Emirates	ARE	0.18 / -0.02			
Uruguay	URY	0.22 / -0.49			
Uzbekistan	UZB	-0.04 / -0.09			
Vietnam	VNM	0.17 / 0.38			

a) unweighted average is computed, for each countries, only on product lines with a positive export (towards EU or not)

Source: author's computation based on COMTRADE/TRAINS Database

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