The Impact of Preferences on Developing Countries' Exports to the European Union
Bilateral Gravity Modelling at the Product Level

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Abstract

Unilateral preferences such as GSP aim at increasing exports from developing countries via reductions on applied tariffs and the incentives created by the preference margin. After decades of existence the evidence as to the extent to which preferential schemes have been genuinely effective in increasing exports is mixed. This paper evaluates the impact of the European Union's (EU) unilateral preferential regimes on the exports of developing countries using a bilateral gravity model at the product level. We use a unique dataset that allows us to determine the actual tariff rate paid by each export flow at the product level (Combined Nomenclature CN-10 digits) to the EU ***and*** the preferential regime of entry. This allows us to accurately specify the impact of each trade regime and to properly address the issue of utilisation and non-utilisation of trade preferences. The most important findings of the paper are that unilateral preferences have been effective in increasing exports to the EU both because as a result of the direct effect of lower tariffs, and because of secondary effects associated with the preference regimes. The most effective preferential regimes appear to be the EU's free trade agreements, the GSP+ and GSP regimes, followed by EBA preferences, and there is little evidence on the effectiveness of Cotonou. The results regarding tariffs and margins are robust to the inclusion of both the intensive and extensive margin in our estimations, but there is little evidence that preferences have had a positive impact on the extensive margin of trade.

Keywords: Preferential Trade Agreements; Unilateral preferences; GSP; EBA; Gravity Models, Preference utilisation.

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1. Introduction

Unilateral trade preferences have long been a key policy offered by developed countries in order to encourage exports from developing countries. The European Union (EU) has been a key player, granting unilateral preferential access to its market since the early 1970s through the Generalised System of Preferences (GSP), the Cotonou Agreement (until 2008), and since 2001 the Everything but Arms (EBA) initiative for Least Developed Countries (LDCs).[5] Other developed countries, notably the US, Canada and Japan have also offered improved access under GSP, and GSP-style schemes such as the Caribbean Basin Initiative (CBI), or the African Growth and Opportunity Act (AGOA). In more recent years, emerging developing countries such as India have also started to offer preferential access to less developed countries.[6] In the WTO, preferential access is covered under Article XXXVI of the GATT where the explicit motivation is to facilitate the growth and diversification of LDC exports "so as to provide them with expanding resources for their economic development".[7]

Unilateral preferences, and especially its most important scheme, the GSP, are a central pillar of the EU's strategy towards developing countries, and in its recent 2011 revisions the EU proposes to refocus the GSP scheme so that it helps those developing countries most in need.[8] The channels by which increased trade might impact on development are varied: increased export earnings, gains from specialisation according to comparative advantage, economies of scale, impact on productivity, impact on investment and capital accumulation, technology transfer, greater incentives to improve domestic physical and institutional infrastructures, improved access to higher quality intermediates… and so on. As a result, and given the centrality of preferences for trade in development policy, it is critical to understand whether trade preferences have had the expected positive impact on exports.

A number of empirical papers have analysed the impact on trade of preferential regimes. However, there are significant limitations to much of the existing literature. These include: (a) the frequent use of aggregate trade data whereas preferences are granted at the product level; (b) the inability to correctly capture preference regimes leading to the widespread use of dummy variables or the use of incorrectly specified preference margins; (c) all the papers which do use some disaggregated data fail to use product specific output variables in the regressions. The central objective of this paper is to address these lacunae, and to hence to identify the extent to which preferences may have impacted on trade much more precisely than heretofore.

We overcome the limitations outlined above by using a unique dataset on country and product level exports to the EU for the period 2002-2008. The dataset allows us to identify for each partner country and for each of 19,000 product lines at 10-digit (Combined Nomenclature CN-

5 Within the GSP system, the EU provides preferential access to the EU market to 176 developing countries in the form of reduced tariffs for their goods. Under EBA, part of the GSP system, 49 LDCs have duty free quota free access to the EU to all products excluding weapons since 2001. In addition to weapons, banana and rice were excluded from EBA between 2006 and 2009, and sugar is being transitioned until 2012 with minimum prices.

6 India for example is proposing to offer duty-free, quota free access to 49 less developed countries.

7 GATT Article XXXVI.

8 For the complete text of the proposal see http://trade.ec.europa.eu/doclib/html/147893.htm. See also Gasiorek & Lopez (2011) for a preliminary assessment of the proposals.

10) product exported to the EU, the value of the trade flow, exactly which trade regime was actually used (i.e. whether it entered using GSP preferences, the MFN regime or used some other trade preferences), ***and*** the actual tariff associated with that particular trade flow. This enables us to estimate a highly disaggregated bilateral gravity model and to contribute to the existing literature in several important aspects. First, it allows us to identify the impact of preferential access by using the actual tariff at the product line level rather than a dummy variable typically applied to much more aggregated trade. This gives a much more precise measure of the impact of preferential advantage. Importantly our data allows us to control for the utilisation of preferences as it correctly associates flows with preferential regimes when preferences are actually used. Secondly, preferences are likely to have an impact on trade flows directly as a result of the lower tariffs, but they may also be associated with additional costs or benefits related for example to the underlying administrative requirements, trade related technical assistance, or resultant changes in investment flows. Because our data enables us to precisely capture the direct tariff effect, we can use appropriately specified preference margins, and preference share indices in order to shed light on these additional effects. Hence, we are able to decompose the impact of the preferential regimes according to the impact of tariffs, preference margins and other specific regime factors. Finally, building on the recent work of French (2012), we use product specific control variables in our regressions.

Overall, our results confirm that preferential regimes have been effective in increasing trade - lower tariffs and larger preference margins increase trade. We find that the FTA, GSP+, GSP and EBA regimes have been the most effective (and typically in that order), with a smaller and with a negative coefficient associated with the Cotonou regime. When considering all potential trade, at both the intensive and the extensive margin, we find that tariffs and preference margins have a smaller impact on trade, and that the effect of the GSP and EBA regimes is smaller relative to the FTA and MFN regimes. In all our specifications we also find that it is important to correctly define the preferential margin as the size of margin effect is sensitive to this definition. The effect on exports is larger when the margin is calculated in relation to MFN tariffs or to the average tariff than when we consider the degree of competition for each specific product.

The paper is organised as follows. Section 2 describes the channels and the empirical literature evaluating the impact of trade preferences. Section 3 outlines the coverage and use of preferential regimes in the EU. Section 4 specifies the gravity model to be used. Section 5 describes the data and methodology used. Section 6 estimates the impact of trade preferences on the intensive and the extensive margin of trade. The last section concludes.

2. The impact of trade preferences on trade flows

Unilateral preferences may impact on trade in several ways – both direct and indirect. In the first instance there is the preferential tariff effect – the lowering or removing of tariffs vis-à-vis exporters should lead to more trade, which could be at the intensive or the extensive margin (either through product diversification, or by encouraging export of the existing set of products to new markets). Preferential regimes could also have a secondary indirect impact on trade with the preference giving country. This could occur through more relaxed rules of origin; or through the interaction between the preference regime and any on-going trade-related technical assistance facilitating trade; and/or through any investment, domestic or foreign, in export industries, which may also have been stimulated by the presence of the preferences.

There are also a number of reasons why unilateral preferences may not have the desired trade effects. This could be because of the underlying complexity of the proffered regimes such as the rules of origin; or from the erosion of preferences as a result of the significant expansion in free trade agreements and from on-going multilateral trade liberalisation; from the conditionality which may be attached to some of the preference regimes with regard to domestic governance (as in the EU's GSP+ scheme); from the exclusion of key products from a number of schemes; from the uncertainty regarding the duration of the schemes; from the graduation clauses which are often built in; and from the possible distortionary impact of preference schemes which might encourage countries to specialise in areas in which they perhaps do not have a comparative advantage.

The evidence from the existing literature, which typically focuses either on EU or US preferential schemes, is somewhat mixed. Some papers indicate that preferences do impact positively on trade flows (see for example, Hoekman et.al., 2006, 2008; Ianchovichina et.al., 2001; Goldstein, 2003; Fraser & Van Biesebroeck, 2010; Agostino et.al 2007; Collier & Venables, 2007; Di Rubbo & Canali, 2008; Nilsson, 2009; Davis & Nilsson, 2013, Gamberoni, 2007; Lederman & Ozden, 2007; Subramaniam & Wei, 2007; Fugazza & Nicita, 2011; Cipollina, Laborde, & Salvatici 2013, Cipollina and Salvatici, 2010); while others find mixed evidence (Aiello, 2009, 2010) or suggest the converse. Ames (1993) suggests that the impact of preferential access to the US market for Caribbean economies was limited because of the improved access the US gave to competitors under other arrangements, such as the FTA with Mexico, and because of the variability associated with sugar quotas. Brenton & Hoppe (2006) suggest that while US AGOA preferences might have increased trade the more significant constraints on trade relate to domestic supply side constraints, poor infrastructure, and weak policy environments (see also Frankel 2010, Hoekman & Ozden 2006, and Edwards & Lawrence 2010). Ozden & Rienhardt (2004) argue that GSP schemes can discourage countries from undertaking domestic liberalisation, and that the uncertainty regarding the duration of GSP regimes can discourage investment. They find that countries' export performance improved once they were no longer part of the US's GSP scheme. Similarly Persson and Wilhelmsson (2007) and Herz and Wagner (2007, 2011), who cover a wide range of GSP schemes since the 1950s, suggest that while unilateral preference may increase exports in the short-run, in the long run trade is lower. There is also work suggesting little impact either on diversification (Collier & Venables, 2007), or on encouraging higher value chain activity (Edwards & Lawrence, 2010).

As suggested above, a typical limitation is the failure to correctly measure preferential regimes. The extensive use of dummy variables to measure preferential regimes ignores the large heterogeneity of these regimes in terms of product coverage, size of the preference margin and the extent of preference utilization; potentially leading to problems of causal attribution from preferential regimes to trade. Dealing with this limitation is a key objective of this paper and requires very detailed product level data.[9]

[9] One implication of the data and consequently approach taken is the difficulty in constructing an ideal regime counterfactual: our dataset contains only exports to the EU and we cannot compare these with exports to other destinations with or without preferential access. Moreover, most preferential regimes have been implemented for various decades, and although some changes in coverage and tariffs have occurred, preferences are quite persistent, which for example, mitigates against a difference in differences approach.

3. Depth, breadth and utilisation of preferential regimes in the EU

The EU currently has reciprocal and/or unilateral preferences with virtually all countries in the American and African continents.[10]Agreements differ in terms of product coverage and the preference margin being offered, which is a function not only of the preferential tariff, but also of the size of the MFN tariff or the tariff of competitors. Consequently, the correct assessment of the impact of trade preferences on export flows requires identifying the depth and breadth of preferences that each scheme offers. Typically, and primarily due to the lack of available data, gravity models have used dummy variables to measure this impact. This, however, is misleading and potentially incorrect in four dimensions. First, because it associates bilateral flows to a preferential regime without considering the preferential lines being offered. Secondly, it does not take into consideration the extent of the preference margin. Thirdly, it fails to take into account the utilisation of the preferential regimes. In addition, dummy variables give equal weight across preferential regimes, and in the case of overlapping preferences, cannot clearly distinguish between the impacts of each separate agreement.

Table 1 illustrates the extent of these problems. Focusing only on the GSP system, it shows the differences in coverage and depth between the GSP, the EBA and the GSP+ regime across three years in our sample. The first element to highlight is the fact that the number of tariff lines with MFN zero rates and, therefore, no preference margin increased from 16% to 22%. In the case of EBA, the remaining tariffs, with the exception of a few products, such as sugar, rice and banana products, are at zero rates. EBA countries have virtually duty free access in the EU market. The coverage of the GSP regime is less generous, with 8.32% of lines excluded for preferential treatment, and 36.04% with some preference margin but paying a positive duty in 2008. On the other hand, the GSP+ regime is similar to the EBA regime but excludes around 8% of product lines.

Table 1 Coverage of EU Preferential Regimes '02-'08 (share of tariff lines)

	2002			2005			2008		
	GSP	GSP+**	EBA	GSP	GSP+	EBA	GSP	GSP+	EBA
MFN = 0	16.45	16.45	16.45	22.07	22.07	22.07	22.11	22.11	22.11
MFN > 0 (no preference)	12.34	8.12	0.23	11.89	7.78	0.21	8.32	7.64	0.34
Pref. Duty Free	37.11	72.14	83.32	32.57	67.32	77.71	33.53	68.15	77.52
Positive pref. Tariff	34.10	3.29	0.00	33.47	2.84	0.01	36.04	2.11	0.04

Source: CARIS (2010) ** GSP+ in 2002 refers to the special arrangement for drug trafficking prevention

The coverage and depth of trade preferences also varies across product and sectors. The larger MFN tariffs are in agricultural products, food processing and textiles (Cirera et al., 2011). However, these larger tariffs imply larger margins only for the EBA and GSP+ regime, since GSP and Cotonou tariffs are positive on average for these sectors. In addition, most average MFN tariffs have decreased from 2002 to 2008. Although they represent a small reduction, preference margins have been squeezed further, and for some minerals and manufactured sectors are below 2.5%.

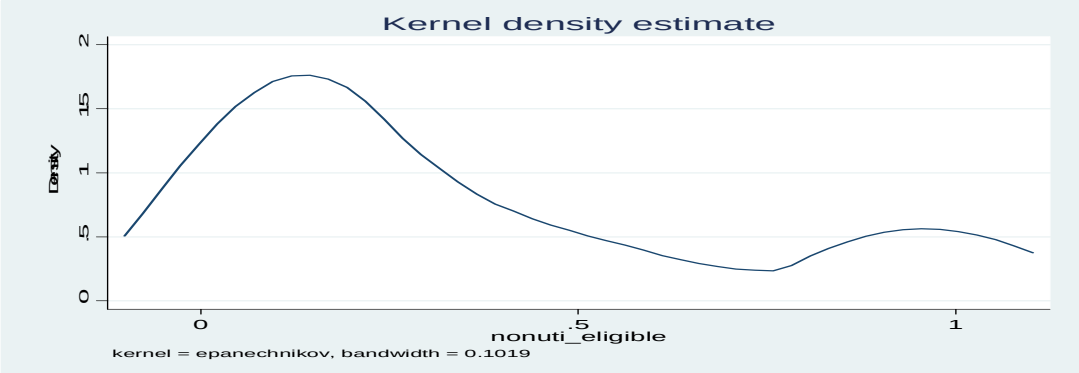
[10] Excluding the US, Venezuela and Cuba in America and Mauritania in Africa.

In addition to different coverage across regimes, countries may be eligible for more than one preferential regime. For example, most EBA and GSP exporters could until 2008 also enter the EU using the Cotonou Agreement. Similarly those ACP countries that have signed an Economic Partnership Agreement with the EU can either use the EPA regime or the relevant GSP preference scheme. Furthermore, not all product lines have the same relevance for exporting countries, since this depends on each country export basket.

CARIS (2011) show that the importance of eligible preferences for existing exports varies by country, and there are striking differences. For example, countries such as Bangladesh export mainly using preference eligible lines, with only 0.95% of existing exports eligible under MFN=0. A similar pattern is observed for countries such as Jamaica (2.91%) or Swaziland (3.78%). On the other hand, there are other countries where preference eligibility is less important to existing exports, and due to a narrow export basket, most export flows are eligible for the MFN=0 regime; for example Lesotho (98.73%), Liberia (98.84%), East Timor(98.89%), Rwanda (98.94%) or Central African Republic (99.03%)[11].

In addition to preference eligibility, another important factor is whether preferences are utilised. The data shows that non-utilisation of preferences varies substantially across countries and products. While most countries utilize most of their preferences, there is small cluster of countries with large preference non-utilisation as Figure 1 shows.[12]

Figure 1 Probability Distribution Function of Preference Non-utilisation Exports as a Share of Eligible Exports in 2007 – by Country



Source: Author's own calculations

[11] While the importance of unilateral preferences varies across exporters, it is worth noting that trade under these regimes is of comparatively low importance for the EU. More than 60% of total imports in the EU are in duty free tariff lines. Around 23% of the remaining imports face positive MFN tariffs, either because exporters are not eligible for preferences or because they do not utilize them. The share of imports using preferential regimes is only 15%, and more than half of this utilises other preferential regimes. The *de facto* share of EU imports via GSP/EBA is around 5%.

[12] Some example of countries with significant exports to the EU and very large non-utilisation rates in 2007 (100% of preference eligible exports exported MFN) are Bouvet Island, Iraq, Kiribati and Palau.

4. The gravity model and unilateral preferences

Gravity models have become a standard workhorse model for assessing the determinants of trade between countries, and in particular for focussing on the possible impact of policies on trade. There is also now a fairly extensive literature (Anderson 1979; Baier & Bergstrand 1985, 1989; Helpman & Krugman 1985; Deardorff 1998, Anderson & Wincoop 2003, Anderson & Yotov 2012, Anderson 2011, French 2012, Head & Mayer 2013) which provides theoretical justification for the basic gravity specification.[13] The literature shows that, at least partial, theoretical justification can be found via both Heckscher-Ohlin models of trade, as well as imperfectly competitive trade models.

With standard Dixit-Stiglitz style CES preferences, the typical structural gravity model takes the following form:

$$X_{ij} = E_j Y_i \frac{P_j^{\varepsilon-1}}{\Omega_i}(1+\tau_{ij})^{1-\varepsilon}, \tag{1}$$

$$P_j = \left[\sum_{i=1}^{j} p_{ij}^{1-\varepsilon} (1+\tau_{ij})^{1-\varepsilon}\right]^{\frac{1}{1-\varepsilon}} \tag{2}$$

$$\Omega_i = \sum_j E_j P_j^{\varepsilon-1}(1+\tau_{ij})^{1-\varepsilon} \tag{3}$$

Where X_{ij} gives exports from country *i* to country *j*; E_j is total expenditure in country *j*; the value of output in the exporting country is given by Y_i; and τ_{ij} represents the bilateral costs, such as tariffs, of trading between i and j. P_j and Ω_j are what Anderson & Wincoop referred to as the inward and outward multilateral resistance terms respectively. These can be interpreted as representing the average trade costs faced by the buyers (inward) and sellers (outward). P_j is the price index in country *j*, with p_{ij} being the price of the good being exported from *i* to *j* and ε is the elasticity of substitution parameter. Hence, exports from *i* to *j* depend on activity levels in both countries (consumption or GDP in country j, production or GDP in country i), tariffs between *i* and *j* and the price index in country j, relative to the price indices in all other countries, and where these price indices depend on the costs of trade – be this tariffs or distance between all countries, hence the notion of multilateral resistance.

This framework can then be applied to trade at the sectoral or product level, or, as is frequently done, at the aggregate level of total trade. GDP is almost invariably used to capture the level of economic activity in the importing and exporting country respectively. While this is correct at the aggregate level, French (2012) shows that this is only correct under the somewhat extreme assumption that the volume of trade flows is independent of the distribution of output and expenditure across product/sectors. What is therefore required is a measure of production in the exporting country and consumption in the importing country. French shows, that an

[13] For an excellent exposition of the theoretical and empirical issues in gravity models see Anderson (2011).

alternative theoretically consistent approach is to use total trade (exports for the exporting country, imports for the importing country) at the given sectoral level of aggregation.

Typically, the standard model is then augmented in one of several ways; using the respective populations of countries *i* and *j* in order to capture economic size as well as per capita income levels, and distance to capture trade costs between countries. Dummy variables are also used to capture other factors, and in particular institutional arrangements between countries which are expected to impact upon trade flows.

For the purposes of this paper a central concern is how to treat tariffs, distance and trade costs. Standard gravity models frequently assume a variety of possible trade costs between countries measuring geographical and cultural proximity such as distance (Dist), common border (Border), common language or colonial ties; as well as variables related to specific trade agreements or preferences (PREF), or to the associated tariffs. The usual procedure (see for example Baier & Bergstrand, 2009, Anderson & Yotov, 2012) is that the term for the tariff (τ_{ij}) or the power of the tariff (1+ τ_{ij}) is then substituted by a term such as:

$$\tau_{ij}^{1-\varepsilon} = e^{\alpha_1 Dist_{ij} + \alpha_2 Border_{ij} + \alpha_3 PREF_{ij} + ... + \alpha_n Tariff_{ij}} \quad (4)$$

In this paper we want to separate out issues of geography from those of preferences. Anderson & Wincoop (2003) (AW) showed that the key coefficients are sensitive to the assumptions made about trade resistance and that the absence of appropriate treatment of multilateral resistance produces biased estimates.[14] Baier & Bergstrand (2009) suggest a Taylor-series expansion approximation. Other authors have used price indices to control for these terms. However, price indices tend to include information on prices of non-tradable goods, and also capture both preferences and geography, which we wish to treat separately. A common approach, suggested by AW and subsequently employed by a number of authors, is to model this multilateral resistance term with country fixed effects. One problem of this approach is the fact that country dummies may not capture time variation of the multilateral resistance terms. In order to control for time variation, this requires the use of country year fixed effects. In the context of our model, at the product level, this is problematic since using product country year fixed effects would not allow identification of the trade policy variables. As a result, as discussed below we use product country fixed effects, and use the time variation to identify trade policy variables at the product level. .

With regard to the issue of geography, as well us using distance directly, we also follow the approach of Carrere et al. (2009) based on Baier & Bergstrand (2009) who suggest the use of a multilateral resistance term based on the remoteness of the country with regards to all countries.[15] This measure is constructed as the weighted average of each country distance to other markets weighted by the share of each market in world's GDP. This term is sometimes

[14] See also Feenstra (2004), pp.144-163, and Anderson (2011) for a more detailed discussion of these issues.

[15] Note that as argued By Baier & Bergstrand (2007) and subsequently by others (Carrere 2010, Eicher et.al 2010) the use of country-year dummies also controls for multilateral resistance. In our context too, and as discussed in section 6.1, the MRI should be seen more as a weighted distance measure, however we include it for the sake of completeness.

incorrectly used (see Head & Mayer, 2013) as a proxy for multilateral resistance in the spirit of Anderson & Wincoop. In this paper, as our estimates using product country fixed effects results in the dropping of the distance variable, we explore the use of the MRI, which varies over time, as a more sophisticated proxy for relative distance[16].

$$MRI_{it} = \sum_{n} \frac{Y_{nt}}{Y_{wt}} \log(D_{in}) \quad (5)$$

A common problem in the literature is the measurement of the preference effect. The common procedure is to use trade regime dummies ($PREF_{ij}$). However, this is not particularly satisfactory. In the first instance the impact occurs via the preferential tariff paid by the exporter, and as we have seen above this varies by trade regime, product and whether preferences are utilized. In addition, effective market access or the value of the preference will also depend on the size of other countries' tariffs for the same product (Carrere et al, 2008), the preference margin. In fact, a large proportion of the policy discussion around regionalism and multilateral trade negotiations have concentrated on the issue of preference erosion, and how preferential margins are decreased as countries liberalise trade with other partners (see Low et al., 2009, Fugazza & Nicita, 2011).

The correct procedure is to identify the actual tariffs paid as a result of any preferential arrangement. To our knowledge our paper is the first to be able to precisely identify for each flow the regime of entry and the actual tariff paid, and therefore to correctly identify the tariff effect. Note that as our data has a panel structure which includes the tariffs paid by all countries exporting to the EU, the estimation procedure itself takes into account the concerns of Carrere et.al (2008) and Low (2009), regarding the identification of the preference margin.[17]

Preferential regimes, however, are also associated with additional possible costs and benefits in addition to the pure tariff effect. On the one hand, there may be administrative costs of compliance with such regimes related to registration and acquisition of valid certificates of origin. These may involve an additional cost for exporters (Anson et al, 2005). On the other hand preferential regimes could instead provide for more relaxed rules of origin, or may impact on trade more indirectly through the interaction between the preference regime and any on-going trade-related technical assistance facilitating trade, and/or through any investment, domestic or foreign, in export industries which may also have been stimulated by the presence of the preferences. Secondary effects could, therefore, impact on trade positively or negatively.

Ideally then we would like to capture both the direct tariff effects associated with preferential regimes, and any indirect effects. As discussed above we capture the direct tariff effects, through the inclusion of the actual tariffs paid on each flow. More difficult are the indirect effects. Here our strategy is twofold. First, in order to pick up on any additional effects that may

[16] Inclusion of this variable has little effect on the sign or significance of the other variables, hence it is not included in all of the regressions reported here.

[17] Some papers (Nilsson & Matsson, 2009; Cipollina et.al) choose to explicitly include the preference margin in order to capture the tariff effect. However, if tariffs are correctly identified the preference margin is then correctly captured. Cipollina et.al. derive a version of the gravity model with an explicit preference margin term, however in order to do so number of extreme assumptions need to be made regarding the symmetry of trade costs.

be present, we use a measure of the share of trade for each country and product and time period which enters the EU via each type of preference regime for each country (*eg. GSP_share, EBA_share, FTA_share…)*. We call these "preference share indices". Note, that unlike, other papers in this area these are in addition to the tariff effects, and are not 0-1 dummies, but vary between 0 and 1. Secondly, some of the indirect effects (e.g. incentives with regard to investment, or trade facilitation) may well be correlated with the size of the preference margin (*margin*$_{ij}$) being offered. So we also test for the significance of difference preference margins on bilateral trade. As with the use of dummies, this is in addition to the direct tariff effects. The margin for a given product is defined as

$$margin_{ij} = \log(1 + (t^{ref} - t^{pref})) \qquad (6)$$

A critical element when looking at the preference margin is what tariff to use as the reference tariff, t^{ref}. Often the preference margin is calculated in relation to the MFN tariff. However, as Low et al. (2009) and Fugazza & Nicita (2011) suggest, this measure should be taken as an upper bound of the preferential advantage, since in reality the margin needs to be adjusted to the tariff paid by the main competitors in each specific product category. As a result we use and compare the results for four different reference tariffs capturing different degrees of competitive advantage: the MFN tariff (margin), the weighted average tariff of all exporters of that product (margin_wtd ave), the tariff of the largest exporter (margin_1st_exp) and the simple average tariff of all exporters of that product (margin_ave).

Using equations (1) to (6) and transforming into log form we derive the following equation:

$$\log(X_{ikt}) = \beta_0 + \beta_1 tariff_{ikt} + \beta_2 margin_{ikt} + \beta_3 \log(Y_{ikt}) + \beta_4 \log(Dist_i) + \beta_5 Lang_i + \beta_6 Col_i + \beta_7 Contig_i + \beta_8 \log(MRI_{it}) + \lambda_t + \lambda_k + \sum \delta_n regimes_n + e_{ikrt} \qquad (7)$$

Where X_{ikt} is the log of exports of good *k* from country *i* to the EU in period *t*, tariff is the logarithm of $(1+t_{ikt})$, where *t* is the actual tariff paid by the export flow,[18] Y_{it} is country's *I*'s total exports of product k to the world at the 6-digit level;[19] , $Dist_i$ is *i* country's distance to Brussels, $Lang_i$ is a dummy with value one if country *i* and an EU country share the same language, and zero otherwise; Col_i is a dummy with value one if country *i* is a former colony of a EU country, and zero otherwise; $contig_i$ is a dummy with value one if the country's *i* shares a border with the EU; MRI_{it} as defined in equation (15); λ_t and λ_k are year and product fixed effects, and; $regime_{it}$ is

[18] For each of these flows we use the average tariff for each regime in a given year. For example, in a given year if exports from country j using the MFN regime paid two different MFN tariffs due to changes in the MFN structure, we use the average of both tariffs. In most cases, however, there is only one tariff for regime and year. Where there are flows from country j to the EU for a given product in a given year but which use *different* regimes (eg. MFN, GSP, EBA) then these are captured separately.

[19] The bilateral 10-digit flows in our data are between the EU and its partner countries. Hence from this data we cannot obtain total exports by each country. To overcome this and also to avoid issues of endogeneity for each of our products we take the total exports of the country at the relevant 6-digit level, excluding their exports to the EU. In the regressions this is reported as TotExp.

an index between zero and one representing the share of each preferential regime *n* in the export flow.

As discussed above, in order to be theoretically consistent we need to employ resistance terms that are country and product specific. As a result, we use exporter-product fixed effects and estimate equation (8). These fixed effects absorb all time-invariant country and product effects, such as distance or common language, but allows identifying in a theoretically consistent way the impact of tariff, margins and preferential regimes.

$$\log(X_{ikrt}) = \beta_0 + \beta_1 tariff_{ikrt} + \beta_2 margin_{ikrt} + \beta_3 \log(Y_{ikt}) + \beta_4 (MRI_{it})\lambda_t + \lambda_{ik} + \sum \delta_n regimes_n + e_{ikrt} \quad (8)$$

5. Data and Methodology

The dataset used includes export flows to the EU from 2002 to 2008, disaggregated by exporting country, Combined Nomenclature (CN-10) product, tariff regime and year. Such a fine level of disaggregation allows us to handle different degrees of coverage, depth and utilisation of preferential regimes as described above, and is a major advantage of our dataset. A limitation of this approach, however, is that beyond the 6-digit level, trade classifications across countries are not harmonised. This implies that we can only estimate the bilateral gravity model on exports to the EU, and, therefore, the results need to be interpreted as the impact of the preferential regimes on exports to the EU.

A key issue is that more than one export flow from the same product, country and year is possible, since exports may enter the EU via different tariff regimes. The tariff regimes are: MFN; GSP, GSP+ or EBA; other preferential regimes; tariff suspension, and; MFN under quota or preferential under quota. Although we cannot identify each specific regional trade agreement, we can differentiate between the GSP/EBA regime and Cotonou/other PTAs. For around 80% of the observations we only observe one tariff regime in the same year, but in the remaining cases we observe more than one tariff regime (more than two in only 1 percent of observations). Import data is then carefully matched with tariff data from TARIC, which enables us to identify the actual tariffs paid by exporting country, CN-10 product and tariff regime. This lengthy process required conversion to *ad valorem* tariffs for some agricultural products (see CARIS, 2011 for a detailed explanation).

Country, product and year flows that have more than one regime of entry to the EU are aggregated in value, and we calculate the share of each trade regime in the export flow and the weighted average tariff that the flow faces in the EU.[20]

[20] Trade data can be noisy due to errors when inputting customs information. In order to detect extreme and unlikely flows, we calculate unit values and search for outliers by applying Hadi's (1992) filter. These extreme values are then removed from the database. In addition, very low value flows, below 500 Euros, are also removed. These small flows are likely to be the result of private individuals moving goods rather than firms' trade, and therefore more likely to be subject to proportionate errors.

The final dataset has around 1.5 million trade flows, including 19,259 different product lines. Some of these product lines disappear at some point during the sample period and some are new additions to the tariff book, mainly representing a split from other product lines due to changes in tariff regimes or other customs controls.

Omitting all zero flows between exporters and the EU can result in biased coefficient estimates on the intensive margin. If zero flows and the decision of exporting are correlated with trade costs, then using only positive flows may underestimate the impact of different trade regimes on exports. In addition, adding zero flows to the dataset allows us to estimate the impact on total exports, and, therefore, also on the scope for countries to diversify to new exports.

However, accommodating zero flows in our dataset is non-trivial since we are looking at product data rather than aggregate flows. One complication arises because the dataset has a large number of products that appear and disappear during the years. Filling our dataset with zeros along the year dimension is problematic due to the fact that imports from specific products on a given year may cease because the product line no longer exists. In order to address this, product lines that are not defined for the entire period of the sample are removed. This ensures that we do not artificially fill with zeros a product that was not defined in the tariff book for a given year.[21] [22] This reduced dataset has around 9,000 product lines. For each product year, all exporters to the EU in that year are potential exporters.[23]

An additional challenge is to define the preference margin for the zero flows. For each product and year we extrapolate on the basis of the existing defined margins for positive flows. When these are not defined, we construct the margin according to whether the country is EBA or GSP. For EBA countries the potential margin is constructed using a preferential tariff of zero. For GSP eligible products and GSP eligible countries we use the GSP tariff (see Appendix 1 for a more detailed explanation). We also use specific tariffs regarding specific country rates due to FTAs and other specific cases that appear in the tariff book. The main difficulty is for countries eligible for more than one preferential regime, GSP and Cotonou, or from 2008 GSP and EPA. Since we cannot identify what regime these countries would use for these products we use the minimum tariff available, and when both are the same we allocate the flow to the GSP/EBA regime. This implies that for some flows we are likely to over emphasise the role of the GSP and EBA regimes. Our methodology minimises the risk of including potential positive preference margins for products excluded from preferential regimes.

There is a growing econometric literature exploring the estimation of the gravity equation with zero flows (see Santos Silva & Tenreyro (2006), Linders & de Groot (2006), Martin & Pham (2008) or Burger et al. (2009)). A key element when dealing with zero flows is whether these are the result of unobservable trade or of exporters' decisions when selecting markets to export

[21] In practical terms we restrict the sample to products with imports in 2002 and 2008, 2003 and 2008 or 2002 and 2007..

[22] While we are aware of the recent literature on the survival of trade flows (Besedes & Prusa, 2006) and the fact that many trade relationships may not survive more than five years, we expect that the number of simultaneous product dropouts for all exporters in the world to the EU in a specific year to be minimal. Therefore, the risk of eliminating products not exported to the EU one specific year is low.

[23] The criterion is that a country should have exported at least one product to the EU in the same year. We look at each separately in order to guarantee that Eastern European EU countries enter the sample in the first period as exporters and after joining the EU are considered members and not exporters.

(See Helpman et al. 2008). If selection is the issue, a Heckman selection model might be more appropriate (see for comparison of estimators Linders & de Groot (2006) and Martin & Pham (2008)). One problem of the Heckman selection model, however, is the strong assumption on the joint normality of the error terms, and also the fact that does it not allow controlling for the large heterogeneity of countries and products.

There is also the issue of the possible endogeneity between the observed trade flows and the explanatory variables. Gravity models do not lend themselves well to IV estimates owing to the difficulty of finding suitable instruments especially in a panel framework. That difficulty is compounded when dealing with trade flows at the 10-digit level. Hence, we follow common procedure which builds upon the arguments of Baier & Berstrand (2007) who argue that the use of country-year fixed effects are effective at dealing with the endogeneity of trade with GDP, and the endogeneous selection of countries into preferential trade agreements (and in our context preferential trade regimes).

Following Santos Silva & Tenreyro (2006), we use the Poisson Pseudo Maximum Likelihood (PPML) estimator. The main advantage of the PPML estimator, in addition to be able to include zero flows in the estimations, is that it allows dealing with heteroscedastic data, which is common in trade data, and also with the panel structure of the dataset and controlling for fixed effects. This estimator also allows us to control for product heterogeneity using product fixed effects.

6. Results

6.1 The impact of preferences on the intensive margin of trade

Table 2 shows the results of estimating equation *(8) with exporter-product* fixed effects, for positive flows only – which therefore capture the intensive margin of trade. In column (1) we show the results where, in addition to the standard gravity variables, we include the actual tariff paid by each export flow (tariffb). Most variables have the expected sign and are statistically significant at the 99% confidence level. The R^2 ranges between 0.11 and 0.12.

As expected, total product exports as a measure of supply capacity increases the level of bilateral exports and the coefficient is statistically significant at the 1% level across all the regression. As explained earlier the MRI is a GDP-weighted distance measure (Carrere, 2008; Carrere et.al., 2009; Eicher et.al 2010) where one would expect that more remote countries would trade less and hence we would expect a negative coefficient. This is the case in all the regressions which include the MRI. Regression (3) is identical to regression (2) except for the exclusion of the MRI variable. As can be seen this has little impact on the results, and this was true across all the regressions.

With regard to our main variable of interest – tariffs - we see that tariff reductions unambiguously increase export flows to the EU, and this is true across all our specifications. In these regressions we are picking up both temporal variation in tariffs, and cross-country variation. As we are working with the power of the tariff a 1 percentage point reduction in tariffs would increase trade by b/(1+tariff), where “b” is the coefficient, so in principle the marginal effect depends on the level of the tariff. However, in practice the coefficient gives a reasonable first order approximation to the marginal effect. In column 1, of table 2 the coefficient is -3.80,

which suggests that a 1 percentage point reduction in (1+tariff) is associated with a 3.8% increase in trade.

It is also worth noting that these results are substantially different than those obtained by working with aggregate. In Appendix 2 we show the results for the same specifications as in Table 1 but where we have aggregated the trade flows such that we are dealing with total bilateral trade between each of the countries and the EU. As found by previous authors, at the aggregate level, there is no discernible effect of tariffs on trade flows. This serves to emphasise the importance of working with trade flows and tariffs at the product level.

In column (2) of the table we also include the preference share indices. Several things are notable here. The inclusion of the preference indices results in a decline in the size of the tariff coefficient. This is not surprising, as the tariff coefficient is likely to be picking up both the direct and indirect effects associated with preference regimes. By including the preference share index, we are, at least in part, separating these two effects out. With regard to those secondary effects we see an interesting pattern of results across the different preferential regimes. The results suggest that the biggest impact as compared to MFN flows is with regard to countries who either have some form of FTA arrangement with the EU, with a similar sized impact for the GSP+ regimes, followed by the GSP regime. The smallest positive additional impact is for the EBA regime. The Cotonou Agreement[24] appears to have had no significant additional impact on exports, and if anything the coefficient is negative. This may be driven by issues such as the product coverage, or the underlying rules of origin. Other things constant, the additional effects from shifting exports from the MFN to an FTA are an average increase of 1.80 thousand Euros (exp(0.59)) Euros per product exported.

Columns (4a) to (4d) decompose the impact of preferential regimes by the tariff paid and the preference margin. This gives us the average impact attributable to tariffs and the average impact effect given the size of the preferential margin. Depending on the margin used, the coefficient on the tariffs is now reduced, and the preferential margin effect varies between 2.23 and 0.14, suggesting a positive impact of preferential margins on exports to the EU in addition to the direct tariff effect. The size of the additional impact depends on how the margin is calculated. The weighted tariff and the largest exporter margins probably capture best the extent to which a given country is de facto getting preferential access, and these suggest that there may be a more modest additional positive impact on trade, than when the MFN or average tariff margin specifications are used.

In columns 5a-5d we provide specifications which include all of the preceding. Hence, we decompose the regime impact according to the tariff paid, the preferential margin enjoyed and regime specific factors proxied by the preference share index. We obtain a very similar pattern of results which confirm the role of tariffs, as well as the larger impact on exports of FTA preferences, the GSP+ and GSP regimes. The results again suggest a negative impact associated with the Cotonou regime. As before, the size of the margin effect depends on how it is calculated. It is now only significant when using the MFN margin or the simple average margin. Once again, this suggests that the impact of preference margins on exports is reduced when we account for the degree of competition within each product category.

[24] EPA regime since 2008

Table 2: Results Gravity model at product level-tariff regime. Panel estimates. Intensive margin

VARIABLES	1	2	3	4a	4b	4c	4d	5a	5b	5c	5d
lTotExp	0.5302***	0.5299***	0.5313***	0.5298***	0.5304***	0.5303***	0.5305***	0.5296***	0.5300***	0.5299***	0.5300***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
tariffb	-3.7994***	-0.8936***	-0.8851***	-2.2529***	-3.4255***	-3.7437***	-2.5152***	-0.7011***	-0.7588***	-0.8863***	-0.4198**
	(0.124)	(0.120)	(0.120)	(0.238)	(0.159)	(0.136)	(0.174)	(0.163)	(0.143)	(0.129)	(0.154)
FTAsh		0.5855***	0.5899***					0.5905***	0.5844***	0.5851***	0.5759***
		(0.014)	(0.014)					(0.014)	(0.014)	(0.014)	(0.014)
cotonou_sh		-0.2276***	-0.2275***					-0.2349***	-0.2289***	-0.2279***	-0.2344***
		(0.035)	(0.035)					(0.035)	(0.035)	(0.035)	(0.035)
GSP_sh		0.4148***	0.4108***					0.4172***	0.4140***	0.4145***	0.4086***
		(0.013)	(0.013)					(0.013)	(0.013)	(0.013)	(0.013)
GSP+_sh		0.4599***	0.4649***					0.4532***	0.4579***	0.4592***	0.4447***
		(0.042)	(0.042)					(0.042)	(0.042)	(0.042)	(0.042)
EBA_sh		0.2754***	0.2832***					0.2667***	0.2725***	0.2746***	0.2569***
Margin_mfn				2.2319***				0.3465*			
				(0.299)				(0.161)			
margin_wtd_ave					0.4772***				0.1595		
					(0.117)				(0.085)		
margin_1st_exp						0.1402**				0.0163	
						(0.053)				(0.048)	
margin_ave							1.7144***				0.6902***
							(0.179)				(0.124)
lmri	-25.3608***	-24.8144***		-25.3539***	-25.2582***	-25.3201***	-25.1900***	-24.7256***	-24.7802***	-24.8091***	-24.7673***
	(1.230)	(1.227)		(1.231)	(1.230)	(1.230)	(1.230)	(1.228)	(1.227)	(1.227)	(1.227)
		(0.037)	(0.037)					(0.038)	(0.037)	(0.037)	(0.037)
Constant	48.0244***	46.7399***	0.3599***	47.9324***	47.8233***	47.9470***	47.6687***	46.5716***	46.6730***	46.7297***	46.6416***
	(2.300)	(2.294)	(0.024)	(2.301)	(2.299)	(2.299)	(2.299)	(2.296)	(2.294)	(2.294)	(2.294)
Observations	1,144,717	1,144,717	1,145,739	1,137,442	1,144,684	1,144,664	1,144,707	1,137,442	1,144,684	1,144,664	1,144,707
R2 within	0.108	0.115	0.114	0.109	0.108	0.108	0.108	0.116	0.115	0.115	0.115
R2 between	0.339	0.346	0.384	0.340	0.339	0.339	0.339	0.349	0.346	0.346	0.346
R2 overall	0.335	0.345	0.398	0.337	0.335	0.335	0.335	0.347	0.345	0.345	0.345

Exporter-product fixed effects; Standard errors in parentheses *** p<0.01, **p<0.05 and * p<0.1

Table3: Results Gravity model at product level-tariff regime- Poisson FE estimates – Intensive and extensive margin

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
tariffb	-6.4916***	-6.2684***	-4.9834***	-5.2364***	-5.8955***	-6.5237***	-4.7598***	-5.0998***	-5.7302***	-6.2910***
	(1.017)	(0.902)	(0.922)	(1.024)	(1.168)	(1.023)	(0.827)	(0.889)	(1.032)	(0.908)
gsp_sh		-1.1026***					-1.1048***	-1.1017***	-1.1022***	-1.1022***
		(0.034)					(0.035)	(0.034)	(0.034)	(0.034)
eba_sh		-0.1035					-0.1349	-0.1305	-0.1206	-0.1039
		(0.208)					(0.206)	(0.205)	(0.205)	(0.208)
export	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
margin_mfn			1.7776***				1.8813***			
			(0.461)				(0.480)			
margin_wtd_ave				1.3923***				1.3830***		
				(0.313)				(0.308)		
margin_1st_exp					0.6978				0.6783	
					(0.383)				(0.379)	
margin_ave						-0.0242				-0.0173
						(0.017)				(0.015)
lmri	-3.0923*	-4.1275***	-3.1303**	-3.1145*	-3.1031*	-3.0818*	-4.1653***	-4.1461***	-4.1268***	-4.1188***
	(1.212)	(1.215)	(1.206)	(1.215)	(1.213)	(1.212)	(1.211)	(1.220)	(1.218)	(1.215)
Observations	2,368,507	2,368,507	2,363,980	2,368,352	2,368,286	2,368,463	2,363,980	2,368,352	2,368,286	2,368,463
Number of exp_prod	283,221	283,221	282,348	283,217	283,214	283,220	282,348	283,217	283,214	283,220
R2 within	.	.	.	.	.	.	.	.	.	.
R2 between	.	.	.	.	.	.	.	.	.	.
R2 overall	.	.	.	.	.	.	.	.	.	.
ll	-1.810e+09	-1.650e+09	-1.800e+09	-1.800e+09	-1.810e+09	-1.810e+09	-1.650e+09	-1.650e+09	-1.650e+09	-1.650e+09

[a] country-product fixed effects and year dummies; Standard errors in parentheses *** p<0.01, **p<0.05 and * p<0.1

In conclusion, the results suggest that preferential regimes have increased exports to the EU at the intensive margin, via lower tariffs, preferential margins and additional regime specific factors. The largest effect is associated with FTA regimes. A potential explanation for this is that FTAs, which provide reciprocal preferences and, therefore, are negotiated product by product, offer margins in products which are more attractive for exporters or better match their export basket[25]. Additional reasons could be because of the greater certainty associated with FTAs, as well as the treatment of behind the border, non-tariff measures, which is an increasing feature in many of the EU's agreements. With regard to the greater impact of GSP+ and GSP, this may reflect the fact that higher income developing countries may be better able to take advantages of the preferences being offered. The smaller coefficient on EBA preferences, and the negative Cotonou coefficient echoes previous results in the literature (Aiello, 2010; Gamberoni, 2007), and conversely may be driven either by the greater administrative difficulties faced by these countries in taking advantage of these preferences. It is less likely to be driven by product composition effects as in principle EBA and Cotonou preferences are offered on almost all products.

6.2 The impact on all trade, the intensive and extensive margin of trade

In the previous section the estimations were based on the positive trade flows in our data-set. In so doing, the regressions focused on the impact of preference margins on the intensive margin of trade. However, omitting all zero flows between exporters and the EU can result in biased coefficient estimates. Countries with a significant number of zero flows may not self-select to exporting due to tariff barriers or lack of preferential regimes, and, therefore, the sample of zeroes is likely to be non-random. This implies the need for including in the estimations those unobserved export flows and to re-estimate the model using the extended sample that includes zero flows.

As discussed earlier, product lines that are not likely to be defined for the entire period of our sample are removed to avoid artificially filling with zeroes a product that was not defined in the tariff book for a given year, and that otherwise would be considered as not exported rather than not defined. The resultant dataset has around ten million observations and more than 9,000 product lines. As a result of including the large number of zero observations, and focussing just on the intensive margin, we would expect that the coefficients on tariffs and on the secondary preference effects (be this the preference share indices, or the preference margins) to be smaller. This is because there are now a large number of cases where there is no observed trade. However, at the same time, the inclusion of the zeros also allows for changes in trade at the extensive margin.

Before estimating the equation for both the intensive and extensive margin, we test for the likely presence of heteroscedasticity in trade data. As proposed by Santos Silva and Tenreyro (2011) we test for heteroscedasticity of a first stage Probit on the probability to export with a RESET test. The results suggest that we cannot accept the null of hypothesis of

[25] This of course raises the issue of the endogeneity between the flows and the preference regimes, As discussed earlier, while we do not explicitly test for endogeneity, our use of fixed effects in good part should deal with this. To the extent that there is endogeneity this is likely to underestimate the impact of the regimes on trade flows.

homoscedasticity, violating the errors assumptions of the Heckman selection model.[26]

In order to include the zero flows in the estimations and address the heteroscedasticity problem, we implement the PPML estimator proposed by Santos Silva and Tenreyro (2006). Table 3 shows the results of the PPML estimates with product fixed effects. Equation (7) is estimated using exports levels as dependent variable, rather than in logarithm form, and therefore, including all zero flows.[27]

Regarding the main gravity variables, the TotExp coefficient is no longer statistically significantly different from zero. This is partly because of scaling since we cannot use logs in the presence of zeros, partly because of the large number of zeros, and partly because country-product supply effects are beingcaptured by country product fixed effects. Once again the MRI variable is negative and statistically significant in all the regressions.

Column (1) provides the benchmark specification with only tariffs, which as before shows a statistically significant negative coefficient. It is important to point out that the PPLM model is estimated on a linear log model, with export levels to include zero flows and the logarithm of the tariff. Therefore, the coefficients in Table 3 are not directly comparable to those of Table 2. Transforming the coefficients from semi-elasticity to elasticity requires dividing the coefficients by $\overline{y}$, the average flow is 567 thousand Euros, which significantly reduces the coefficient size as compared to the estimates in Table 1. Perhaps not surprisingly, tariff reductions increase trade, but only marginally when considering all trade, including potential trade at the extensive margin.

For specification (2) we only use the GSP and EBA preference indices. We cannot include an FTA preference index, as for the zero trade flows we have no way of knowing whether the individual products would have had preferential access since we do not have access to all FTA tariff schedules with the EU and this would require looking at the exclusion lists of every FTA signed with the EU. In addition, all the product coverage of Cotonou is included in EBA and partially in GSP, so for most Cotonou eligible flows not exported, countries could also export using the GSP/EBA regime. Since we do not have any information about what regime would be used if the country could export that specific product we are constrained to use only the GSP/EBA regime, hence these results are now relative to the FTA (and MFN) regimes. The coefficients show a negative sign indicating a negative impact of these regimes as compared to MFN or other FTA regimes when considering the combined effects on exports at the intensive and extensive margin. However, the coefficient for the EBA regime is not statistically significant. Note that earlier the results showed that the FTA regimes had the biggest impact so the negative coefficient is not surprising. An additional reason could be because, the GSP and EBA countries are more highly specialised in a few key export products to the EU, and there is a much larger proportion of zero trade flows.

Specifications (3) to (6) introduce preference margins to measure the additional possible impact

[26] Also, an additional problem of the Heckman model is that we cannot control for heterogeneity at the product level in the first stage Probit, since we cannot estimate a fixed effects model.

[27] Equation 16 using including country years fixed effects cannot be estimated using maximum likelihood estimators due to lack of convergence given the large number of parameters to estimate. For this reason we focus only on equation (15)

of the regimes. The impact of the preference margin on exports depends on the reference tariff used. Specifically, the size of the preference effect is reduced when the main competitor tariffs are used considering the weighted average applied tariff and not statistically significant when using the tariff of the main exporter. In the case of using the simple average the coefficient is also not statistically significant. This result is likely to be driven by the fact that EBA countries tend to have very narrow export baskets and, therefore, very large shares in zero flows. This implies that preference margins using the simple average tariff will tend to be zero or even negative, since the average tariff will be close to zero when including all zero flows for EBA countries. As for the estimates of the intensive margin, the size of the coefficients on margins drop when the degree of competition in the market is considered.

Finally, the coefficients on the regime indices in specifications (7) to (10) confirm the negative impact of the GSP and, especially, the EBA regime on exports at the intensive and the extensive margin relative to FTA and MFN flows. Although, as discussed above given the lack of information on regime use for zero flows we impose on the data that zero flows use the GSP/EBA regime and not the Cotonou regime and this might result in overestimating the impact of the GSP/EBA regime. Therefore, while the results suggest that GSP/EBA exporters may still benefit from lower tariffs and the preference margin on average, the size of the effects is substantially reduced, and regime specific factors such as rules of origin or costs of compliance may reduce the ability of exporters to export to the EU, especially in new products.

Table 4 provides a summary of the results where we focus on the specifications taken from Tables 2 and 3, and for comparative purposes we include the results from the regressions undertaken on aggregated trade reported in Appendix 2. The positive impact of preferences on the intensive margin via tariffs is clear. However, the impact of preference margins depends on how these are calculated, and the additional regime effects vary by preferential regime. The significant reduction in the tariff effects when including the extensive margin also comes across clearly. The third row in each category shows that these effects cannot be determined when undertaking the regressions on aggregate trade.

Table 4 Summary results

Margin	Flow	Tariff	Margin	GSP	EBA	FTA	Cotonou	GSP+
MFN	Intensive [a]	-0.70***	0.35*	0.42***	0.27***	0.59***	-0.23***	0.454***
	Int + ext [b]	-0.008***	0.003***	-0.002***	-0.0002			
	Aggregate[a]	-1.56	4.5***	-0.88*	0.33	0.03	0.19	-1.08
Weightd average Tariff	Intensive [a]	-0.76***	0.16	0.41***	0.27***	0.58***	-0.23***	0.46***
	Int + ext [b]	-0.009***	0.002***	-0.002***	-0.0002			
	Aggregate[a]	-0.88	2.39	-0.72	0.71	0.29	0.41	-0.48
Largest exporter tariff	Intensive [a]	-0.89***	0.02	0.41***	0.27***	0.59***	-0.23***	0.46***
	Int + ext [b]	-0.01***	0.001	-0.002***	-0.0002			
	Aggregate[a]	-1.26	1.20	-0.70	0.74	0.33	0.40	-0.47
Average Tariff	Intensive [a]	-0.42***	0.69***	0.41***	0.26***	0.58***	-0.23***	0.44***
	Int + ext [b]	-0.011***	-0.0000	-0.002***	-0.0002			
	Aggregate[a]	-0.17	4.5**	-0.77	0.60	0.18	0.37	-0.61

*** p<0.01, **p<0.05 and * p<0.1 ; [a] dependent variable log(export)), [b] coefficients transform to elasticities by dividing by average flows since dependent variable is the value of flows.

6.3 The impact on the extensive margin of trade

Finally, we explore whether there is any evidence of the impact of preferential regimes on the extensive margin of trade. To do this we estimate an additional specification that uses as the dependent variable the measure of the extensive margin proposed by Feenstra & Kee (2004).[28] The measure is given for each country i by the share of its export basket in world exports. In our case since we are working with bilateral exports to the EU, the variety index reflects for each country i, the share of world exports to the EU using country i export basket.

Appendix 3 shows the results for the extensive margin only estimates. Here we see that there is no evidence that tariffs, or preference regimes have impacted on the diversification of trade be this by product or country. Interestingly, it is only the GDP and the MRI variables which appear to increase the number of varieties exported. As the MRI is a GDP-weighted distance measure, both these results suggest that trade at the extensive margins is correlated with higher levels of GDP.

7. Conclusions

Unilateral preferences have been one of the most important instruments offered by developed to developing countries in the last four decades to foster exports. This paper has provided an evaluation of the impact of trade preferences in the EU, based on a unique dataset that links each flow with the tariff paid and preferential regime of entry. This element is critical in order to

28 The authors derive a measure of variety based on a CES production function that can be implemented using data on export shares.

attribute causality between the trade policy regime and the level of export flows.

The most important finding of the paper is that we find a positive impact of preferential regimes on exports to the EU. We find evidence that the positive impact is transmitted via lower tariffs, larger preferential margins and indirect effects linked to these regimes. These indirect regime effects appear to be larger for FTAs and the EBA and GSP+ regimes. The size of the preferential margin also depends on how the preference advantage is calculated, and we show the importance of taking account of the degree of competition from other export markets.

The results regarding tariffs and margins are robust to the inclusion of both the intensive and extensive margin in our estimations. The size of these effects, however, is substantially decreased when we consider the extensive margin, and the impact coefficients on the two regimes that we can identify, EBA and GSP, indicate a negative impact on overall trade *relative* to alternative regimes, such as FTA regimes. The results suggest little impact on the exports of preferential regimes when the scope for export diversification is considered. This is confirmed by the estimates for the extensive margin only, where there is no evidence of the impact of preferential regimes.

Overall the findings indicate that unilateral preferences have played a role in increasing exports to the EU. Nevertheless, this role appears to be limited to trade at the intensive margin when considering the large scope for export diversification in developing countries. Furthermore, pressure from preference erosion is largely to increase in the future due to the increasing number of FTAs likely to be signed by the EU and future MFN tariff reductions. This implies reduced scope for increasing the impact of trade preferences.

More work is required in order to understand the diverse impact of different preferential regimes. It is possible that this is due to the different product coverage of each regime, and the possibility that especially FTAs offer preferences in key export products where margins play a more important role. Other potential explanations are the role of RoOs, other non-tariff barriers.

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Appendix 1. Methodology for calculating zero flows dataset

The main challenges when calculating the zero flows dataset are:

i) differentiating products that disappear due to changes in classification
ii) inferring tariffs for trade flows that do not occur

Selecting products that occur all the period

We select only those product lines that are exported most of the period. This implies selecting those exported in 2002 and 2008, those in 2003 and 2008, and those exported in 2002 and 2007. In total we select 9,068 (over 19,259 products defined in some year) product lines that represent 73.31% of value and 71.50% of flows.

Inference of tariffs for no flows

For all the zero flows, we use the following procedure. We use the complete tariff book and paste tariffs in the following order.

1. First we attach country specific duties, which are the result of FTAs or specific situations
2. We set tariffs to 0, when MFN rates are 0.
3. We use zero tariffs for all EBA countries
4. We use GSP plus tariffs for GSP+ countries
5. With countries with double membership GSP and Cotonou, and in 2008 GSP and EPA, we use the minimum tariff. When both are the same we group the country with the GSP regime.
6. Remaining tariffs are set to MFN rates

We create a dummy variable which indicates whether the tariff applied belongs to the GSP/EBA regime. Since in the case of multiple preferential regimes we do not know what regime would be utilised for zero flows, the results of the coefficient on the margin decomposition needs to be interpreted with caution.

Appendix 2 Country aggregate gravity

FE estimates – Aggregate flows

VARIABLES	(1) log(value)	(2) log(value)	(3) log(value)	(4) log(value)	(5) log(value)	(6) log(value)	(7) log(value)	(8) log(value)	(9) log(value)	(10) log(value)
Tariff	-1.8655	-1.4891	-1.4106	-0.9801	-1.4586	-0.1168	-1.5625	-0.8843	-1.2602	-0.1661
	(1.1050)	(1.1405)	(1.0868)	(1.1866)	(1.1380)	(1.1873)	(1.1236)	(1.2116)	(1.1683)	(1.2080)
Margin (MFN)			4.6497***				4.4998***			
			(0.7732)				(0.8401)			
Margin (weighted tariff)				3.2220*				2.3907		
				(1.5913)				(1.6244)		
Margin (largest export)					1.9260				1.1976	
					(1.3017)				(1.3226)	
Margin(average tariff)						5.2182***				4.5008**
						(1.3574)				(1.4090)
gsp_ind		-0.6758					-0.8830*	-0.7223	-0.6954	-0.7723
		(0.4222)					(0.4177)	(0.4231)	(0.4228)	(0.4212)
eba_ind		0.7805*					0.3332	0.7111	0.7396	0.5955
		(0.3769)					(0.3805)	(0.3796)	(0.3796)	(0.3794)
FTA_ind		0.3604					0.0289	0.2879	0.3302	0.1770
		(0.6724)					(0.6652)	(0.6737)	(0.6732)	(0.6714)
Cotonou_ind		0.4156					0.1877	0.4078	0.4000	0.3712
		(0.7177)					(0.7082)	(0.7172)	(0.7179)	(0.7142)
GSP+_ind		-0.4872					-1.0760	-0.4783	-0.4653	-0.6141
		(0.9486)					(0.9409)	(0.9481)	(0.9491)	(0.9447)
lgdp	2.4646***	2.3469***	2.5143***	2.4509***	2.4513***	2.4715***	2.4346***	2.3417***	2.3420***	2.3680***
	(0.3812)	(0.3815)	(0.3741)	(0.3806)	(0.3810)	(0.3783)	(0.3761)	(0.3813)	(0.3816)	(0.3796)
lpop	-0.8922	-1.1221	-0.7257	-0.7942	-0.8404	-0.7382	-1.0002	-1.0470	-1.0858	-0.9945
	(1.0674)	(1.0683)	(1.0477)	(1.0667)	(1.0673)	(1.0602)	(1.0526)	(1.0689)	(1.0692)	(1.0637)
lmri	39.5700	45.8761	49.3920	40.7184	40.0340	45.2246	51.2150*	46.0703	45.7856	49.0036
	(26.4162)	(26.3941)	(25.9710)	(26.3774)	(26.4008)	(26.2595)	(26.0180)	(26.3774)	(26.3969)	(26.2790)
Constant	-61.5847	-72.9879	-80.6779	-63.9067	-62.5276	-72.6157	-83.4567	-73.4596	-72.8608	-79.1550
	(50.1936)	(50.1430)	(49.3523)	(50.1214)	(50.1649)	(49.9001)	(49.4309)	(50.1117)	(50.1482)	(49.9270)
Observations	1088	1088	1088	1088	1088	1088	1088	1088	1088	1088
R-squared	0.668	0.601	0.680	0.680	0.675	0.683	0.629	0.620	0.611	0.628
Countries	169	169	169	169	169	169	169	169	169	169
R2 within	0.104	0.118	0.138	0.108	0.106	0.118	0.145	0.120	0.119	0.128
R2 between	0.683	0.612	0.694	0.696	0.690	0.698	0.640	0.632	0.622	0.641

Country fixed effects and year dummies; Standard errors in parentheses *** p<0.01, **p<0.05 and * p<0.1

Appendix 3 Impact on the extensive margin

FE estimates- FEENSTRA AND KEE variety index

	(1) Feenstra	(2) feenstra	(3) Feenstra	(4) Feenstra	(5) feenstra	(6) Feenstra	(7) feenstra	(8) feenstra	(9) feenstra	(10) feenstra
Tariff	0.0511	0.0172	0.0480	0.0382	0.0397	0.0254	0.0173	0.0101	0.0088	0.0012
	(0.0493)	(0.0511)	(0.0494)	(0.0531)	(0.0508)	(0.0534)	(0.0511)	(0.0543)	(0.0523)	(0.0544)
Margin (MFN)			-0.0308				-0.0073			
			(0.0352)				(0.0382)			
Margin (weighted tariff)				-0.0466				-0.0281		
				(0.0712)				(0.0728)		
Margin (largest export)					-0.0538				-0.0439	
					(0.0581)				(0.0592)	
Margin(average tariff)						-0.0767				-0.0544
						(0.0610)				(0.0634)
gsp_ind		-0.0182					-0.0178	-0.0176	-0.0175	-0.0170
		(0.0189)					(0.0190)	(0.0190)	(0.0189)	(0.0190)
eba_ind		-0.0252					-0.0245	-0.0244	-0.0237	-0.0230
		(0.0169)					(0.0173)	(0.0170)	(0.0170)	(0.0171)
otherpref_ind		-0.0170					-0.0165	-0.0162	-0.0159	-0.0148
		(0.0301)					(0.0303)	(0.0302)	(0.0302)	(0.0302)
cotonou_ind		0.0058					0.0062	0.0059	0.0064	0.0064
		(0.0321)					(0.0322)	(0.0322)	(0.0322)	(0.0322)
GSP+_ind		-0.0975*					-0.0965*	-0.0976*	-0.0983*	-0.0959*
		(0.0425)					(0.0428)	(0.0425)	(0.0425)	(0.0425)
lgdp	0.0888***	0.0905***	0.0884***	0.0890***	0.0891***	0.0887***	0.0904***	0.0906***	0.0907***	0.0903***
	(0.0170)	(0.0171)	(0.0170)	(0.0170)	(0.0170)	(0.0170)	(0.0171)	(0.0171)	(0.0171)	(0.0171)
lpop	0.0973*	0.0876	0.0962*	0.0959*	0.0959*	0.0950*	0.0874	0.0868	0.0863	0.0861
	(0.0476)	(0.0479)	(0.0477)	(0.0477)	(0.0477)	(0.0477)	(0.0479)	(0.0479)	(0.0479)	(0.0479)
lmri	5.7800***	5.6128***	5.7150***	5.7634***	5.7671***	5.6969***	5.6041***	5.6105***	5.6161***	5.5750***
	(1.1789)	(1.1822)	(1.1814)	(1.1796)	(1.1791)	(1.1804)	(1.1837)	(1.1828)	(1.1825)	(1.1832)
Constant	-11.0068***	-10.6709***	-10.8803***	-10.9732***	-10.9805***	-10.8447***	-10.6538***	-10.6653***	-10.6755***	-10.5963***
	(2.2401)	(2.2459)	(2.2450)	(2.2414)	(2.2404)	(2.2431)	(2.2489)	(2.2470)	(2.2465)	(2.2479)
Observations	1088	1088	1088	1088	1088	1088	1088	1088	1088	1088
R-squared	0.395	0.409	0.398	0.397	0.397	0.399	0.409	0.410	0.409	0.410
Number of partner	169	169	169	169	169	169	169	169	169	169
R2 within	0.0610	0.0695	0.0618	0.0614	0.0619	0.0626	0.0695	0.0696	0.0700	0.0702
R2 between	0.365	0.377	0.367	0.366	0.366	0.368	0.377	0.378	0.378	0.379

Country fixed effects and year dummies; Standard errors in parentheses *** p<0.01, **p<0.05 and * p<0.1