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The Trade Effect of the EU's Preference Margins and Non-Tariff Barriers

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Abstract: Nowadays, trade negotiations afford both liberalism- and protectionism-oriented policies. Indeed, in recent decades, the developed countries have been actively engaged in negotiating many preferential agreements to integrate developing countries (DCs) into world trade and encourage their economic growth, but many of these schemes contrast with the complex rules, often imposed on international markets, that still are an obstacle for exporters. Their presence and related costs reduce the importance of preferential trade agreements (PTAs) in increasing trade flows. This article attempts to assess the impact of preferential trade policies on trade flows controlling for different non-tariff barriers (NTBs), using a structural gravity model. The analysis uses disaggregated data, registered in the year 2017, on EU imports (defined at level HS-6 digit) from a large number of exporters (187 developed and developing countries) and also includes the intra-EU trade. Our results show robust and positive estimates for the impact of preferences on bilateral trade flows, however, higher non-tariff barriers are likely to play a role in reducing both the extensive margins of trade, and so tariff preferences alone are not sufficient to access international markets. The impact of NTBs on the intensive margin of trade is ambiguous; some measures may act as catalysts and therefore increase trade, and others may act as an additional cost of trade and thus hinder trade.

Keywords: trade policy; preferential margins; non-tariff barriers; gravity model; hierarchical regression; Poisson estimator

JEL Classification: F13; F14; Q17

1. Introduction

Since the 1970s, non-reciprocal preferential regimes have been thought to be effective in promoting world trade integration and economic growth in developing countries (DCs). Relying on the concept of "Trade as Aid" many preferential trade agreements (PTAs) including reduction or, in a large number of cases, elimination of tariff barriers, have been established between developed and developing countries. Changes in the structure of international trade due to such proliferation of preferential treatments have attracted quite substantial empirical research interested in evaluating the relationship between PTAs and trade performances. In the literature, the positive impact of preferences on trade is confirmed, however, some critics claim that non-reciprocal preferences have perverse effects (Borchert 2009; Reynolds 2009; Foster and Stehrer 2011; Kahouli and Maktouf 2015), while some authors find that preferential trade policies are ineffective: in sectors characterized by the presence of administrative burdens, restrictive sanitary and phytosanitary regulations, or quotas, generous preferences did not increase the volume of trade (Iimi 2007; Desta 2008). Indeed, beside the proliferation of PTAs, the role of non-tariff barriers (NTBs) has been increasing. The decline of tariffs increased the role of the NTBs which

are often used to protect the domestic market; as a consequence, not all trade flows under a preferential agreement can be considered truly preferential. The term NTBs refers to restriction from prohibition or market conditions which make imports or exports demanding and costly. These measures try to protect domestic firms from the competition of foreign firms. Furthermore, for many traded goods the presence of non-tariff measures, such as restrictive sanitary and phytosanitary regulations and standards, may be an obstacle for access to foreign markets, especially for poor countries. Due to the cost of issuing and administering restrictive measures, the preferential scheme becomes complicated and expensive (WTO 2011). Additionally, one of the major disadvantages of free trade agreements is the administrative burden caused by rules of origin (ROOs). The origin of a product is particularly important in preferential agreements which require rules of origin to determine the national source of a good. ROOs often acts as a subtle form of protection (Baldwin et al. 2009). In fact, preferential schemes are likely to remain unused as long as the Most Favored Nation (MFN) tariff (i.e., the ceiling set by the World Trade Organization (WTO) commitments) is at or below the administrative costs of proving eligibility for preference; exporters do not take advantage of preferences and therefore trade flows cannot be considered preferential (Brenton and Ikezuki 2005; Medvedev 2010).[1]

With respect to existing literature, in this article we analyse the role that preference margins play in the extensive (numbers of positive trade flows) and intensive margin (quantities traded) of trade when they are accompanied by NTBs and assess the impact of preferential trade policies on trade flows accounting for different types of NTBs.

Our point of view is that preference margins have a different impact on increasing trade depending on the non-tariff barriers related to the use of the preferential scheme.

Starting from a gravitational model including many commodity classes of goods we estimate a structural gravity model, using the Pseudo Poisson Maximum Likelihood (PPML), paying attention to the effect of the other restrictive non-tariff policies. For our analysis, we use Cipollina and Salvatici (2019) dataset on EU imports and include dummy variables for the presence of a large number of NTBs. This dataset includes the intra-EU trade, that can be used as a proxy of the intra-national trade flows, information on the tariff regime of imports (provided by the Eurostat Comext database), and estimates of trade substitution elasticities at the sectoral level, necessary to compute a theoretically based measure of the intensity of EU preferential policies.[2] The preference margin defined by Cipollina and Salvatici measures the tariff advantage (or disadvantage) provided to the actual exports from country i on product k, given the tariff structure of the importer.

Therefore, it allows us to estimate the gravity model using both intra-national and international trade flows, in line with the recent literature (e.g., Yotov 2012; Yotov et al. 2016; Heid et al. 2017), and to evaluate the preference margins' trade impact in the presence of NTBs. We also provide a micro-level assessment of EU trade policies on the intensive and the extensive margins of trade. We analyze the contemporaneous presence of preferences and NTBs and their impact on volumes of trade (*intensive margin*) and numbers of positive trade flows (*extensive margin*).

Results suggest that NTBs negatively affect both the intensive and extensive margin of trade and the utilization rate of preferential schemes. Therefore, the positive impact of the preferential margin can be drastically reduced when the presence of NTBs is increasing.

The rest of the paper is structured as follows. Section 2 provides a synthetic scheme of the structure of trade policies. Section 3 briefly summarizes the literature that is relevant for our analysis. Section 4 introduces the empirical methodology and the econometric model. Section 5 describes the sources

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[1] For this reason, a substantial research focuses on the rate of utilization preferences. See Bureau et al. (2007) for an overview.

[2] As argued by Cipollina and Salvatici (2020, p. 2): "Such a measure is consistent with a theoretically grounded gravity model and offers an intuitive way to reconcile empirics and theory without relying on arbitrary assumptions. Specifically, this measure accounts for cross-country heterogeneity by incorporating the elasticities of substitution estimated at the HS 6-digit level and exploiting a robust theoretical mechanism that links the substitution elasticity estimation to the tariff relative advantage/disadvantage computation".

of our data and presents some descriptive statistics. Section 6 shows and discusses the results of the empirical analysis and, finally, Section 7 concludes.

2. The Hierarchical Structure of Trade Policies

The hypothesis driving this study is that trade may exhibit a hierarchical structure. Imports can enter into a foreign market under two alternative tariff regimes: MFN and preferential regimes. As specified in several empirical studies cited above, the importance of NTBs at the international level has increased after decreasing tariffs due to the conclusion of multilateral and bilateral trade agreements. These kinds of measures are often used as both protectionist and regulatory trade instruments to control and hamper trade. Their presence may also limit the beneficial effects of PTAs.

Trade policies may exhibit a hierarchical structure (see Figure 1). In studying the relationship between trade flows and tariff regimes, we may identify the following links showed in Figure 1: trade flows in tariff lines where the MFN duty is zero cannot be considered preferential as the "zero" preference margin is extended to all trading partners; a country may choose to export products under MFN rates, and then give up the preferential regime, if the costs of complying with the relevant rules of origin (ROOs) are too high. Preferential tariffs may affect trade flows, then the number of NTBs may affects the preferential tariffs and thus trade flows.

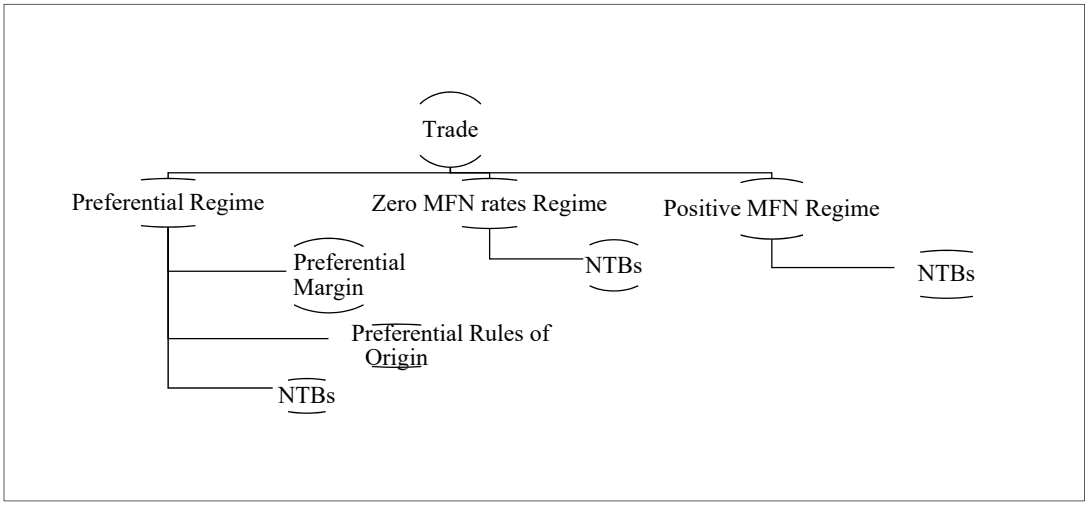

Figure 1. Hierarchical structure of trade policies. Source: authors' elaborations.

Preferential tariffs always involve ROOs since customs officers must be able to identify where an imported good is made in order to know which tariff to apply. ROOs always involve rules of cumulation (ROCs) (Baldwin et al. 2009).

Preferential margins may positively affect trade flows which benefit from preferential access, however, their impact on trade flows may be affected by both the intensity of the preference and the number of NTBs affecting products. There exists a link between the intensity of the preference margin and the presence of NTBs: (i) NTBs may reduce the advantages coming from preferences; (ii) when the intensity of preferences is very low, the presence of NTBs makes underutilized, or indeed ineffective, the preference scheme.

It should be also emphasized that overlapping preferences imply that tariff lines may be eligible for several different treatments: this makes a hard analysis for a specific preferential agreement. Moreover, because information about the scheme under which imports actually take place is not available for the EU, our database does not allow us to distinguish different preferential schemes. However, the Eurostat Comext database provides information on actual preferential trade flows and allows an analysis of the preference utilization with the presence of NTBs.

NTMs Comparison

Non-tariff measures (NTMs) include all regulatory measures that protect both health safety and the environment, and all traditional trade policy measures such as quotas and non-automatic licenses. These restrictions affect most of the products that we use on a daily basis, such as packaging requirements and limits on the use of pesticides to ensure safe food, restrictions on toxins in toys, mandatory voltage standards for household plugs that enable regional mobility, and emission standards for cars to limit climate change (UNCTAD and World Bank 2018). To date, most of the trade (more than 80% in developed countries and more than 90% in the EU) is affected by NTMs (TRAINS data).

Three types of costs can be associated with NTMs: direct compliance costs and indirect costs (which demonstrate compliance through testing and certification), and finally, the indirect time cost to demonstrate compliance (delays at borders resulting from the need to produce documents and demonstrate compliance to the satisfaction of border officials). As highlighted in the work of Fugazza et al. (2017), these costs are not proportional and, in some cases, are highly prohibitive for small and medium enterprises. In recent decades, with the decline of tariffs in several markets, NTMs have become important in trade policy because of their nature in terms of obstacles to trade. Their impact is different across countries, sectors and types of companies. Since 2010, the EU Commission has been actively engaged in negotiating NTM provisions in multilateral and bilateral free trade agreements (FTAs) with the aim of addressing costs related to the NTMs (Baccini et al. 2011). The EU acts in a different way depending on the presence or not of an agreement. WTO rules apply to countries that are not involved in FTAs with the EU, so trade restrictions must follow certain principles such as those specified in the WTO TBT and SPS agreements. If a trade agreement exists, it includes provisions to strengthen regulatory cooperation, as in the case of South Korea or more recently with Canada. PTAs or free trade areas have increased over time by changing structure and becoming more complex in terms of coverage and contents. These changes are important because a new form of standards different from the rules of the WTO is taking shape (Acharya 2016). The latest trade agreements are at the fulcrum of a large debate, where attention is around the NTMs chapters including the EU demand for recognition of Geographical Indications (GIs).

Observing the measures that regulate the trade relationships, we can say that developed countries (such as the EU and US) aim at the same goal which is to achieve a high level of food safety for protection of consumers or in the perception of the risk. However, the way these two countries set standards is different: the EU, for instance, employs a precautionary approach such as in the case of Genetically Modified Food (GMO) or in the case of hormones in beef. In other cases, the United States has strict regulations such as for mad cow disease (BSE) in beef and dairy products. While in other cases, the regulations adopted by these two countries converge. Furthermore, standards and restrictions adopted by the EU and Central Asia appear to hinder imports more than North American policies (Ghodsi et al. 2017).

The main challenges for developing countries are the compliance with the EU regulations, in particular in terms of food safety, product quality and conformity with European standards.

Looking at the EU as exporters, there were 396 active barriers to trade and investment in 2017 (the EU Market Access database). The most important barriers affecting the EU trade relationships are protectionist policies, unjustified customs delays, technical barriers and other stumbling blocks.

Analyzing barriers that hinder EU export and investment opportunities, it is possible to observe that Russia imposes the highest stock of barriers (36 measures recorded); while China has 25 reported active barriers and Indonesia currently has 23 measures in place. A group of other countries (Argentina, Australia, Brazil, India, South Korea, Thailand, Turkey, the United States and Mexico) instead impose 10 or more trade and investment barriers. Analyzing the role of the different barriers, we distinguish between the border measures (216 in total) and traditional border measures (180 in total). Border measures are restrictions on investments, services, intellectual property rights, government procurement or unjustified technical barriers to trade. As previously, Russia imposes the highest number of such measures recorded (19), followed by China (17). Traditional measures refer to restrictions that directly

affect imports and exports, typically through tariff and quantitative restrictions, import licensing, sanitary and phytosanitary (SPS) measures or through outright trade bans. Even in this case, Russia is the country with the highest number of such measures (17), followed by Indonesia, Turkey and the United States (11), and India (9). Among all these measures, 22 are affecting manufacturing products, 31 agri-food and only 2 affect services.

NTBs are characterized by different degrees of restrictions, most of them, other than bans, do not eliminate trade altogether, but rather reduce it. Moreover, an overlapping of measures between products is also possible, implying an increase in costs for exporters.

3. Literature Review

3.1. The Effect of Preferences

A preferential trade agreement provides the elimination or the reduction of tariffs on imports from beneficiary countries. Most of the literature finds positive estimates of the impact of preferences on trade[3], however this impact can be reduced by the presence of complex rules that often accompany preferential schemes.

When the preferential margin is high, it is more likely to be used, however for various reasons not all imports of products nominally eligible for preferential treatment enter the granting country at the preferential rate. The costs for fulfilling the requirements, such as rules of origin and other formalities, which are often linked to the preferential scheme, hinder the use of the preferences and it becomes convenient to bear these costs only if the volumes of trade are enough high and allow a substantial saving on duties. Furthermore, the complexity of rules of origin is an integral part of all preferential agreements, so available preferences are not always fully utilized. Although preferences can be considered quite generous, other complex rules represent a major obstacle for exporters of goods. In the last decade, the utilization rate of preferences has attracted many analysts (Bureau and Gallezot 2004; Estevadeordal and Suominen 2005; Cadot and Melo 2007; Hakobyan 2010; Dieter 2013) who have found that the use of the preferential scheme is generally quite high for products with high preferential margins (Brenton and Ikezuki 2004) and also vary with the size of export volumes for a range of regimes (Bureau et al. 2007; Hakobyan 2010). Some authors estimate a threshold margin, ranging between 2 and 6%, that is required for exporters to use preferences (Francois et al. 2006; Manchin 2006). Bureau et al. (2007) show that some preferential regimes are preferred over others, so the compliance costs may cause a distortion of the preferential schemes' utilization. We refer to non-price variables such as the rules of origin provided for each agreement. However, another relevant obstacle comes from the NTBs which may be defined as all the government policies and practices able to affect international trade. It is well known that such tools are pervasive, difficult to quantify and finally they are politically sensitive (Dee and Ferrantino 2005). Studies focusing on specific sectors find that where restrictive non-tariff barriers are (sanitary and phytosanitary regulations, quotas and administrative burdens), generous preferences do not seem to be important in increasing trade (Brenton and Ikezuki 2005; Iimi 2007; Desta 2008; Medvedev 2010). Some authors show how utilization rates vary for different categories of goods based on the different cost impacts that different types of rules of origin have on these goods (Carerre and Melo 2011; Anson et al. 2005).

Keck Alexander (2012), focusing on disaggregated data on preference utilization for a large panel of countries, find that preference utilization rates are often high even where margins are low and tariff savings are limited. Their results suggest that the costs of using preferences are low (and in some cases equal to zero) and there are benefits in connection with claiming preferential market access.

This paper is closely related to recent literature verifying the impact of preferential agreements on trade volume. For developing countries (DCs), which are beneficiaries of many preferential

[3] A comprehensive survey of this literature is provided by Cipollina and Pietrovito (2011).

arrangements for most of their exported goods, tariff preferences are particularly important. From a political point of view, the purpose of the reduction in tariff rates is to allow DCs to participate more actively in international trade and to generate additional revenue from exports to support the development of industry, employment and to reduce poverty.

In the literature it is largely confirmed that preference programs increase trade (Cipollina et al. 2017; Davies and Nilsson 2013). Preference margins provide a significant boost to DCs' exports (Olarreaga and Özden 2005; Siliverstovs and Schumacher 2009; Nilsson and Matsson 2009; Aiello and Demaria 2012; Aiello et al. 2010; Cipollina and Salvatici 2010), though there is also some evidence reporting schemes, for example Everything But Arms (EBA) agreement, that have not been effective in expanding DCs' exports (Gradeva and Martinez-Zarzoso 2009; Pishbahar and Huchet-Bourdon 2008).

The literature that uses a quantitative variable for preferential policy and disaggregated data defines the preference margin as the advantage or disadvantage conferred by a preferential tariff to a given exporter given the tariff structure of the importer, therefore, depending on tariffs faced by other competitors from other countries in the same market (Low et al. 2009; Cipollina et al. 2017; Cipollina and Salvatici 2019, 2020). This literature provides, in general, a positive evaluation of the trade impact of EU's preferential policies, even if such impact may differ greatly across sectors: preference margins are likely to be less effective in those sectors, especially in the agricultural sector, where NTBs are very high (Scoppola et al. 2018; De Melo and Nicita 2018).

3.2. The Effect of NTBs

The empirical literature shows the direction and the extent to which the non-tariff measures affect trade. There are several elements to be considered, as the specific type of measure, the product or sector coverage, size of exporting firms and the country affected. With recent theoretical advances in international trade, a large number of studies are aimed at providing new approaches to quantify the trade effects of NTMs. The main purpose of these methods is to offer quantitative estimates of the level of restrictiveness imposed by NTMs. The quantification of the effects of NTMs on trade is often done through the gravity model. However, the partial equilibrium model (Van Tongeren et al. 2009; Beghin et al. 2012; Ghodsi 2015) and general equilibrium model (Berden and Francois 2015) have also been applied. Empirical evidence reveals that although the magnitude of the trade effects may vary, in agriculture and for the food sector, sanitary and phytosanitary measures, as well as technical measures, are strongly trade-restricting.

Disdier et al. (2008), focusing on specific products/sectors, analyze the determinants of trade and find that the EU's imposition of sanitary and phytosanitary measures (SPS) and technical barriers to trade (TBT) are more restrictive to trade than any other OECD standard. Kee et al. (2009), on the other hand, believe that NTMs act as tariff substitutes rather than tariff complements. Furthermore, they find that NTMs hinder agricultural trade more than manufacturing trade. A part of the literature compares the effects of NTMs, computing the ad valorem equivalents (AVEs), on trade with the trade impact of tariffs of NTMs (Kee et al. 2009; Bratt 2014; Beghin et al. 2015; Cadot and Gourdo 2015).[4]

The work of Kee et al. (2009) assesses the NTMs' impact on import values with a gravity model. Computing AVEs by using import demand elasticities, their findings reveal that the average AVE of all products affected by NTMs is 45%, and if weighted by import values it is 32%. It is important to note that in this paper, authors have restricted their AVEs to be positive. Beghin et al. (2015) have re-estimated the gravity approach proposed by Kee et al. (2009) for the years 2001 to 2003 and find positive and negative values of AVEs of NTMs in the case of market imperfections. In particular, their results suggest that about 39% of the tariff lines affected by NTMs exhibit negative AVEs, indicating a net trade-facilitating effect of these measures. Bratt (2014) shows that overall, NTMs impede trade,

[4] The work of Ferrantino (2006) provides a deeper description of methods used to assess the effects of NTMs on flows of trade and prices by NTM type.

with a median AVE of 15.7%. However, 46.1% of all AVEs computed show a positive effect on trade. Even this work reveals that NTMs are more import-restricting in the agri-food sector than in the manufacturing one. Beghin et al. (2015) extended the work of Kee et al. (2009) by considering the case of domestic regulations and market imperfections. Their focus on standard-like non-tariff measures, finding that about 39% of the product lines affected by NTMs exhibit negative AVEs, indicates a net trade-facilitating effect of these measures.

A part of the literature has investigated the role of national and international standards. The harmonization of standards may enhance trade because it increases the number of exported varieties and export destinations. However, harmonization can also hinder trade in cases where standards are really different and complying with them imposes additional costs. Studying the impact of harmonization of standards on the textiles sector, footwear goods and clothing, Shepherd (2007) notes that harmonization is associated with greater export variety, mainly for exports from low-income countries to the EU. An increase of 10% in the total number of EU standards is associated with a decrease of 6% in the product variety of exports to the EU market. Additionally, Reyes (2011) analyzed the response of US manufacturing companies to the harmonization of EU product standards with international ones, and showed that US exports to the EU increased as new US firms entered the EU market since they were likely to have a positive trade relationship. At the same time, if US firms are already present in the EU market, the harmonization decreases the volume of trade. Chen and Mattoo (2008) confirmed this result. The authors find that harmonization increases exports from developed countries while reduces exports from developing countries, showing that harmonization agreements increase trade between the country involved in the agreement, but not necessarily with other countries. Moenius (2004) studies product and process standards for specific countries and confirms that bilaterally shared standards increase trade. The study makes known that country-specific standards of importers reduce imports for non-manufactured goods, for instance, agriculture, and they do promote trade in the manufacturing sector. Results on the role of information costs appear puzzling. Ronen (2017) studied the trade effects of a variety of NTMs on virgin olive oil imports, and found a significant demand-enhancing impact, particularly of maximum residue levels (MRLs). Anders and Caswell (2009) show a different impact on trade of Hazard Analysis and Critical Control Points (HACCP) requirements for seafood products in the USA between developed and developing countries.

Volpe et al. (2015) assess the impact of customs processing times on the trade at the firm level. Their findings reveal that pre-shipment inspections to customs create delays, which have a significant negative impact on the firms' exports. Yet, Andriamananjara et al. (2004) do not find evidence of a statistically significant impact on the agricultural sector, but recognize the apparel industry as the sector with the largest number of significant NTMs. Other sectors such as vegetable oils and fats, leather products, and paper products are also affected by multiple NTMs.

The measurement of food safety standards has been explored by the use of heterogeneity indicators, using maximum residue limits and other policies that can be equally aggregated. In this case the empirical evidence goes beyond the simple counts of NTMs and looks at stringency in deviation either from international standards (Li and Beghin 2014) or from another reference value such as the highest value (Liu and Yue 2013). Often, the hypothesis behind the bilateral heterogeneity of policies is that heterogeneity in regulation impedes trade (Liu and Yue 2013; Vigani et al. 2012), particularly asymmetric heterogeneity, when one country is more stringent than another (de Faria and Wieck 2014). Several distance measures have been used, for example, Drogué and Demaria (2012) used a Pearson correlation coefficient of pesticide residue limits per product between any two countries trading the product. Winchester et al. (2012) use the Gower index to estimate the impact of regulatory heterogeneity on agri-food trade. The study discloses that when importing countries have stricter MRLs for plant products than exporting countries, trade is significantly reduced. For most other measures, establishing a clear effect is quite hard as no robust relationship between measures has been found. Demaria and Drogue (2017) compare the EU regulations on baby food products on MRLs of

pesticides to those of its major trading partners through a severity index. Their results show that the EU's regulation may constrain trade.

Findings of Foletti and Shingal (2014) suggest that regulatory heterogeneity of MRLs decreases trade by an extensive margin if the exporter has to face more rigorous regulation abroad. However, when exporting countries set stringent standards, the volume of trade increases.

Analyses that focus on the incidence of specific standards, such as the maximum residue levels (MRLs) of pesticides, on developing countries exports often find negative results, i.e., a trade-restrictive effect. Otsuki et al. (2001a, 2001b), for instance, estimate the trade impact of the change from the Codex Alimentarius standard to the more stringent and uniform EU standard on aflatoxin, and find that African exports of cereals, dried fruits, and nuts to the EU have decreased. A similar result is found in the work of Wilson and Otsuki (2004), which finds that chlorpyrifos MRLs on bananas negatively affect exports to the OECD countries from Africa, Latin America, and Asia.

The literature has shown and continues to highlight the importance of NTMs in global trade, and the incidence of these measures is increasing (Martinez and Poole 2004; Carerre and Melo 2011).

The effects that NTMs have on trade are different and depend on different factors. Evidence points out that agricultural goods are more sensitive to the application of these policy measures in comparison to the manufactures. Most of the studies reviewed confirm that NTMs have the effect of reducing trade, nevertheless a part of this literature also highlights the trade benefits generated by some measures aimed at ensuring better quality and major information provided to consumers (Curzi and Olper 2012). Relevant factors influencing the results are the relative size of the exporting firm, their experience in serving the market, as well as the level of the economic development of the exporting and the importing countries (Fontagne et al. 2015). An important finding that the empirical literature states is that developing countries are more likely to face stringent requirements on their exports than developed ones.

4. Empirical Methodology

The contribution that this work adds to the existing literature is that of understanding the impact on trade of the EU preferential trade policies in the presence of higher NTBs by considering the gravity model which also includes domestic trade flows. Much of the literature estimating the effects of preferential policies refers to the works of Tinbergen (1962) and Pöyhönen (1963). However, recent literature (Anderson and van Wincoop; Anderson James E. 2012, 2016) uses bilateral trade flow at the sectoral level (h) between country i and j at time t ($X^h_{ij,t}$) as:

$$X^h_{ij,t} = \frac{E^h_{j,t} Y^h_{i,t}}{Y^h_t} \left(\frac{t^h_{ij,t}}{P^h_{j,t} \Pi^h_{i,t}} \right)^{1-\sigma_h} \tag{1}$$

where Y^h_i / Y^h is the share of the world sales of goods class h of country i; E^h_j / Y^h is the share of world spending on h of country j; $\sigma_h > 1$ is the elasticity of substitution across goods in h;[5] $P^h_j \Pi^h_i$ are "multilateral resistance terms" (Anderson and van Wincoop 2003); finally, t^h_{ij} is the trade cost (distance, tariff, language, colony, etc).

This section is based on (Cipollina and Salvatici 2019) framework. Authors use a model of international trade with Armington differentiation and estimate trade elasticities at the tariff line-level. Specifically, in order to estimate these parameters, disaggregated bilateral applied tariff cross-section data are used. The use of country-sector fixed effects allows controlling for the endogeneity of trade policies (Baier and Bergstrand 2007). This methodology allows us to generate a set of elasticities

[5] The assumption $\sigma > 1$ implies that consumers in country i have a preference to consume the largest possible number of varieties.

which is then used to calculate the reference tariff, in order to provide a reliable measure of the preference margins.

Given that it is possible to separate tariffs from other trade cost components, it is feasible obtain Π^h as a weighted average tariff factor $\left(1+T^h\right)$ applied on product h (in coherence with the structure of the import demand) computed as a CES price aggregator. Therefore, the gravity Equation (1) is rewritten as follows:

$$import_i^h = \alpha_i^h M^h \frac{\left(p_i^h \beta_i \gamma^h \left(1+\tau_i^h\right)\right)^{-\sigma}}{\left(1+T^h\right)^{(1-\sigma)}} \tag{2}$$

where $import_i^h$ are the EU import of item h from country i, σ is the substitution elasticity between varieties ($\sigma > 1$) (i.e., product's origin), α_i^h represents consumer preference parameter, M^h is the expenditure on import h, Π^h is the product h import price index computed across all exporters i, and P_i^h represents the domestic price of imported item h from country i. $p_i^h c_i^h \left(1+\tau_i^h\right)$ is the domestic price where $c_i^h > 1$ captures the transportation costs that differ by product (γ^h) and by exporter (β_i); the term τ_i^h is the bilateral applied ad valorem tariff. p_i^h is the fixed free-on-board (FOB) export price of a physical unit. The relative preference margin ($mpref_i^h$) is defined as:

$$mpref_i^h = \frac{\left(1+T^h\right)}{\left(1+\tau_i^h\right)} \tag{3}$$

The preference margin is computed only when flows enters in the territory of the EU under a preferential agreement. The margin ranges between 0 and 1 if the reference tariff is lower than the applied one, and indicates the presence of negative margins, identifying a disadvantage of the country in comparison to other competing exporters. Conversely, if the reference tariff is higher than the applied one, then the margin is greater than 1, thus the margin is positive, and it indicates an advantage with respect to other competitors.

Trade flows increase because trade preferences reduce trade costs, as a consequence of tariff reduction. However, the trade cost depends on the whole structure of trade policies, therefore also non-measure barriers are relevant in determining costs. To evaluate the effect of NTBs on EU imports, we estimate a probit model, including dummies for presence of NTBs at the tariff lines, to measure the impact on the probability of having positive trade and a gravity equation to quantify the impact on of the volume of trade.

The probit model allows us to test the propensity of recording a positive trade flow, proving the presence of a greater set of bilateral trade flows (extensive margin), in the presence of NTBs:

$$\rho\_trade_i^h = \Pr(import_i^h > 0\ dummy\_pta_i^h,\ dummy\_ntb_i^h, \varphi_i, \varphi_h \tag{4}$$

where *dummy_pta* is a dummy equal to 1 if a preference exists between EU and country-partner i for good k, *dummy_ntb* indicates the presence of an NTBs imposed by the EU for good k from country i, φ_i and φ_h are exporter and sector fixed effects.

We consider the effect of both preferences and NTBs on the level of trade (intensive margin) estimating the following gravity equation in its multiplicative form, using a Poisson pseudo-maximum-likelihood (PPML) estimator, widely utilized in empirical analyses (Yotov et al. 2016), and including fixed effects[6] for exporter and product at HS6 digit level which allow checking for any other observable and unobservable characteristics for each exporter and sector, respectively:

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[6] Literature widely use fixed effects in the estimation of gravity equations in order to consider multilateral resistance. Moreover, (Fally 2015) points out that estimation of gravity equation with PPML procedure and a complete structure of fixed effects is coherent with a structural approach, as in (Anderson and van Wincoop 2003).

$$import_i^h = \exp\left\{\sigma\, ln\left(mpref_i^h\right) + dummy\_ntb_i^h + \varphi_i + \varphi_h\right\} + \varepsilon_i^h \quad (5)$$

$mpref_i^h$ is the preference margin as defined in Equation (3), and ε_i^h is the error term. Data are described in the next section, we present NTBs imposed by the EU in 2017 and dummies included in our models.

5. Data

For our analysis, we expand the dataset on EU imports compilated recently by Cipollina and Salvatici (2019) and include dichotomic variables for the presence of a large number of NTBs from the dataset defined at tariff line with a level of disaggregation of HS6-digit level (Harmonized System) and provided by the UNCTAD Trade Analysis Information System—TRAINS (https://trains.unctad.org/). Using trade data from the Eurostat Comext database and data on tariffs from TRAINS database (which is integrated into the World Bank's WITS software), in the original study Cipollina and Salvatici (2019) estimate the elasticities of substitution for 16 sectors based on the WTO definition. Such elasticities are used to compute the preference margin (Equation (3)). The dataset under investigation covers imports of 4767 products from 188 countries to EU28 in the year 2017 and contains a total of 937,036 observations (of which 317,745 have positive flows). The dataset includes intra EU trade. Taking the observations with a positive MFN tariff, only 8% of them can be referred to a preference that is used for the 67% of observations.

With regards to NTBs, we use UNCTAD's TRAINS database which covers imports technical and non-technical measures and export measures as well as information on "procedural obstacles", e.g., administrative burdens, transparency issues or infrastructural challenges (see Table 1).

Table 1. Structure of non-tariff measures (NTMS).

Technical measures	A	Sanitary and phytosanitary measures
	B	Technical barriers to trade
	C	Pre-shipment inspection and other formalities
Non-technical measures	D	Contingent trade protective measures
	E	Non-automatic licensing and quality control measures
	F	Price control measures, additional taxes and charges
	G	Financial measures
	H	Measures affecting competition
	I	Trade related investment measures
	J	Distribution Restrictions
	K	Restriction on post sales services
	L	Subsidies
	M	Government procurement restrictions
	N	Intellectually property
	O	Rules of origin
Export Measures	P	Export related measures

Source: authors' elaborations on data by UNCTAD Trade Analysis Information System—TRAINS.

Starting from this information we define dummies for each group if NTBs that denote the presence of NTBs for the specific product (HS product line) from each country. Each NTBs variable is defined as follows: it is equal to 1 if at least one of the tariff lines underlying is imposed with an NTB, and 0 otherwise. Table 2 shows the NTBs included in our dataset referring to the EU import in 2017. In particular, the EU requires: (1) sanitary and phytosanitary measures, concerning the application of food safety and animal and plant health regulations, for imports of plastics, wood products, stones and glasses, metals, machineries and other manufactured articles; (2) technical barriers to ensure that technical regulations, standards, and conformity assessment procedures for the textile sector, stones and glasses, metals and machineries; (3) pre-shipment inspection and other formalities and (4) non-automatic licensing and quality control measures for textile and metal products.

Table 2. Non-tariff barriers (NTBs) applied by the EU (year 2017).

	VII: Plastics/Rubbers	IX: Wood and Articles of Wood	XI: Textiles	XIII: Stone/Glass	XV: Metals	XVI: Machineries	XX: Misc. Manufactured Articles
Sanitary and phytosanitary measures	Certification requirement	Certification requirement		Treatment for elimination of plant and animal pests and disease-causing organisms in the final product or prohibition of treatment (irradiation and fumigation); Certification requirement; Inspection requirement	Treatment for elimination of plant and animal pests and disease-causing organisms in the final product or prohibition of treatment (irradiation and fumigation); Certification requirement; Inspection requirement	Certification requirement	Certification requirement
Technical barriers to trade			Conformity assessment related to technical barriers to trade (TBT) (certification requirement)	marking requirements	marking requirements	Product-quality, safety or performance requirement	
Pre-shipment inspection and other formalities			Import-monitoring, surveillance and automatic licensing measures		Import-monitoring, surveillance and automatic licensing measures		
Non-automatic licensing and quality control measures			Licensing for economic reasons		Licensing for economic reasons; quotas (country allocation)		

Source: authors' elaborations on data by UNCTAD Trade Analysis Information System—TRAINS.

6. Econometric Results

Results on the extensive margin of trade are in Table 3, which displays the impact of our key variables. Model 1 considers *dummy_ntbs*; model 2 *dummy_ntbs* with *dummy_pta*; model 3 *dummy_pta* and dummies for each group of NTBs applied.

Table 3. Impact on the extensive margin of trade.

	(1)		(2)		(3)	
	Probit	**Average Marginal Effects (dy/dx)**	**Probit**	**Average Marginal Effects (dy/dx)**	**Probit**	**Average Marginal Effects (dy/dx)**
dummy_ntb	−0.23 *** (0.01)	−0.08 *** (0.00)	−0.13 *** (0.01)	−0.04 *** (0.00)		
dummy_pta			2.31 *** (0.01)	0.75 *** (0.00)	2.31 *** (0.01)	0.75 *** (0.00)
dummy for Sanitary and phytosanitary measures (code A)					2.55 *** (0.19)	0.82 *** (0.01)
dummy for Technical barriers to trade (code B)					1.35 *** (0.16)	0.44 *** (0.05)
dummy for Pre-shipment inspection and other formalities (code C)					−0.22 *** (0.01)	−0.07 *** (0.00)
dummy for Non-automatic licensing and quality control measures (code E)					−0.34 ** (0.14)	−0.11 ** (0.05)
N	937,036		937,036		937,036	
adj. R^2						
pseudo R^2	0.000		0.105		0.106	

Robust standard errors, clustered by country-product, are shown in parentheses. Data refer to 2017. All specifications include exporter and product fixed effects. ** significant at 5 per cent level; *** significant at 1 per cent level. Source: elaboration on data by COMEXT and TRAINS; Software Stata/SE 16.1.

Globally, the dummy for the presence of NTBs shows a negative and statistically significant coefficient (−0.23), revealing that the imposition of an NTBs negatively affects the probability of trade: looking at the marginal effect we can say that, in general, the presence of NTBs decreases the probability of registering a positive trade flow by 0.08.

Model 2 includes the dummy for PTAs and confirms previous results; here, the presence of a preferential agreement increases the probability of having positive trade flow, PTA's coefficient is positive and statistically significant (2.31): the one unit change in the preference treatment, increases the probability of registering a positive trade flow by 0.75. NTBs work as a trade barrier on the trade (−0.13, with a marginal effect of −0.04); nevertheless, the presence of PTAs reduces the effect of NTBs, indeed the size of the coefficient is lower than model 1. On the other hand, model 3 looks at the effects of each group of NTBs. Results are heterogeneous, some measures positively affect the probability of trade, and coefficients are statistically significant, while others display a negative and significant parameter. The EU preferences granted to the beneficiary countries are effective in increasing the probability of trade (+2.31, with a marginal effect of 0.75). Similarly, the effect of sanitary and phytosanitary measures (+2.55, with a marginal effect of 0.82) and technical barriers to trade (+1.35, with a marginal effect of 0.44); conversely, pre-shipment formalities (−0.22, with a marginal effect of −0.07) and non-automatic licensing (−0.34, with a marginal effect of −0.11) increase the adverse effect. The results obtained are consistent with the empirical evidence highlighting that the effect of NTBs is not univocal; it depends on the type of measure and on the products to which measures are applied. According to one view, the presence of SPS and TBT can foster the probability of having a positive export of the EU partners. Consumers' preferences are affected by SPS in the importing countries, as well as import demand which may shift and increasing exports. On the other hand, other NTBs may hinder trade, as in the case

of pre-shipment requirements or non-automatic licensing. This is due to the high cost of compliance and/or the complexity of the procedure which in many cases is time-spending and burdensome.

Table 4 reports results on the intensive margin with a PPML estimator. As for the previous estimates, we estimate three different models. The first one considers the preferential margin and the dummy NTBs; the second one studies the dummy of NTBs by groups; finally, the third one includes a single dummy for the relevant NTBs. Results are showing that NTBs stimulate trade among countries. The only negative effect is reported on the measures related to "Quotas allocated to exporting countries[7]" (−5.68). This measure restricts the quantity of imports of manufactured goods. In all other cases, measures refer to documents and certifications. Thus, if the exporting country proves the capability to comply with the EU requirements, NTBs are not a barrier to trade. Among all results, the greatest positive effect is found for measure B83 which refers to the certification requirement (+5.84).

Table 4. Impact on the intensive margin of trade.

	(1)	(2)	(3)
	PPML	**PPML**	**PPML**
mpref (log)	8.10 ***	8.11 ***	8.13 ***
	(0.82)	(0.82)	(0.82)
dummy_ntb	0.71 ***		
	(0.17)		
dummy for Sanitary and phytosanitary measures (code A)		0.83 ***	
		(0.19)	
dummy for Technical barriers to trade (code B)		−0.45	
		(0.38)	
dummy for Pre-shipment inspection and other formalities (code C)		−0.21	
		(0.22)	
dummy for Non-automatic licensing and quality control measures (code E)		−0.40	
		(0.45)	
NTM code A52			−0.12
			(0.26)
NTM code A83			0.95 ***
			(0.19)
NTM code B7			1.09 ***
			(0.34)
NTM code B83			5.84 ***
			(0.80)
NTM code C4			−0.22
			(0.22)
NTM code E212			−5.68 ***
			(0.66)
N	937,036	937,036	937,036
adj. R^2			
pseudo R^2	0.906	0.906	0.906

Robust standard errors, clustered by country-product, are shown in parentheses. Data refer to 2017. All specifications include exporter and product fixed effects. *** significant at 1 per cent level. Source: elaboration on data by COMEXT and TRAINS; Software Stata/SE 16.1.

[7] Chapter E includes licensing, quotas and other quantity control measures, including tariff rate quotas. The measure E212 Country allocation refers to permanent quotas where a fixed volume or value of the product must originate in one or more countries.

Table 5 displays sectoral level results on the volume of trade. Results reveal how preference margin increase the level of trade, coefficients are statistically significant, they range between 4.27 and 14.72, implying that EU partners benefit from the EU PTAs. Furthermore, they suggest that SPS, TBT and pre-shipment formalities positively affect the volume of trade; whereas, non-automatic licensing and quality control measures decrease the volume of trade. SPS coefficients among sectors range between +1.87 and +2.57, with the greatest effect on Metals (+2.57) followed by Woods (+2.55) and the lowest on Miscellanies manufactured articles (+1.87). SPS measures require a high level of transparency and they are frequently used as a reference of quality in agri-food. Indeed, the aim of these measures is that of protecting the health of human, animal and plant life. SPS measures gather procedures such as restriction for the use of dangerous substances, guaranteeing and certifying food safety, and others regarding the prevention and dissemination of disease or pests. Countries can impose temporary prohibition or restriction on products posing a hazard to human, animal or plant health. Therefore, SPS can be trade-distorting for agricultural products and trade promoting for manufactured products (Disdier et al. 2008); although TBT and other formalities may have a prevalent negative effect.

TBT measures have a negative effect on Metals (−2.15) and positive on machinery (+0.64); similar results are found in the work of Moenius (2004) where positive effects on manufacturing imports are shown (oils, chemicals, manufacturing and machinery). Yet, in the same work, Moenius points out that standards can reduce transaction costs although they impose adaptation costs; indeed, standards provide exporters valuable information on market preferences. Similarly, (Blind 2001; Moenius 2004) highlight the positive effects of standards on trade in "instruments for measurement and testing" and for "electrical products", respectively. These results are relevant, each kind of regulation implies that exporters in attempting to gain market access for their products are obligated to meet the foreign requirements and to upgrade their products or processes. In addition, if regulations are different across countries, then the cost of compliance is huge and became complicated exports in different markets.

Pre-shipment requirements refer to all pre-shipment and customs formalities, such as inspections or verification of requirements. The aim of this specific NTM is to confirm the quality and quantity of the materials; the reported coefficient positively affects trade (+0.69) on Metals implying that exporters have complied with all the requirements established by the EU regulation. Conversely, non-automatic licensing negatively affects trade (−7.49). Comparing signs, it emerges clearly that non-automatic licensing and quality control measures act as a strong barrier to trade even in the presence of a positive preference margin. Therefore, if on the one hand trade is facilitated by the presence of a PTA, on the other hand, it is limited by NTBs.

However, these results are not surprising since the European Union is making considerable efforts in implementing and regulating SPS and TBT within the new generation of trade agreements, such as those signed with Korea, Canada, Singapore and Japan. Currently, the EU is negotiating FTAs with Australia, New Zealand, Indonesia, and the Mercosur countries. With the new generation of arrangements, the EU intends to go beyond the simple reduction of tariffs. The purposes are different such as improving market access by removing NTBs, through regulatory cooperation, liberalizing trade in services, and opening markets for public procurement. Therefore, cooperation becomes important given that it opens the way to greater and deeper integration between regions and markets by increasing economic production's efficiency. Therefore, cooperation between the EU and its trading partners is essential in overcoming trade obstacles, increasing integration and in promoting stable trade relationships.

Table 5. Industry-wise analysis—impact on the intensive margin of trade.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	VII: Plastics/Rubbers	**IX: Wood and Articles of Wood**	**XI: Textiles**	**XIII: Stone/Glass**	**XV:Metals**	**XVI: Machineries**	**XX: Misc. Manufactured Articles**
mpref (log)	14.72 ***	6.99 **	12.78 ***	4.27 *	4.13 **	14.16 ***	6.09
	(1.77)	(3.22)	(1.01)	(2.21)	(1.67)	(2.55)	(4.01)
dummy for Sanitary and phytosanitary measures (code A)	1.89 ***	2.55 ***	-	1.96 ***	2.57 ***	0.01	1.87 ***
	(0.32)	(0.32)		(0.35)	(0.18)	(0.24)	(0.41)
dummy for Technical barriers to trade (code B)	-	-	−0.57	−0.62	−2.15 ***	0.64 *	-
			(0.40)	(0.45)	(0.34)	(0.35)	
dummy for Pre-shipment inspection and other formalities (code C)	-	-	0.22	-	0.69 ***	-	-
			(0.49)		(0.25)		
dummy for Non-automatic licensing and quality control measures (code E)	-	-	-	-	−7.49 ***	-	-
					(0.73)		
N	39,659	19,865	160,859	24,829	105,729	151,063	23,304
adj. R^2							
pseudo R^2	0.944	0.899	0.906	0.931	0.911	0.935	0.955

Robust standard errors, clustered by country-product, are shown in parentheses. Data refer to 2017. All specifications include exporter and product fixed effects. * significant at 10 per cent level; ** significant at 5 per cent level; *** significant at 1 per cent level. Source: elaboration on data by COMEXT and TRAINS; Software Stata/SE 16.1.

7. Conclusions

After controlling for the presence of different NTBs, using a structural gravity model, the impact of preferential tariff margins is positive on both the probability of having a positive trade relationship and on the volume of trade. We find that the effect of NTBs is not univocal, as empirical evidence has been widely shown. In general, NTBs negatively affect the extensive margin of trade, but when we distinguish the type of NTBs, we can discriminate measures that can increase the probability of registering positive flows because of the promoted quality of domestic products and related information by increasing the confidence of foreign consumers. The positive impact of sanitary and phytosanitary measures overcomes the negative impact of the other barriers (such as technical barriers to trade; pre-shipment inspection and other formalities; and non-automatic licensing and quality control measures) so that, globally, the net effect on the volume of trade is positive. Sectoral evidence confirms that some measures, as quality standards, have a more pronounced effect on trade; furthermore, complying with other regulations (foreign and/or national) can be a key element among trading partners. Indeed, these measures can be an additional cost of entering foreign markets and thus may hinder trade.

From a policy point of view, on the one hand, our results debunk some of the criticisms relating to the effectiveness of trade policies, on the other hand, they demystify the mainly confirmed positive effect of preferential policies, specifically on the propensity of trade.

Works on the hierarchical structure of trade policies require further research for a full understanding of their impact on trade flows. Future studies could consider a panel data analysis and an assessment of the hierarchical structure on specific products where a different indicator of non-tariff barriers could be used. In addition, in order to help scholars and policymakers to achieve a deeper understanding of the negotiations and their future, an in-depth analysis of a specific agreement, stressing the role of interaction among regions or areas, called "specific PTA case study", could be used.

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