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TARIFF AND TECHNICAL INTERNATIONAL TRADE MEASURES: A LOOK AT ADVANCED AND EMERGING COUNTRIES

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Initial considerations

One of the most frequent questions in economic science debates is how developed countries have reached the threshold experienced by them and what the emerging ones would need to do to achieve this high level of economic development. The analysis of this question can be done from several perspectives, but many discussions rest under the field of macroeconomic policies, especially those that have been adopted by the current advanced ones and those that should be used by the emerging[3] ones.

Chang (2004) points out an important tripod for this analysis: industrial, commercial and technological (ICT) policies. The author states that it is the differences in these policies that separate the successful countries, in terms of economic development, from the other countries. Other factors, such as economic and political stability, high investment rate, adequate monetary and fiscal policy, are also important and linked to these policies, but this author indicates that special attention should be given to the issues associated with the ICT tripod, which is the focus of his work.

Among these aspects, this paper seeks to give special attention to the role of trade policy. This covers the position of the country in relation to international trade. This is very important for all countries, because it serves not

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3 The terms advanced (developed) and emerging (developing) refer to the classification of countries based on economic development, according to the International Monetary Fund (IMF). The list of advanced countries can be found in Appendix A.

only to bring the most diverse goods available to consumers from different places, but also serves as a source of resources, an instrument of political agreements, technology transfer between nations, among other benefits.

Notably, in the context of the trade policy study, the emphasis is on tariff and non-tariff barriers[4] (for example, technical barriers, health barriers, import quotas, safeguards) that the country applies, or not to its imports, and also to the stimulus it gives to exports (for example, export subsidies).

International trade is constantly used as an instrument to promote economic development. This can be done by protecting infant sectors, monopolizing key sectors with large downstream and upstream linkages, generating income through tariffs, promoting exports through subsidies, among others. For instance, many countries have used the import-substitution model for economic development, for example, Latin American countries. In this model, in short, the country heavily protects key sectors with high import tariffs and import quotas, enabling the industry to grow and thrive before facing external competitiveness, as well as encouraging the domestic production of goods with greater technological content.

There is strong evidence that international trade is a good business for all countries, a fact that is explicit in trade theories such as Ricardo's comparative advantage theory, Heckscher and Ohlin's factor endowment (and Stolper and Samuelson) among others, as shown by Krugman and Obstfeld (2010). The authors also point out that one of the most important perceptions of the international economy is that there are trade gains, that is, that the exchange of goods and services between countries may provide mutual benefit.

Rodríguez and Rodrik (2001) argue that the prevailing view in political circles in Europe and North America is that countries with lower barriers to international trade achieve faster economic progress. According to the authors, multilateral institutions such as the Organization for Economic Co-operation and Development (OECD), the World Bank and the International Monetary Fund (IMF) strongly advocate that trade liberalization generates predictable and positive consequences for economic development.

International trade enables the consumption of all goods in greater abundance for all countries, serves as a source of income, enhances technological transfer, allows certain sectors to achieve economies of scale and contributes to economic development. However, such a statement does not mean that international trade must necessarily be totally free of barriers, and that

4 The term non-tariff measures fits better than barriers, since they do not always have a negative effect on trade. However, the nomenclature used by the World Trade Organization (WTO) still contains the term barriers.

this is also good for all actors. Commercial protection may still be necessary, for example, for the protection of the infant industry or quality assurance for consumer products. Each country, given its current level of development, lives in a different economic environment, which is affected by the external environment, which may demand freer or more protected trade.

In fact, economic history shows that, although (some) strongly preach free trade, developed countries had not always followed (or are currently following) this recommendation. This is precisely the argument in Chang's book (2004). According to the author, the advanced countries would be "kicking away the ladder", that is, they suggest a growth formula for developing countries that they themselves did not follow when they were in this situation. Specifically under trade policy, countries like the United States and the United Kingdom say that their growth is due, in part, to the policy of laissez-faire, liberalism, and the invisible hand. However, throughout their development trajectory, they have often used protectionist trade and industrial policies, currently considered "bad" policies, such as high tariffs and quotas. And what we see now is that the advanced countries continue to use several types of trade barriers.

Regarding tariffs, since the first round of the General Agreement on Trade and Tariffs (GATT), these have been declining in most countries. Initially, according to Batista (1992), the negotiations were essentially confined to a liberalization of trade in manufactures and were put into effect through tariff reductions. Since then, there has been a great wave of tariff cuts, which has been spreading among nations to this day.

However, what has been observed since then is a proliferation of non-tariff measures (NTM's) mainly by the developed countries. Regarding Sanitary and Phytosanitary Measures (SPS), in the period 1995 to 2014, the United States, Brazil and Canada were the ones that adopted the most measures. In the case of Technical Barriers to Trade (TBT), the United States, China and the European Union lead the ranking. Finally, with regard to quantitative restrictions (quotas) we have Australia, Hong Kong and New Zealand with the largest number, despite the restriction of the imposition of such barriers by the World Trade Organization (WTO 2015).

Hoekman and Nicita (2011) show that, in general, the use of NTM's increases according to the degree of development of the country. That is, more developed countries tend to use more NTM's. In addition, the results indicate that while traditional trade policies (tariffs) continue to be important for developing countries, as well as for some sectors in developed countries, NTM's and domestic trade costs are also of great importance in trade dynamics.

Therefore, it can be inferred that the reasons for using commercial

instruments are strong for both advanced and emerging countries. All countries use these instruments, some more intensely than others.

Despite the importance of international trade in the relevance of trade protection for the development of certain countries, there are no studies to analyze their behavior regarding the adoption of tariff barriers and NTM's. There are also few studies that seek to understand the effects of these different policies on commercial transactions, more specifically on imports from countries.

The effects of tariffs on trade are very clear, since they increase the transaction cost and therefore discourage imports. However, the effects of certain NTM's are varied. TBT and SPS measures can have ambiguous effects, that is bringing benefits to trade due to product standardization, facilitating commercial transactions or, if too restrictive, possibly creating obstacles.

Lee and Swagel (1994) have shown that the differentiated structure of NTB's between countries could be explained by sectorial conditions (such as labor productivity and wages per worker). It is to be hoped that these conditions will be different not only between sectors of different technological contents, but also between countries, and even more between developed and emerging countries. Thus, what is observed is that the imposition and effect of NTM's may differ not only between countries but also between sectors of the economy.

To ascertain whether these differences really exist and what the effects of this on different levels of economic development is of great importance to understand the functioning of today's globalized trade, as well as to serve as a reflection for policy makers regarding the use of trade protection mechanisms and their effects.

Theoretical aspects

Trade Policies

There are a number of theories to explain trade between countries, but most have one thing in common: countries will export what they produce more efficiently and more abundantly, and import what they are less efficient. In this way, everyone would gain and afford abundance of all goods to their consumers. But, in practice, it is not so simple. Despite the benefits of international trade, many countries adopt policies, called trade policies, aimed at protecting the internal market from competition for foreign products.

There are several types of commercial protection, and these can be

divided into tariff and non-tariff measures - NTM's. Among the latter, the TBT measures, which are the focus of the analysis together with the tariffs, stand out among the latter.

First, according to Krugman and Obstfeld (2010), the effect of adopting a tariff is different for economies large and small (from an economic point of view). In the absence of tariff, the price of a product *i* is equal to a value P*i* in each country. With the adoption of the tariff, the price in the domestic market (of a large economy) increases with respect to the external market, benefiting domestic producers, because the price becomes higher internally, however, as a consequence, consumers due to high prices are harmed. Such behavior reduces the demand for imports, causing that there is abundance of goods in the foreign market, reducing the price in the same. The prices are modified in a proportional amount to the rate. Thus, the volume traded falls and both countries are affected, as well as the world trade of such good. In the case of a small country whose imported share of goods is generally relatively low, the effect on external prices is insignificant.

The effect of regulatory measures (TBT), when configured as barriers to trade, is to reduce imports, but this behavior occurs differently. These effects are described below, and the work of Roberts, Josling and Orden (1999) is based. Figure 1 shows the effects of a regulatory measure on the trade of a good, from the perspective of an importing country.

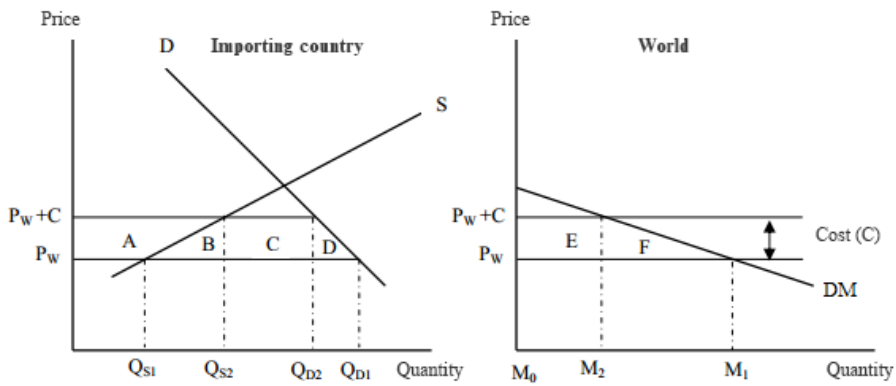

Figure 1: Effects of the imposition of a regulatory measure on imports
Source: Based on Roberts, Josling and Orden (1999).

The left side of Figure 1 shows the interaction between demand and domestic supply versus the world price P_W, for which the quantities demanded and offered of the product are Q_{D1} and Q_{S1}, respectively. The difference be-

tween these quantities is solved by imports into the international market (M_1).

If the importer adopts a new regulatory measure, this brings a cost to producers, which may or may not be absorbed. If not, the world price changes from P_W to $P_W + C$. Such behavior affects demand and domestic supply, resulting in a lower excess of domestic demand. Thus, the imported quantity reduces to M2, benefiting the domestic producer and harming the consumer, since the producer surplus increases in A and the consumer decreases in B + C + D.

However, as mentioned earlier, a TBT measure may have ambiguous effects on trade. If it acts to reduce imports, this characterizes a barrier. However, the standardization provoked by a technical measure can generate a stimulus to trade, increasing imports, which can be observed in Figure 2. Roberts, Josling and Orden (1999) affirm that this occurs when the regulatory measure is informative, that is, brings relevant information to the consumer.

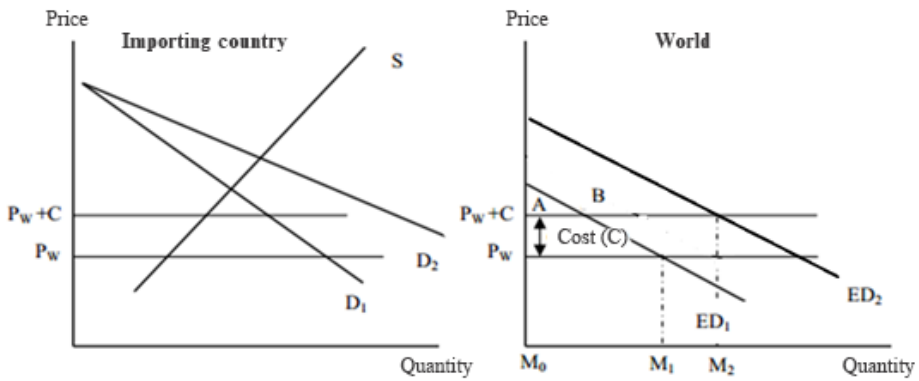

Figure 2: Effects of imposing an information measure
Source: Based on Roberts, Josling and Orden (1999).

M1 is the total imported before the imposition of the new measure, whose initial domestic supply and demand are S and D1. In the face of higher levels of consumer demands, the government imposes a new information regulation (TBT) that changes domestic demand, in which it moves to D2 (more elastic). This new requirement also raises production costs, as in the previous case, and the new price is P_W+C. However, as demand is steeper, the demand curve for imports goes from ED1 to ED2, which means that total imports increase from M1 to M2 due to the adoption of the measure.

The problem with the theory of regulatory measures is that they do not take into account an important point that is associated with the TBT agreement (WTO 2015), since the country, when adopting a new TBT measure,

causes domestic producers also be required to follow it. Thus, if the country has not made a period of adaptation to the domestic producer before imposing the measure, they may also suffer a possible increase in costs, which may or may not be offset by the increase in the price C. Thus, the effect of depends on the efficiency of the domestic producer.

The gravity model

Several factors influence trade flows between countries, such as transport costs, tariffs and non-tariff barriers. Other factors such as the size of the countries (Gross Domestic Product - GDP) and the distance between them are gaining great importance with the use of gravitational models, based on Newton's theory of gravity.

According to Baldwin and Taglioli (2006), the gravitational model is a widely used tool in various empirical fields and has a number of applications in the study of international trade. Its popularity is based on three pillars: First, international trade flows are a key element in all types of economic relations; Second, the data needed to estimate it are easily accessible to everyone today; Third, a large number of high-standard jobs brought greater respectability to the gravity model.

The theoretical basis for the gravity model was developed by Anderson (1979), who formulated the equation based on preferences with constant elasticity of substitution (CES) and differentiation of goods by region of origin.

In general terms, bilateral international trade flows would be directly related to the economic masses of the countries (PIBs) and inversely related to the geographical distance between them, and can be represented by the following equation:

$$(1)\ \ln X_{ij} = \alpha + \delta_1 \ln M_i + \delta_2 \ln M_j + \eta \ln Dij + \mu_{ij}$$

where X_{ij} is the exports from country i to country j; α is a constant of proportionality; M_i and M_j are the economic masses (GDPs) of countries, which directly affect trade; and D_{ij} represent all trade-related costs, commonly represented by the distance between countries.

In addition to these variables, other variables were already being inserted in the gravity models to better specify the costs of trade, and thus it became possible to explain the effects of tariff and non-tariff barriers on trade flows. This new model, which includes trade barriers, can be found in several papers such as Anderson and van Wincoop (2004). Thus, the equation can be

expressed as follows:

$$(2)\quad \ln X_{ij} = \alpha + \delta_1 \ln GDP_i + \delta_2 \ln GDP_j + \delta_3 \ln dij + \sum_{m=1}^{M} \gamma_m \ln Z_{mij} + \mu_{ij}$$

where X_{ij} is exports (which could be imports as quantification of trade flows) from country i to country j; PIB_i and PIB_j are the GDP of the exporting country and the importer, respectively; d_{ij} is the distance between countries i and j; Z_{mij} is a set of variables that represent trade barriers ranging from the variable $m=1$ to M; and μ_{ij} is the error term.

The gravity model is used in the present work to verify the effects of the TBT measures on the imports of the selected sectors. Different studies, such as Almeida et al (2011), Fassarella et al (2011), Li and Beghin (2012), Fontagné et al (2013) and Corrêa et al (2015) show the different effects of these policies.

Almeida et al (2011) analyzed Brazilian exports of green coffee in the period from 2000 to 2006 and found evidence that TBT and SPS measures adopted by the trading partners negatively affected Brazilian exports of this product, that is, reduced imports of the product by its business partners.

The work of Fassarella et al (2011) shows that for Brazilian poultry meat exports from 1996 to 2009, the TBT and SPS measures adopted by the importing countries related to labeling expanded trade, while measures on the conformity assessment procedure reduced.

Li and Beghin (2012) concluded that the agricultural sector and the food industry tend to be more negatively affected by SPS measures than other sectors. These are also more likely to be hindering imports from developed countries from developing countries than similar barriers in trade between developed countries.

Fontagné et al (2013) analyzed the effects of SPS measures (specific trade concerns[5]) on exports of French firms between 1995 and 2005. The results show that the imposition of these measures reduces the participation of firms in the export market, but the negative effect is attenuated for large firms.

Corrêa et al (2015) measured the effects of TBT measures, adopted by Brazil, on imports from various sectors of the economy (fuels, machines and industrial equipment, electronics, vehicles, organic chemicals and fertilizers)

5 These are the measures that trigger complaints from other WTO member countries, that somehow may have violated the rules of the SPS agreement. The WTO promotes a dialogue among countries to address such issues.

and found that, for them, TBT measures were not barriers and that they were trade facilitators. That is, the TBT measures adopted in the period from 2000 to 2012 had a positive effect on Brazilian imports from the selected sectors.

Thus, it can be seen that the effect of TBT measures is ambiguous. Thus, if the effect is negative, it will be concluded that TBT constitutes a barrier. Otherwise, it will be considered trade facilitator.

Methodology

The first step to verify differences in adoption and effects of protective measures by countries was to select the study sectors. To that end, it was decided to select the most imported HS chapters worldwide in the year 2014. Table 1 shows the sectors (chapters[6]) that were most imported in the world in 2014, in addition to their percentage of value of total world imports in that year.

Table 1: Description of the most imported sectors (chapters) in the world in 2014

Chapters	Short Description	US$ millions	% of total
27	Mineral fuels and oils	2840371684,16	16,77
85	Electronics	2226635611,14	13,14
84	Nuclear reactors, boilers, etc.	1937374887,56	11,44
87	Vehicles	1269500006,37	7,49
39	Plastics and articles thereof	562250721,05	3,32
71	Pearls and precious stones	548810714,70	3,24
90	Medical and Optical Equipment	510259877,99	3,01
30	Pharmaceutical Products	490919710,96	2,90
29	Organic Chemicals	432202467,57	2,55
99	Special Code	394640885,05	2,33
72	Iron and Steel	363430539,40	2,15
73	Works of iron and steel	274063621,46	1,62
26	Ores, slag and ash	250302998,42	1,48
88	Aircraft and space devices	217987676,31	1,29
94	Furniture	200375967,45	1,18

Source: Own elaboration with data from WITS (2015).

6 Chapters of the Harmonized System (HS), which is an international method of classification of goods, based on a code structure. It was created to facilitate and promote the development of international trade (MDIC 2014). Chapters are aggregations of similar products, with 2-digit code. More information at: http://www.mdic.gov.br/ sitio / interna / interna.php? Area = 5 & menu = 411 & refr = 374.

It is observed that the great majority of the reported chapters are industrial sectors, which shows the strength of the industry in world international trade, besides the importance of it in the imports of the countries. Kaldor (1967, 1975) argues that economic growth and productivity growth must be supported by the expansion of aggregate demand, so that they can be continuous. The expansion of markets allows the incorporation of technical progress, as this is endogenous in sectors where economies of scale occur. Industry plays a key role in this process as it is the most dynamic and innovative sector. Thus, the industrial sector was the focus of the present work.

It is also important to note that most chapters contain goods with high added value. Of particular note are the electronics, vehicles, medical equipment, pharmaceuticals and chemicals and aircraft, which are advanced industrial sectors with high added value in their products. Therefore, they are very important assets in the process of technological diffusion, besides having high power of chainings and overflows to other sectors.

Therefore, one sector of each technological intensity was selected according to the OECD classification (2015). The most imported sectors in the world were selected, taking into account the number of TBT notifications in force for them. With data from WITS (2015), based on total world imports for 2014, the selected sectors were: (i) High intensity: chapter 90; Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; surgical, dental or veterinary sciences, including scintigraphic apparatus; parts and accessories thereof; (ii) Medium-high: Chapter 85; Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles; (iii) Medium-low: Chapter 73; Articles of iron or steel; (iv) Low intensity: Chapter 94; Furniture; medical and surgical furniture; mattresses, mattress supports, cushions and similar stuffed furnishings; lamps and lighting fittings, not elsewhere specified or included; illuminated signs, illuminated nameplates and the like; prefabricated constructions.

The period of analysis of the study comprised the years 2010 to 2014. The reason for the choice of this time interval occurred because, firstly, it is desired to verify the pattern of adoption of protective measures and their most recent effects, since the degree of development of the countries is given. If a broader time frame was considered, it would be possible to have a variation in the classification of emergent/advanced; Secondly, due to the global economic crisis in 2008, a sharp decline in world imports occurred in 2009 and this could lead to a bias in the estimates; Thirdly, the fact that variables such as GDP only present complete data available until 2014 and; Fourthly, data

collection, tabulation and classification of the data used here (mainly TBT measures) is time-consuming and would therefore require a long period of time to use the entire duration of the agreement (since 1995).

The 40 countries[7] that most imported products from each of these chapters in 2014 were selected, 20 of which were advanced and 20 were emerging, since they accounted for more than 80% of imports of these sectors in 2014. The option of not using all countries was because poorer countries (which import less goods) often do not use the TBT agreement fully, in most cases due to technical issues. Thus, since they issue few (or even none) notifications, it was decided not to include them in the sample. In addition, their weight in world trade in these chapters is negligible[8].

Finally, we selected the 20 largest trading partners from each of the countries previously selected for each chapter. Exports from these partners represent more than 80% of the imports from each selected country (of the assets of the chapters in question). After this, the average bilateral tariffs adopted by each importing country for each chapter were collected in relation to each trading partner. The TBT[9] measures adopted by the importing countries for the chapters in question were also collected. A relevant descriptive analysis of these data was held.

TBT notifications (information documents) issued between 2010 and 2014 were then separated in accordance with the different requirements for importing the products, as described in the notification itself.

In this study, the classification of requirements was based on the criteria adopted by a group of experts appointed by UNCTAD, the United Nations agency for trade and development, known as MAST (*Multi Agency Support Team*), presented in Table 2.

Type 1 - Product changes
- Standards that define the characteristics of products (for example, size, color, components and quality) nd which contribute to the safety and suitability of products. Also included are those related to product performance. - Labeling, packaging and marking requirements (for transport and customs information). - Tolerance limits (residues, toxic substances, maximum concentration of certain components) and prohibitions on the use of certain substances. - Restrictions on genetically modified organisms. - Requirements to prevent environmental damage, or to ensure environmental protection.

7 Strictly, adaptations had been made and some countries had to be changed for the next largest importer because they did not provide all the necessary data for the survey.

8 The importing countries used in the sample are listed in Appendix B.

9 Because they are industrial sectors not linked to the food industry, the number of SPS notifications is very small. Thus, they were not part of the analysis.

Type 2 - Process changes
- Definition of standards for process and/or the production chain that contribute to the safety and suitability of products. - Requirements for good management practices that establish a form of production (for example, the quality system may include a more efficient look at production processes or to speed up distribution). - Product transport and traceability requirements.
Type 3 - Conformity assessment procedures
- Control, inspection and approval, including procedures for sampling, testing and inspection, assessment, verification and assurance of conformity and approval. - Export certification requirements or importing country. - Further requirements for conformity assessment.

Source: Own elaboration based on the classification of MAST, contained in the article by Tongeren et al (2009).

Such separation is necessary because of the great diversity of demands in technical measures. It was hoped, therefore, to group notifications in order to verify a pattern in the effects of the same given the type of requirement contained.

Operation of the gravitational model

First, an equation was estimated for each technological intensity (one for high/medium high, another for low/medium low), with a *dummy* to capture the difference between the groups (advanced and emerging). Interaction *dummies* were also included to measure whether there is a difference between tariffs and TBTs adopted by the groups. The estimated equations follow the following format:

$$\ln Y_{ijt} = \delta_1 \ln GDP_{it} + \delta_2 \ln GDP_{jt} + \delta_3 \ln D_{ij} + \delta_4 \ln(1 + T^K{}_{ijt}) + \\ + \sum_{m=5}^{7} \delta_m TBT^k_{nijt} + \delta_8 F_i + \delta_9 G_K + \delta_{10}(F \times \ln(1 + T_{ijt})) + \delta_{11}(F \times TBT^K_{nijt}) + H_t + I_i + J_j + \mu_{ijt} \quad (3)$$

where Y_{ijt} = imports (of products of the chapter in question) of country i, originating in country j, in period t; GDP_{it} = GDP of country i in period t; GDP_{jt} = GDP of country j in period t; D_{ij} = distance between country i and

country j; (T_{ijt}) = average tariff imposed by country i to country j, for chapter K, in period t; K = 1 if the trade flow refers to goods from chapter K, 0 otherwise; TBT*mijt* = 1, if there is notification of type n (1, 2 or 3) imposed by country i, for goods of chapter K, in period t; 0, otherwise; F = 1, if country i belongs to group 1, from advanced countries; 0, otherwise (controls fixed effects of groups of countries); G = 1, if data belongs to the chapter K, 0 otherwise (controls fixed effects of the chapters); Fx (1 + T) = dummy of interaction between group and tariff. It shows if there is a difference in the effect of the tariffs applied by the groups; Fx (TBT) = group and TBT interaction dummies. Shows if there is a difference in the effect of the TBTs adopted by the groups; Ht = dummy variables to control the specific effects of years; I_i and J_j = dummy variables to control the specific effects of importing and exporting countries; μ_{ijt} = error term.

Subsequently, a second equation was estimated in order to verify if there are differences between the policies adopted between groups in different technological intensities, as well as to verify if there are differences in policies between technological intensities. Thus, the chapters of both intensities were included as well as a dummy to capture differences between the sectors of high/medium high and low/medium low technologies.

$$\begin{aligned}(4)\qquad & \ln Y_{ijt} = \delta_1 \ln GDP_{it} + \delta_2 \ln GDP_{jt} + \delta_3 \ln D_{ij} + \delta_4 \ln(1+T^{K}{}_{ijt}) + \\ & + \sum_{m=5}^{7} \delta_m TBT^{k}_{nijt} + \delta_8 F_i + \delta_9 (F_i \times \ln(1+T_{ijt})) + \delta_{10} (F_i \times TBT^{K}_{nijt}) + \delta_{11} G_k + \\ & + \delta_{12} (G_k \times \ln(1+T_{ijt})) + \delta_{13} (G_k \times TBT^{K}_{nijt}) + H_i + I_j + J_t + \mu_{ijt}\end{aligned}$$

where Y_{ijt}, PIB_{it}, PIB_{jt}, Dij, (T_{ijt}), K and TBT_{mijt} are the same variables of equation (3); F = 1, if country i belongs to group 1; 0, otherwise (controls fixed effects of groups); Fxln (1 + T) = dummy of interaction between group and tariff. It shows if there is a difference in the effect of the tariffs applied by the groups; Fx (TBT) = group and TBT interaction dummies. Shows if there is a difference in the effect of the TBTs adopted by the groups; G = 1 if the good is high / medium high technology; 0 otherwise; Gxln (1 + T) = dummy of interaction between technological intensity and tariff. It shows if there is a difference in the effect of tariffs applied to goods of different technological intensities; Gx (TBT) = interaction dummies between technological intensity and TBTs; H_i e I_j = dummy variables to control the specific effects of importing and exporting countries; J_t = dummy variables to control the specific effects of years; μ_{ijt} = error term.

Thus, it became possible to measure the effect of trade barriers and measures on imports, as well as the effect of other variables equally relevant to the understanding of international trade, through the analysis of regressions with stacked data.

In general, the gravity model is estimated for all pairs of countries and not only for certain importers. However, since the objective is to measure the effects of the obstacles imposed by specific groups, an adaptation of the model is made and only the largest importers are used on the left side of the equation. This approach, with only one country on one side of the flow, has been successfully executed in other works, such as Karass et al (2009), Mata and Freitas (2008), Fassarella et al (2011).

The importance of controlling country-specific effects is highlighted by Baldwin and Taglioli (2006). According to the authors, estimation in this way allows the inclusion of multilateral resistance terms (different for each country) as factors not observed in the equation, preventing the occurrence of bias caused by their omission, which would be expressed in the error term of the equations. This can be done by creating a dummy that assumes value 1 for the trade flows of a given country, and 0 otherwise. The authors also argue that recent estimations with gravity models preferentially use panel data, and in this case controlling the country-specific effects is not enough, as it does not remove the time series bias, so dummies are used for years.

Regarding the estimation, it was performed using the Ordinary Least Squares (OLS) method with correction for heteroskedasticity and for Poisson Pseudo Maximum Likelihood (PPML), since it generates consistent results in the presence of unobservable heteroscedasticity[10], according to Santos Silva and Tenreyro (2006), thus making a counterpoint between a linear and a non-linear estimator.

Both methods had their error terms set in predefined groups, in this case by country pairs. According to Shepherd (2013), this procedure is constantly used by researchers and avoids underestimated standard errors.

The data used in this study were taken from several sources. Imports by country, free on boarding (FOB) dollar values were collected in WITS, as well as the bilateral average tariff rates. The GDP of each country in each year, also in dollars, was withdrawn from the World Bank. The distances between the capitals of the countries (in kilometers) come from CEPII. Finally, the regular TBT measures adopted by the countries were collected in the WTO database.

10 This type of problem, if it happens, violates the premises of the OLS and cannot be corrected by a robust correlation matrix. PPML serves precisely to solve this problem.

Results and Discussion

With regard to TBT tariffs and measures, a different behavior was expected in relation to adoption by advanced and emerging countries. Table 3 below shows the descriptive statistics of tariffs and TBT measures confirming this hypothesis.

Table 3: Descriptive statistics of selected trade measures

	Technology	Chapter	Measure	Average	Standard Deviation	Minimum	Maximum
Advanced	High	85	Tariff	1,20	1,10	0,00	5,10
			TBT	6,75	14,34	0	47
		90	Tariff	0,75	0,53	0,00	2,38
			TBT	2,20	6,12	0	20
	Low	73	Tariff	0,99	0,76	0,00	3,63
			TBT	0,75	2,51	0	11
		94	Tariff	1,04	0,91	0,00	3,46
			TBT	2,30	7,63	0	34
Emerging	High	85	Tariff	4,42	3,52	0,50	13,23
			TBT	12,40*	26,83	0	116
		90	Tariff	3,39	3,52	0,16	11,96
			TBT	4,35	8,74	0	34
	Low	73	Tariff	5,34	4,01	0,38	13,90
			TBT	2,95	4,64	0	19
		94	Tariff	6,32	4,45	0,29	16,52
			TBT	3,45	8,11	0	35

Values in percentages (*ad valorem rates*).

* In this case Israel presented a disproportionate number of notifications, 116. Withdrawing Israel from the sample the average TBT would be 6.94 and tariffs 4.60[11].

Source: Own elaboration with data from the WTO and WITS, 2015.

Firstly, it is observed that emerging countries present average tariffs much higher than advanced countries for all the chapters. In the case of TBT measures, the mean was also higher for the emerging ones, but the difference between the two groups is lower. As expected, emerging countries tend to use higher fares. With regard to TBT measures, it was expected that they would be used more by advanced countries. However, it is important to note that the emerging countries in the sample are not very backward countries and are not among the poorest countries. In short, they are countries that have the technical and financial capacity to actively participate in the TBT agreement, whether for legitimate or protectionist objectives.

11 This type of problem, if it happens, violates the premises of the OLS and cannot be corrected by a robust correlation matrix. PPML serves precisely to solve this problem.

Another interesting fact is that in emerging countries the average tariff is higher in the low-tech sectors than in the high-technology ones. There may be several reasons why a country may adopt a relatively lower tariff in high-tech sectors: encourage technology transfer, need to import high-tech goods due to low domestic production, stimulate physical capital formation, etc.

However, it should be noted that a higher average TBT was observed in the high technology sector, which may indicate an attempt to adapt the domestic sector itself to high standards, since when a country adopts a TBT measure domestic producers are also obliged to follow -over there. In addition, it may be a sign of consumer protection given the complexity of the sectors.

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Undeniably, for the sectors analyzed here, the levels of protection currently practiced by the advanced countries are really low. This is due in large part to the European Union countries, since they practice zero tariffs for almost all trading partners and have not adopted TBT measures in the period under review (except Czech Republic for Chapter 90).

Table 4 shows the results of the econometric model (3) proposed in the methodology. The control variables, because they were not relevant to the discussion, were omitted from the table.

Table 4: Results of gravity models, for high and low technology, estimated by the methods OLS and PPML

High/medium high technology - OLS			High/medium high technology - PPML		
Variable	Coefficient	Robust standard error	Variable	Coefficient	Robust standard error
Country GDP	-0,00938ns	0,039347	Country GDP	-0,11911ns	0,104929
Partner GDP	-0,04052ns	0,054331	Partner GDP	0,079269ns	0,113745
Distance	-0,36209***	0,0307	Distance	-0,54908***	0,029761
Tariff	-0,12256**	0,051792	Tariff	-0,0335ns	0,078734
TBT type 1	0,0924**	0,044408	TBT type 1	0,033286ns	0,070281
TBT type 2	-0,07385**	0,03756	TBT type 2	-0,03717ns	0,053669
TBT type 3	-0,00808ns	0,038058	TBT type 3	-0,05258ns	0,051355
group*tariff	-0,22938**	0,086798	group*tariff	-0,22052**	0,098791
group*type1	0,03676ns	0,073867	group*type1	0,010395ns	0,076213
group*type2	0,049104ns	0,076651	group*type2	0,015725ns	0,052394
group*type3	-0,4039***	0,100756	group*type3	-0,0028ns	0,119612
Constant	25,6631***	1,766243	Constant	27,58388** *	4,219236
R^2	0,77		Pseudo R^2	0,78	
Low/medium low technology - OLS			**Low/medium low technology- PPML**		
Country GDP	0,643767** *	0,15025	Country GDP	0,748411** *	0,13419
Partner GDP	0,412151** *	0,082392	Partner GDP	0,277512**	0,091995
Distance	-0,65251***	0,042253	Distance	-0,79341***	0,0554
Tariff	-0,16323**	0,048616	Tariff	0,011546ns	0,058488
TBT type 1	0,143755**	0,065113	TBT type 1	0,464741**	0,121032
TBT type 2	0,372318** *	0,058851	TBT type 2	0,101402*	0,063031
TBT type 3	0,001245ns	0,053326	TBT type 3	-0,10146ns	0,064269
group*tariff	-0,13207ns	0,087962	group*tariff	-0,19387ns	0,125558
group*type1	-0,04231ns	0,085003	group*type1	-0,22871ns	0,156375
group*type2	0,065529ns	0,118767	group*type2	0,265174**	0,114703
group*type3	-0,18465**	0,082559	group*type3	-0,12817ns	0,085365
Constant	-6,7808ns	4,908056	Constant	-5,19159ns	4,670805
R^2	0,74		Pseudo R^2	0,76	

Group = 1 if advanced countries, 0 if emerging countries.
In high technology, chapter = 1 if 90, 0 if 85. Low, chapter 1 = if 73, 0 if 94.
*, **, *** denote significance levels at 10%, 5% and 1% respectively and ns denotes not significant.
Source: Own elaboration.

For the high tech model the GDPs were not significant for both estimates. This can be explained by the fact that the relationship between GDP and international trade is positive, but this does not necessarily mean that trade in all goods increases with an increase in GDP. Another reason for this

may be the analyzed period, which is still bitter after the post-crisis effects of 2008/2009.

The distance variable was significant and with expected signal for both estimates. The greater the distance the smaller the trade between the countries, which is mainly due to the transport costs. Distance is an important source of commercial resistance, along with trade barriers and political issues. In addition to transport costs, closer countries are more likely to be in an economic bloc (for example, MERCOSUR or European Union) or bilateral agreement, which further facilitates transactions.

The variable Tariff was significant and with negative signal as expected by the estimation by OLS (by PPML was not significant). It occurs because the tariff increases the cost of the good in the domestic market, consequently, has the effect of reducing imports. In addition, it was found that the interaction dummy (group*tariff) shows in both estimates that the effect of the tariff is different between advanced and emerging countries. The negative effect of the tariff for advanced countries is higher, since the group*tariff coeficient is added to that of the tariff for advanced countries. Thus, tariffs reduce imports to both groups, but reduce more to advanced countries[12]. This may signal a greater reliance on external markets for emerging countries (in this case, import dependency).

The variable TBT type 1 was significant and positive by the estimation by OLS. This shows that TBT measures that require changes in the product (for the chapters in question) are not trade barriers but trade facilitators. This fact occurs by bringing standardization and greater reliability to the goods. For example, standard labeling makes imported products bring all the necessary information to government and consumers in the country, thus reducing the time and cost of collecting additional information and testing.

The variable TBT type 2 was significant and negative in the estimation by OLS, which indicates that changes in the productive process incur barriers to trade, at least in the short term. It is worth noting that there are relatively few such measures in the period under review. It is uncommon for countries to make demands that exclusively affect the productive process. By the PPML model, none of the measures had a significant coefficient.

Also, by the MQO model, the dummy of interaction between groups of countries and TBT shows that there is no difference in the effect between groups for TBTs type 1 (changes in the product) and 2 (changes in the production process), but for type 3 of conformity). It can be inferred that there is a

12 Although the tariff was not significant in the PPML, it is admitted that the effect of the tariff is negative following the economic theory and the empirical findings.

difference between the effects of TBT type 3 measures adopted by advanced and emerging countries, but it cannot be inferred for which the same would be greater or less since it is unknown if the effect of TBT type 3 is positive or negative (for its non-significance).

For low technology the GDPs were significant and showed positive signal as expected in both estimation methods. That is, positive changes in the economic size of importing and partner countries positively affected the value of imports of all products. The larger the GDP of the countries, the more they tend to trade in international trade.

Again distance was significant and negative as expected, corroborating the relevance of transport costs (among others) as a cost of trade.

The variable Tariff was also significant and negative, by OLS, as expected. It was not significant by PPML. On the other hand, the dummy of the interaction group*tariff was not significant in any of the methods, indicating that for low technology goods there is no difference between the effects of tariffs between groups.

The TBTs type 1 and type 2 were significant and had a positive effect in both methods. This means that measures that require product and production process changes for the chapters in question are trade facilitators. Again, the idea that technical measures generate standardization and reliability, which is important to facilitate international trade, is reinforced.

Regarding the interaction dummies, by OLS, there is a difference between the effect of TBT type 3 between groups. However, the direction of the effect cannot be inferred since TBT type 3 was non-significant. By PPML, there is a difference between the effect of TBT type 2 between groups. The positive effect is higher for developed countries, since the variable group*type 2 has a positive coefficient, which is added to the TBT coefficient type 2 for group 1. It is the standardization generating more confidence to the consumers of advanced countries.

Table 5 shows the results of the model (4) proposed in the methodology. The control dummies were omitted because they were not of interest for the present analysis.

Table 5: Gravity model results, for both technological intensities, estimated by the MQO and PPML methods

OLS			PPML		
Variable	**Coefficient**	**Robust EP**	**Variable**	**Coefficient**	**Robust EP**
Country GDP	0,13457**	0,046731	**Country GDP**	0,339523***	0,088239
Partner GDP	-0,0998137ns	0,1245292	**Partner GDP**	0,153003**	0,08134
Distance	-0,5710771***	0,0295611	**Distance**	-0,60959***	0,030211
Tariff	-0,0790365*	0,0429804	**Tariff**	-0,04238ns	0,070527
TBT type 1	0,3872745***	0,0699416	**TBT type 1**	0,632284*	0,192919
TBT type 2	0,3365517***	0,0689675	**TBT type 2**	-0,18221ns	0,134929
TBT type 3	-0,1813273**	0,063506	**TBT type 3**	-0,13464ns	0,143029
group*tariff	-0,18641**	0,072627	**group*tariff**	-0,34822**	0,111724
group*type1	-0,63983***	0,083207	**group*type1**	-0,4543**	0,170072
group*type2	0,134869ns	0,089623	**group*type2**	0,137475*	0,081603
group*type3	-0,13044ns	0,106857	**group*type3**	0,334072**	0,134103
technology*tariff	0,241206***	0,040337	**technology*tariff**	0,253233***	0,068542
technology *type1	0,189542**	0,086935	**technology *type1**	-0,08625ns	0,238668
technology *type2	-0,38353***	0,094414	**technology *type2**	0,104034ns	0,143422
technology *type3	0,290036***	0,078052	**technology *type3**	0,195391ns	0,176302
Constant	22,21433***	3,157315	**Constant**	9,762356***	3,278164
R^2	0,67		**Pseudo R^2**	0,59	

Grupo = 1 if advanced countries, 0 if emerging countries.
Technology = 1 if high / medium high (chapters 85 and 90); Low / medium low (chapters 73 and 94).
*, **, *** denote significance levels at 10%, 5% and 1% respectively and ns denotes not significant.
Source: Own elaboration.

In this model important differences emerge between the estimates by OLS and PPML, mainly regarding the technical measures and their effects, as can be appreciated in the following explanation.

In the OLS model only the importer's GDP was significant and positive as expected, while in the PPML model both were. Again, what the theory asserts is confirmed, the higher the income (GDP) of the countries, the greater the trade between them.

The distance showed to be significant and expected signal in both estimations, evidencing that a greater distance tends to reduce the trade between countries.

The rate was also significant and with negative signal, according to the theory, by OLS. By PPML the same was not significant. In addition, it was possible to verify that the effect of the same differs between groups (the negative effect is greater for advanced countries, which can be verified by the coefficient of group*tariff) and also between sectors (technology*tariff), its effect being lower for sectors of high/medium high technologies (since this

had a positive coefficient). This indicates that the demand for high-tech goods is relatively more inelastic. Again, one can cite as an incentive for the transfer of technology, even in advanced countries. When they import goods of high technological content from other advanced countries, they participate in the process of technological diffusion.

As a matter of fact, when analyzing the effect of interaction between sectors and tariff by the model estimated by OLS, adding the coefficients of Rate and technology * tariff it is observed that the rate coefficient becomes positive, which is a contrast with theory and with the empirical observation. The simple correlation between tariff and imports is small but negative for high technology goods (-0.0157), so the positive value is not consistent. This may have occurred due to several factors, but the great heterogeneity of products stands out, generating very different tariffs aggregated in an industry average. Additionally, a possible limitation of the OLS estimator due to unobservable heteroskedasticity is highlighted. By the PPML estimator, the bias of the coefficient with a different sign than expected was not observed (not significant).

Regarding the technical measures, TBTs type 1 and 2 are facilitators of trade, by OLS, being only type 1 significant by PPML. Also by OLS it is verified that TBT type 3 measures have negative effect, indicating that requirements of conformity assessment procedures would have negative effects on imports.

The estimation by OLS shows that the effect of TBT type 1 varies between groups, becoming negative for imports from advanced countries. In the estimation by the PPML method the effect also varies between groups, and is smaller for the advanced ones, but remains positive. This result is more in agreement with the one obtained in model (3). By PPML the effects of TBT types 2 and 3 also vary between groups.

Regarding the difference of the effects of the measurements by technological intensities, it is verified that the three types of TBTs differ between the technologies according to the estimation by OLS. By adding the coefficients of type*technology to those of TBT type, the effect becomes positive and greater for TBT type 1, negative for TBT type 2 and positive for TBT type 3 when it comes to high technology chapters. For the PPML the estimates were not significant.

Thus, the theoretical ambiguity of the effect of the imposition of non-tariff measures is also evident in the empirical context. This is because the effect of each TBT measure, in each period of time, for each country and for each product tends to be different. There are innumerable questions that permeate the final result of this action, such as the country's productive efficiency in that good, the support of the government for the understanding and

implementation of technical regulations, the internal and external market, price elasticity of demand for good, among others.

With regard to the question initially raised, are the advanced countries currently recommending reduction of trade barriers, but practicing the opposite of what they preach? It can be said that for the sectors and period of time studied here, no. By analyzing the descriptive statistics, it was possible to observe that the protection (with the instruments analyzed here) is lower in both technological intensities for advanced countries, since, on average, the tariffs adopted by emerging countries are higher in all the chapters.

As expected the adoption and effects of the measures differ between countries. Tariff levels applied by advanced countries are much lower than those of emerging ones. This is largely due to the fact that the tariff is a source of income, an instrument of protection of the domestic producer and easy to adopt. In addition, the effect of tariffs is greater for the advanced ones, showing a greater elasticity in the demand of the same ones.

Different than expected, the adoption of TBT measures was not greater on the part of the advanced ones. However, it should be noted that the sampled emerging countries are not extremely backward countries with full capacity to use the TBT agreement. In any case, even if the advanced ones adopt more TBTs, this would not mean that they are raising their trade barriers, since the evidences of the most recent works and the results found here suggest that such measures are, in many cases, facilitating trade.

But that does not mean that the advanced countries are not "kicking the ladder." The data analyzed here comprise the period from 2010 to 2014, a period in which these countries are already at a high level of economic development. In fact, commercial freedom is the goal, the trend most countries seem to be moving towards. But each one is in a different place on this long road.

Conclusions

The present work proved that the adoption and effects of tariff and technical measures differ between advanced and emerging countries. It has been noted that emerging countries have higher tariffs. Regarding to technical measures, it was possible to observe that they can be trade facilitators.

It is undeniable that meeting the requirements of a TBT measure incurs costs to the producer. If these costs are too high, some may even be expelled from the market. Another negative aspect of TBT measures is that they can be used with purely protectionist intent, and it is much more difficult to

identify than in the case of a tariff or quota.

However, in many cases, the benefits outweigh these ills. An important trade policy recommendation is therefore to be found here: the TBT agreement can be useful for a number of purposes and, once it brings a wide range of beneficial effects to consumers and the environment, should be given greater attention by the countries. This can be corroborated by the following facts:

First, it acts in the standardization of the products, bringing greater security for the consumer, for the environment and greater reliability in the products. It is a benefit to consumers around the world;

Secondly, given the rules of the agreement (national treatment principle), domestic producers are also obliged to follow what is determined in a technical measure established by their country, that is the rule for the external product cannot be more rigid than for the national product. Therefore, this is a way of ensuring that national productive assets and processes reach an international standard of quality, in addition to signaling this to the whole world, which may facilitate the exports of the country that imposed the measure;

Third, it provides information exchange and learning between countries. That is because when a country issues a notification, everyone has access to it. Assuming it has legitimate objectives, it presents the world with a more reliable and efficient product, process or conformity assessment procedure. The other countries can copy such a measure, if it suits them, incorporating the improvement for their imports and domestic production;

Fourth, there may be an international spillover effect when a country adopts a measure. If a country adopts a new requirement, all those countries (even without imposing TBT measures) importing that affected good, from the same partners in the country that imposed TBT, will benefit from their higher quality or reliability. That is, when partners in that country need to adapt to the new requirement, to export to it, they end up making their products better for all their partners, indirectly, if they incorporate the change into all goods produced for export. If the domestic industry also follows this trend, the overflow will reach even the domestic consumers of the exporting countries in question.

Despite many benefits, many countries use the agreement[13] sparingly. This may be due to the fear that internal producers may not adapt to the requirements or because of a technical inability to understand and use them. In

13 For example, according to WTO data (2015), Burundi, Gabon, Guinea, Fiji, Nigeria, Haiti, Suriname, Mali and Lao have only one TBT notification.

the first case the solution is more complex: it requires a series of pro-industry and pro-development policies. In the second case, however, the solution already envisaged in the agreement: more developed countries should provide technical assistance to less favored nations so that they can adopt the necessary TBT measures to protect the consumer, the nation or the environment, or even to encourage adoption , internal and external, of standards of excellence. It is therefore necessary to encourage greater integration and international dialogue so that such aid can take place in a more extensive and effective way and thus encourage universal harmonization and excellence of standards and regulations.

The world is getting smaller, more connected and therefore countries, governments, companies and even people need to adapt to this new situation. Globalization has provided opportunities for all countries to expand their markets, move into previously unexplored areas, and acquire all kinds of knowledge and technology. However, those who do not conform to this new reality will be doomed to stagnation.

Appendix

Appendix A - Classification of countries according to the degree of economic development

According to the IMF classification, countries can be divided into advanced and emerging. This classification occurs under a very economical, but includes several variables. This methodology may vary according to the country analyzed, but, in summary, the analysis includes: 1) per capita income level; 2) diversification of exports; and 3) degree of integration in the global financial system. Table 1A shows the countries considered advanced by these criteria.

Table 1A: Advanced Economies according to the IMF in 2015

Germany	Estonia	Luxembourg
Australia	Finland	Malta
Austria	France	Norway
Belgium	Greece	New Zealand
Canada	Netherlands	Portugal
Cyprus	Hong Kong	United Kingdom
Singapore	Ireland	Czech Republic
South Korea	Iceland	Slovakia
Denmark	Israel	San Marino
Slovenia	Italy	Sweden
Spain	Japan	Switzerland
United States	Latvia	Taiwan

Source: IMF, 2015.

The remaining countries, except those that are not members of the IMF[14] and do not enter the analysis, are classified as emerging economies.

Appendix B - Importing countries by chapter of the HS

Table 1B: 40 largest importers of the chapters currently selected[15]

Cap. 73	Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Chile, China, Denmark, France, Germany, Hungary, India, Indonesia, Italy, Japan, Kuwait, Malaysia, Mexico, Netherlands, Norway, Peru, Poland, Qatar, Romania, Russia, Singapore, South Africa, Sweden, Switzerland, Thailand, The Czech Republic, Turkey, United States
Cap. 94	Australia, Austria, Belgium, Brazil, Canada, Chile, China, Colombia, Croatia, Denmark, France, Germany, Hong Kong, Hungary, India, Indonesia, Israel, Italy, Japan, Kuwait, Malaysia, Mexico, Netherlands, Norway, Oman, Poland, Qatar, Romania, Russia, Slovakia, Spain, South Africa, South Korea, Sweden, Switzerland, Thailand, The Czech Republic, Turkey, United Kingdom, United States.
Cap. 85	Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, China, Colombia, Denmark, egypt, France, Germany, Hong Kong, Hungary, India, Indonesia, Israel, Italy, Japan, Kuwait, Malaysia, Mexico, Netherlands, Peru, Poland, Russia, Singapore, Slovakia, South Africa, South Korea, Spain, Sweden, Switzerland, Thailand, The Czech Republic, Turkey, Ukraine, United Kingdom, United States
Cap. 90	Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, China, Colombia, Denmark, Egypt, Finland, France, Germany, Hong Kong, Hungary, India, Indonesia, Israel, Italy, Japan, Kuwait, Malaysia, Mexico, Netherlands, Peru, Poland, Russia, Singapore, Slovakia, South Africa, South Korea, Spain, Sweden, Switzerland, Thailand, The Czech Republic, Turkey, United Kingdom, United States

Source: Own elaboration with data from WITS, 2015.

14 Anguilla, Cuba, Democratic People's Republic of Korea, and Montserrat are examples of countries that are not members of the IMF

15 Since the complete data is very extensive (there are 160 countries as importers, each with its 20 partners), the partners of each of the countries listed here, as well as percentage values of trade of these are found in http: // technical measures. blogspot.com.br/.

Appendix C - Number of TBT notifications issued by the sample importing countries between 2010 and 2014

Table 1C: TBT notifications, by chapter, issued by selected countries 2010-2014

	73		85		90		94	
	Country	TBT	Country	TBT	Country	TBT	Country	TBT
Advanced	Canada	3	Australia	9	Canada	3	Australia	1
	Japan	1	Canada	30	The Czech Republic	20	Canada	7
	US	11	Hong Kong	1	South Korea	1	Japan	2
			Japan	1	US	20	Korea	2
			Korea	5			US	34
			Singapore	1				
			Switzerland	1				
			US	47				
Emerging	Brazil	8	Brazil	21	Brazil	8	Brazil	13
	China	19	Chile	2	China	34	Chile	2
	Colombia	6	China	40	Colombia	1	China	8
	Indonesia	7	Colombia	3	Indonesia	1	Indonesia	1
	Kuwait	1	Indonesia	3	Israel	22	Israel	35
	Malaysia	2	Israel	116	Malaysia	1	Malaysia	3
	Mexico	5	Kuwait	5	Mexico	3	Mexico	3
	Peru	2	Malaysia	6	Peru	9	South Africa	2
	South Africa	1	Mexico	5	South Africa	4	Thailand	2
	Thailand	6	Peru	3	Thailand	4		
	Peru	1	South Africa	7				
			Thailand	33				
			Peru	1				
			Ukraine	3				

Source: Author's elaboration with data from the WTO, 2015.

* This table also includes notifications made to products belonging to the selected chapters, but indexed in the ICS merchandise classification. These were those used in the econometric model.

REFERENCES

Almeida, F. M., O. M. Silva and M. J. Braga. 2011. "O comércio internacional do café brasileiro: a influência dos custos de transporte". *Revista de Economia e Sociologia Rural* 49, 2, 323-340.

Anderson, J. E. 1879. "Theoretical foundation for the gravity equation". *American Economic Review*, Nashville 69, 1, 106-116.

Anderson, J. E., and E. Van Wincoop. 2004. "Trade costs". *Journal of Economic Literature* 42, 3, 691-751.

Baldwin, R.E., and D. Taglioli. 2006. "Gravity for dummies and dummies for gravity equations". London. *CEPR Discussion Paper*, 5850. http://ssrn.com/ abstract=945443.

Banco Mundial. 2015 "World Development Indicators". http://data.worldbank.org/indicator/ NY.GDP.MKTP.CD.

Batista, P. N. 1992. "Perspectivas da Rodada Uruguai: implicações para o Brasil". *Estudos Avançados* 6, 16, 103-116.

CENTRE D'ESTUDES PROSPECTIVES ET D'INFORMATIONS INTERNATIONALES – CEPI. *Distance databases*. Accessed May 15, 2017. http://www.cepii.fr/anglaisgraph/bdd/ distances.htm.

Chang, H. J. 2004. *Chutando a escada: a estratégia do desenvolvimento em perspectiva histórica*. São Paulo: Editora UNESP.

Corrêa, C. R., M. F. M. Gomes and J. E. Lima. 2015. "Medidas técnicas ao comércio internacional: facilitadoras de comércio ou barreiras não tarifárias?" *Política Externa* 24, 147-159.

Fassarella, L. M., M. J. P. Souza and H. L. Burnquist. 2011. "Impact of Sanitary and Technical Measures on Brazilian Exports of Poultry Meat". *Agricultural & Applied Economics Association's 2011 AAEA & NAREA Joint Annual Meeting*, Pittsburgh, Pennsylvania, 24-26.

Fontagné, L.; G. Orefice; R. Piermartini and N. Rocha. 2013. "Product Standards and Margins of Trade: Firm Level Evidence". *WTO Working Paper ERSD*, 04, 40.

Fundo Monetário Internacional – FMI. *World Economic Outlook*. Accessed Jun 1, 2016. https://www.imf.org/external/pubs/ft/weo/2014/02/weodata/groups.htm.

Hoekman, B., and A. Nicita 2011, "Trade policy, trade costs and developing country trade". *World Development* 39, 12.

Kaldor, N. 1967. *Strategic factors in economic development*. New York: Cornell University.

Kaldor, N. 1975. "Economic growth and the Verdoorn law: a comment on Mr Rowthorn´s article". *Economic Journal*, v. 85.

Karov, V., D. Roberts, J.H. Grant and E.B. Peterson. 2009. "A preliminary empirical assessment of the effect of phytosanitary regulations on US fresh fruit and vegetable imports". http://ideas.repec.org/p/ags/aaea09/49345.html.

Krugman, P. R, and M. Obstfeld. 2010. *Economia Internacional: teoria e política*. 8 ed. São Paulo: Pearson Brasil, 556 p.

Lee, J. W., and P. Swagel. 1994. "Trade Barriers and Trade Flows across Countries and Industries". *Nber Working Paper Series*, Cambridge, MA.

Li, Y., and J. C. Beghin. 2012. "A meta-analysis of estimates of the impact of technical barriers to trade". *Journal of Policy Modeling* 34, 3, 497-511.

Mata, D. da, and R.E. Freitas. 2008. "Produtos agropecuários: para quem exportar?" Rio de Janeiro: IPEA. http:/www.ipea.gov.br/sites/000/2/publicacoes/tds /td_1321.pdf.

MINISTÉRIO DO DESENVOLVIMENTO, INDÚSTRIA E COMÉRCIO (MDIC). n.d. "Outras estatísticas de comércio exterior". Acessed Mar 22, 2015. http://www.mdic.gov.br// sitio/interna/interna.php?area=5&menu=608.

ORGANIZAÇÃO PARA A COOPERAÇÃO E DESENVOLVIMENTO ECONÔMICO (OCDE). 2006. "Stan indicators 2005 edition". http://www.oecd.org/industry/ind/40230754.pdf.

ORGANIZAÇÃO MUNDIAL DO COMÉRCIO (OMC). n.d. "Integrated Trade Inteligence Portal". Acessed Mar 1, 2015. http://i-tip.wto.org/goods/Default.aspx.

Roberts, D., D. Orden, and T. Josling. 1999. *A framework for analyzing technical barriers to agricultural markets*. Washington (DC): U.S. Department of Agricultural, Economic Research Service, 52p.

Rodriguez, F., and D. Rodrik. 2001. "Trade policy and economic growth: a skeptic's guide to the cross-national evidence". In: *NBER Macroeconomics Annual 2000*, 15, MIT Press, 261-338.

Santos Silva, J.M.C., and S.Tenreyro. 2006. "The log of gravity". *The Review of Economics and Statistics*, Cambridge, 88, 4, 641-658.

Shepherd, B. 2013. *The Gravity Model of International Trade: A User Guide*. United Nations publication.

Tongeren, V., F. J.Beghin and S. Marette. 2009. "A Cost-Benefit Framework for the Assessment of Non-Tariff Measures in Agro-Food Trade". *OECD Food Agriculture and Fisheries Working Papers*, 21, OECD Pub-

lishing.

UNCTAD. 2015. *Trade and development report*. http://unctad.org/en/PublicationsLibrary/tdr2015_en.pdf.

WITS. n.d. "Database". Accessed Mar 20, 2015. http://wits.worldbank.org/WITS/WITS//Default-A.aspx?Page=Default.

ABSTRACT

This study evaluates the adoption and impact of tariffs and technical measures for emerging and advanced countries. The results showed that tariffs are considerably higher in emerging countries, but the negative effect of these tariffs is more intense for advanced countries. With regard to technical measures, the ones that requires changes in the product tend to be facilitating trade, while that demanding changes in the production process have shown mixed results. Thus, despite the elevation of production costs, technical measures can facilitate trade due standardization, which makes universal harmonization of standards and regulations a benefit possible with broad international dialogue.

KEYWORDS

International Trade; Trade Barriers; Gravitational Model.

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