# Integrating Latin America and the Caribbean

## Potential effects of removing tariffs and streamlining non-tariff measures

Marcelo Dolabella
José Elías Durán Lima

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United Nations publication
LC/TS.2020/113
Distribution: L

Printed at United Nations, Santiago
S.20-00597

This publication should be cited as: M. Dolabella and J. E. Durán L., "Integrating Latin America and the Caribbean: potential effects of removing tariffs and streamlining non-tariff measures", *Project Documents* (LC/TS.2020/113), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), 2021.

# Table of contents

**Tables**



**Figures**

**Maps**

# Abstract

This work analyzes the potential economic effects in Latin America and the Caribbean of reducing intra-regional trade barriers. First, trade costs coming from two main sources; customs tariffs and non-tariff measures (NTMs), are analyzed. The impact of NTMs on trade quantities was estimated for more than 5,000 products at the 6-digit level of the Harmonized System using a panel for 2001-2015 with NTM data notified by more than 150 member countries of the World Trade Organization (WTO). Trade effects were transformed into Ad-valorem equivalents (AVEs) using import elasticities and were aggregated into a GTAP country-sector classification. These estimates were used to assess the potential effects of liberalizing intra-regional trade in Latin America and the Caribbean by both eliminating tariffs and streamlining trade restrictive NTMs. Results point to a positive impact of 0.73 in the regional GDP, with a larger share of this impact coming from tariff liberalization.

Key words: tariffs, NTMs, AVEs of NTMs, intra-regional trade, Latin America and the Caribbean, CGE model.

# Introduction

Traditionally, the trade literature has focused its attention on tariffs as its main trade policy instrument. In the last 30 years the room for maneuvering in trade policy on the base of customs tariffs has decreased notably, mainly due to the reduction in the applied tariffs on imports, whether unilaterally, or by subscribing to free trade agreements, which has also drastically reduced tariffs on imports. In the beginning, when customs tariffs were high, the global economy received a positive effect due to the big impulse from the decrease in customs protection. Nonetheless, although customs tariffs have been reduced, many countries have maintained a series of measures that still decrease their capacity to reach new markets through international trade. Due to this, in recent years an increasing emphasis has been placed on Non-Tariff Measures (NTMs), also commonly referred to as the unseen barriers to trade. UNCTAD (2015) defines NTMs as policy measures other than ordinary custom tariffs that can potentially have an economic effect on international trade in goods, changing quantities traded, prices or both. Such measures can take the form of instruments of commercial policy (e.g. antidumping duties, quantitative restrictions, safeguards) or technical measures aimed at ensuring food safety, quality of products, protection of the environment, among others (e.g. sanitary and phytosanitary measures, technical barriers to trade).

The persistence of non-tariff measures in the intra-regional commerce has been a main point of concern in the agenda of several sub-regional integration schemes. More and more businesses and government officials throughout Latin America and the Caribbean have become aware of the need to remove/harmonize some of the main non-tariff measures. However, before being able to undertake any process of NTMs streamlining, it is of paramount importance to acquire a better understanding on how NTMs affect international trade. With such estimates it is then possible to have an idea of the surcharge paid by regional importers and exporters at different disaggregation levels. Moreover, it provides the foundations for the analysis of unlocking the region's potential for international trade, as well as the gains/losses that could come as a result of public policies trying to streamline such measures.

Given this need, this work sets to quantify trade barriers at a global level, including not only tariffs but also NTMs. Since these measures are normally set on a very specific and disaggregated level (product level), assessing their trade impact and bringing them to a common metric is not a simple task. This work joins the group of studies which estimate the impacts of NTMs on traded quantities for all 5,103 six-digit product lines of the harmonized system (HS). These estimates are then transformed to ad-valorem equivalents (AVEs) and aggregated into fewer country and sector groups. Adding tariffs with the estimated ad-valorem protection coming from NTMs proposes a clearer and more realistic picture of the barriers surrounding international trade of goods. Therefore, this work focuses on assessing trade costs from tariffs and NTMs quantitatively rather than discussing the ways to streamline, harmonize and give transparency to these restrictive measures.

The Latin American Integration Association (ALADI, in Spanish) requested ECLAC an evaluation of an eventual large-scale Latin American economic agreement (*Acuerdo Económico Comercial Integral Latinoamericano* – AECIL, in Spanish), which assumes full tariff reduction of bilateral trade not covered by trade agreements. Such an agreement would also benefit from a harmonization of standards and an elimination of trade defense measures. Using a computable general equilibrium model (CGE), this document assesses how reducing the trade barriers from tariffs and NTMs could impact trade, production, welfare and employment across the region.

The following section presents the current applied tariff protection imposed by different countries across the world, including the preferential tariffs negotiated in different trade agreements. Section II outlines the structure of non-tariff measures affecting international trade. Coverage ratios, frequency indexes and prevalence scores are calculated and analyzed here. Section III guides the reader through how the trade impacts stemming from NTMs were estimated and then transformed into AVEs. Results over different dimensions are displayed in this section alongside with the assumptions held during the aggregation process. This section also compiles information on AVEs of NTMs and tariffs as an effort of presenting a more realistic picture of trade impediments. Section IV shows how a regional economic agreement could benefit from the elimination and harmonization of these measures by analyzing the potential economic and social effects from such policies. Section V brings to light some concluding remarks of this work.

# I. Tariff protection

Tariff protection has been experiencing a downward trend at the global level over the last decades. Although recent tensions between China and the United States have led to the mutual placement of tariffs, tariffs remain at lower levels when compared to previous decades. This trend becomes clearer when the global tariff structure is analyzed. The evolution of the applied tariff rate (which considers preferential tariffs for selected partners) over the last three decades reveals that the global tariff structure has decreased by more than half in the period (see panel A of Figure 1). Similarly, tariff protection in Latin America and the Caribbean, China and East Asia and Pacific countries has shown a similar path, with a much more intensified fall (see panel B of figure 1).

The analysis global trade and tariff protection imposed and faced by different regions gives a brighter picture of trade tariff barriers. This work split countries into 10 country-groups for descriptive purposes.[1] The state of tariff protection, considering data consolidated by the World Trade Integrated Trade Solution (WITS) database, shows that at the global level, the applied tariff is of around 3.0%.[2] The lowest tariffs applied are those by most developed nations, such as Canada, the United States, the European Union (EU) and Japan.[3] Tariffs imposed by Sub-Saharan Africa and Latin America and the Caribbean countries are the highest. As to tariff resistance faced by the same country groups, it is observed that, on average, developing economies receive lower tariffs than those that they apply and more developed countries face the highest tariffs in comparison with its less developed counterparts. This goes in lines with different preferential agreements signed by developed nations with low-income countries, such as the Generalized System of Preferences (GSP).

1 Annex 1 exhibits the countries included in each group.

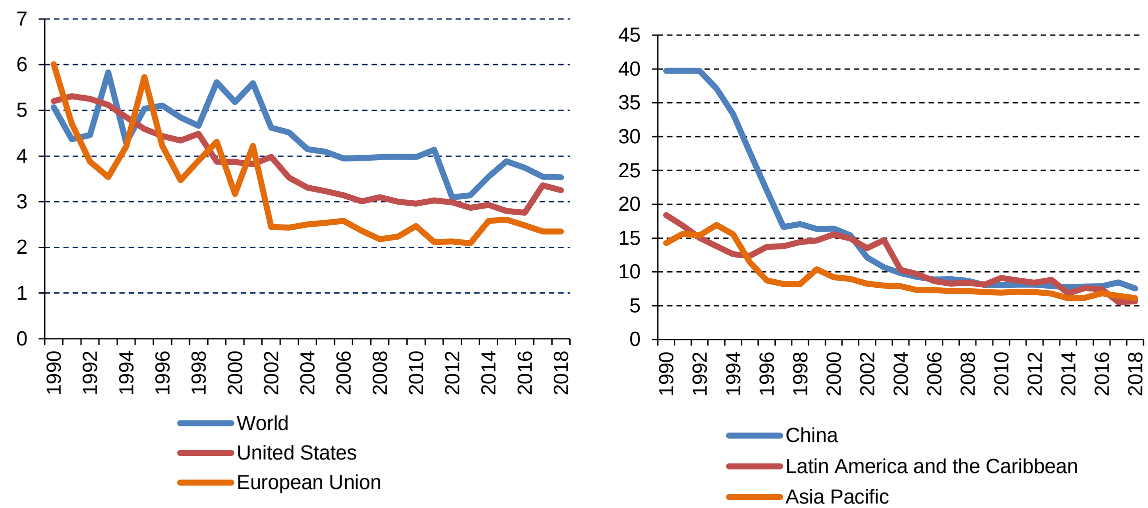
2 Tariffs are displayed for 2015 in order to match with the year for which NTMs were estimated.

3 For consistency with the following sections intra-European Union trade is not taken into account. When intra-EU trade is considered global tariffs are reduced to 2.4%, with the EU imposing a tariff of 0.9 and facing a tariff of 1.4.

**Figure 1**
**Evolution of the applied tariff rate, 1990-2018**
*(Trade weighted average, in percentages)*

A. World, European Union and USA

B. Latin America & Caribbean, China & Asia Pacific




Source: Author's calculation, based on information from the World Bank and the COMTRADE database of the United Nations. Missing values were interpolated for China in 1995, 2012 and 2013, for the United States in 1994, and for some countries in the group of Latin America and the Caribbean and Asia Pacific.

**Table 1**
**Tariffs by regions**
*(Trade values in billions of dollars, 2015)*

| Regions | Imports | Percentage of Total Trade | Tariff Imposed (in percentage) | Exports | Percentage of Total Trade | Tariff Faced (in percentage) |
|---|---|---|---|---|---|---|
| Latin America and the Caribbean | 946 | 8.3 | 5.4 | 913 | 8.0 | 2.4 |
| United States | 2 107 | 18.4 | 1.5 | 1 315 | 11.5 | 3.3 |
| Canada | 400 | 3.5 | 1.1 | 383 | 3.3 | 1.1 |
| European Union | 1 951 | 17.0 | 2.2 | 1 791 | 15.6 | 3.7 |
| Japan | 566 | 4.9 | 2.3 | 611 | 5.3 | 4.3 |
| China | 1 198 | 10.5 | 3.9 | 2,204 | 19.2 | 3.6 |
| Other Asia Pacific | 2 524 | 22.0 | 3.6 | 2,287 | 20.0 | 3.2 |
| Middle East and North Africa | 903 | 7.9 | 3.6 | 863 | 7.5 | 1.7 |
| Sub-Saharan Africa | 270 | 2.4 | 8.2 | 277 | 2.4 | 1.6 |
| Rest of World | 594 | 5.2 | 2.1 | 815 | 7.1 | 2.0 |
| World | 11 460 | 100 | 3.0 | 11 460 | 100 | 3.0 |

Source: Author's calculations, based on information from the WITS and the BACI database. Note: Intra-EU trade not considered. See annex 2 for details.

Table 2 shows tariff protection across sectors for the world and for Latin America and the Caribbean. Processed foods, beverages and tobacco (12.7%) and textiles, footwear and clothing (12.6%) are the sectors in which Latin America and the Caribbean impose the highest tariffs. Both sectors are also the most protected when global trade is considered. Latin American and Caribbean's exporters receive higher tariffs on agricultural products (7.8% on average) and on processed foods, beverages (7.3%). On the other hand, the sectors of oil, extraction and mining, and machinery and equipment face the lowest tariffs.

**Table 2**
**Tariffs affecting different sectors**
*(Trade values in billions of dollars, 2015)*

| | World | | | Latin America and the Caribbean | | | |
|---|---|---|---|---|---|---|---|
| Regions | Total Trade | Percentage of Total Trade | Applied Tariff (in percentage) | Imports | Tariff Imposed (in percentage) | Exports | Tariff Faced (in percentage) |
| Agriculture, hunting and fishing | 415 | 3.6 | 7.0 | 27 | 6.3 | 95 | **7.8** |
| Oil extraction and mining | 569 | 5.0 | 1.1 | 10 | 0.7 | 78 | 0.4 |
| Processed foods, beverages and tobacco | 566 | 4.9 | 10.1 | 54 | 12.7 | 114 | **7.3** |
| Textiles, footwear and clothing | 728 | 6.4 | 7.5 | 44 | 12.6 | 31 | 2.3 |
| Wood and paper | 205 | 1.8 | 2.2 | 21 | 3.9 | 22 | 1.1 |
| Chemical and petrochemical | 2 871 | 25.1 | 1.9 | 265 | 3.3 | 168 | 1.1 |
| Non-metallic minerals | 200 | 1.7 | 3.3 | 10 | 6.3 | 8 | 1.7 |
| Metals and derivatives | 946 | 8.3 | 2.3 | 77 | 4.2 | 75 | 0.6 |
| Cars and transportation equipment | 1 183 | 10.3 | 4.1 | 115 | 8.9 | 128 | 1.3 |
| Machinery and equipment | 3 476 | 30.3 | 1.6 | 305 | 3.9 | 178 | 0.4 |
| Other manufactures | 300 | 2.6 | 2.5 | 19 | 8.7 | 17 | 0.6 |
| Total | 11 460 | 100.0 | 3.0 | 946 | 5.4 | 913 | 2.4 |

Source: Author's calculations based on information from the WITS and the BACI database. Note: Intra-EU trade not considered. See annex 2 for details.

# II. Non-tariff measures (NTMs)

Given the broad definition of the term Non-tariff measures and its inherent heterogeneity, this work opted to assess trade effects of different NTMs. For this task the following seven types of NTMs were analyzed: sanitary and phytosanitary (SPS), technical barriers to trade (TBT), quantitative restrictions (QR), antidumping duties (ADP), countervailing duties (CV), safeguard measures (SG) and special safeguard measures (SSG). The first two measures are termed technical measures or standard-like measures, for their objective of regulating the domestic market. The remaining are termed trade defense measures (TDM) due to their trade policy objective.[4]

The NTM database used in this work was retrieved from the work of Ghodsi et al. (2017) from The Vienna Institute for International Economic Studies (wiiw, in its German acronym). The authors processed NTM data from the subsection of goods of the World Trade Organization's (WTO) Integrated Trade Intelligence Portal (I-TIP). Since the original notification database is incomplete and does not always display which HS 6-digit codes are affected by each measure, the authors applied an identification strategy in order to match the missing codes. As a result, the notifications with missing codes were reduced from around 45% to 22.3%. From their notification database, a panel ranging from 2001 to 2015 containing information about the existence of the different NTMs per year was constructed for the analysis purposes of this paper.

Some points are worth highlighting before moving on. First, there is still a number of notifications for which a HS06 line has not been assigned. Second, only WTO members are listed as reporters, because the database is built on notifications to the WTO by member countries. Therefore, this work excludes from the estimation sample, import flows of non-WTO members to WTO members at any point in the sample period. Third, the database has three types of dates (initiation, in-force and withdrawal) which might have different features according to the type of NTM. For example, TBT and SPS notifications, which comprise most of the NTM notifications, do not have information on the

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[4] See UNCTAD (2015) for further information on each type of measure. They provide a classification of NTMs, categorizing them into 16 chapters (A to P) with several subgroups, alongside with definitions and examples.

withdrawal date. Although this might be a significant issue for countries applying a temporary measure, these cases are not that frequent, since most of these measures are set on permanent basis. This is further discussed in the estimation section. The fourth point is related to the reporting capacity of different WTO members. According to Ghodsi et al. (2017) high income countries tend to be the heaviest users of NTMs. They give two reasons for this, first, these countries ask for higher standards for the products they consume and second, they have a better reporting capacity when compared to low income countries. Some countries report every NTM applicable, whereas others report only NTMs which depart from international standards. Lastly, according to ESCAP (2019), pre-1995 regulations, since they were not "new" or "amended", are not in the WTO database.

One indicator that gives a clear picture of the percentage of trade that is under the regulation of an NTM is the coverage ratio. In line with the definition by UNCTAD-World Bank (2018), the indicator was calculated for each NTM type and each country group g in the following manner:

$$Coverage\ Ratio_g = \left(\frac{\sum_i \sum_j \sum_k D_{ijk} * V_{ijk}}{\sum_i \sum_j \sum_k V_{ijk}}\right) * 100 \quad \forall\, i \neq j\,,$$

where $D_{ijk}$ is a dummy variable reflecting the presence of an NTM imposed by country *i* to country *j* in product *k* and $V_{ijk}$ is the value of imports for country *i* from country *j* in product *k*. On the product dimension *k*, over 5,100 product lines of the Harmonized System of 1996 at the 6-digit level (HS06) were considered. The number of countries included in group *i* was restricted to those members of the WTO and it varies depending on the group $g$ analyzed (for instance Latin America and the Caribbean, 33 and China, 1). Lastly, the number of affected economies *j* is either 182 for non-EU members or 156 for EU members.

Calculated in a similar way, the frequency index captures the percentage of products that are subject to one or more NTMs:

$$Frequency\ Index_g = \left(\frac{\sum_i \sum_j \sum_k D_{ijk} * M_{ijk}}{\sum_i \sum_j \sum_k M_{ijk}}\right) * 100 \quad \forall\, i \neq j\,,$$

where $D_{ijk}$is defined as above and $M_{ijk}$ is a dummy which takes the value of one when country *i* imports any quantity of product *k* from country *j*, and zero otherwise.[5] These indicators can be calculated for different NTMs. For exposition issues, the following table shows these indicators for three types of NTMs, namely SPS, TBT and QR, as well as its aggregated value.

A first overview on table 3 shows that according to the I-TIP database, TBT measures are the ones affecting most of the HS06 lines traded in 2015 and also covering most of the world's imports in almost all regions. In Latin America and the Caribbean, for instance, TBT regulations affected 48.7% of all partner-products for which there was trade. These lines represented 78.1% of its imports. On the other hand, SPS measures covered around 20% of trade of Latin America and the Caribbean, the United States, the European Union, Japan and China, with its frequency index oscillating from 32.2% in the USA to 14.1% in Latin America and the Caribbean. Japan, China and the group "Rest of the World" were the ones with the highest percentage of trade under a quantitative restriction. Other kinds of NTMs are not as frequently used as the ones previously mentioned and represented therefore a low frequency index and coverage ratio. For a detailed description of coverage ratios by importing countries see Annex 4.

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5 Considering only the country pair-product observations for which trade any quantity of trade was observed in a particular period might not give a complete picture of the frequency of NTMs. A modified frequency index is proposed and results are displayed in annex 3.

**Table 3**
**Coverage ratios and frequency indexes for different importing regions**
*(In percentages, 2015)*

| Region/Country | Coverage Ratios | | | | | Frequency Indexes | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | All NTMs | SPS | TBT | QR | OtherNTM | All NTMs | SPS | TBT | QR | Other NTM |
| Latin America and Caribbean | 80.6 | 20.9 | 78.1 | 0.9 | 1.1 | 52.4 | 14.1 | 48.7 | 1.1 | 0.3 |
| United States | 95.9 | 21.7 | 93.6 | 17.7 | 5.5 | 90.4 | 32.2 | 85.3 | 12.9 | 4.5 |
| Canada | 96.3 | 16.0 | 95.8 | 5.2 | 0.4 | 91.9 | 17.5 | 91.4 | 9.2 | 0.2 |
| European Union | 89.4 | 21.4 | 86.9 | 13.9 | 1.4 | 85.5 | 22.9 | 81.6 | 10.9 | 0.8 |
| Japan | 100.0 | 19.2 | 89.2 | 100.0 | 1.2 | 100.0 | 19.6 | 86.8 | 100.0 | 0.8 |
| China | 98.1 | 21.7 | 96.7 | 52.0 | 0.7 | 94.8 | 27.9 | 91.3 | 33.2 | 0.4 |
| Other Asia Pacific | 71.7 | 11.7 | 47.4 | 39.0 | 0.9 | 61.6 | 14.6 | 42.5 | 31.2 | 0.4 |
| Middle East & North Africa | 66.3 | 10.1 | 54.6 | 20.4 | 1.1 | 52.1 | 8.4 | 45.2 | 11.0 | 0.5 |
| Sub-Saharan Africa | 32.4 | 4.2 | 29.7 | 1.2 | 0.1 | 25.3 | 2.3 | 22.7 | 1.8 | 0.0 |
| Rest of World | 78.4 | 15.8 | 49.3 | 66.4 | 0.4 | 50.0 | 10.2 | 28.4 | 31.6 | 0.2 |
| World | 83.6 | 17.3 | 73.8 | 30.0 | 1.8 | 59.6 | 13.9 | 50.4 | 16.4 | 0.5 |

Source: Author's calculations.
Note: Intra-European Union trade was not considered so that coverage ratios and frequency indexes would not be downward biased. Some HS06 codes, that were not relevant for the analysis, were also not taken into account. See annex 2 for details.

By changing the dimension of the summation of the coverage ratio and frequency index formulas and splitting products into a few product groups, the analysis can be transformed into a sectoral one. The frequency indexes, taking into account all NTM types, reveal that agriculture, hunting and fishing followed by processed foods, beverages and tobacco were the sectors with highest frequency of NTMs (82.3% and 79.9% respectively) while metals and derivatives (40.8%) wood and paper (41%) presented the lowest percentage of products affected. Coverage ratios show higher figures among sectors, with agriculture, hunting and fishing; processed foods, beverages and tobacco and machinery and equipment presenting more than 90% of its HS06 trade under at least one NTM. When the ratio is broken down into the different types of NTMs, one can observe that TBT regulation is covering relevantly most of the sectors while SPS measures are more frequently used and therefore cover a higher percentage of trade in agriculture, hunting and fishing and processed foods, beverages and tobacco. This goes in line with the purpose of an SPS measure that is to protect human, animal or plant life from risks arising from additives, contaminants, toxins, pests and diseases, prevent or limit the spread of pests and to protect biodiversity. Quantitative restrictions, on the other hand, are more frequent in the sector of cars and transport equipment but it covers a higher share of trade in the sectors of machinery and equipment and chemical and petrochemical.

**Table 4**
**Coverage ratios and frequency indexes affecting different sectors**
*(In percentages, 2015)*

| Sectors | Coverage Ratios | | | | | Frequency Indexes | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | All NTMs | SPS | TBT | QR | Other NTM | All NTMs | SPS | TBT | QR | Other NTM |
| Agriculture, hunting and fishing | 93.7 | 84.6 | 86.5 | 25.9 | 3.0 | 82.3 | 69.5 | 71.2 | 19.0 | 0.3 |
| Oil extraction and mining | 65.0 | 3.1 | 58.9 | 25.8 | 0.0 | 59.7 | 19.7 | 54.3 | 13.5 | 0.1 |
| Processed foods, bev. & tobacco | 93.4 | 87.2 | 90.7 | 19.5 | 7.0 | 79.9 | 68.7 | 75.0 | 10.0 | 1.8 |
| Textiles, footwear and clothing | 80.4 | 5.0 | 66.2 | 24.3 | 1.1 | 62.3 | 2.8 | 48.8 | 19.2 | 0.3 |
| Wood and paper | 57.2 | 21.6 | 40.8 | 22.7 | 4.5 | 41.0 | 9.5 | 31.4 | 12.3 | 0.3 |
| Chemical and petrochemical | 83.6 | 32.0 | 77.2 | 35.1 | 0.9 | 61.5 | 29.4 | 51.0 | 17.3 | 0.3 |
| Non-metallic minerals | 63.6 | 1.7 | 57.9 | 12.0 | 2.4 | 49.7 | 2.1 | 43.1 | 12.1 | 0.8 |
| Metals and derivatives | 62.8 | 1.8 | 50.0 | 18.9 | 6.4 | 40.8 | 1.1 | 32.5 | 12.3 | 1.4 |

| Sectors | Coverage Ratios | | | | | Frequency Indexes | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | All NTMs | SPS | TBT | QR | Other NTM | All NTMs | SPS | TBT | QR | Other NTM |
| Cars and transportation equip. | 88.3 | 1.9 | 79.8 | 30.3 | 0.8 | 62.1 | 1.4 | 54.3 | 26.4 | 0.3 |
| Machinery and equipment | 91.4 | 1.8 | 77.9 | 35.0 | 0.7 | 62.3 | 1.8 | 54.4 | 17.3 | 0.1 |
| Other manufactures | 81.9 | 2.7 | 74.4 | 21.2 | 2.1 | 49.7 | 3.1 | 40.6 | 16.6 | 0.1 |
| World | 83.6 | 17.3 | 73.8 | 30.0 | 1.8 | 59.6 | 13.9 | 50.4 | 16.4 | 0.5 |

Source: Author's calculations.
Note: Intra-European trade was not considered so that coverage ratios and frequency indexes would not be downward biased. Some HS06 codes, that were not relevant for the analysis, were also not taken into account. See annex 2 for details.

One weakness of frequency and coverage ratios is its inability to capture the magnitude of NTM. If country A imposes one NTM and country B imposes one hundred NTMs across all sectors and partners, its frequency index and coverage ratios are going to be the same despite the difference in levels. The use of count NTMs makes it possible to access this information. In order to do so, prevalence scores were computed according to the formula below:

$$Prevalence\ Score_g = \frac{\sum_i \sum_j \sum_k L_{ijk} * M_{ijk}}{\sum_i \sum_j \sum_k M_{ijk}} \quad \forall\, i \neq j\,,$$

where $L_{ijk}$ is a count variable reflecting the number of NTMs imposed on the bilateral relationship by country *i* on country *j* for product *k*. The variable $M_{ijk}$ is the same dummy used while calculating the frequency indexes: whenever country *i* imported any quantity of product *k* from country *j* the dummy takes up a value of one, and zero otherwise. This indicator weights the stock of NTMs using a simple average over the products imported in a particular year. Another way to calculate the prevalence score is to weight it with imported value figures, changing $M_{ijk}$ to $V_{ijk}$. This allows us to calculate a trade-weighted prevalence score.

Table 5 shows the results for the three most relevant NTM types for the year of 2015. A first conclusion is that even though Latin America and the Caribbean, the United States, the European Union, Japan and China have all around 20% of its trade covered by SPS measures (see table 3) there are significant differences in the number of measures imposed by these country/regions. This means that despite the fact that all these countries have no SPS measures affecting around 80% of its imports, the remaining 20% are under the influence of different levels of measures. For instance, while the United States imposes on average 34.6 measures and China 20.1, Latin America and the Caribbean and the European Union impose on average 2.3 and 3.1 SPS measures, respectively. Canada, with an even lower coverage ratio (16%), and China follow the US as the countries imposing on average more NTM per product.

**Table 5**
**Prevalence score of NTMs imposed by different importing regions**
*(Average number of measures, 2015)*

| Region/Country | Trade weighted average | | | Simple average | | |
|---|---|---|---|---|---|---|
| | SPS | TBT | QR | SPS | TBT | QR |
| Latin America and the Caribbean | 2.3 | 7.5 | 0.0 | 1.0 | 2.5 | 0.0 |
| United States | 34.6 | 26.4 | 0.4 | 39.1 | 15.9 | 0.3 |
| Canada | 30.7 | 18.8 | 0.1 | 42.5 | 7.6 | 0.2 |
| European Union | 3.1 | 16.8 | 0.2 | 3.7 | 16.5 | 0.1 |
| Japan | 9.6 | 11.8 | 8.5 | 7.9 | 7.5 | 8.0 |
| China | 20.1 | 13.1 | 0.6 | 22.6 | 11.8 | 0.4 |
| Other Asia Pacific | 3.6 | 3.2 | 2.3 | 3.1 | 2.4 | 1.4 |
| Middle East and North Africa | 0.6 | 6.9 | 0.4 | 0.4 | 5.7 | 0.2 |
| Sub-Saharan Africa | 0.1 | 1.3 | 0.0 | 0.1 | 0.8 | 0.0 |
| Rest of World | 0.6 | 2.2 | 1.5 | 0.4 | 1.1 | 0.5 |
| World | 11.4 | 12.1 | 1.2 | 4.0 | 5.7 | 0.6 |

Source: Author's calculations.
Note: Intra-European trade was not considered so that coverage ratios and frequency indexes would not be biased downward. Some HS06 codes, that were not relevant for the analysis, were also not taken into account. See annex 2 for details.

Turning to TBT measures, the world has a trade weighted average of 12.1 measures and a simple average of 5.7 measures. This difference reflects the fact that more developed countries, which represent a larger share of global trade, are also the ones imposing more measures. Latin America and the Caribbean also present a lower prevalence score of TBTs compared to more developed nations such as the United States, the European Union and others. On simple average basis, the three larger users of TBTs are the EU, with 16.5 measures per partner-product, the USA, with 15.9 measures, and China with 11.8 measures. With respect to quantitative restrictions, Japan and the group of other Asia-Pacific countries present the higher averages for 2015. All in all, the difference between developed and developing nations observed in the coverage ratios and frequency indexes is also seen when the stock of NTMs is analyzed.

Taking the analysis of NTM stock to the sectoral level reveals more information. Both TBT and SPS measures have a higher average in the sectors of agriculture, hunting and fishing; processed foods, beverages and tobacco; and chemical and petrochemical, with SPS showing a higher average when trade weights are used and a lower average when simple weights are employed. When trade weights are considered, SPS measures have a higher stock of measures on average in the three abovementioned sectors than TBT measures. On the other hand, the picture changes for all the other sectors with a higher stock of TBT measures when compared to SPS measures. Trade of cars and transportation equipment has the highest trade weighted average of TBT measures, 31.2 measures, highly influenced by 117-115 TBT measures imposed by US to multiple partners in around 15% of this sector's trade in just couple of products.[6] This sector was followed by processed foods, beverages and tobacco (29.3) and agriculture, hunting and fishing (25.8) as the ones with more TBTs on average. Around 1.2 QR measures affected on average the global trade. Other NTMs were not displayed due to their low average (both simple and trade weighted), with most of the sectors and country groups not reaching 0.1 measures in 2015.

**Table 6**
**Prevalence score of NTMs affecting different sectors**
*(Average number of measures, 2015)*

| Region/Country | Trade weighted | | | Simple average | | |
|---|---|---|---|---|---|---|
| | SPS | TBT | QR | SPS | TBT | QR |
| Agriculture, hunting and fishing | 63.2 | 25.8 | 1.0 | 25.9 | 21.9 | 0.6 |
| Oil extraction and mining | 0.8 | 1.6 | 1.0 | 0.5 | 2.3 | 0.4 |
| Processed foods, beverages and tobacco | 57.8 | 29.3 | 0.7 | 25.7 | 22.5 | 0.3 |
| Textiles, footwear and clothing | 0.1 | 3.3 | 0.8 | 0.1 | 1.8 | 0.5 |
| Wood and paper | 1.7 | 1.6 | 0.9 | 0.4 | 0.8 | 0.4 |
| Chemical and petrochemical | 24.3 | 10.8 | 1.3 | 7.5 | 5.8 | 0.7 |
| Non-metallic minerals | 0.1 | 2.7 | 0.5 | 0.1 | 2.3 | 0.4 |
| Metals and derivatives | 0.1 | 2.6 | 0.7 | 0.0 | 1.4 | 0.4 |
| Cars and transportation equipment | 0.0 | 31.2 | 0.9 | 0.0 | 8.3 | 0.7 |
| Machinery and equipment | 0.1 | 9.5 | 1.8 | 0.2 | 5.0 | 0.7 |
| Other manufactures | 1.2 | 12.8 | 0.9 | 0.7 | 3.0 | 0.5 |
| World | 11.4 | 12.1 | 1.2 | 4.0 | 5.7 | 0.6 |

Source: Author's calculations.
Note: Intra-European trade was not considered so that coverage ratios and frequency indexes would not be downward biased. Some HS06 codes, that were not relevant for the analysis, were also not taken into account. See annex 2 for details.

This section sheds light on how NTMs are employed across different sectors and countries. Since NTMs can be trade deterring as well as trade promoting, there is the need to assess the trade effects of different NTMs in order to determine the direction of the impact, in case there is indeed a significantly non-zero impact. The next section guides the reader through how these impacts were estimated on a country-pair-product basis and presents the results.

6 The above mentioned products were 870310, 870390, 870332, 870331, 870324, 870322, 870323, 870321 and 870333.

# III. Estimated bilateral total protection

This section presents some results on potential trade impact coming from the unseen barriers of trade, namely, from different types of NTMs. First, the methodology for estimating the impact of NTMs on trade and its *ad-valorem* equivalent (AVE) is presented. Since it is possible for the same NTM to affect partner countries differently, an identification strategy was chosen that allowed for the estimation of bilateral trade effects without running out of degrees of freedom.[7] In the sequence the results, which were estimated at the 6-digit level of the Harmonized System (HS06), are aggregated into a country group-sector level. The aggregation was initially set up to 34 country groups and 33 sectors which fit a Global Trade Analysis Project (GTAP) model for Latin America and the Caribbean.[8] This aggregation allows the estimation of a Computable General Equilibrium (CGE) model. The following subsection gives a brief overview on the methodology undertaken and specification chosen. In the sequence some results are presented.

## A. Methodology for the estimation of AVEs barriers of NTMs

This section explains the methods used and assumptions held in order to calculate AVEs barriers of NTMs. Bilateral volume trade effects of different NTMs were retrieved from Dolabella (2020) and were converted to AVEs using GTAP import demand elasticities.[9]

Following the common practice in the literature, a gravity framework was selected for assessing the impact of NTMs on trade, more specifically, the quantity based methodology where the variation of trade quantities is used to identify AVEs of NTMs. As argued by De Melo and Nicita (2018), in practice, the imposition of NTMs could result in an increase in price and a reduction in quantity, leaving the value

7 For intuition on how uneven NTM trade effects can be, see Dolabella (2020) and Bratt (2017).

8 Annex 1 display how countries were distributed into groups for the GTAP model.

9 The complete and detailed description of the estimation procedure, derivations of formulas, discussion on the econometric issues steaming from the chosen specification and the heterogeneity of NTMs and data analysis are found in Dolabella (2020).

of trade unaffected. Thus, this work chose to use traded quantities instead of the trade value as the dependent variable in order to better capture the final impact of NTMs.

Since NTMs are normally set on a disaggregated trade level (product level), regressions were performed separately for all HS06 codes (as in Kee et al., 2009). This resulted in more than 5,000 regressions, which were estimated using a fixed effects Poisson Pseudo Maximum Likelihood (PPML) estimator. The panel covered fifteen years, from 2001 to 2015. The NTM variable entered the equation as a dummy variable, presenting a unity value whenever a positive number of measures applied to the bilateral relationship, and zero otherwise. This variable was built from notifications imposed (and not terminated) prior to the last year on the panel.

One advantage of using panel data is that it is able to control for endogeneity stemming from time invariant variables, normally included in cross section gravities (landlocked dummies, language, culture, distance, among others). These and all other time invariant variables (observable and non-observable) are controlled by the inclusion of fixed effects in the panel specification. On the other hand, the choice for panel data makes simple bootstrapping methods invalid, since observations are no longer independent and identically distributed. Therefore, this work drives apart from those studies which used bootstrapping methods and exploited the cross sectional dimension of the data (Kee et al., 2009; Kee and Nicita, 2016; Bratt, 2017).

The model which was estimated in order to calculate the AVE impact NTMs in the bilateral trade was specified as follows:

$$M_{ijt}^{k} = \exp\Big(\beta_{ij}^{k} + \beta_{1ijt} tar_{ijt-1}^{k} + \sum\nolimits_{n=1}^{10} \beta_{2nijt} NTM_{nijt-1}^{k} + \beta_3 share_{it-1}^{k} + \beta_4 share_{jt-1}^{k} + \beta_5 lnY_{it} + \beta_6 lnY_{jt} + \beta_7 PTA_{ijt} + \beta_8 WTO_{ijt} + \sum\nolimits_{t} \theta_t T_t\Big)$$

where $M_{ijt}^{k}$ represents the quantity in tons imported by country *j* of product *k* from country *i* in year *t*; $tar_{ijt}^{k}$ stands for the tariff imposed by country *j* on country *i* at the product level; $NTM_{nijt}^{k}$ represents a variable capturing the existence of measures applied by country *j* on country *i* for the NTM type *n*, presented above.[10] The variables $expsh_{it}^{k}$ and $lnY_{it}$ are the share of the exporter country in the world trade's value of product *k* and the logarithm of its GDP. Similarly, $impsh_{jt}^{k}$ and $lnY_{jt}$ represent the same variables from the importing economy. The remaining controls are time fixed effects ($T_t$) and two dummies; one dummy indicating the existence of a preferential trade agreement between countries *i* and *j* ($PTA_{ijt}$), and one indicating if both countries were members of the WTO at year *t* ($WTO_{ijt}$). Lastly, $\varepsilon_{ijt}^{k}$ stands for the residual. Even though no variation is found at the product dimension *k*, the subscript is included to differentiate the variables measured at the product level from the ones measured at national level (multilateral or bilateral). Annex 4 briefly describes the data source.

The bilateral impact is estimated by the interaction of the NTM with specific variables of each importing and exporting country. Following Kee and Nicita (2016), the variable of NTM is multiplied by the percentage that the importing country and the exporter represent of the total value of imports and exports of that product according to the equation below:

$$\beta_{1ijt} = \beta_1 + \beta_{11} share_{it}^{k} + \beta_{12} share_{jt}^{k} \ ,$$

$$\beta_{2nijt} = \beta_{2_n} + \beta_{21_n} share_{it}^{k} + \beta_{22_n} share_{jt}^{k} \ .$$

These import and export shares are taken as proxies of the market power of each importer and exporter for each product. The intuition for this specification according to Kee and Nicita (2016) is that

10 As controls antidumping investigations and specific trade concerns were added to the regression. Results are not displayed.

compliance costs should be lower if the exporter has a larger share in the world trade of the product, which results in smaller trade impact due to the presence of importing country's SPS/TBT measures. However, it is also possible that the exporter could easily divert their export to other market when face with burdensome NTMs of a specific importer and the trade impact will be larger. Regarding importers, compliance costs for exporters should be higher if the importer has a larger share in the world trade of the product, leading to a larger trade impact. Also, a large market power makes it more difficult for exporters to divert trade to other markets when faced with a new NTM, which would lead to a smaller trade impact.[11] All in all, this specification allows us to simulate a bilateral time-specific effect of NTMs without running out of degrees of freedom.

Such bilateral identification approach has been used before by the literature but is not free of criticism. For instance, Cadot et al. (2018b) say that it does not describe a particular country's estimated AVE; instead, they simulate what the estimated AVE ought to be at that country's level of trade share. The real impact could only be captured by interactions with import and export dummies. In our case, estimation of bilateral parameters using country dummies would be feasible since the data contains the time dimension providing additional degrees of freedom. However, the chosen estimator PPML, required for gravity estimations with many zero trade flows, presented computing problems in the presence of large numbers of dummies. This problem was also described by Cadot et al. (2018b).

Since the dependent variable, quantity imported in tons, is an estimated value, it may also carry noise in its values. A few products showed a large share of its global trade value with missing quantities. Since missing quantity values are not considered for estimating the parameters, the inclusion of such products might bias some relevant bilateral trade effects. Hence, the impact of NTMs on these products was set to missing. Another check was to examine if the impact was sensitive to the exclusion of outliers in terms of implicit price. So, the above-mentioned model was re-estimated, eliminating outliers of the depended variable at the product level. For this purpose, an observation was determined as an outlier whenever the price (value over quantity) of the traded good was in the largest or smallest 1% of the distribution per year of the panel. This was another attempt to increase the robustness of results (see annex 7).

Some remarks on endogeneity are worth pointing out before moving on. To begin with, the simple fact that estimations are carried at the very specific product level already eliminates the possibility of unobserved product specific invariant factors being correlated with the NTMs. Secondly, this paper chose not to include exporter-time and importer-time dummies because non-discriminatory trade policies, the ones applied multilaterally such as safeguards and special safeguards would be perfectly collinear with the number of imposed NTMs. This would preclude estimation of $\beta_1$ and $\beta_{21_n}$. However, we include time dummies to capture the time-varying heterogeneity that is common among the country pairs. In addition, the variables of interest of this study are lagged by one period. As argued by Ghodsi *et al.* (2016a) there are two reasons for this. First, demand takes time to react to policy changes, which seems particularly reasonable for intermediate products. Second, for some NTMs, reverse causality should be a barrier to the estimation of the true NTM effect. Sometimes, NTMs are the cause imports grow or reduce, so not only trade reacts to the imposition of a NTM but also a NTM might be implemented to promote or reduce imports. The lagged value of an NTM is expected to lessen this problem.

Due to the fact that the bilateral impact of an NTM depends on three coefficients, the decision of which of these coefficients to consider (in accordance with its significance) in the calculation of trade effects can influence the value of the impact of each measure. Due to this tradeoff, two types of trade effects for NTM were calculated: I) If the coefficient $\beta_{2_n}$, referring to the general impact of an NTM in that product, and at least another one of the coefficients of the interactions ($\beta_{21_n}, \beta_{22_n}$) were significant at 10%, the trade effect type 1 was calculated; and II) if any coefficient ($\beta_{2_n}, \beta_{21_n}, \beta_{22_n}$) was significant at 10%, the trade effect

[11] A trade inducing effect may or may not come in a second stage, when consumers respond to new information provided by NTMs.

type 2 was calculated. Non-compliance with any of these requirements, on the other hand, means that the impact does not differ from zero. Summing up the requirements:

- Trade effect Type 1: Significant market coefficient plus at least one coefficient of the interaction between the NTM and the importer / exporter share significant;
- Trade effect Type 2: At least one of the three coefficients significant;

The next step comprised in transforming these trade effects of imposing an NTM into ad valorem impacts. For this purpose, we use GTAPs elasticities which capture the impact of a price increase in the import quantities across different sectors. Here it is assumed that the impact at the sectorial level is the same as the one at the tariff line level.[12] The following equation shows that the trade effect of imposing an NTM can be decomposed into how the NTM impact prices, i.e. an ad-valorem equivalent, and how the price affects quantities, i.e. import demand elasticity:

$$\frac{\Delta Q_{ijkt}}{\Delta NTM_{ijkt}^{n}} = \frac{\Delta Q_K}{\Delta p_K} * \frac{\Delta p_K}{\Delta NTM_{ijkt}^{n}} = \varepsilon_K * AVE_{ijkt}^{n} \,,$$

where the capital subscript K the GTAP sectorial group. Rearranging the terms and substituting the NTM's trade effects into the equation, AVEs were computed for each NTM type as follows:

$$AVE_{ijkt}^{n} = \frac{\exp\left(\beta_k^n + \beta_{ik}^n * impsh_{ikt} + \beta_{jk}^n * expsh_{jkt}\right) - 1}{\varepsilon_K}.$$

As commonly assumed, a minimum of -100% was set to AVEs based on the intuition that the price cannot drop beyond this value. Given the proposed estimation strategy, AVEs can be calculated for all countries in the sample, independent if there was trade or an NTM in force. However, since the aim of this study is to reach a measure of protection/promotion on trade due to NTMs, only the AVEs for which NTMs were present were considered.

Also, measures which by definition reduce trade (trade defense measures), such as ADP, CV, QR, SG and SSG, but for which the estimation presented a trade promoting impact on the product level average were set to zero. In case there were binding NTMs for a particular HS06 line but the estimated model returned an error, this HS06 line was set to missing. So as to reduce the impact of the missing values, the country-pair-sector group was reweighted and more weight was given to the barrier estimated to a similar product from the bilateral relationship.[13] [14]

The choice to specify the NTM variable as a dummy instead of a variable with the count of measures is mainly because of what we are trying to capture here. When the NTM is inserted in as a binary variable, its accompanying parameter captures the trade protection/promotion related to the existence of this NTM. When a count variable is considered, the parameter captures the mean effect of imposing one additional NTM. Since what we want to capture here is an overall protection/promotion associated with NTMs at the bilateral dimension, the NTM dummy variable was chosen. Another advantage of using the dummy NTM is that it reduces the probability of measurement error from our NTM variable. As previously mentioned, NTM data do not have withdrawal dates for some types of NTM (including TBT and SPS). By using a count variable, some measures that are imposed temporarily will not quit the stock of NTM and inflate the variable. Although the problem is not completely eliminated when the dummy is used, it should be reduced.

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[12] Therefore the price impact on $Q_K$ equals the impact on $Q_{ijkt}$. For more information on import demand elasticities see annex 6.

[13] Whenever all HS06 lines from a country-pair-sector group were missing, no value was input. Cases like these happened seldom.

[14] The impact of setting missing values to zero is assessed in Annex 7 and results did not change much.

## B. Post estimation tests and identification coverage

Before moving to the analysis of results, an initial assessment of the regressions is performed. Out of the 5,111 products of the HS06 1996 classification with data available in the BACI database, 8 non-relevant codes were not considered (stamps, antiques, collections and others). Out of the remaining 5,103 relevant product lines, 326 lines presented some kind of estimation error.[15] Lastly, another 48 HS lines, representing 1.86% of the world trade, were not considered because most of these products' trade (in terms of value) lacked data on its respective traded quantities.[16] Hence, 4,729 regressions were estimated at the product level.

In order to assess if the regressions were correctly specified, the RESET test was performed.[17] Out of the 4,514 models for which there were no errors with the RESET estimation, around 82% of the regression did not reject the null that the model was correctly specified. This test was meant to assess the overall acceptance of the specification and was not taken as a criterion to exclude HS06 lines from the analysis.

All in all, some HS lines were not significant at 10% significance level.[18] As mentioned in the previous section, in order to calculate the marginal effects from an NTM, the significance of three parameters had to be assessed. Two of them are included in the figures: trade effect type 1 (TE1), which was calculated whenever, the product specific parameter ($\beta_{2_n}$) and another importer/exporter parameter ($\beta_{21_n}, \beta_{22_n}$) were jointly significant and trade effect type 2 (TE2), which was calculated whenever any parameter was significant. By construction, the product coverage of TE2 has to be higher or equal to the coverage of TE1. Figure 2 and 3 give a more complete description of the identification coverage of each of these marginal effects by sector of the two main NTM types: SPS and TBT. The figures present the number of products, for which, each kind of trade effect was calculated. Furthermore, one can see the number of products for which there was no SPS/TBT applied at the global level as well as the number of products for which a SPS/TBT existed, but no impact could be identified as statistically significant. Also, there is information on the number of products for which an estimation error occurred. Panel A of both figures displays this information by number of tariff lines while panel B weights each product by 2015's global trade.

The simple average over products shows that trade effects of SPS were calculated for more than 40% of the total tariff lines using TE2 and for less than 20% using TE1. Weighting each tariff line by its relative trade importance gives us slightly higher identification coverage when global trade weights are used. In regard to sectors, SPS TE1 presented high identification coverage for wheat, other cereals, oilseeds, fiber and vegetables, energy mining and dairy products when global trade weights are considered (see Figure 2). On average, products for which an estimation error occurred were not many. Some sectoral aggregation such as the rice and non-energy mining were most affected.

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15 Three types of errors were identified: (i) the PPML function did not converge after innumerous iterations, (ii) a discontinuous region was found in the PPML function and therefore an improvement could not be computed or (iii) the variance matrix was nonsymmetric or highly singular precluding the calculation of standard errors.

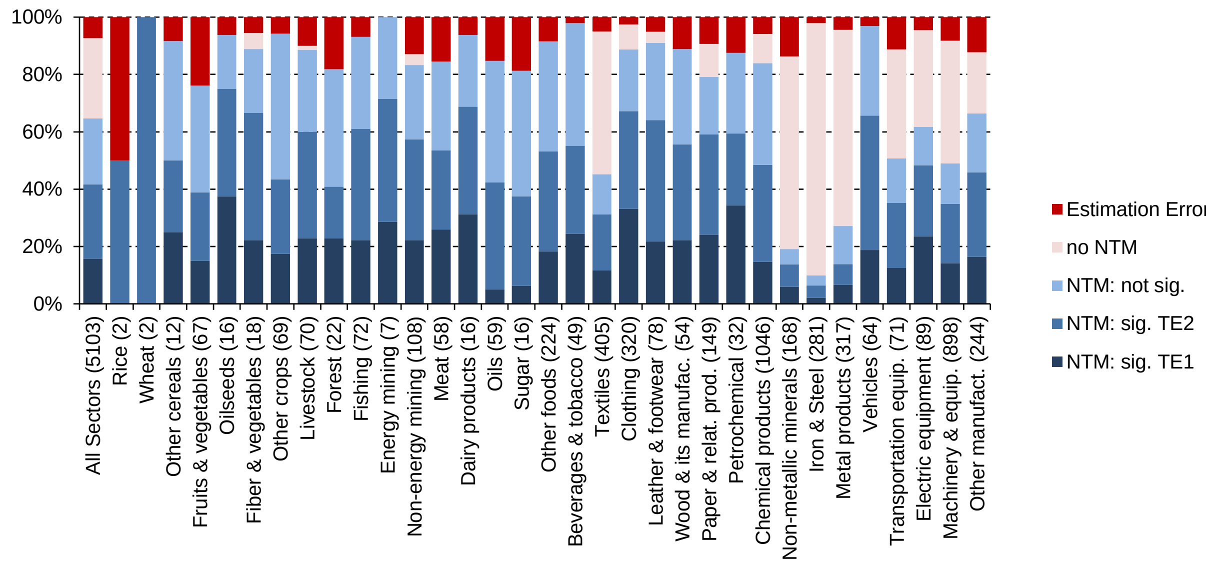
16 This work eliminated 1% of the lines (48) with most missing quantities in terms of traded value. Thus, products for which the missing quantities for the whole panel represented 19% or more of this product's traded value were not taken into account. Among the most relevant products excluded are Non-industrial Diamonds (710231, 710239) and some types of vessels (890190, 890590 and 890520).

17 So as to conduct the test, the regressions for all products were re-estimated but this time including the squared fitted values as an additional regressor. This parameter significance was assessed and whenever this coefficient was statistically significant the model was considered as misspecified. This work used the significance level of 1%.

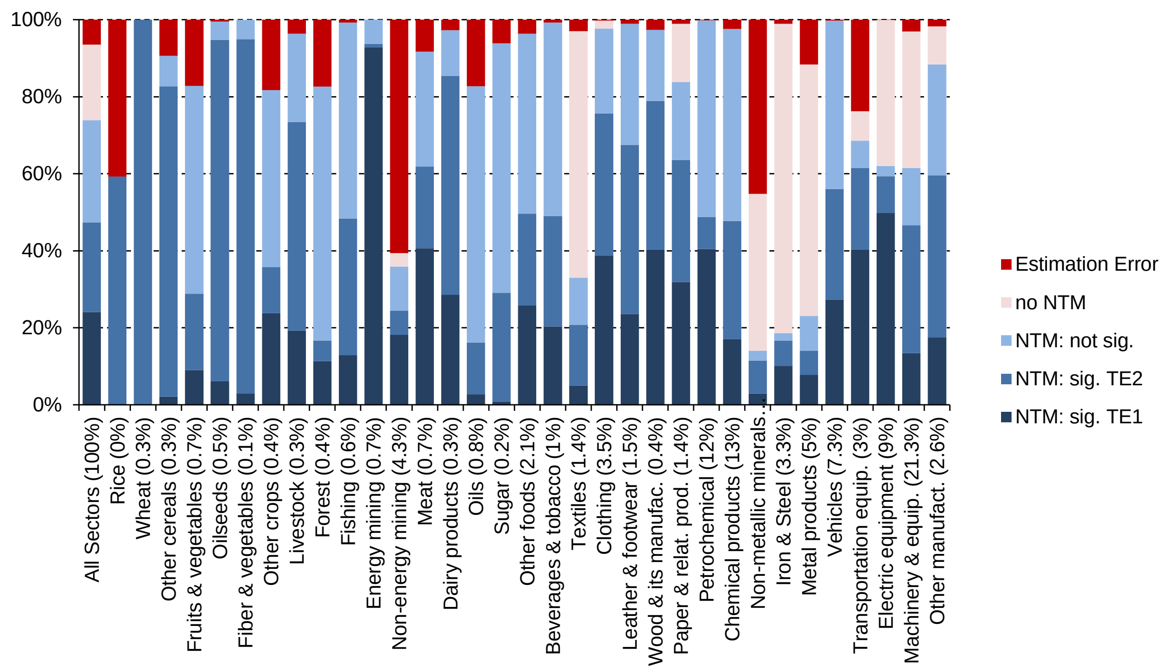
18 Considering trade effect type 1, the identification coverage was higher than in the works of Kee *et al.* (2009) and Bratt (2017) for instance.

**Figure 2**
**Significance of SPS measures by sector**
*(GTAP sector classification, trade weights for 2015)*

A – Simple average over HS06 lines




B – Trade weighted average over total global trade



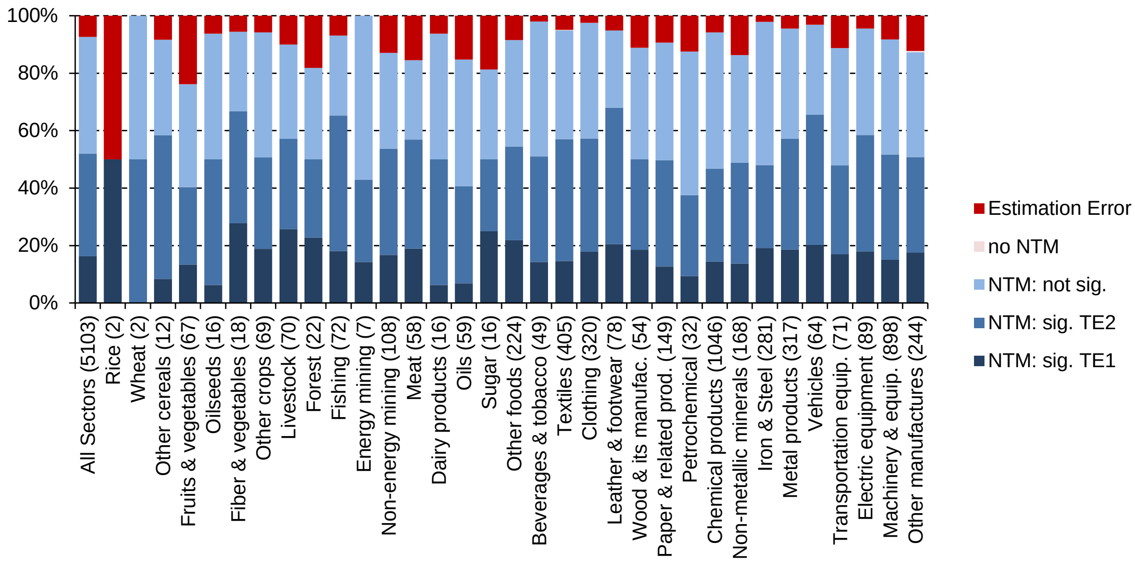

Source: Author's calculations. TE1 and TE2 represent the trade effects type 1 and 2. The light blue bar represents number of products for which there was at least one NTM applied at the global level, not the frequency index for the regional or global trade.

Figure 3 shows somehow similar results for TBT measures. The number of products and share of global trade for which a TE2 was calculated surpasses the 50% threshold. Considering the value traded, some sector showed an increased identification coverage while others showed a decreased coverage.

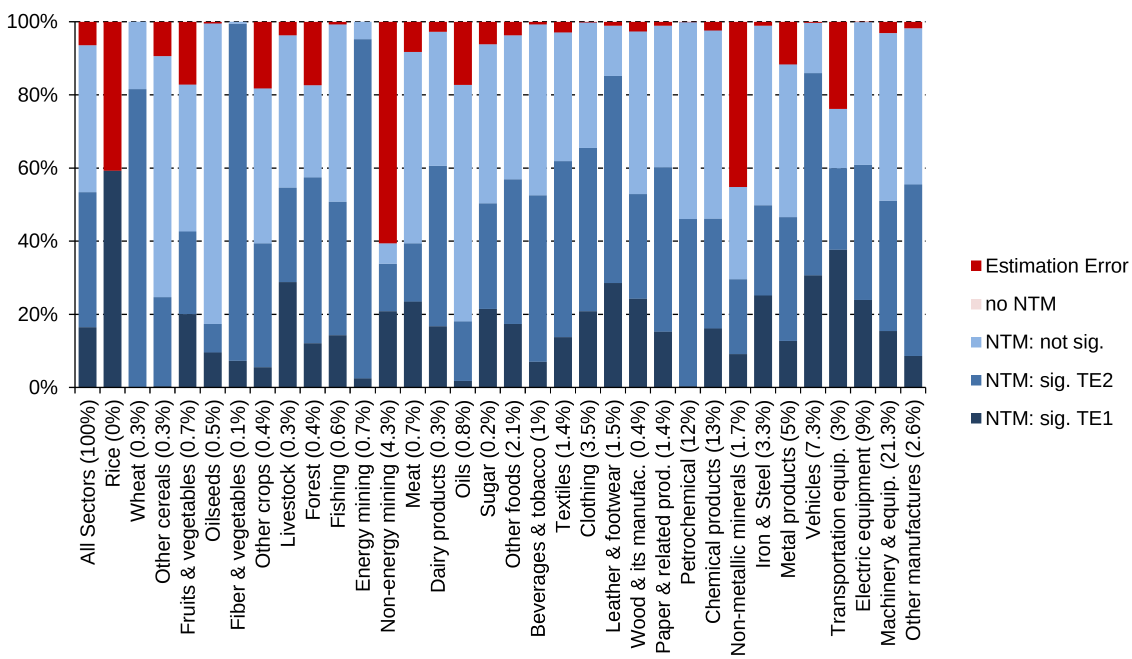
Sectorial trade of vehicles, energy mining, fiber and vegetables among others were more concentrated in tariff lines where a significant impact was found. On the other hand, oils, oilseeds, other cereals had the major part of its trade in non-statistically significant HS06 lines.

**Figure 3**
**Significance of TBT measures by sector**
*(GTAP sector classification, trade weights for 2015)*

A – Simple average over HS06 lines




B – Trade weighted average over total global trade




Source: Author's calculations. TE1 and TE2 represent the trade effects type 1 and 2. The light blue bar represents number of products for which there was at least one NTM applied at the global level, not the frequency index for the regional or global trade.

Turning the analysis to the non-considered lines, the sector of non-energy mining was the most affected, mainly due to the estimation error in non-monetary gold, other unwrought forms (710812). As previously mentioned, non-metallic minerals and transport equipment were also affected by missing data with the dependent variable.

Considering all country pair products for which an NTM was imposed in 2015, positive AVEs were the majority. For both types of marginal effects analyzed, the ratio of positive and negative AVEs was similar. Analyzing AVEs calculated using trade effect type 2, around 65% of all TBT and SPS which were under the influence of a measure had a restrictive impact on trade. The remaining 35% percent promoted trade. For trade effect type 1, the percentage of positive AVEs increased slightly (TBT: 70%; SPS: 66%).

In terms of trade defense measures (ADP, CV, QR, SG and SSG) the significance also increases when TE2 is considered instead of TE1. For TE2 estimates, AVEs not statistically different from zero varied from 45% for quantitative restrictions to 26% for countervailing measures. Most of trade defense measure output a negative impact on trade. Still, a relevant share of country-pair products was estimated to impact trade positively. The percentage of country-pair products with negative AVEs (positive trade effects), which were set to zero, for TDM were respectively: 41% for SG, 33% for ADP and CV, 31% for QR and 24% for SSG. As for SPS and TBT, when TE1 was considered, the percentage of positive AVEs was larger.

In order to increase the identification coverage, the next section presents AVE estimated based on trade effect type 2. Annex 7 analyzes different robustness checks of these estimates.

## C. Estimates of AVE of NTMs

This work made an effort to include the greatest number of countries possible in the analysis. The number of importers included in the analysis were 153, which comprise only WTO members present in the BACI database. Countries were included in the panel from their WTO's entrance date onwards, in case they joined the organization after the year 2001. The affected country sample contained additional countries and reached the count of 182. After estimation, the countries in the sample were split into ten groups according to their geographical location. The results presented here cover most of global trade under the influence of NTMs.[19]

Before moving on, it is important to echo the remarks of Cadot et al. (2018a) regarding the interpretation of country specific AVE effects. Consider first the case of technical regulations (SPS and TBT), and suppose that two importing countries share the same body of regulations (e.g. two EU countries) but the first imports more from countries with weak SPS infrastructures (assuming also alike product import structures). While identical with those of the second importing country, its regulations will require more adaptation from origin producers, and hence will entail higher AVEs. Likewise, product-composition effects will affect average AVEs. For example, a country importing more highly sensitive products will have a mechanically higher average AVE for SPS measures than a county that imports less sensitive products.

That said, this work presents two set of results according to the direction of trade effects. The first set of results averages both positive and negative volume trade effects of SPS/TBT while considering only negative trade effects for TDMs. As previously mentioned, some NTMs (trade defense measures - TDM) are expected to reduce trade, but this must not be the case for standard-like measures (SPS and TBT). As commonly accepted by the literature; measures such as SPS and TBT may present trade inducing effects. This happens because a new regulation might reduce information asymmetries,

[19] See annex 1 for details on country coverage and annex 3 for this section trade coverage.

increase consumer trust and assure a product's quality, which can induce an increase in demand. A second set of results assesses only costs estimates of NTMs (following the work of UNCTAD-World Bank, 2018). Here, only negative volume estimates (positive AVEs) at the HS06 level are taken into account for the averages.

## 1. Cost and benefits of NTMs

Altogether results show that most NTMs increase the costs of trade. In aggregated terms, even when standard like measures are allowed to promote trade, trade reducing effects of NTMs appear to exceed trade promoting effects. As a consequence, global trade faces an additional AVE barrier of 2.38% due to NTMs. Quantitative restrictions and technical barriers to trade are the most restrictive measures, with an AVE close to unity. Although many SPS restrict trade, the trade weighted aggregated impact of SPS measures appear to be small and trade promoting. Another conclusion that can be inferred from the initial analysis is that trade defense measures, such as ADP, CV, SG and SSG, presented a small trade weighted AVE barrier. This happened mainly due to its low coverage ratio (see Table 3).

**Table 7**
**Cost and benefits of NTMs: AVE of NTM imposed by different regions**
*(Trade weighted average, 2015)*

| Regions | Total | ADP | CV | QR | SG | SPS | SSG | TBT |
|---|---|---|---|---|---|---|---|---|
| Latin America and the Caribbean | 0.51 | 0.03 | 0.00 | 0.05 | 0.02 | -0.53 | 0.00 | 0.94 |
| United States | 3.70 | 0.21 | 0.10 | 0.31 | 0.08 | -0.52 | 0.05 | 3.49 |
| Canada | 1.46 | 0.01 | 0.03 | 0.22 | 0.00 | -0.18 | 0.00 | 1.39 |
| European Union | 0.73 | 0.04 | 0.01 | 0.25 | 0.00 | -0.27 | 0.00 | 0.69 |
| Japan | 5.40 | 0.00 | 0.00 | 4.81 | 0.00 | -0.06 | 0.03 | 0.62 |
| China | 7.40 | 0.06 | 0.00 | 2.86 | 0.00 | 0.93 | 0.00 | 3.55 |
| Other Asia Pacific | 1.88 | 0.04 | 0.00 | 2.25 | 0.01 | -0.16 | 0.01 | -0.27 |
| Middle East and North Africa | 0.97 | 0.02 | 0.00 | 0.88 | 0.02 | -0.08 | 0.00 | 0.13 |
| Sub-Saharan Africa | -0.06 | 0.00 | 0.00 | 0.03 | 0.00 | 0.04 | 0.00 | -0.14 |
| Rest of World | -1.65 | 0.01 | 0.00 | 1.89 | 0.02 | -0.03 | 0.00 | -3.54 |
| World | 2.38 | 0.07 | 0.02 | 1.30 | 0.02 | -0.14 | 0.01 | 1.10 |

Source: Author's calculations. Note: Intra-European trade not considered. Missing estimates were replaced by bilateral AVEs of similar products.

Breaking down the impact of NTMs over different countries/regions reveals that China, the United States, Japan and Canada impose a higher trade barrier coming from the NTMs when compared to customs tariffs. On the other side, the current structure of NTMs in Sub-Saharan Africa and the Rest of World appeared to promote trade. Splitting these aggregated results into the different types of NTMs gives us a better understanding of the impact. Asian countries trade protection is increased by more than 2% due to quantitative restrictions. The structure of SPS regulations imposed worldwide seems to be trade promoting or close to zero in almost all regions, except in China, where these measures pose an additional barrier of approximately 1%. Table 7 summarizes these results.

The way the regressions were specified gives the possibility to analyze which countries face the most restrictive barriers. Table 8 shows the results for the selected country groups. Exports from Canada, Latin America and the Caribbean and Other Asia-Pacific countries faced the highest barrier due to NTM to enter its destination domestic market. Exporters from these regions faced an AVE barrier equivalent of an increase of more than 4% in its tariffs. Again, most of the restrictiveness came from TBT and QR measures. Result for SPS and TBT are influenced not only by what each country exports but also by its capability to comply with foreign regulations.

**Table 8**
**Cost and benefits of NTMs: AVE of NTM affecting different regions**
*(Trade weighted average, 2015)*

| Regions | Total | ADP | CV | QR | SG | SPS | SSG | TBT |
|---|---|---|---|---|---|---|---|---|
| Latin America and the Caribbean | 4.34 | 0.15 | 0.00 | 0.36 | 0.02 | 0.02 | 0.03 | 3.75 |
| United States | 1.93 | 0.02 | 0.00 | 1.00 | 0.00 | 0.46 | 0.02 | 0.44 |
| Canada | 4.53 | 0.00 | 0.00 | 0.45 | 0.10 | 0.03 | 0.04 | 3.91 |
| European Union | 1.29 | 0.01 | 0.00 | 1.26 | 0.03 | -0.17 | 0.02 | 0.14 |
| Japan | 3.88 | 0.04 | 0.00 | 1.57 | 0.03 | -0.14 | 0.00 | 2.39 |
| China | 0.99 | 0.20 | 0.10 | 1.84 | 0.02 | -0.48 | 0.00 | -0.69 |
| Other Asia Pacific | 4.20 | 0.03 | 0.01 | 1.99 | 0.02 | -0.24 | 0.02 | 2.37 |
| Middle East and North Africa | 1.56 | 0.00 | 0.00 | 0.80 | 0.01 | 0.09 | 0.00 | 0.65 |
| Sub-Saharan Africa | -1.56 | 0.00 | 0.00 | 0.53 | 0.00 | -0.48 | 0.01 | -1.62 |
| Rest of World | 2.37 | 0.01 | 0.00 | 0.58 | 0.01 | -0.27 | 0.01 | 2.04 |
| World | 2.38 | 0.07 | 0.02 | 1.30 | 0.02 | -0.14 | 0.01 | 1.10 |

Source: Author's calculations. Note: Intra-European trade not considered. Missing estimates were replaced by bilateral AVEs of similar products.

Another dimension, which enlightens the analysis, is the sectoral one. The sector most affected by NTMs is the cars and transportation equipment sector. This sector's additional trade cost comes mainly from TBT. NTMs also restrict trade in Agriculture, hunting and fishing, being SPS and QR barriers the most restrictive NTMs in this sector and accounting for an AVE impact close 2%. Oil extraction and mining as well as machinery and equipment pose relevant barriers to trade, with an impact larger than 2%. On the other hand, the global trade structure of some sectors presented a trade promoting AVE. AVEs of TBT in non-metallic minerals, metal and derivatives and textiles, footwear and clothing presented the largest negative estimate, with values inferior to -1%. Quantities restrictions in machinery and equipment respond to most of this sectors NTM barrier.

**Table 9**
**Cost and benefits of NTMs: AVE of NTM affecting different sectors**
*(All NTMs, trade weighted average, 2015)*

| Sectors | Total | ADP | CV | QR | SG | SPS | SSG | TBT |
|---|---|---|---|---|---|---|---|---|
| Agriculture, hunting and fishing | 4.23 | 0.31 | 0.00 | 1.76 | 0.00 | 1.66 | 0.00 | 0.51 |
| Oil extraction and mining | 2.62 | 0.00 | 0.00 | 0.83 | 0.00 | -0.32 | 0.00 | 2.10 |
| Processed foods, beverages and tobacco | 0.12 | 0.05 | 0.01 | 0.73 | 0.01 | -0.22 | 0.27 | -0.73 |
| Textiles, footwear and clothing | -0.60 | 0.03 | 0.09 | 0.84 | 0.02 | -0.33 | 0.00 | -1.24 |
| Wood and paper | 0.70 | 0.29 | 0.12 | 0.87 | 0.00 | -0.14 | 0.00 | -0.44 |
| Chemical and petrochemical | 1.69 | 0.06 | 0.00 | 0.98 | 0.00 | -0.34 | 0.00 | 0.98 |
| Non-metallic minerals | -1.87 | 0.12 | 0.01 | 0.34 | 0.00 | -0.04 | 0.00 | -2.30 |
| Metals and derivatives | -0.48 | 0.23 | 0.06 | 0.55 | 0.18 | -0.07 | 0.00 | -1.43 |
| Cars and transportation equipment | 9.65 | 0.03 | 0.00 | 0.98 | 0.01 | -0.56 | 0.00 | 9.18 |
| Machinery and equipment | 2.47 | 0.01 | 0.03 | 2.21 | 0.00 | 0.00 | 0.00 | 0.22 |
| Other manufactures | 0.23 | 0.12 | 0.00 | 0.75 | 0.00 | -0.09 | 0.00 | -0.55 |
| **World** | 2.38 | 0.07 | 0.02 | 1.30 | 0.02 | -0.14 | 0.01 | 1.10 |

Source: Author's calculations. Note: Intra-European trade not considered. Missing estimates were replaced by bilateral AVEs of similar products.

## 2. Cost estimates of NTMs

So far, aggregated results containing both positive and negative AVEs were displayed. Considering the potential positive trade effect of NTMs may hinder negative impacts from other products in the aggregation. Therefore, now we analyze the cost estimates of NTMs. Here, negative AVEs of TBT and SPS at the product level are to zero (as in UNCTAD-World Bank, 2018).

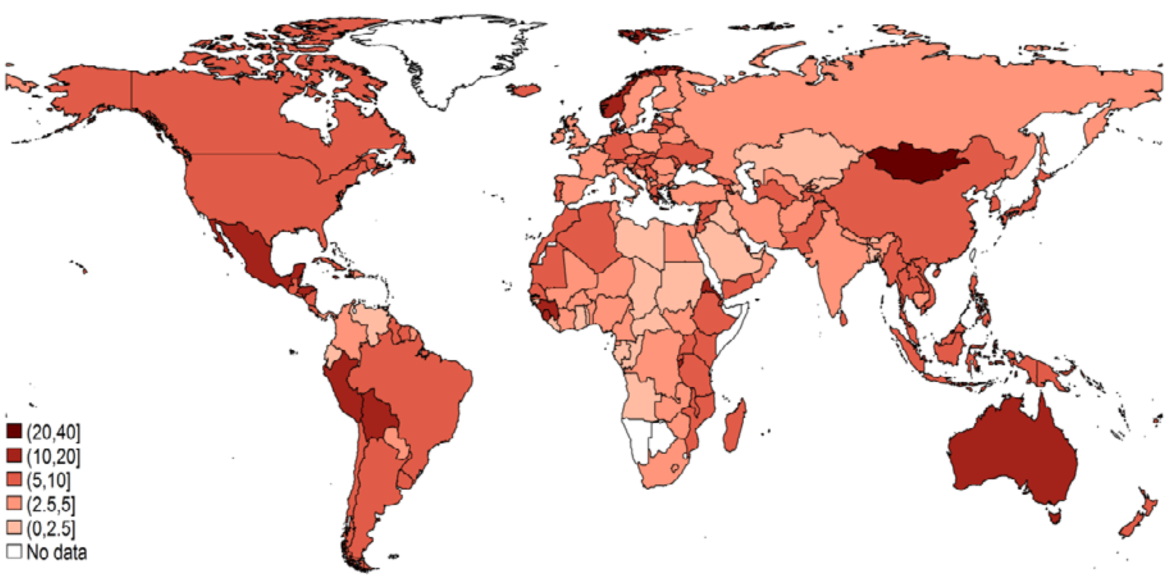
As expected, when only positive AVEs of NTMs are taken into account, the overall AVE increases in magnitude. The overall AVE of NTM is now associated with a 6.23% tariff, which is mostly attributed to TBT measures. Table 10 gives us an insight on how NTM affect importers and exporters from different regions. China and the United States' NTMs add the highest cost to global trade. This in turn might be linked to these countries' reporting capacity. On the exporter side, the effect is more spread and appears to hit harder on Latin American, Caribbean and Canadian exporters, which face an estimated additional barrier of almost 10%. NTMs form Middle East and African countries impose and receive the smallest barrier to trade. The disaggregated impact over all exporters considered in this work is shown in figure 4. Table 11 shows how the bilateral cost of NTMs are spread across partners.

**Table 10**
**Cost estimates of NTMs: AVE of NTM across regions**
*(Trade weighted average, 2015)*

| Regions | Imposing (Importer) Country | | | | Affected (Exporter) Country | | | |
|---|---|---|---|---|---|---|---|---|
| | Total | SPS | TBT | TDM | Total | SPS | TBT | TDM |
| Latin America and the Caribbean | 3.58 | 0.80 | 2.68 | 0.10 | 9.38 | 2.30 | 6.51 | 0.57 |
| United States | 10.01 | 1.46 | 7.81 | 0.74 | 5.51 | 1.41 | 3.07 | 1.04 |
| Canada | 5.56 | 0.76 | 4.55 | 0.26 | 9.75 | 2.06 | 7.09 | 0.59 |
| European Union | 4.73 | 1.03 | 3.40 | 0.31 | 5.45 | 0.99 | 3.14 | 1.32 |
| Japan | 9.77 | 1.03 | 3.90 | 4.84 | 7.41 | 0.56 | 5.21 | 1.63 |
| China | 11.19 | 2.30 | 5.97 | 2.92 | 5.40 | 0.50 | 2.74 | 2.16 |
| Other Asia Pacific | 4.23 | 0.53 | 1.39 | 2.31 | 7.25 | 0.93 | 4.25 | 2.07 |
| Middle East and North Africa | 2.91 | 0.40 | 1.59 | 0.92 | 3.93 | 0.83 | 2.29 | 0.82 |
| Sub-Saharan Africa | 0.92 | 0.16 | 0.73 | 0.04 | 4.07 | 0.69 | 2.85 | 0.54 |
| Rest of World | 3.50 | 0.58 | 1.01 | 1.92 | 5.40 | 0.86 | 3.94 | 0.60 |
| **World** | 6.23 | 1.02 | 3.78 | 1.42 | 6.23 | 1.02 | 3.78 | 1.42 |

Source: Author's calculations. Note: Intra-European trade not considered. Missing estimates were replaced by bilateral AVEs of similar products.

**Map 1**
**Cost estimates of NTMs: AVE of NTM faced by different exporters**
*(Trade weighted average, 2015)*




Source: Author's calculations. Note: Intra-European trade not considered. Missing estimates set to zero.
Note: The boundries and names shown on this map do not imply official endorsement or acceptance of the United Nations.

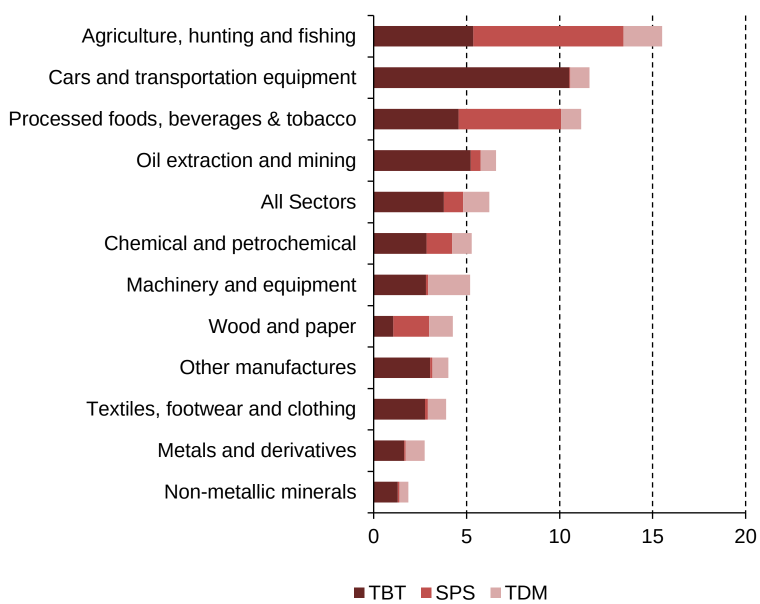
**Table 11**
**Cost estimates of NTMs: AVE of NTM affecting different regions**
*(All NTMs, trade weighted average, 2015)*

| Imposing (Importer) Regions | Affected (Exporter) Regions | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Latin America and the Caribbean | United States | Canada | EU | Japan | China | Other Asia Pacific | Middle East & North Africa | Sub-Saharan Africa | Rest of World | World |
| Latin America & Caribbean | 3.8[a] | 4.3 | 4.3 | 2.8 | 3.0 | 2.7 | 3.1 | 5.4 | 4.0 | 3.3 | 3.6 |
| United States | 11.9 | | 11.3 | 10.0 | 14.3 | 8.5 | 8.9 | 3.5 | 6.9 | 8.0 | 10.0 |
| Canada | 7.9 | 6.2 | | 4.1 | 6.1 | 3.5 | 4.8 | 1.9 | 4.9 | 4.0 | 5.6 |
| European Union | 6.4 | 4.0 | 3.0 | | 4.9 | 3.8 | 5.1 | 3.8 | 4.2 | 6.2 | 4.7 |
| Japan | 12.4 | 9.8 | 8.4 | 7.1 | | 10.1 | 10.7 | 9.9 | 9.2 | 7.3 | 9.8 |
| China | 18.0 | 14.0 | 10.7 | 10.1 | 10.3 | | 12.3 | 6.8 | 5.2 | 5.7 | 11.2 |
| Other Asia Pacific | 5.2 | 3.8 | 4.2 | 3.6 | 4.4 | 5.2 | 5.0[b] | 2.1 | 2.0 | 1.7 | 4.2 |
| Middle East and North Africa | 4.7 | 3.0 | 3.2 | 2.5 | 2.8 | 2.6 | 3.1 | | 2.8 | 4.4 | 2.9 |
| Sub-Saharan Africa | 1.6 | 0.7 | 1.2 | 0.8 | 1.1 | 1.0 | 1.4 | 0.3 | | 0.8 | 0.9 |
| Rest of World | 5.4 | 2.7 | 1.5 | 3.5 | 3.5 | 4.3 | 3.8 | 2.0 | 2.1 | | 3.5 |
| World | 9.4 | 5.5 | 9.7 | 5.5 | 7.4 | 5.4 | 7.2 | 3.9 | 4.1 | 5.4 | 6.2 |

Source: Author's calculations. Note: Intra-European trade not considered. Missing estimates were replaced by bilateral AVEs of similar products.
[a] This value does not take into account intra-regional trade for group "rest of Caribbean".
[b] This value does not take into account intra-regional trade for ASEAN and countries of the GTAP group "Other Asia Pacific". See annex 1 and 2.

Agriculture, hunting and fishing is the sector most affected by NTMs. An additional cost of around 15% was estimated with SPS being the most burdensome measure. When compared to the average considering trade promoting and restrictive measures, this value increased in more than ten percentage points. This means that a relevant part of the trade was under trade promoting NTMs. This was not the case for NTMs in the sector of cars and transport equipment. This sector's AVE increased slightly to around 11%. On the other side, among the less restrictive NTMs are those covering the trade of non-metallic mineral, metals and derivatives.

**Figure 4**
**Cost estimates of NTMs: AVE of NTM affecting different sectores**
*(Trade weighted average, 2015)*




Source: Author's calculations.
Note: Intra-European trade not considered. Missing estimates were replaced by bilateral AVEs of similar products.

### 3. Intra-regional trade: AVE of NTMs in Latin America and the Caribbean

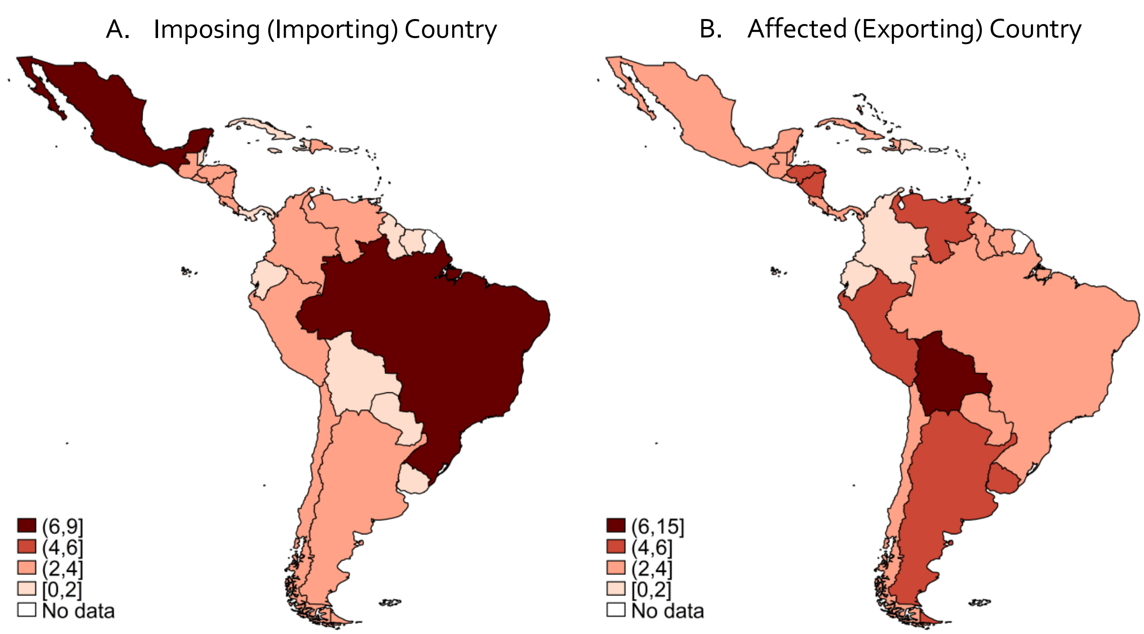
Aiming to identify potential unseen barriers from NTMs within Latin America and the Caribbean, cost estimates were also calculated for intra-regional trade. Intra-regional NTMs impose an additional cost of 3.85% to trade. SPS and TBT are the main contributors for the estimated barrier, with the AVE of TBT being twice the AVE of SPS. Agriculture, hunting and fishing presented the highest AVE (8.4%) followed by the sector of processed foods, beverages and tobacco (5.6%) and chemical and petrochemical (4.36%).

Brazil and Mexico were the countries, in which NTMs imposed the highest barrier for imports, with an AVE of 8.2% and 6.3% (see panel A of Figure 6). Brazilian NTMs additional trade cost come mainly from the chemical and petrochemical sector (14.1%) and agriculture, hunting and fishing (11.5%). Oil extraction and mining and cars and transport equipment are the sectors in which NTMs appear to add more cost to trade, with an AVE estimate of 18.8% and 11.1% respectively. The greater reporting capacity of these countries might be correlated with this higher barrier.

On the exporter's side, Bolivia is the country most affected by regional NTMs (see panel B of map 2). The country's chemical and petrochemical is the most affected sector. Trinidad and Tobago, Uruguay, Venezuela, Argentina, Nicaragua and Honduras also face a relatively high cost to export to the region due to NTMs. All of them face an AVE of NTM superior to 4%. In most cases, agriculture, hunting and fishing is the sector with the highest intra-regional barrier.

Information on how barriers are spread across a broad category of products is displayed in Table 12. Primary products are the most affected products with an AVE of 7.1%, mainly because of the high coverage of both SPS and TBT. Colombia, Panama, Mexico and Jamaica impose a barrier above 10% on such products, which in turn affects Argentina, Peru, Costa Rica and some Caribbean countries, the most. Light and heavy manufactures presented a similar intra-regional AVE barrier close to 3.5%.

**Map 2**
**Cost estimates of NTMs: Intra-regional AVE of NTM**
*(Trade weighted average, 2015)*




Source: Author's calculations.
Note: The boundries and names shown on this map do not imply official endorsement or acceptance of the United Nations.

**Table 12**
**Cost estimates of NTMs: AVE of NTM affecting different regions**
*(All NTMs, trade weighted average, 2015)*

| | Imposing (importing) country | | | | Exporting (affected) country | | | |
|---|---|---|---|---|---|---|---|---|
| | Total | Primary products | Light manufact. | Heavy manufact. | Total | Primary products | Light manufact. | Heavy manufact. |
| Argentina | 3.6 | 2.8 | 3.2 | 3.7 | 4.8 | 11.1 | 5.5 | 3.1 |
| Brazil | 8.2 | 9.9 | 7.7 | 7.9 | 2.7 | 5.3 | 4.3 | 2.1 |
| Paraguay | 1.5 | 5.2 | 2.7 | 0.8 | 3.2 | 5.5 | 2.0 | 2.2 |
| Uruguay | 1.9 | 4.1 | 1.1 | 2.0 | 5.6 | 9.5 | 7.7 | 2.9 |
| Venezuela | 3.8 | 7.8 | 5.8 | 0.4 | 5.4 | 2.6 | 0.9 | 5.6 |
| Chile | 3.6 | 2.2 | 5.2 | 3.2 | 3.1 | 7.6 | 3.1 | 1.1 |
| Bolivia | 0.3 | 0.5 | 1.3 | 0.0 | 14.3 | 6.5 | 1.1 | 18.1 |
| Colombia | 2.9 | 10.6 | 2.5 | 2.6 | 1.7 | 0.7 | 3.2 | 1.4 |
| Ecuador | 2.0 | 4.5 | 1.5 | 2.0 | 0.9 | 0.3 | 2.3 | 0.3 |
| Peru | 2.1 | 2.7 | 3.2 | 1.6 | 4.6 | 11.5 | 4.3 | 2.6 |
| Mexico | 6.3 | 12.4 | 4.7 | 6.0 | 3.3 | 3.4 | 3.4 | 3.3 |
| Costa Rica | 2.9 | 6.1 | 3.6 | 2.3 | 3.0 | 14.2 | 2.9 | 2.1 |
| El Salvador | 3.1 | 7.8 | 3.7 | 2.1 | 2.9 | 8.4 | 3.8 | 1.8 |
| Guatemala | 2.4 | 5.8 | 4.2 | 1.2 | 3.2 | 3.5 | 4.5 | 2.1 |
| Honduras | 2.6 | 4.5 | 3.8 | 1.3 | 4.9 | 6.6 | 5.0 | 4.4 |
| Nicaragua | 2.7 | 8.7 | 3.4 | 1.7 | 4.7 | 5.0 | 4.1 | 5.6 |
| Panama | 1.2 | 11.7 | 4.3 | 0.4 | 3.7 | 4.4 | 1.7 | 4.1 |
| Dominican Rep. | 3.3 | 8.5 | 4.6 | 2.0 | 0.9 | 1.9 | 0.5 | 1.0 |
| Jamaica | 1.4 | 12.2 | 3.0 | 0.2 | 1.9 | 0.2 | 3.6 | 0.1 |
| Trinidad & Tobago | 0.4 | 0.1 | 0.2 | 0.6 | 9.6 | 17.7 | 2.0 | 9.9 |
| Rest of Caribbean | 0.3 | 0.3 | 0.4 | 0.3 | 3.7 | 12.2 | 4.8 | 0.9 |
| Intra-regional Total | 3.9 | 7.1 | 3.9 | 3.4 | 3.9 | 7.1 | 3.9 | 3.4 |

Source: Author's calculations.
Note: Missing estimates were replaced by bilateral AVEs of similar products.

## D. Total trade protection

Total trade protection is then calculated by adding up the estimated AVE of NTMs with customs tariffs. Table 13 presents an estimated ad-valorem total trade protection imposed and faced by different countries/regions in the world, taking into account the costs and benefits deriving from NTMs. China, Sub-Saharan African countries, Japan and Latin American and Caribbean countries were the ones imposing the highest barriers for foreign products. In the case of Japan and China, NTMs represented great part of this burden. For Latin America, the Caribbean and Sub-Saharan Africa, tariffs were the main barrier. Influenced by the lowest coverage ratios among the selected countries, Sub-Saharan Africa and Middle East and North Africa presented a small barrier coming from NTMs.

Figures increase when only costs estimates are contemplated. Now, the burden from NTM increases to more than twice of ordinary tariffs. While developed countries impose the highest protection, Asian countries, alongside with Canada and Latin America and the Caribbean are the countries suffering more with such protection. Exporters from developing regions have a protection coming from NTM more than two times larger than that coming from tariffs. While Latin America and the Caribbean's imposed protection from NTMs is smaller than tariff protection, the barrier faced by the region's exporters is almost 4 times larger than the tariff barrier (see table 14).

**Table 13**
**Trade protection considering tariffs and costs/benefits of non-tariff measures**
*(Selected countries and regions, in percentages, 2015)*

| Country/Regions | Protection imposed to Imports | | | Protection faced by Exports | | |
|---|---|---|---|---|---|---|
| | Applied Tariff (1) | AVE of NTMs (2) | Total protection (1+2) | Applied Tariff (3) | AVE of NTMs (4) | Total protection (3+4) |
| Latin America and the Caribbean | 5.4 | 0.5 | 5.9 | 2.4 | 4.3 | 6.7 |
| United States | 1.5 | 3.7 | 5.2 | 3.3 | 1.9 | 5.2 |
| Canada | 1.1 | 1.5 | 2.6 | 1.1 | 4.5 | 5.7 |
| European Union | 2.2 | 0.7 | 2.9 | 3.7 | 1.3 | 5.0 |
| Japan | 2.3 | 5.4 | 7.7 | 4.3 | 3.9 | 8.1 |
| China | 3.9 | 7.4 | 11.3 | 3.6 | 1.0 | 4.6 |
| Other Asia Pacific | 3.6 | 1.9 | 5.5 | 3.2 | 4.2 | 7.4 |
| Middle East and North Africa | 3.6 | 1.0 | 4.5 | 1.7 | 1.6 | 3.2 |
| Sub-Saharan Africa | 8.2 | -0.1 | 8.1 | 1.6 | -1.6 | 0.0 |
| Rest of World | 2.1 | -1.7 | 0.4 | 2.0 | 2.4 | 4.4 |
| World | 3.0 | 2.4 | 5.4 | 3.0 | 2.4 | 5.4 |

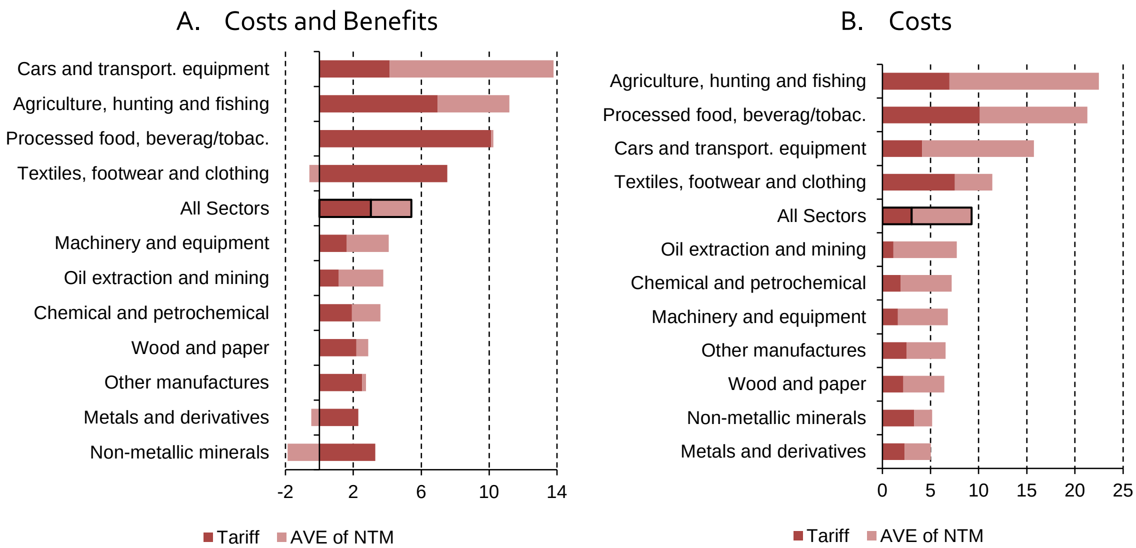
Source: Author's calculations.
Note: Intra-European trade not considered for weighting tariffs and AVEs of NTMs.

**Table 14**
**Trade protection considering tariffs and costs of non-tariff measures**
*(Selected countries and regions, in percentages, 2015)*

| Country/Regions | Protection imposed to Imports | | | Protection faced by Exports | | |
|---|---|---|---|---|---|---|
| | Applied Tariff (1) | AVE of NTMs (2) | Total protection (1+2) | Applied Tariff (3) | AVE of NTMs (4) | Total protection (3+4) |
| Latin America and the Caribbean | 5.4 | 3.6 | 9.0 | 2.4 | 9.4 | 11.8 |
| United States | 1.5 | 10.0 | 11.5 | 3.3 | 5.5 | 8.8 |
| Canada | 1.1 | 5.6 | 6.7 | 1.1 | 9.7 | 10.9 |
| European Union | 2.2 | 4.7 | 6.9 | 3.7 | 5.5 | 9.1 |
| Japan | 2.3 | 9.8 | 12.0 | 4.3 | 7.4 | 11.7 |
| China | 3.9 | 11.2 | 15.1 | 3.6 | 5.4 | 9.0 |
| Other Asia Pacific | 3.6 | 4.2 | 7.8 | 3.2 | 7.2 | 10.4 |
| Middle East and North Africa | 3.6 | 2.9 | 6.5 | 1.7 | 3.9 | 5.6 |
| Sub-Saharan Africa | 8.2 | 0.9 | 9.1 | 1.6 | 4.1 | 5.6 |
| Rest of World | 2.1 | 3.5 | 5.6 | 2.0 | 5.4 | 7.4 |
| World | 3.0 | 6.2 | 9.2 | 3.0 | 6.2 | 9.3 |

Source: Author's calculations.
Note: Intra-European trade not considered for weighting tariffs and AVEs of NTMs.

**Figure 5**
**Overall AVE barrier over sectors: NTMs and tariffs**
*(In ad-valorem percentages)*




Source: Author's calculations. Note: Intra-European trade not considered for weighting tariffs and AVEs of NTMs.

In terms of sectoral protection and considering the trade inducing effects of NTMs, cars and transport equipment is the most protected sector, with an estimated protection summing up to 15% of its value. Agriculture, hunting and fishing follows with an AVE barrier of 11.2%, with 4.2% coming from NTMs. Processed food, beverages and tobacco and textiles, footwear and clothing complete the list of sectors with a protection superior to that of all sectors (panel A, figure 5).

Agriculture, hunting and fishing as well as processed foods, beverages and tobacco are the most protected sectors, with an overall protection of more than 20% when only cost estimates are considered (panel B, figure 5). The former displayed the highest AVE of NTM (15.5%). Natural resources related sectors such as non-metallic minerals and metals and derivatives, on the other hand, show the smallest barrier to trade with an overall AVE protection of 5%.

Given this overview of how NTMs and tariffs protect the domestic market of different economies, the following section sets to simulate potential effects coming as a result of removing this protection for intra-regional trade in Latin America and the Caribbean.

# IV. A Latin American Free Trade Agreement (FTA): incorporating NTMs into a CGE framework

This section introduces NTMs in the analysis of a computable general equilibrium (CGE) model. The objective here is to analyze potential effects from a regional trade agreement among all countries in Latin America and the Caribbean (LAC). Simulations were carried out using a CGE model and reflect the economic effects of a potential change in trade and regulation policies leading to a full reduction of tariffs in Latin America, together with a harmonization of NTMs (SPS and TBT) and the elimination of trade defense NTMs (such as ADP, ADPINV, QR, SG and SSG).

The proposed simulation exercises are based on the bilateral applied tariff database included in the database of the Global Trade Analysis Project (GTAP), as well as on the cost estimates of ad valorem equivalents for bilateral trade of each country. As previously mentioned, the model considers a set of 33 sectors, and 34 countries with a higher disaggregation level for Latin American countries (see annex 1). These AVE of NTMs estimates were used to update the baseline of tariffs for the GTAP multi-country model and to define macroeconomic conditions that consider the degree of tariff protection including both bilateral tariffs and the econometrically estimated AVEs of NTMs. The complete description of the model and the details of the databases considered for its calibration can be assessed in Schuschny, Durán and De Miguel (2007). Three analytical scenarios, describing different levels of regional integration, were defined in order to estimate the potential effects of a regional FTA.

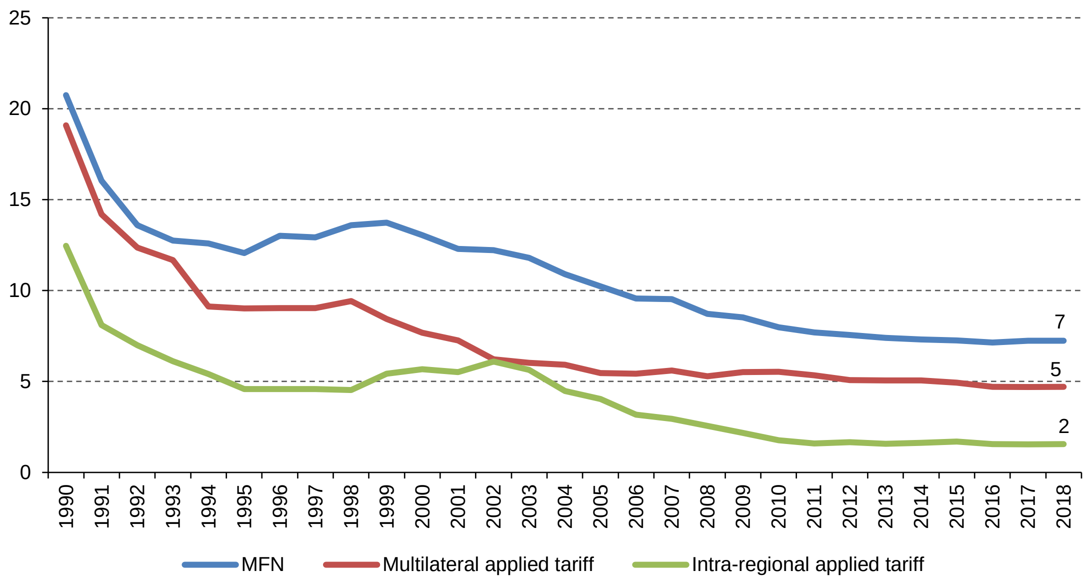
At the end of this section, we present the macroeconomic results that account for the impacts on production, trade and employment, as well as some conclusions that could be derived for the regional integration strategy in Latin America and the Caribbean.

### Tariff and non-tariff protection

The Latin America and the Caribbean region applied in 2018 an average MFN tariff of 7%. This is a rather small percentage compared to the 1990 average when the multilateral regional tariff was 21%. Since then countries of the region have been deepening their intra-regional relations by negotiating regional trade agreements and reducing intra-regional tariff preferences; a process which intensified during the

2000s. This has led to tariff reduction in the applied tariff from 7% to 5%, and up to 2% when considering the intra-regional preferences applied by neighbors (see figure 6).

**Figure 6**
**Latin America and the Caribbean: evolution of the multilateral MFN tariff and applied tariff, and intra-regional applied tariff, 1990-2018**
*(Trade weighted average in ad-valorem percentages)*

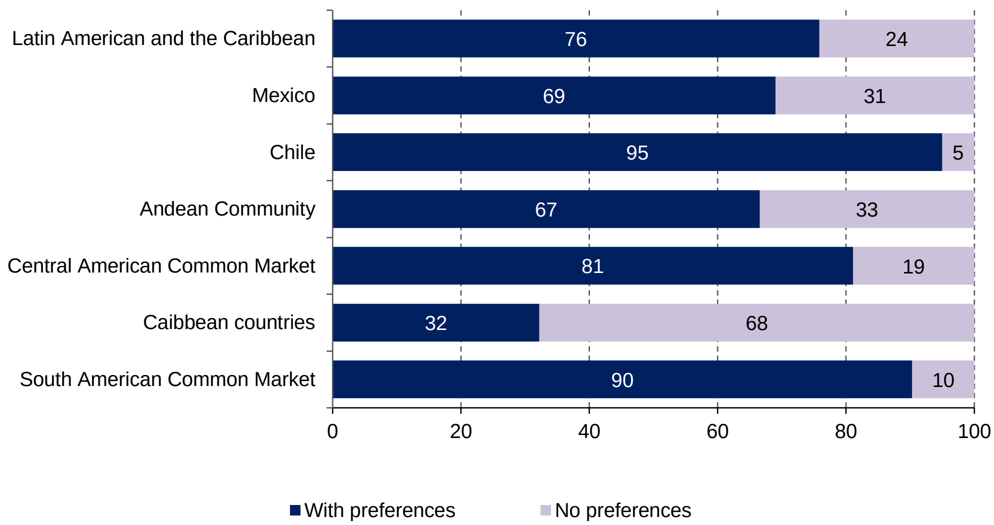



Source: Authors, based on official information of MFN tariffs, and information on tariff preferences covered by free trade agreements and regional integration agreements (MERCOSUR, Andean Community, Central American Common Market, Pacific Alliance, CARICOM).
Note: The multilateral applied tariff was calculated by subtracting from the MFN tariff the proportion equivalent to the percentage of imports subject to tariff preferences over the total imports of each country. The intra-regional preferential tariff was calculated using the same methodology, but now limited only to intra-regional flows.

The trade relations with lower preferences and which still face high tariffs are the bilateral trade between Mexico and South America, as well as between South America and Central America and the Caribbean. There are segments of intra-regional trade for some specific sectors such as food and beverages in which the applied tariffs are above average. Approximately 24% of intra-regional flows still have to pay custom duties, that is, one in every four dollars of intra-regional exports pays MFN tariffs or alternatively Customs Union Tariffs. This figure is greater for trade between Mexico and the rest of the region, mainly South America, and particularly Brazil. Nevertheless, trade between South America and Central America is also bounded by a high tariff protection. The Caribbean Community appears as the least connected group in terms of preferences with the rest of the region, with 68% of its LAC imports paying MFN tariffs. This value is lower for Mexico, and Central America (31% and 19%, respectively) but it still represents a high intra-regional trade cost among these countries with the rest of the LAC counterparts not covered by regieonal agreements.

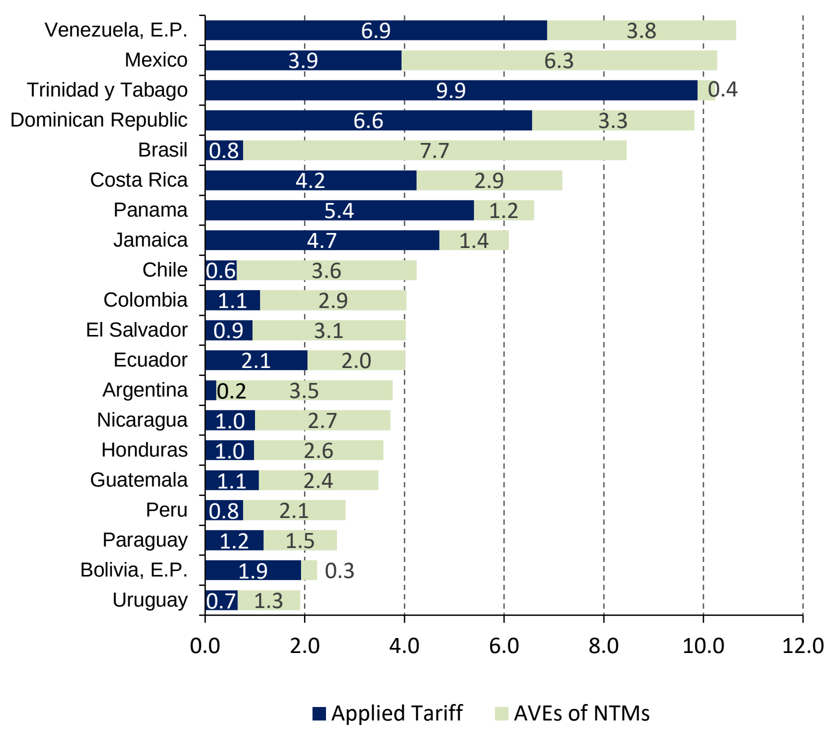
As shown in the previous section, estimates of AVEs of NTMs for intra-regional trade for countries are overall higher than applied tariffs. In the case of 13 countries, intra-regional AVEs of NTMs are higher than applied tariffs and are also particularly high in the cases of Argentina, Brazil, Chile, Colombia, Mexico, and the countries of the Andean region, with the exception of Bolivia. Only in the cases of the Caribbean countries and those of Central America is this ratio lower. However, part of the explanation is that applied tariffs are on average much higher than in South America (see figure 7).

**Figure 7**
**Latin America and the Caribbean: intra-regional imports with and without tariff preferences**
*(In percentages of total imports)*




Source: Authors, based on official information of the countries.

**Figure 8**
**Latin America and the Caribbean: applied tariff[a] and non-tariff protection in intra-regional trade**
*(18 countries, 2015, in ad valorem percentages)*




Source: Authors, based on official information of the countries and estimations from the previous section.
[a] The applied tariff was calculated here as the average MFN tariff minus the proportion of imports subject to trade preferences. If preferences are 100%, whatever the value of the MFN tariff, the applied tariff will be 0%. If the preferences are 50%, and the initial tariff is 10, the applied tariff will be 5.

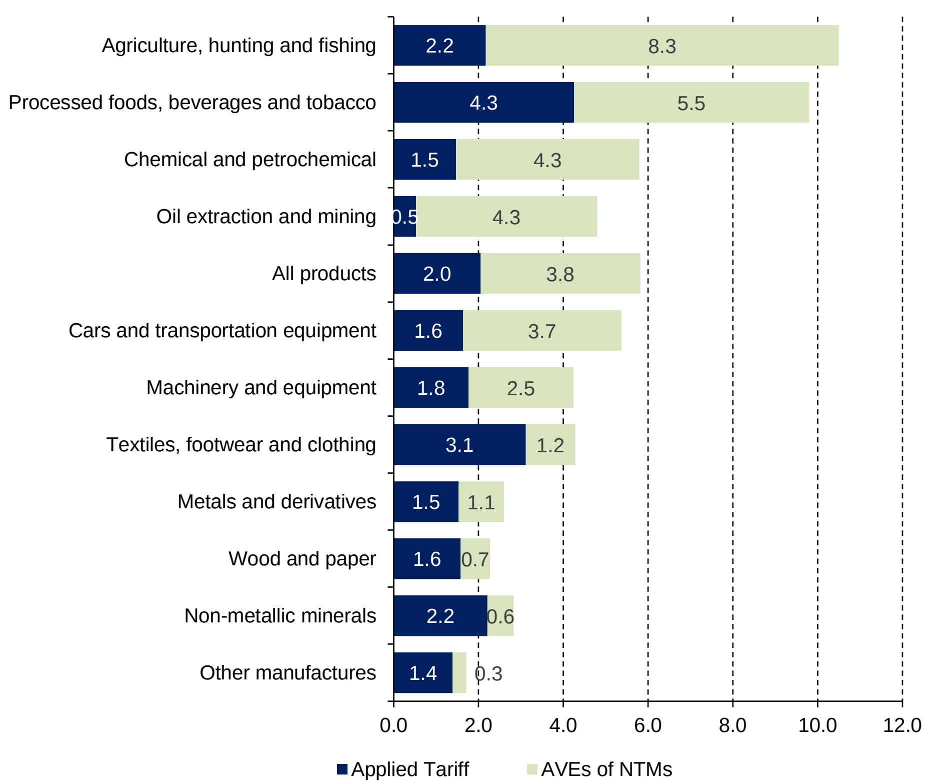
The corresponding AVEs of NTMs for the entire region showed an equivalent tariff of 3.8%, two percentage points higher with respect to the applied tariff at the intra-regional level. In total, the tariff and non-tariff protection due to NTMs at regional level reaches a total of 5.8%. At the sub-regional level, a higher AVE of NTM compared to applied tariffs was observed for MERCOSUR, the Andean Community, as well as for the Pacific Alliance. This was not the case of the Central American Common Market and the Caribbean countries, for which the AVE of NTMs is lower than applied tariffs (see table 15). By sectors, the most elevated costs are for agricultural products, the agroindustry, and chemical and petrochemicals (see figure 9). All this leads to a reduction in trade, and economic and social losses associated with lesser flows and higher payment of unitary prices by consumers.

**Table 15**
**Latin America and the Caribbean: applied tariffs and AVE of NTMs in intra-regional trade**
*(In ad-valorem percentages, 2015)*

| | Applied Tariff (1) | AVE of NTMs (2) | Total Protection (3)=(1+2) | NTM weight in Total Protection (2/3)*100 |
|---|---|---|---|---|
| Andean Community | 1.3 | 2.1 | 3.4 | 61.7 |
| Southern Common Market (MERCOSUR) | 1.4 | 5.1 | 6.5 | 78.4 |
| Central American Common Market | 2.5 | 2.3 | 4.9 | 47.9 |
| Pacific Alliance | 1.6 | 3.8 | 5.4 | 70.6 |
| Caribbean Community | 6.4 | 1.4 | 7.8 | 17.9 |
| Mexico | 3.9 | 6.3 | 10.3 | 61.6 |
| Latin America and the Caribbean | 2.0 | 3.8 | 5.8 | 64.8 |

Source: Authors, based on preferential tariffs and AVE estimates of NTMs.

**Figure 9**
**Latin America and the Caribbean: sectoral applied tariff and non-tariff protection in intra-regional trade**
*(2015, in ad-valorem percentages)*




Source: Author's calculations, based on official information of the countries and estimations from the previous section.

## A. CGE modelling and scenarios considered

First, the baseline scenario was adjusted to consider applied tariffs between the different countries of the region up to 2018. In the sequence, estimated AVEs for bilateral trade were incorporated by partners and sectors of the model, using the methodology applied by Malcom (1998), also known as the Altertax methodology. This procedure allows the database to reflect the tariff and non-tariff protection associated with each country pair-sector combination before the shocks under the different scenarios were implemented.

For the simulations, Gragg's method for extrapolating numerical solutions was used, which allows numerous disturbances to be applied simultaneously, in our case, tariff cuts on the calibrated baseline. The results obtained after the application of the shocks should represent the short to medium term effects of the liberalization agreements considered. The closure used in the simulations keeps the balance of payments fixed and establishes a fixed real salary for unskilled labor. In this way, the simulations consider the existence of unemployment for our labor market results.

Another way to model ad-valorem equivalent tariffs is through the use of iceberg costs. This method considers AVEs as measures of loss of trade efficiency. AVEs can be thought as "sand in the wheels" of trade. In this case, simulations are performed through shocks in technological change. While it is a very popular form of modeling due to its simplicity it tends to generate much larger efficiency impacts of reducing the costs associated to NTM. These effects might be unreasonably large since it is unlikely that many NTMs have pure efficiency impacts (Gilbert, 2019).[20]

The methodology applied for the simulation model of tariff equivalents of NTMs follows ECLAC (2017).[21] For the revision of tariffs and identification of the levels of tariff preferences in force until December 2018, the schedule relief lists of each existing bilateral agreement, provided by the Latin American Integration Association (ALADI) were used.

That said, a CGE model was calibrated using the GTAP 9.0 database, from which simulations were carried out reflecting the possible changes in trade policy in three different scenarios:

- Scenario 1: FTAs among all LAC countries. All tariffs for intra-regional trade are cut to zero;
- Scenario 2: NTMs harmonization (60% cut of AVEs of SPS and TBT) and elimination of trade defenses;
- Scenario 3: Combination of scenario 1 and 2.

The key question behind the exercise was: 'What is the likely effect from applying a policy that unifies customs territories?'. Firstly, cutting tariff to zero filling the gaps of bilateral relations without preferences, and secondly applying a set of policy to converge in more comprehensive NTMs. Lastly a combination of both is analyzed.

## B. Welfare and macroeconomic results

Results indicate that, at a macroeconomic level, an FTA among all LAC countries could generate an increase of 0.41% of GDP from the baseline, while regulatory convergence plus the elimination of trade defense measures would impulse GDP by 0.31%. If both scenarios happen simultaneously, the change of GDP would be higher and would reach 0.73% (see figure 10). As for the rest of the macroeconomic variables, namely consumption, investment and trade, an increase is expected in all simulated

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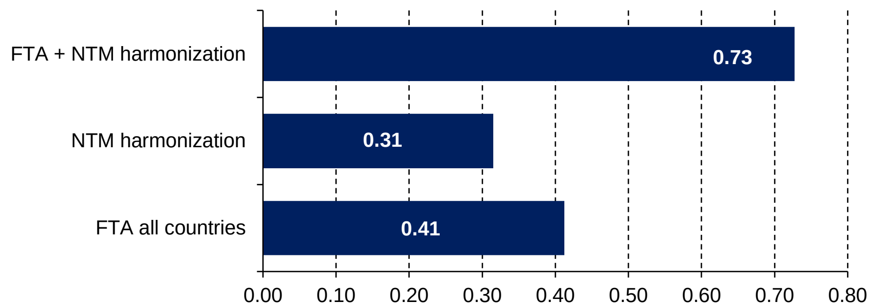
[20] For authors using this methodology see Fugazza and Maur, (2008); Decreux and Fontagné (2009); Zaki (2014), and Vanzetti et al. (2016).

[21] ECLAC (2017) analyzes the potential economic and social effects of the deepening of the Customs Union between Guatemala and Honduras.

scenarios, with the expected changes in scenario 3 being the largest. Foreign trade figures experience positive changes, although modest. Also, trade creation effects dominate that of trade diversion, with trade creation being even more important for intra-regional relationships, as it is later shown.

**Figure 10**
**Latin America and the Caribbean: impact on production under various scenarios**
*(Changes in percentage points over the baseline)*




Source: Author's calculations, based on GTAP simulations.

From the well-being point of view, all scenarios would deliver positive results. Here, welfare gains are measured as the equivalent variation —a measure that quantifies the amount of wealth, in terms of money that consumers receive or lose when their level of profit increases or decreases after the policy shocks (above described scenarios). As expected, the scenario which combines both a tariff reduction and elimination of NTM related costs would generate the highest well-being, estimated to surpass US$25 billion. Approximately 62% of this impact is attributed to tariff reductions while the remaining 38% is linked to the reduction of NTM related costs. As a proportion of gross domestic product, the increase in welfare comes to mean 0.3% in the ambitious scenario (see table 16).

**Table 16**
**Latin America and the Caribbean: impact on macroeconomic variables and welfare under various scenarios**
*(Changes in percentage points over the baseline and millions of dollars)*

| Variables | Regional Free Trade Zone (FTA) | NTMs harmonization and elimination of trade defenses | FTA plus NTM harmonization |
|---|---|---|---|
| Consumption | 0.4 | 0.3 | 0.7 |
| Investment | 0.7 | 0.6 | 1.4 |
| GDP | 0.4 | 0.3 | 0.7 |
| Exports | 1.3 | 0.5 | 1.9 |
| Imports | 1.5 | 0.8 | 2.3 |
| Welfare (US$ million) | 15 712 | 9 443 | 25 155 |
| Welfare (% GDP) | 0.2 | 0.1 | 0.3 |

Source: Author's calculations, based on GTAP simulations.

At the sub-regional level, welfare gains are greater in the case of Central America, as well as for the Southern Market (MERCOSUR) and Caribbean countries. These countries' intra-regional trade still face a greater proportion trade under MFN tariffs when compared to Andean Community countries and Chile, where a significant proportion of intra-regional trade is already carried out under preferential tariff.

The welfare impact can be further decomposed into different sources.[22] The main reason behind the welfare gains of the simulated scenarios are the changes in factor endowments, that is, in the availability of primary factors. Trade measures aimed at boosting intra-regional integration in Latin American and the Caribbean would impact positively in the region's productive capacity due to higher

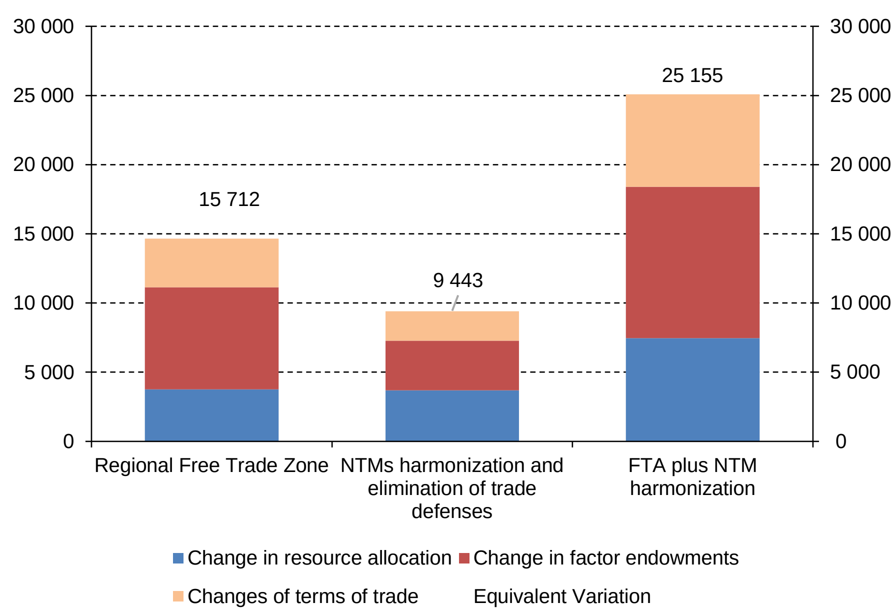
[22] See Schuschny, Durán and De Miguel (2007).

quantities of capital and labor available. Just over 40% of regional welfare improvements are attributable to changes in factor endowments.

A second factor explaining the increase in well-being are the allocative efficiency gains that arise as a result from a better allocation of resources in the economy. Inter-sectoral movements of capital and labor would be driving income increases in the sectors that would be using them more efficiently than at baseline. In aggregate terms, this effect represented 30% of welfare gains in the ambitious scenario (scenario 3), and about 40% in the case where only NTMs are harmonized/streamlined (scenario 2).

A third factor is attributed to the changes in relative prices. In all scenarios, an improvement in the terms of trade was observed. This mean that countries can buy inputs and regional final goods at more competitive prices, and that exporters can access the regional market with more convenient prices for exports. This effect was observed in all scenarios and it had, on average, a smaller impact of around 22% of the value of welfare gains (see figure 11).

**Figure 11**
**Latin America and the Caribbean: welfare decomposition under different scenarios**
*(Millions of dollars)*




Source: Author's calculations, based on GTAP simulations.

## C. Sectoral effects and intra-regional trade

Impacts also varied across sectors. Analyzing the ratio of intra-regional exports with respect to total exports gives us a clearer picture of which sectors would benefit more from the different scenarios. A first message is that the share of intra-regional exports out of total exports increases in all sectors given the proposed scenarios. A regional free trade zone agreement (AECIL scenario) is estimated to increase intra-regional exports by 2.1 percentage points, as the observed coefficient rose from 16.6% to 18.7%. If countries undertake regulatory harmonization efforts in their various forms (mutual recognition of regulations, transparency, improvements in technical standards, approval regional sanitary and phytosanitary certifications, among other measures), the impact on intra-regional trade would be an increase in the intra-regional trade coefficient of 1.1 percentage points, going from 16.6% to 17.7%. If it were the case that the countries agreed on a great double convergence effort; tariff and regulatory-wise, the impact of creating intra-regional trade would be much more auspicious than in scenarios 1 and 2, since intra-regional trade could rise to 19.8%, representing an additional 3.2 percentage points when compared to the baseline (see table 17).

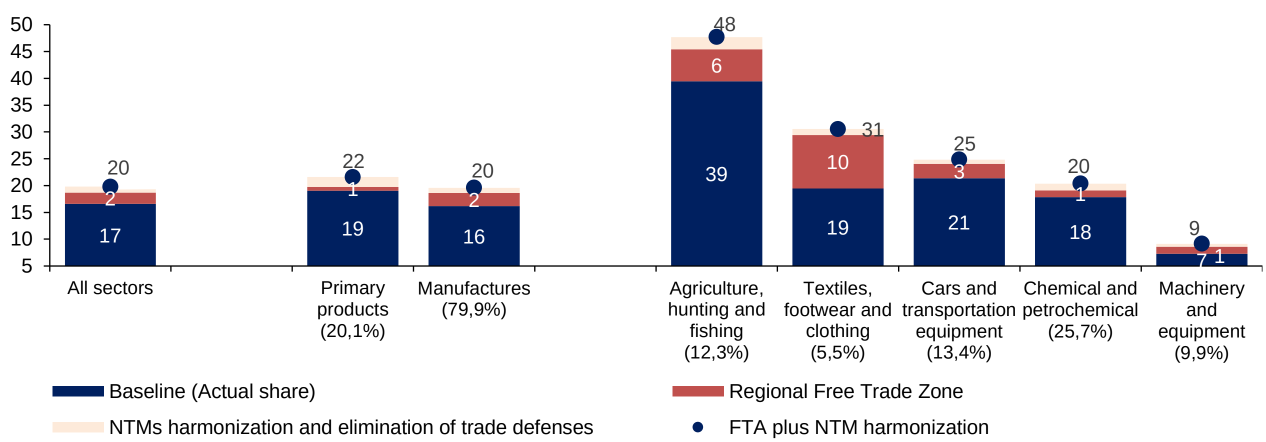
A detailed analysis by sectors shows that the greatest increases would occur in manufacturing, mainly in the "food, beverage and tobacco" sector, "textiles, clothing and footwear", "cars and transport equipment", as well as "machinery and equipment". These four sectors, which concentrate just over 61% of intra-regional flows, are estimated to increase its intra-regional trade share at a greater rate than the regional average. For example, in agroindustry the rate of intra-regional exports would increase from 39.4% to 45.5% in a scenario of a broad intra-regional trade agreement, and up to 42.7% in the case of the regulatory convergence scenario, and up to 47.3% under scenario 3. Similarly, the textile, clothing and footwear sector, could reach a share of intra-regional exports of over 30% of total exports under scenario 3.

**Table 17**
**Latin America and the Caribbean: intra-regional trade share, different scenarios**
*(In percentages of total exports)*

| Sectors | LAC Export basket | Baseline | FTA | Regulatory convergence | FTA plus regulatory convergence |
|---|---|---|---|---|---|
| Primary products | 20,1 | 18,3 | 19,1 | 20,1 | 20,8 |
| Agriculture, livestock, hunting and fishing | 6,1 | 31,8 | 34,3 | 32,3 | 34,8 |
| Oil and mining | 14,0 | 15,5 | 15,8 | 17,6 | 17,8 |
| Manufactures | 79,9 | 16,2 | 18,6 | 17,2 | 19,5 |
| Food, drinks and tobacco | 12,3 | 39,4 | 45,4 | 41,7 | 47,3 |
| Textiles, clothing and footwear | 5,5 | 19,5 | 29,4 | 20,5 | 30,2 |
| Wood and paper | 3,3 | 22,4 | 24,5 | 22,6 | 24,7 |
| Chemical and petrochemical | 25,7 | 17,8 | 19,1 | 19,1 | 20,3 |
| Non-metallic minerals | 4,6 | 12,0 | 12,8 | 12,4 | 13,1 |
| Metals and derived products | 4,7 | 15,5 | 17,4 | 16,0 | 17,7 |
| Cars and transport equipment | 13,4 | 21,4 | 24,1 | 22,2 | 24,7 |
| Machinery and equipment | 9,9 | 7,3 | 8,6 | 7,8 | 9,1 |
| Other manufactures | 0,5 | 5,7 | 9,0 | 5,9 | 9,1 |
| Total intra-regional exports of goods | 100,0 | 16,6 | 18,7 | 17,7 | 19,8 |

Source: Author's calculations, based on GTAP simulations.

**Figure 12**
**Latin America and the Caribbean: actual and potential intra-regional exports under different scenarios**
*(In percentage of total sectorial exports)*




Source: Author's calculations, based on GTAP simulations. Note: Percentages under each sector represent this sector's export share in total intra-regional exports.

## D. Effects on employment

Given that the closure of the model considered a fixed salary, or its equivalent to fixed employment for unskilled labor, the simulated shocks induced the mobility of the labor factor, which can move from one sector to another. The dynamics generated at the labor factor level are collected through the changes generated in remuneration, which increased in all simulated scenarios. In particular, scenario 1 (FTA-AECIL) would produce a positive overall impact equivalent to the increase in the remuneration of the labor factor of 0.5%. On the other hand, the effort of regulatory convergence would entail an additional 0.3% increase in remuneration of the labor factor. As previously observed with the other variables, the impact is largest in the case in which the efforts of greater liberalization of intra-regional tariffs are combined with a regulatory harmonization. In this scenario, the total impact on the wage bill is a 0.8% increase.

The most favorable impact in terms of employment is attributed to four sectors that together capture just over a third of the total wage bill of goods (34%). These sectors are "cars and transport equipment" with a percentage variation of 2.9%, "chemical and petrochemical", 1%; "food, beverages and tobacco", 1%; and "metals and derivatives", 0.9%. Other manufacturing sectors which were favorably impacted in terms of intra-regional trade, "textiles and clothing" and "machinery and equipment", showed variations slightly below the regional average (see table 18).

**Table 18**
**Latin America and the Caribbean: effects of simulated scenarios on the wage bill of employment according to large sectors**
*(In percentage variations with respect to the baseline)*

| | Structure | FTA | Regulatory convergence | FTA plus regulatory convergence |
|---|---|---|---|---|
| Agriculture, livestock, hunting and fishing | 28.0 | 0.3 | 0.1 | 0.3 |
| Oil and mining | 5.4 | 0.4 | 0.2 | 0.6 |
| Food, drinks and tobacco | 13.7 | 0.6 | 0.4 | 1.0 |
| Textiles, clothing and footwear | 8.8 | 0.5 | 0.2 | 0.7 |
| Wood and paper | 5.7 | 0.3 | 0.3 | 0.6 |
| Chemical and petrochemical | 9.5 | 0.6 | 0.5 | 1.1 |
| Non-metallic minerals | 4.4 | 0.0 | 0.1 | 0.1 |
| Metals and derived products | 5.4 | 0.5 | 0.4 | 0.9 |
| Cars and transport equipment | 5.5 | 1.7 | 1.2 | 2.9 |
| Machinery and equipment | 9.9 | 0.4 | 0.3 | 0.7 |
| Other manufactures | 3.6 | 0.3 | 0.4 | 0.6 |
| Total wage bill | 100.0 | 0.5 | 0.3 | 0.8 |

Source: Authors calculations, based on GTAP simulations.

# Conclusions

Trade barriers can take multiple forms. This work puts effort in quantifying and bringing different trade barriers to a common metric, an *ad-valorem* equivalent tariff. Making use of the gravity framework, this task was performed for all products and different non-tariff measures. As a result, aggregate levels of trade protection could be calculated and compared across countries and sectors. Subsequently, a CGE model simulation was performed in order to analyze potential benefits of reducing trade barriers for intra-regional trade in Latin America and the Caribbean.

Overall, NTMs appeared to be relevant in terms of adding cost to international trade, especially technical barriers to trade, quantitative restrictions and sanitary and phytosanitary measures. The additional cost was estimated to be more than two times larger than the protection imposed by tariffs. This additional cost to trade varied in magnitude when NTMs are allowed to promote trade, representing in aggregate terms 80% of the global tariff protection. Results pointed to higher protection coming from the sector of cars and transport equipment and agriculture, hunting and fishing. The heavy users of NTMs, China and the United States were also the ones for which imports were bound by the highest barrier. On the affected side, exports from Latin America, the Caribbean and Canada stand out as facing the highest barriers from NTMs.

To bear good estimations of the unseen barriers to trade can be very handy for trade analysis. One example was given in section IV where the potential impacts of harmonization of standards and elimination of trade defense measures on the economy were analyzed for Latin America and the Caribbean using a CGE model. The macroeconomic results suggest that eliminating tariffs, in the first instance, can lead to gains in production and trade by improving the conditions of access to intra-regional markets. Secondly, harmonizing and streamlining restrictive measures, simulated with the reduction of 60% in the AVEs cost of NTMs for SPS and TBT measures, as well as the elimination of some barriers (quotas, countervailing duties, and import prohibitions), led to positive changes in production, trade and employment, although at lower levels. Potential gains expand further in the event that both policy scenarios are applied simultaneously. Such benefits would be perceived through increases in production and trade levels, especially in increases in intra-regional trade flows, mainly in the sectors of "food, beverages and tobacco", "textiles, clothing and footwear", "cars and transport equipment" and "machinery and equipment". Regional GDP could expand 0.73% in the most ambitious scenario, and intra-regional trade could expand at a larger rate than extra-regional trade. Tariff convergence policies and regulations could increase regional welfare and boost employment in the region. This would also positively impact labor income, benefiting families and consumers of the region.

All in all, the results presented here could still benefit from further analysis. Estimation of AVEs of NTMs using different data sources, identification strategies and estimation methods could shed light on the robustness of results. Moreover, the quantification of procedural costs associated to NTMs is also a relevant issue. Procedural costs are practical challenges such as long delays in customs, poor infrastructure conditions, high costs associated with high insurance prices, excessive paperwork, excessive waiting time in ports and border crossings, etc. Procedural costs are likely to make NTMs much more restrictive, especially for agricultural and agricultural products, or those that require speed for clearance, medications, chemicals, or intermediate inputs from complementary industries. Estimates of the impact of removing such measures, such as those made here, could serve as important inputs for the road map of decision makers in the region.

Lastly, it is desirable that policymakers promote measures aimed at promoting regional convergence at all possible levels. Reducing the costs associated to NTMs is much more complex than eliminating tariff barriers. This would require several rounds of negotiations at different sectoral levels in order to identify potential bottlenecks and areas in which an NTM can be simplified or harmonized while still retaining its original purpose. Mutual recognition agreements (including those related to conformity assessments), recognition of international standards and transparency requirements, not only within, but also between the different regional integration schemes could be a way forward.

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# Annexes

# Annex 1
# Country coverage and classification

**Table A1**
**Country sample by region**
*(Countries with an asterisk entered the sample as partners only)*

| Latin America and the Caribbean | European Union | Other Asia Pacific | Middle East and North Africa | Sub-Saharan Africa | Rest of World | Individual Economies |
|---|---|---|---|---|---|---|
| ARG - Argentina | AUT - Austria | AUS - Australia | ARE - United Arab Emirates | AGO – Angola | ALB - Albania | CAN - Canada |
| BRA - Brazil | BEL - Belgium-Luxembourg | NZL - New Zealand | BHR - Bahrain | BDI – Burundi | ARM - Armenia | USA - USA |
| PRY - Paraguay | BGR - Bulgaria | KOR - Rep. of Korea | CPV - Cabo Verde | BEN – Benin | CHE - Switzerland | JPN - Japan |
| URY - Uruguay | CYP - Cyprus | BRN - Brunei Darussalam | EGY - Egypt | BFA - Burkina Faso | GEO - Georgia | CHN - China |
| VEN - Venezuela | CZE - Czech Rep. | IDN - Indonesia | ISR - Israel | CAF - Central African Rep. | ISL - Iceland | |
| CHL - Chile | DEU - Germany | KHM - Cambodia | JOR - Jordan | CIV - Côte dIvoire | KGZ - Kyrgyzstan | |
| BOL - Bolivia | DNK - Denmark | LAO - Lao Peopl. Dem. Rep | KWT - Kuwait | CMR - Cameroon | MDA - Rep. of Moldova | |
| COL - Colombia | ESP - Spain | MMR - Myanmar | MAR - Morocco | COD - Dem. Rep. of Congo | MNE - Montenegro | |
| ECU - Ecuador | EST - Estonia | MYS - Malaysia | MKD - TFYR of Macedonia | COG – Congo | NOR - Norway | |
| PER - Peru | FIN - Finland | PHL - Philippines | OMN - Oman | DJI – Djibouti | RUS - Russian Federation | |
| MEX - Mexico | FRA - France | SGP - Singapore | QAT - Qatar | GAB – Gabon | SYC - Seychelles | |
| CRI - Costa Rica | GBR - United Kingdom | THA - Thailand | SAU - Saudi Arabia | GHA – Ghana | TJK - Tajikistan | |
| SLV - El Salvador | GRC - Greece | VNM - Viet Nam | TUN - Tunisia | GIN – Guinea | UKR - Ukraine | |
| GTM - Guatemala | HRV - Croatia | BGD - Bangladesh | TUR - Turkey | GMB – Gambia | ABW - Aruba* | |
| HND - Honduras | HUN - Hungary | FJI - Fiji | YEM - Yemen | GNB - Guinea-Bissau | AZE - Azerbaijan* | |
| NIC - Nicaragua | IRL - Ireland | HKG - China Hong Kong | DZA - Algeria* | KEN – Kenya | BIH - Bosnia Herzegovina* | |
| PAN - Panama | ITA - Italy | IND - India | IRN - Iran* | MDG - Madagascar | BLR - Belarus* | |
| DOM - Dominican Rep. | LTU - Lithuania | LKA - Sri Lanka | IRQ - Iraq* | MLI – Mali | BMU - Bermuda* | |
| JAM - Jamaica | LVA - Latvia | MAC - China Macao SAR | LBN - Lebanon* | MOZ - Mozambique | KAZ - Kazakhstan* | |
| TTO - Trinidad and Tobago | MLT - Malta | MDV - Maldives | LBY - Libya* | MRT - Mauritania | SCG - Serbia Montenegro* | |
| ATG - Antigua and Barbuda | NLD - Netherlands | MNG - Mongolia | PSE - State of Palestine* | MUS - Mauritius | SRB - Serbia* | |
| BLZ - Belize | POL - Poland | NPL - Nepal | SDN - Sudan* | MWI – Malawi | TKM - Turkmenistan* | |
| BRB - Barbados | PRT - Portugal | PAK - Pakistan | SBS - Fmr Sudan* | NER – Niger | UZB - Uzbekistan* | |

| Latin America and the Caribbean | European Union | Other Asia Pacific | Middle East and North Africa | Sub-Saharan Africa | Rest of World | Individual Economies |
|---|---|---|---|---|---|---|
| CUB - Cuba | ROU - Romania | PNG - Papua New Guinea | SYR - Syria* | NGA – Nigeria | | |
| DMA - Dominica | SVK - Slovakia | SLB - Solomon Isds | | RWA - Rwanda | | |
| GRD - Grenada | SVN - Slovenia | AFG - Afghanistan* | | SEN – Senegal | | |
| GUY - Guyana | SWE - Sweden | BTN - Bhutan* | | SLE - Sierra Leone | | |
| HTI - Haiti | | | | TCD – Chad | | |
| KNA - Saint Kitts and Nevis | | | | TGO – Togo | | |
| LCA - Saint Lucia | | | | TON – Tonga | | |
| SUR - Suriname | | | | TZA - United Rep. Tanzania | | |
| VCT – S.Vincent & Grenad. | | | | UGA – Uganda | | |
| BHS - Bahamas* | | | | VUT – Vanuatu | | |
| | | | | WSM – Samoa | | |
| | | | | ZAF - South Africa | | |
| | | | | ZMB – Zambia | | |
| | | | | ZWE - Zimbabwe | | |
| | | | | COM - Comoros* | | |
| | | | | ERI - Eritrea* | | |
| | | | | ETH - Ethiopia* | | |
| | | | | GNQ - Equatorial Guinea* | | |
| | | | | LBR - Liberia* | | |
| | | | | STP – S. Tome & Principe* | | |
| | | | | SSD - South Sudan* | | |

Source: Author.

**Table A2**
**GTAP country aggregation**
*(Countries with an asterisk entered the sample as partners only)*

| GTAP groups | Countries included in each GTAP group |
|---|---|
| 1- Argentina | Argentina (ARG) |
| 2- Brazil | Brazil (BRA) |
| 3- Paraguay | Paraguay (PRY) |
| 4- Uruguay | Uruguay (URY) |
| 5- Venezuela | Venezuela (VEN) |
| 6- Chile | Chile (CHL) |
| 7- Bolivia | Bolivia Plurinational State of (BOL) |
| 8- Colombia | Colombia (COL) |
| 9- Ecuador | Ecuador (ECU) |
| 10- Peru | Peru (PER) |
| 11- Mexico | Mexico (MEX) |
| 12- Costa Rica | Costa Rica (CRI) |
| 13- El Salvador | El Salvador (SLV) |
| 14- Guatemala | Guatemala (GTM) |
| 15- Honduras | Honduras (HND) |
| 16- Nicaragua | Nicaragua (NIC) |
| 17- Panama | Panama (PAN) |
| 18- Dominican Republic | Dominican Rep. (DOM) |
| 19- Jamaica | Jamaica (JAM) |
| 20- Trinidad and Tobago | Trinidad and Tobago (TTO) |
| 21- Rest of the Caribbean | Antigua and Barbuda (ATG), Belize (BLZ), Barbados (BRB), Cuba (CUB), Dominica (DMA), Grenada (GRD), Guyana (GUY), Haiti (HTI), Saint Kitts and Nevis (KNA), Saint Lucia (LCA), Suriname (SUR), Saint Vincent and the Grenadines (VCT), Bahamas* (BHS) |
| 22- Canada | Canada (CAN) |
| 23- USA | United States (USA) |
| 24- European Union | Austria (AUT), Belgium-Luxembourg (BEL), Bulgaria (BGR), Cyprus (CYP), Czech Rep. (CZE), Germany (DEU), Denmark (DNK), Spain (ESP), Estonia (EST), Finland (FIN), France (FRA), United Kingdom (GBR), Greece (GRC), Croatia (HRV), Hungary (HUN), Ireland (IRL), Italy (ITA), Lithuania (LTU), Latvia (LVA), Malta (MLT), Netherlands (NLD), Poland (POL), Portugal (PRT), Romania (ROU), Slovakia (SVK), Slovenia (SVN), Sweden (SWE) |
| 25- Japan | Japan (JPN) |
| 26- China | China (CHN) |
| 27- Australia | Australia (AUS) |
| 28- New Zealand | New Zealand (NZL) |
| 29- South Korea | Rep. of Korea (KOR) |
| 30- ASEAN | Brunei Darussalam (BRN), Indonesia (IDN), Cambodia (KHM), Lao Peoples Dem. Rep. (LAO), Myanmar (MMR), Malaysia (MYS), Philippines (PHL), Singapore (SGP), Thailand (THA), Viet Nam (VNM) |
| 31- Other Asia Pacific | Bangladesh (BGD), Fiji (FJI), China Hong Kong SAR (HKG), India (IND), Sri Lanka (LKA), China Macao SAR (MAC), Maldives (MDV), Mongolia (MNG), Nepal (NPL), Pakistan (PAK), Papua New Guinea (PNG), Solomon Isds (SLB), Afghanistan* (AFG), Bhutan* (BTN) |
| 32- Middle East and North Africa | United Arab Emirates (ARE), Bahrain (BHR), Cabo Verde (CPV), Egypt (EGY), Israel (ISR), Jordan (JOR), Kuwait (KWT), Morocco (MAR), TFYR of Macedonia (MKD), Oman (OMN), Qatar (QAT), Saudi Arabia (SAU), Tunisia (TUN), Turkey (TUR), Yemen (YEM), Algeria* (DZA), Iran* (IRN), Iraq* (IRQ), Lebanon* (LBN), Libya* (LBY), State of Palestine* (PSE), Sudan* (SDN), Fmr Sudan* (SBS), Syria* (SYR) |
| 33- Sub-Saharan Africa | Angola (AGO), Burundi (BDI), Benin (BEN), Burkina Faso (BFA), Central African Rep. (CAF), Côte dIvoire (CIV), Cameroon (CMR), Dem. Rep. of the Congo (COD), Congo (COG), Djibouti (DJI), Gabon (GAB), Ghana (GHA), Guinea (GIN), Gambia (GMB), Guinea-Bissau (GNB), Kenya (KEN), Madagascar (MDG), Mali (MLI), Mozambique (MOZ), Mauritania (MRT), Mauritius (MUS), Malawi (MWI), Niger (NER), Nigeria (NGA), Rwanda (RWA), Senegal (SEN), Sierra Leone (SLE), Chad (TCD), Togo (TGO), Tonga (TON), United Rep. of Tanzania (TZA), Uganda (UGA), Vanuatu (VUT), Samoa (WSM), South Africa (ZAF), Zambia (ZMB), Zimbabwe (ZWE), Comoros* (COM), Eritrea* (ERI), Ethiopia* (ETH), Equatorial Guinea* (GNQ), Liberia* (LBR), South Sudan* (SSD), Sao Tome and Principe* (STP) |
| 34- Rest of the world | Albania (ALB), Armenia (ARM), Switzerland (CHE), Georgia (GEO), Iceland (ISL), Kyrgyzstan (KGZ), Rep. of Moldova (MDA), Montenegro (MNE), Norway (NOR), Russian Federation (RUS), Seychelles (SYC), Tajikistan (TJK), Ukraine (UKR), Aruba* (ABW), Azerbaijan* (AZE), Bosnia Herzegovina* (BIH), Belarus* (BLR), Bermuda* (BMU), Kazakhstan* (KAZ), Serbia and Montenegro* (SCG), Serbia* (SRB), Turkmenistan* (TKM), Uzbekistan* (UZB) |

Source: Author.

# Annex 2
# Note on trade coverage

This annex clarifies the trade's coverage of the analysis. First, since NTM data was available only for WTO members, trade data considered here does not account for non-WTO imports. This eliminates for instance 0.3% of 2015's trade. Secondly, when analyzing the 1996 version of HS at 6 digits some lines were not considered. Whenever no trade was available at the BACI database or because they were not relevant for trade analysis, the HS06 lines were dropped. For the sake of completeness, they are listed below.

**Table A3**
**1996 HS06 codes not considered**

| | |
|---|---|
| Inexistence of data in BACI database | |
| 271011 | Aviation spirit **LEGACY NON-WCO CODE** |
| 271012 | Petroleum spirit for motor vehicles **LEGACY NON-WCO CODE** |
| 271013 | Petroleum spirit except aviation or motor fuel **LEGACY NON-WCO CODE** |
| 271014 | Petroleum spirit-type fuel **LEGACY NON-WCO CODE** |
| 271015 | White spirit **LEGACY NON-WCO CODE** |
| 271016 | Petroleum naphtha **LEGACY NON-WCO CODE** |
| 271019 | Light petroleum distillates nes **LEGACY NON-WCO CODE** |
| 271021 | Kerosene jet fuel **LEGACY NON-WCO CODE** |
| 271022 | Kerosene, for furnaces **LEGACY NON-WCO CODE** |
| 271025 | Kerosene lamp oil, motor kerosene, light diesel, etc **LEGACY NON-WCO CODE** |
| 271026 | Gas oils - bunker oil, No.1 furnace, motor diesel **LEGACY NON-WCO CODE** |
| 271027 | Diesel oils- No.2 furnace, marine diesel **LEGACY NON-WCO CODE** |
| 271029 | Fuel oils nes, heavy distillates **LEGACY NON-WCO CODE** |
| 271091 | Heavy furnace oil (heating or motor fuel) <1% sulphur **LEGACY NON-WCO CODE** |
| 271093 | Heavy furnace oil nes **LEGACY NON-WCO CODE** |
| 271094 | Petroleum oil used in road building **LEGACY NON-WCO CODE** |
| 271095 | Petroleum lubricating oils **LEGACY NON-WCO CODE** |
| 271096 | Petroleum lubricating greases **LEGACY NON-WCO CODE** |
| 271099 | Petroleum oils and products nes **LEGACY NON-WCO CODE** |
| 710820 | Gold, monetary |
| 711890 | Coin; other than coin of item no. 7118.10 |
| Not relevant and services related codes | |
| 271600 | Electrical energy |
| 970110 | Paintings, drawings and pastels; executed entirely by hand, other than drawings of heading no. 4906 |
| 970190 | Artwork; collages and similar decorative plaques |
| 970200 | Engravings, prints and lithographs; original |
| 970300 | Sculptures and statuary; original, in any material |
| 970400 | Stamps; postage or revenue; stamp-postmarks, first-day covers, postal stationery (stamped paper) and like, used, or if unused not of current or new issue in the country to which they are destined |
| 970500 | Collections and collectors' pieces; of zoological, botanical, mineralogical, anatomical, historical, archaeological, palaeontological, ethnographic or numismatic interest |
| 970600 | Antiques; of an age exceeding one hundred years |

Source: Authors, based on the UN Comtrade Commodity Classifications.

Lastly, as previously mentioned, the trade impacts of NTMs were calculated and aggregated to country-pairs-sectors following a GTAP aggregation of 33 sectors and 34 countries. Since the aim of the project is to analyze potential economic effects of a Latin American and Caribbean trade agreement, the model includes most of the countries of the region (some Caribbean islands are aggregated under Rest of the Caribbean) but takes some regions of the world as aggregated economies. Due to the fact that the descriptive analysis of the paper is carried on another aggregation level a small amount of information is lost. This implicates that for the countries which were initially aggregated into GTAP-groups (ASEAN, the European Union, Middle East and North Africa, Sub-Saharan Africa, Rest of the Caribbean, Rest of the World) the NTM barrier will not include information of NTMs of intra-regional trade. Since most of this intra-regional trade happens in the European Union and knowing that its intra-regional trade is free from NTMs, the universe of trade that is not considered and that is potentially affected by NTM is reduced to less than 4% as showed in the table below.

**Table A4**
**Trade coverage**
*(Percentages)*

| Year | Global Trade (billions US$) | Interregional Trade | Intra-regional Trade | | | GTAP-groups coverage | Sample covered |
|---|---|---|---|---|---|---|---|
| | | | Total | Intra-EU | Non Intra-EU | | |
| 2011 | 16 065.0 | 70.2 | 29.8 | 21.8 | 8.0 | 74.9 | 96.7 |
| 2015 | 14 711.5 | 71.6 | 28.4 | 20.5 | 7.9 | 75.8 | 96.3 |

Source: Author's calculations based on data from BACI. Note: Inter and Intra-regional trade is based by the 10 groups of countries previously defined.

# Annex 3
# Frequency indexes comparison

The definition of the universe country pairs and products to be considered in the calculation of the frequency index is likely to affect its results. The results presented in section II were calculated according to UNCTAD-World Bank (2018), where only products for which there was trade at the bilateral level were considered. However, it is possible that even when there is no trade, NTMs are applied to the bilateral relationship. So, in one hypothetical case where country *i* impose a really restrictive measure on country *j* so that trade is completely diverted, this would not be captured by UNCTAD-WB frequency index as this product would not enter the universe of considered products. On the other hand, the inclusion of all products might consider some irrelevant products for a particular exporting country. For instance, if country *j* does not produce product *k* it is not that important how restrictive an NTM from country *i* is. One way to lessen both of these problems is to account only for partner countries which exported a particular product for at least one destination in a particular year. Formally, a modified frequency index can be calculated as follow:

$$Modified\ Frequency\ Index_g = \left(\frac{\sum_{i=1}^{N}\sum_{j=1}^{J}\sum_{k=1}^{5103} D_{ijk} * M_{ijk}^{*}}{\sum_{i=1}^{N}\sum_{j=1}^{J}\sum_{k=1}^{5103} M_{ijk}^{*}}\right) * 100 \quad \forall\, i \neq j\,,$$

where $D_{ijk}$ is defined as in section II; a dummy variable reflecting the presence of an NTM imposed by country *i* to country *j* in product *k* and $M_{ijk}^{*}$ is a dummy equal to one whenever the partner country *j* is an exporter of product *k* at the global level, and zero otherwise. What changes is the dimension in which the sum is performed. As previously mentioned, the number of countries included in group *i* (*N*), was restricted to those members of the WTO and it varies depending on the group *g* analyzed. Lastly, the number of affected economies *J* is either 182 for non-EU members or 156 for EU members.

For the sake of completeness, this annex compares values from section II to the modified version of the frequency index. In general, results are similar but give us some additional insights. By including the additional country-pair-product observations with no trade, the modified frequency indexes by imposing regions for TBT are, in general, smaller, indicating that the additional country pair product considered are not bound by NTMs. On the other hand, SPS modified frequency index are larger for different regions, showing that even when no trade was observed an NTM was present. Although this index includes a bigger universe of partner-products it is not enough to reach conclusion about restrictiveness of NTMs.

**Table A5**
**Comparison of frequency Indexes for different importing regions**
*(In percentages, 2015)*

| Region/Country | Modified Frequency Indexes | | | | | UNCTAD –WB Frequency Indexes | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | All NTMs | SPS | TBT | QR | OtherNTM | All NTMs | SPS | TBT | QR | Other NTM |
| Latin America and the Caribbean | 38.0 | 12.8 | 33.4 | 0.9 | 0.1 | 52.4 | 14.1 | 48.7 | 1.1 | 0.3 |
| United States | 89.8 | 41.1 | 82.8 | 16.4 | 4.8 | 90.4 | 32.2 | 85.3 | 12.9 | 4.5 |
| Canada | 92.8 | 18.8 | 92.1 | 15.6 | 0.1 | 91.9 | 17.5 | 91.4 | 9.2 | 0.2 |
| European Union | 84.8 | 32.9 | 80.4 | 10.3 | 0.6 | 85.5 | 22.9 | 81.6 | 10.9 | 0.8 |
| Japan | 100.0 | 23.7 | 84.4 | 100.0 | 1.1 | 100.0 | 19.6 | 86.8 | 00.0 | 0.8 |
| China | 93.7 | 34.0 | 89.8 | 30.7 | 0.2 | 94.8 | 27.9 | 91.3 | 33.2 | 0.4 |
| Other Asia Pacific | 41.0 | 13.9 | 26.9 | 18.4 | 0.2 | 61.6 | 14.6 | 42.5 | 31.2 | 0.4 |
| Middle East and North Africa | 40.0 | 9.3 | 34.4 | 6.7 | 0.3 | 52.1 | 8.4 | 45.2 | 11.0 | 0.5 |
| Sub-Saharan Africa | 17.6 | 2.5 | 13.1 | 3.0 | 0.0 | 25.3 | 2.3 | 22.7 | 1.8 | 0.0 |
| Rest of World | 34.8 | 9.4 | 24.2 | 14.5 | 0.1 | 50.0 | 10.2 | 28.4 | 31.6 | 0.2 |
| **World** | **43.2** | **13.8** | **36.5** | **8.7** | **0.3** | **59.6** | **13.9** | **50.4** | **16.4** | **0.5** |

Source: Author.
Note: Intra-EU trade was not considered so that frequency indexes would not be downward biased. See annex 2 for trade coverage details.

# Annex 4
# Coverage ratios by countries (GTAP classification)

**Table A6**
**Coverage Ratios for SPS, TBT and Trade Defense Measures (TDM)**
*(In percentages, 2015)*

| Country | Percentage of Global Imports | By importing country: Total NTM | SPS | TBT | TDM | Percentage of Global Exports | By exporting country: Total NTM | SPS | TBT | TDM |
|---|---|---|---|---|---|---|---|---|---|---|
| Argentina | 0.5 | 77.0 | 6.4 | 76.0 | 2.1 | 0.5 | 89.9 | 61.9 | 86.4 | 12.6 |
| Brazil | 1.4 | 92.9 | 46.6 | 91.4 | 1.6 | 1.6 | 80.9 | 39.5 | 74.3 | 20.0 |
| Paraguay | 0.1 | 52.4 | 5.0 | 51.9 | 0.0 | 0.1 | 92.9 | 78.1 | 87.0 | 14.5 |
| Uruguay | 0.1 | 45.8 | 3.9 | 43.2 | 17.9 | 0.1 | 80.8 | 59.1 | 72.3 | 25.1 |
| Venezuela | 0.2 | 53.7 | 9.4 | 53.1 | 0.0 | 0.3 | 74.2 | 4.5 | 73.7 | 61.2 |
| Chile | 0.5 | 79.7 | 30.2 | 66.8 | 2.3 | 0.5 | 80.9 | 34.7 | 69.1 | 17.3 |
| Bolivia | 0.1 | 12.2 | 1.9 | 10.3 | 0.0 | 0.1 | 88.3 | 44.2 | 80.1 | 8.2 |
| Colombia | 0.4 | 80.9 | 25.7 | 79.3 | 0.5 | 0.3 | 87.5 | 25.0 | 84.7 | 28.1 |
| Ecuador | 0.2 | 57.6 | 4.5 | 54.5 | 0.4 | 0.2 | 92.3 | 50.4 | 90.1 | 33.5 |
| Peru | 0.3 | 46.3 | 14.6 | 29.5 | 12.0 | 0.3 | 83.4 | 27.1 | 77.9 | 16.4 |
| Mexico | 3.2 | 95.6 | 14.6 | 95.5 | 0.3 | 3.3 | 95.2 | 14.8 | 93.2 | 14.7 |
| Costa Rica | 0.1 | 57.7 | 23.6 | 57.1 | 18.5 | 0.1 | 91.1 | 46.8 | 88.0 | 10.1 |
| El Salvador | 0.1 | 73.4 | 28.9 | 69.9 | 0.0 | 0.1 | 87.0 | 25.4 | 83.9 | 6.6 |
| Guatemala | 0.1 | 57.7 | 33.3 | 50.0 | 0.0 | 0.1 | 84.5 | 52.1 | 82.2 | 9.2 |
| Honduras | 0.1 | 64.5 | 24.9 | 61.3 | 0.0 | 0.1 | 96.3 | 35.1 | 95.0 | 4.1 |
| Nicaragua | 0.1 | 78.4 | 35.8 | 74.7 | 1.3 | 0.04 | 97.9 | 42.1 | 96.9 | 9.8 |
| Panama | 0.2 | 45.8 | 9.7 | 43.0 | 0.1 | 0.04 | 82.8 | 27.0 | 80.0 | 22.7 |
| Dominican Republic | 0.1 | 68.5 | 17.6 | 68.5 | 0.1 | 0.1 | 79.2 | 26.3 | 76.8 | 10.8 |
| Jamaica | 0.04 | 43.8 | 1.7 | 43.8 | 0.0 | 0.01 | 87.7 | 52.7 | 85.0 | 34.6 |
| Trinidad and Tobago | 0.1 | 52.7 | 3.2 | 49.5 | 0.0 | 0.1 | 81.5 | 39.0 | 80.0 | 13.2 |
| Rest of the Caribbean | 0.2 | 24.9 | 4.4 | 19.1 | 1.7 | 0.1 | 84.7 | 27.0 | 81.7 | 29.7 |
| Canada | 3.4 | 96.3 | 16.0 | 95.8 | 5.6 | 3.3 | 89.8 | 27.8 | 84.7 | 32.2 |
| USA | 18.0 | 95.9 | 21.7 | 93.6 | 22.5 | 11.4 | 88.8 | 23.2 | 82.0 | 25.9 |
| European Union | 16.7 | 89.4 | 21.4 | 86.9 | 15.0 | 15.6 | 81.5 | 21.1 | 69.6 | 37.9 |
| Japan | 4.8 | 100.0 | 19.2 | 89.2 | 100.0 | 5.3 | 88.3 | 10.9 | 78.6 | 33.7 |
| China | 10.2 | 98.1 | 21.7 | 96.7 | 52.5 | 19.3 | 83.9 | 8.9 | 69.2 | 32.1 |
| Australia | 1.6 | 91.5 | 13.8 | 51.3 | 84.9 | 1.6 | 86.6 | 22.0 | 79.5 | 33.1 |
| New Zealand | 0.3 | 85.5 | 35.1 | 60.0 | 58.0 | 0.3 | 92.1 | 67.8 | 78.7 | 41.3 |
| South Korea | 3.5 | 99.9 | 18.7 | 99.5 | 8.0 | 4.3 | 86.8 | 10.2 | 74.8 | 43.8 |
| ASEAN | 8.9 | 71.2 | 12.2 | 49.2 | 41.9 | 10.0 | 84.6 | 16.2 | 70.8 | 38.6 |
| Other Asia Pacific | 8.9 | 57.0 | 7.4 | 24.1 | 40.5 | 4.2 | 75.1 | 16.8 | 67.7 | 19.1 |
| Middle East & North Africa | 7.7 | 66.3 | 10.1 | 54.6 | 20.7 | 7.5 | 76.8 | 11.7 | 71.0 | 32.0 |
| Sub-Saharan Africa | 2.5 | 32.4 | 4.2 | 29.7 | 1.2 | 2.4 | 68.8 | 16.5 | 63.0 | 25.0 |
| Rest of the world | 5.1 | 78.4 | 15.8 | 49.3 | 66.6 | 7.0 | 79.8 | 19.4 | 73.9 | 25.3 |

Source: Author.
Note: Trade defense measures include antidumping duties, quantitative restrictions, countervailing duties, safeguard and special safeguard measures. Coverage ratios for antidumping investigations were not considered in this table. Intra-European trade not considered.

# Annex 5
# Data sources for the gravity estimation

This annex provides more information on the data used for the analysis. As previously mentioned, the variable of interest of this paper was retrieved from *wiiw's* NTM database with all notifications member countries imposed (both multilaterally and bilaterally) and its affected HS 6-digit code (Ghodsi et al., 2017). Trade flows, measured in quantities, were retrieved from the CEPII's BACI database elaborated by Gaulier and Zignago (2010) with data from UN-Comtrade. The authors harmonize export and import data using an estimation of CIF (cost, insurance and freight) and a measure of reporter reliability. The HS version of 1996 was selected to perform a match with the *wiiw* dataset. Tariff data comes from the Trade Analysis Information System (TRAINS) and the WTO Integrated Data Base (IDB) via the World Integrated Trade Solutions (WITS). Dolabella (2020) shows how these two datasets were merged in order to minimize data loss. Bilateral preferential tariff data was considered first and when no data was available for this tariff type the Most Favored Nation (MFN) tariff was used. Currently, 163 countries plus the European Union are members of the WTO. Since the NTM data only covers reporters which are WTO members, observations concerning nonmember's imports are not taken into account. Data on member countries, their ascension year and the preferential trade agreements between different country pairs are made available by the WTO.

# Annex 6
# Note on import demand elasticities

In order to transform NTM trade effects into AVEs, the elasticities of substitution between domestic and imported goods from the GTAP model 9.0 were used. The data was extracted from GTAP database 9.0 for an aggregation of 34 sectors and 33 countries. These sectorial elasticities were averaged across country groups and applied to all HS06 lines comprised within the sector. Therefore, it is assumed that an increase of import prices has the same impact on import quantities of all products within the sector at the sectorial. Since one of the objectives of this work is to estimate the barriers steaming from NTMs in order to fit a CGE model it seemed reasonable to transform the NTM trade effects into AVE using the same the elasticities used by the CGE model.

Hertel and van der Mensbrugghe (2016) explain that GTAP uses the "rule of two" to get their elasticity of substitution between domestic and imported goods, i.e. the import demand elasticity. The "rule of two", which states that *the elasticity of substitution among imports from different sources is twice the elasticity of substitution between domestic and imported commodities*. Thus, estimates for the elasticity of substitution among imports from different sources were obtained from Hertel et al. (2007) and then divided by two to get the elasticity of substitution between domestic and imported goods.

For the sake of completeness table A7 shows a comparison between the GTAP elasticities and other more recent estimates of import demand elasticities. Kee et al. (2008) and Ghodsi et al. (2016b) estimated import demand elasticities at HS06 level for different importer-product combinations. Aggregating them to the 33 sectors of the model ("Services, n.e.s" is not displayed) weighted by its trade a comparison between the three types of elasticities can be made. Because only significantly different from zero elasticities are considered some importer-product elasticities are missing. The last two columns record this information by showing what trade's percentage is missing in the calculation of the sectorial import demand elasticity from Kee et al. (2008) and Ghodsi *et al*. (2016b). Trade weights were computed using the total trade related to the non-missing elasticities. It can be seen that the trade weighted average elasticities from GTAP are bigger than the estimates of Kee *et al*. (2008) and Ghodsi et al. (2016b). This pattern is also reflected across almost all sectors, with exceptions of "other cereals", "fishing", "non-energy mining" and "beverages and tobacco".

**Table A7**
**Comparison of import demand elasticities**
*(Trade values from 2015)*

| Sector ID | Sector Name | Trade in Billions USD | Elasticities | | | Percent of trade with missing elasticities | |
|---|---|---|---|---|---|---|---|
| | | | GTAP | Kee *et al.* (2008) | Ghodsi *et al* (2016b) | Kee *et al.* (2008) | Ghodsi *et al.* (2016b) |
| 1 | Rice | 2.4 | -5.09 | -0.78 | -1.29 | 7 | 24 |
| 2 | Wheat | 36.8 | -4.40 | -3.73 | -0.92 | 11 | 20 |
| 3 | Other cereals | 39.1 | -1.30 | -2.33 | -0.94 | 6 | 20 |
| 4 | Fruits and vegetables | 121.8 | -1.89 | -1.48 | -0.90 | 6 | 15 |
| 5 | Oilseeds | 69.1 | -2.49 | -1.02 | -1.06 | 4 | 2 |
| 6 | Fiber and vegetables | 12.6 | -2.50 | -1.00 | -0.98 | 19 | 4 |
| 7 | Other crops | 65.9 | -3.08 | -1.65 | -0.96 | 3 | 17 |
| 8 | Livestock | 54.6 | -2.17 | -1.72 | -0.97 | 7 | 17 |
| 9 | Forest | 55.9 | -2.50 | -2.26 | -0.98 | 5 | 4 |
| 10 | Fishing | 81.9 | -1.29 | -1.60 | -1.00 | 7 | 10 |
| 11 | Energy mining | 81.1 | -6.21 | -2.00 | -1.00 | 4 | 10 |
| 12 | Non-energy mining | 520.6 | -0.90 | -1.44 | -1.00 | 29 | 23 |
| 13 | Meat | 120.6 | -4.15 | -1.60 | -1.01 | 7 | 14 |
| 14 | Dairy products | 56.2 | -3.69 | -1.21 | -0.87 | 7 | 21 |
| 15 | Oils | 114.0 | -3.30 | -1.57 | -1.05 | 9 | 15 |
| 16 | Sugar | 37.3 | -2.70 | -1.24 | -1.01 | 9 | 34 |
| 17 | Other foods | 358.4 | -2.07 | -1.79 | -0.97 | 7 | 25 |
| 18 | Beverages and tobacco | 173.9 | -1.11 | -1.88 | -1.00 | 5 | 17 |

| Sector ID | Sector Name | Trade in Billions USD | Elasticities | | | Percent of trade with missing elasticities | |
|---|---|---|---|---|---|---|---|
| | | | GTAP | Kee *et al.* (2008) | Ghodsi *et al* (2016b) | Kee *et al.* (2008) | Ghodsi *et al.* (2016b) |
| 19 | Textiles | 192.6 | -3.78 | -1.92 | -1.01 | 13 | 25 |
| 20 | Clothing | 484.6 | -3.70 | -1.31 | -1.03 | 6 | 9 |
| 21 | Leather and footwear | 212.7 | -4.10 | -2.44 | -1.00 | 5 | 10 |
| 22 | Wood and its manufactures | 71.2 | -3.40 | -1.67 | -1.01 | 5 | 13 |
| 23 | Paper and related products | 241.5 | -2.99 | -1.65 | -1.01 | 4 | 14 |
| 24 | Petrochemical | 1 567.6 | -2.10 | -1.08 | -1.07 | 23 | 2 |
| 25 | Chemical products | 2 124.5 | -3.30 | -1.23 | -0.95 | 4 | 14 |
| 26 | Non-metallic minerals | 245.9 | -3.34 | -1.90 | -0.95 | 40 | 36 |
| 27 | Iron and Steel | 542.7 | -2.99 | -1.73 | -1.00 | 7 | 13 |
| 28 | Metal products | 730.6 | -3.79 | -1.36 | -0.93 | 17 | 13 |
| 29 | Vehicles | 1,256.8 | -2.80 | -1.58 | -0.96 | 4 | 7 |
| 30 | Transportation equipment | 435.9 | -4.30 | -2.05 | -0.87 | 7 | 29 |
| 31 | Electric equipment | 1 203.8 | -4.40 | -1.10 | -0.93 | 3 | 10 |
| 32 | Machinery and equipment | 3 051.0 | -4.09 | -1.27 | -0.89 | 5 | 13 |
| 33 | Other manufactures | 392.9 | -3.78 | -1.27 | -0.87 | 18 | 12 |
| | Total | l4 756.6 | -3.31 | -1.40 | -0.96 | 9 | 13 |

Source: Author.

Note: The HS06 multilateral elasticities from Kee et al. (2008) and Ghodsi et al. (2016b) were weighted across partners and products using 2015 trade weights.

# Annex 7
# Result's robustness to outliers

This annex digs deeper and performs a number of assessments in order to check the robustness of the results. As previously mentioned, one concern is that our dependent variable (quantity traded in tons from BACI) might carry some noise because it is not the official data reported by countries. A proposed way to control for the impact of extreme values was to eliminate 1% of extreme observation based on their price per year of the panel. The implicit price was obtained by dividing the value paid by the quantity traded. So, whenever a country sold a product for a much higher/lower price than it was used to in the other years of the panel, this would be highlighted as an outlier and was set to missing. The problem is that, on more heterogeneous products, this criterion also eliminated all the data from particular country pair with low or high quality products. Even though, as an additional check, all product regressions alongside with their RESET tests were performed again excluding these extreme values. Comparison results are presented in the sequence.

Another way to check the robustness of the results presented in section III is to assess how dependent these results are from the influence of some extreme estimated coefficients. Given the exponential form of the trade effect function, the resulting trade effects might explode if any of the estimated coefficient is large and positive, which would be translated to a very negative AVE. As explained in section III, trade effects have a lower bound of -1 (or -100%) by construction and, when transformed to AVE, values are also cut at the -100% threshold. These bounds eliminate extreme values from the aggregation, but their impact might be still influencing the final result. For this reason, results were also calculated without the inclusion of these outliers. One first criterion to eliminate extreme values was imposed on the estimated coefficients. Given the distribution of the significant coefficients at 10% significance level, the interquartile range was calculated for each one of the NTM coefficients. The distribution of the estimated coefficients is displayed below.

**Table A8**
**Identifying outliers: distribution of estimated coefficients**

| | Number of lines with sign. coefficient at 10% | min | Percentiles | | | | | max | Interquartile range (IQR) | Number of lines beyond 5 times the IQR |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | p1 | p25 | p50 | p75 | p99 | | | |
| Coefficient ß1 | | | | | | | | | | |
| ADP | 1 658 | -1357.91 | -42.20 | -2.90 | 0.78 | 2.66 | 40.12 | 688.62 | 5.57 | 24 |
| CV | 271 | -162.16 | -31.34 | -2.32 | 1.64 | 4.48 | 114.17 | 175.89 | 6.80 | 2 |
| QR | 1 610 | -47.04 | -19.17 | -1.39 | -0.80 | -0.29 | 2.81 | 5.23 | 1.10 | 111 |
| SG | 149 | -41.89 | -22.15 | -1.52 | 0.81 | 1.63 | 15.67 | 195.81 | 3.15 | 3 |
| SPS | 1 170 | -48.34 | -15.88 | -1.74 | -0.55 | 0.92 | 17.42 | 41.13 | 2.65 | 34 |
| SSG | 48 | -16.23 | -16.23 | -2.29 | -0.91 | 1.79 | 23.54 | 23.54 | 4.08 | 0 |
| TBT | 1 235 | -17.76 | -3.86 | -0.73 | -0.35 | 0.52 | 2.42 | 14.68 | 1.25 | 6 |
| Coefficient ß2 (interaction with importer share) | | | | | | | | | | |
| ADP | 1 640 | -13454.8 | -131.93 | -0.82 | -0.10 | 0.39 | 37.45 | 3 250.62 | 1.22 | 119 |
| CV | 268 | -178.41 | -96.42 | -0.49 | -0.11 | 0.20 | 14.62 | 123.10 | 0.70 | 12 |
| QR | 1 564 | -761.91 | -1.34 | -0.08 | 0.10 | 0.30 | 2.98 | 21.21 | 0.39 | 13 |
| SG | 185 | -108.13 | -84.63 | -0.20 | 0.13 | 1.33 | 50.95 | 365.10 | 1.53 | 5 |
| SPS | 1 186 | -17574.3 | -1 066.0 | -0.20 | -0.07 | 0.34 | 63.98 | 2 327.40 | 0.54 | 172 |
| SSG | 59 | -9 610.51 | -9 610.5 | -0.36 | 0.18 | 3.37 | 2 706.4 | 2 706.35 | 3.73 | 2 |
| TBT | 1 443 | -78.54 | -0.77 | -0.09 | -0.04 | 0.08 | 0.83 | 10.38 | 0.17 | 27 |
| Coefficient ß3 (interaction with exporter share) | | | | | | | | | | |
| ADP | 1 666 | -4 494.54 | -101.38 | -0.18 | -0.03 | 0.23 | 72.61 | 39 486.9 | 0.41 | 96 |
| CV | 276 | -21 628.2 | -618.77 | -0.53 | -0.09 | 0.35 | 57.29 | 539.24 | 0.88 | 17 |
| QR | 1 314 | -4.46 | -0.23 | -0.04 | -0.01 | 0.03 | 0.20 | 0.44 | 0.07 | 4 |
| SG | 188 | -8.61 | -1.25 | -0.07 | -0.02 | 0.05 | 12.21 | 6 453.73 | 0.12 | 3 |
| SPS | 1 091 | -32.07 | -0.55 | -0.04 | 0.02 | 0.06 | 0.37 | 1.25 | 0.09 | 16 |
| SSG | 59 | -4.38 | -4.38 | -0.11 | -0.02 | 0.09 | 6.71 | 6.71 | 0.20 | 1 |
| TBT | 1 202 | -3.83 | -0.15 | -0.03 | 0.01 | 0.03 | 0.14 | 0.45 | 0.06 | 2 |

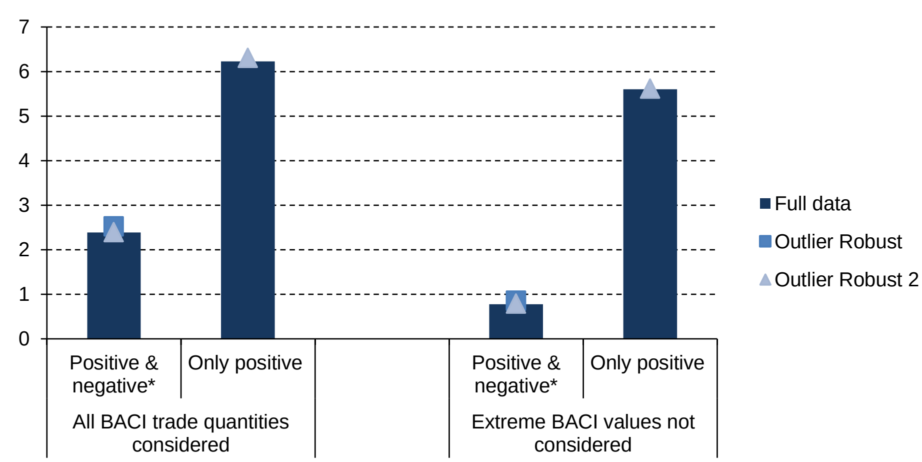
Source: Author.

Whenever each of the estimated coefficients were five times bigger than the upper quartile or five times smaller than the lower quartile, they were set to missing, and the impact of this particular measure on this particular product was not considered. These results are later displayed as “outlier robust 2”.

This check allowed us to eliminate the impact of an NTM for entire products based on their coefficient. Still extreme values might appear after the export/import shares are plot into the trade effect function. Therefore, this time, outliers were not eliminated based on their coefficients but on their actual estimated AVE of SPS or TBT. Extreme AVEs were not considered when its trade effect surpassed an upper threshold of 1,000 or (100,000%). These values were set to zero. Out of all significant country-pairs-products considered under the influence of an SPS or a TBT, 9.0% of SPS and 7.2% of TBTs were above this threshold. These extremes country-pair products represented respectively, 5.2% (SPS) and 4.2% (TBT) of the trade under the influence of each NTM. Results of cutting AVEs with this criterion are displayed with the label “outlier robust”. Lastly, the influence of missing values I also analyzed. Results setting missing values to zero instead of re-weighting them using similar country-pairs products were calculated and compared.

A first comparison is given by the following figure. The estimation which does not consider extreme price values renders smaller estimates for AVEs when compared to the full data. The magnitude of this difference is larger when AVE values are allowed to be either positive or negative for SPS and TBTs. When this difference is tracked down, the impact of TBT in the sector of non-energy mining appears to be the responsible for a significant share of this difference (figure 3 in section III shows that more than 50% of this sector’s trade is missing). Due to an estimation error using the full data, the missing values were re-weighted using a similar product of the bilateral relationship, which resulted in a small positive AVE. On the other hand, eliminating BACI outliers, AVE of TBT for this sector were estimated as a strong trade promoting effect. This explains the difference between this sector’s AVE estimates. Analyzing other influential observations (large difference between AVEs estimates times its trade weights) other sectors showed smaller differences, which did not tip much the balance in either direction. TBTs in both beverages and tobacco, chemical and petrochemical sector were also higher in the model with full data, being responsible for an aggregate 0.45% percent point difference in the final result. Metal products, on the other hand were 0.15% higher in the estimation without extreme values. This second specification rendered larger estimations for AVEs of SPS especially in the fishing and chemical sectors. When only the negative trade impacts of NTMs are considered (setting negative AVEs to zero) aggregate results show a similar level, close to 6%.

**Figure A1**
**Trade weighted AVE impact for different robustness checks**
*(Trade values from 2015; trade effect type 2)*




Source: Author.

The influence of specific extreme coefficients (values labeled "outliers robust 2") does not appear to be large. When the aggregated results are analyzed, results are at maximum 0.01 percentage point larger, even when different NTMs are analyzed separately. The impact of removing extreme marginal effects (values labeled "outliers robust") increases the aggregated AVEs since we are setting large negative values to zero. For the full data this increases the overall AVE in 0.14 percentage points.

Focusing the analysis only to the model with full data, the impact of positive and negative AVEs are analyzed in more details when different dimensions are considered. China, Japan and the United States impose the most restrictive measures, while the NTMs imposed by "Rest of the world" are trade promoting and therefore present a negative AVE. When comparing with the other estimations one can see that extreme coefficients do not significantly affect the result (values labeled "outliers robust 2"). However, the impact of extremes AVEs is more influential. When these are not considered, the estimated AVE imposed by the USA increases from 3.7% to 4.2% and the estimated protection imposed by Japan increases from 5.4% to 5.8% (see table A9).

**Table A9**
**Sensitiveness results: trade weighted AVE impact by importing/imposing countries**

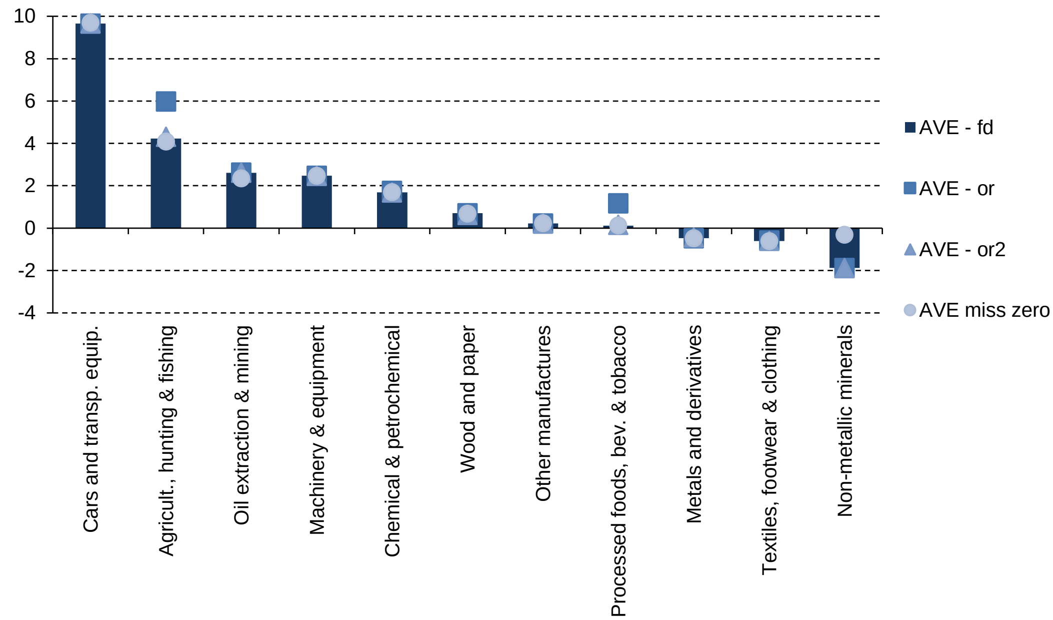
| Countries/Regions | NTMs Costs and benefits | | | | NTMs Costs | | |
|---|---|---|---|---|---|---|---|
| | Full data | or | or2 | No re-weight | Full data | or2 | No re-weight |
| China | 7.4 | 7.5 | 7.4 | 6.4 | 11.2 | 11.4 | 11.1 |
| Japan | 5.4 | 5.8 | 5.4 | 5.4 | 9.8 | 9.8 | 9.7 |
| United States | 3.7 | 4.2 | 3.7 | 3.9 | 10.0 | 10.0 | 10.0 |
| Other Asia Pacific | 1.9 | 1.9 | 1.9 | 1.9 | 4.2 | 4.3 | 4.2 |
| Canada | 1.5 | 1.5 | 1.5 | 1.8 | 5.6 | 5.6 | 5.5 |
| Middle East & North Africa | 1.0 | 1.0 | 1.0 | 1.0 | 2.9 | 3.2 | 2.9 |
| European Union | 0.7 | 0.8 | 0.7 | 0.8 | 4.7 | 4.8 | 4.7 |
| Latin America & Caribbean | 0.5 | 0.5 | 0.5 | 0.5 | 3.6 | 3.6 | 3.6 |
| Sub-Saharan Africa | -0.1 | -0.1 | -0.1 | -0.1 | 0.9 | 0.9 | 0.9 |
| Rest of World | -1.7 | -1.6 | -1.6 | -0.3 | 3.5 | 3.8 | 3.5 |
| World | 2.4 | 2.5 | 2.4 | 2.4 | 6.2 | 6.3 | 6.2 |

Source: Author.

From the affected country/region perspective, results did oscillate much. Protection faced by exporters from Latin America and the Caribbean were among the most sensitive and increased from 4.34 to 4.63 when extreme trade effects were not considered (or). Values did not change much when missing were set to zero or when some extreme coefficients were not taken into account.

The sectorial dimension helps explain the differences in the outlier robust results. Agriculture, hunting and fishing as well as processed foods beverages and tobacco showed some divergent values when extreme promoting effects from NTMs are unconsidered. NTMs imposed by the USA appear to be driving this difference, mainly due to its large market share in products of these sectors, when the full data is considered the barrier is close to zero and increases to around 7% and 5% respectively when these large negative AVEs are not taken into account. Again, at the sectorial dimension, extreme coefficients of different NTMs are not influencing the result. In terms of missing values, if they are set to zero instead of reweighting, sectors with most missing HS lines present the biggest changes. For example, the sector of non-metallic minerals had its AVE of NTM increased from -1.9% to -0.3%.

**Figure A2**
**Sensitiveness results: trade weighted costs/benefits of NTMs by sectors**
*(Full data - fd; outlier robust - or; outlier robust 2 - or2; trade effect type 2)*




Source: Author.

In sum, this annex gives us more information on the results presented in section III. First, even though the estimated coefficients for some types of NTMs were extremely large, they appear not to influence the trade weighted average AVE. This might be because they were estimated for products in which there was not much trade or there were not many countries imposing NTMs for these particular products. Second, eliminating extreme values of AVE, based on marginal effects which displayed an extremely large estimated trade promoting effect, showed that AVE estimates for agriculture, hunting and fishing as well as processed foods beverages and tobacco were sensitive for these results, especially those barriers imposed by the USA. Thirdly, another sensitive sector was identified by eliminating the extreme values of BACI based on their implicit price and re-estimating the tariff level gravities. Oil extraction and mining, especially non-energy mining, presented conflicting results mainly due to an estimation error with the full database.

# Annex 8
# AVEs of NTMs by importing and exporting countries

**Table A10**
**Costs and benefits of NTMs: AVE of NTMs for different importing/exporting countries**
*(In percentages, 2015)*

| Regions/Countries | AVE – Importing Country | | | | AVE – Exporting Country | | | |
|---|---|---|---|---|---|---|---|---|
| | Total | SPS | TBT | TDM | Total | SPS | TBT | TDM |
| Latin America and the Caribbean | | | | | | | | |
| Argentina | 0.7 | -0.4 | 0.9 | 0.2 | 4.4 | 3.3 | 0.9 | 0.2 |
| Brazil | -2.4 | -2.7 | 0.2 | 0.1 | 4.4 | 3.7 | 0.2 | 0.6 |
| Paraguay | 0.4 | 0.2 | 0.2 | 0.0 | 2.2 | 1.7 | 0.4 | 0.1 |
| Uruguay | 0.8 | 0.0 | 0.3 | 0.5 | 1.8 | 0.5 | 0.4 | 0.9 |
| Venezuela | 1.3 | 0.5 | 0.8 | 0.0 | 1.5 | 0.5 | 0.2 | 0.8 |
| Chile | -2.8 | -2.3 | -0.6 | 0.1 | 2.1 | -1.6 | 3.3 | 0.3 |
| Bolivia | 0.1 | 0.0 | 0.0 | 0.0 | 5.1 | 5.7 | -0.8 | 0.2 |
| Colombia | 0.9 | 0.4 | 0.4 | 0.0 | 0.7 | -0.3 | 0.8 | 0.2 |
| Ecuador | 0.9 | 0.0 | 0.9 | 0.0 | -0.8 | -0.4 | -1.0 | 0.6 |
| Peru | 1.1 | 0.4 | 0.1 | 0.5 | 4.0 | 0.9 | 2.8 | 0.3 |
| Mexico | 2.2 | 0.1 | 2.1 | 0.0 | 6.3 | -1.8 | 7.3 | 0.7 |
| Costa Rica | 1.9 | 0.2 | -0.1 | 1.8 | 1.7 | -0.3 | 1.4 | 0.6 |
| El Salvador | 0.1 | 0.3 | -0.2 | 0.0 | 4.8 | -0.1 | 4.7 | 0.2 |
| Guatemala | -0.8 | -0.6 | -0.3 | 0.0 | 4.2 | -0.2 | 4.1 | 0.3 |
| Honduras | 0.3 | 0.3 | -0.1 | 0.0 | 8.0 | -0.6 | 8.3 | 0.2 |
| Nicaragua | 0.3 | 0.1 | 0.1 | 0.0 | 5.7 | -2.2 | 7.0 | 0.9 |
| Panama | 0.1 | 0.1 | 0.0 | 0.0 | 2.2 | -0.5 | 1.9 | 0.8 |
| Dominican Republic | 0.4 | 0.2 | 0.2 | 0.0 | -14.8 | -6.5 | -8.5 | 0.3 |
| Jamaica | 0.3 | 0.0 | 0.3 | 0.0 | 17.4 | 8.8 | 8.2 | 0.4 |
| Trinidad and Tobago | -0.4 | 0.0 | -0.3 | 0.0 | -1.8 | -4.8 | 2.6 | 0.3 |
| Rest of the Caribbean | 0.2 | -0.1 | 0.1 | 0.2 | 2.5 | -1.5 | 3.1 | 0.9 |
| Canada | 1.5 | -0.2 | 1.4 | 0.3 | 4.5 | 0.0 | 3.9 | 0.6 |
| United States | 3.7 | -0.5 | 3.5 | 0.7 | 1.9 | 0.5 | 0.4 | 1.0 |
| European Union | 0.7 | -0.3 | 0.7 | 0.3 | 1.3 | -0.2 | 0.1 | 1.3 |
| Japan | 5.4 | -0.1 | 0.6 | 4.8 | 3.9 | -0.1 | 2.4 | 1.6 |
| China | 7.4 | 0.9 | 3.5 | 2.9 | 1.0 | -0.5 | -0.7 | 2.2 |
| Other Asia Pacific | | | | | | | | |
| Australia | 3.2 | -0.2 | 0.6 | 2.8 | 9.2 | -0.7 | 7.7 | 2.2 |
| New Zealand | -1.8 | -3.2 | -0.4 | 1.9 | -1.7 | -4.3 | 1.2 | 1.3 |
| South Korea | 0.0 | -0.2 | -0.1 | 0.3 | 5.2 | 0.0 | 2.3 | 3.0 |
| ASEAN | 1.1 | 0.0 | -1.0 | 2.0 | 3.3 | -0.2 | 1.2 | 2.2 |
| Other Asia Pacific | 3.2 | -0.2 | 0.1 | 3.3 | 3.3 | -0.1 | 2.7 | 0.8 |
| Middle East and North Africa | 1.0 | -0.1 | 0.1 | 0.9 | 1.6 | 0.1 | 0.7 | 0.8 |
| Sub-Saharan Africa | -0.1 | 0.0 | -0.1 | 0.0 | -1.6 | -0.5 | -1.6 | 0.5 |
| Rest of World | -1.7 | 0.0 | -3.5 | 1.9 | 2.4 | -0.3 | 2.0 | 0.6 |

Source: Author.

**Table A11**
**Costs of NTMs: AVE of NTMs for different importing/exporting countries**
*(In percentages, 2015)*

| Regions / Countries | AVE – Importing Country | | | | AVE – Exporting Country | | | |
|---|---|---|---|---|---|---|---|---|
| | Total | SPS | TBT | TDM | Total | SPS | TBT | TDM |
| Latin America and the Caribbean | | | | | | | | |
| Argentina | 2.7 | 0.1 | 2.5 | 0.2 | 7.7 | 4.8 | 2.7 | 0.2 |
| Brazil | 4.3 | 1.6 | 2.6 | 0.1 | 8.8 | 5.3 | 3.0 | 0.6 |
| Paraguay | 1.2 | 0.2 | 1.0 | 0.0 | 4.5 | 3.1 | 1.2 | 0.1 |
| Uruguay | 1.6 | 0.1 | 0.9 | 0.5 | 6.0 | 3.4 | 1.7 | 0.9 |
| Venezuela | 2.1 | 0.6 | 1.5 | 0.0 | 2.3 | 0.6 | 1.0 | 0.8 |
| Chile | 2.4 | 0.7 | 1.6 | 0.1 | 8.9 | 2.2 | 6.3 | 0.3 |
| Bolivia | 0.2 | 0.0 | 0.2 | 0.0 | 10.5 | 6.5 | 3.7 | 0.2 |
| Colombia | 2.9 | 1.0 | 1.8 | 0.0 | 4.2 | 0.3 | 3.7 | 0.2 |
| Ecuador | 1.7 | 0.1 | 1.6 | 0.0 | 2.3 | 0.8 | 1.0 | 0.6 |
| Peru | 1.9 | 0.7 | 0.7 | 0.5 | 10.0 | 1.9 | 7.9 | 0.3 |
| Mexico | 4.9 | 0.7 | 4.2 | 0.0 | 11.8 | 1.0 | 10.0 | 0.7 |
| Costa Rica | 3.6 | 0.8 | 1.0 | 1.8 | 6.9 | 2.0 | 4.3 | 0.6 |
| El Salvador | 2.3 | 1.0 | 1.3 | 0.0 | 7.3 | 0.9 | 6.3 | 0.2 |
| Guatemala | 1.8 | 1.1 | 0.8 | 0.0 | 6.5 | 0.9 | 5.4 | 0.3 |
| Honduras | 1.9 | 0.8 | 1.1 | 0.0 | 11.1 | 0.9 | 9.9 | 0.2 |
| Nicaragua | 2.4 | 0.9 | 1.5 | 0.0 | 9.5 | 0.6 | 7.9 | 0.9 |
| Panama | 0.9 | 0.3 | 0.6 | 0.0 | 4.3 | 0.4 | 3.2 | 0.8 |
| Dominican Republic | 2.2 | 0.6 | 1.6 | 0.0 | 4.9 | 1.1 | 3.5 | 0.3 |
| Jamaica | 1.2 | 0.0 | 1.2 | 0.0 | 20.0 | 10.1 | 9.4 | 0.4 |
| Trinidad and Tobago | 0.6 | 0.1 | 0.6 | 0.0 | 11.4 | 2.1 | 9.0 | 0.3 |
| Rest of the Caribbean | 0.5 | 0.1 | 0.2 | 0.2 | 7.5 | 1.8 | 4.7 | 0.9 |
| Canada | 5.6 | 0.8 | 4.5 | 0.3 | 9.7 | 2.1 | 7.1 | 0.6 |
| United States | 10.0 | 1.5 | 7.8 | 0.7 | 5.5 | 1.4 | 3.1 | 1.0 |
| European Union | 4.7 | 1.0 | 3.4 | 0.3 | 5.5 | 1.0 | 3.1 | 1.3 |
| Japan | 9.8 | 1.0 | 3.9 | 4.8 | 7.4 | 0.6 | 5.2 | 1.6 |
| China | 11.2 | 2.3 | 6.0 | 2.9 | 5.4 | 0.5 | 2.7 | 2.2 |
| Other Asia Pacific | | | | | | | | |
| Australia | 5.0 | 0.4 | 1.8 | 2.8 | 13.3 | 1.2 | 9.9 | 2.2 |
| New Zealand | 4.2 | 1.2 | 1.1 | 1.9 | 8.5 | 3.0 | 4.1 | 1.3 |
| South Korea | 4.5 | 1.0 | 3.2 | 0.3 | 8.0 | 0.5 | 4.5 | 3.0 |
| ASEAN | 3.8 | 0.5 | 1.2 | 2.0 | 7.0 | 1.1 | 3.7 | 2.2 |
| Other Asia Pacific | 4.3 | 0.3 | 0.7 | 3.3 | 4.4 | 0.8 | 2.8 | 0.8 |
| Middle East and North Africa | 2.9 | 0.4 | 1.6 | 0.9 | 3.9 | 0.8 | 2.3 | 0.8 |
| Sub-Saharan Africa | 0.9 | 0.2 | 0.7 | 0.0 | 4.1 | 0.7 | 2.8 | 0.5 |
| Rest of World | 3.5 | 0.6 | 1.0 | 1.9 | 5.4 | 0.9 | 3.9 | 0.6 |

Source: Author.

This study analyses the impact of reducing intraregional trade barriers in the context of a free trade agreement in Latin America and the Caribbean. It concludes that a full tariff reduction and elimination of non-tariff measures would have positive impacts on trade, production, welfare and employment across the region.

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LC/TS.2020/113