

DECEMBER 2019

UNCTAD Research Paper No. 41  
UNCTAD/SER.RP/2019/13

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# COMPUTING NON-TARIFF MEASURES INDICATORS: ANALYSIS WITH UNCTAD TRAINS DATA

## Abstract

Data on Non-Tariff Measures (NTM) contribute to transparency and can be used for statistics suitable for economic analysis. This study provides a description of the data cleaning process applied to the UNCTAD TRAINS NTM Data for Research and describes the standard methodology to compute indicators. Analysts can use the indicators for descriptive statistics or as variables in economic models. The objective of this document is to describe in detail the nuances in the treatment of the data in practical terms and share the procedures to synthesize the data into indicators that provide information that is useful to build knowledge and derive conclusions. The indicators resulting from the application of the described methodology are available for download from the UNCTAD TRAINS ([trains.unctad.org](http://trains.unctad.org)) web site and the NTM hub [unctad.org/ntm](http://unctad.org/ntm).

**Key words:** non-tariff measures, database, statistics



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### Acknowledgements

The publication was prepared by Denise Penello Rial, and benefitted from contributions from members of the Trade Analysis Branch.

The UNCTAD NTMs TRAINS database is a product of the Trade Information Section in the Trade Analysis Branch of UNCTAD's Division on International Trade and Commodities.

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## 1. Introduction

Non-Tariff Measures (NTMs) data in the Global TRAINS NTM database stems from legal national requirements that can directly or indirectly affect international trade in goods. The regulatory information is linked to the specific product to which the legal requirement is applied. The TRAINS NTM database contains comprehensive data for more than 100 countries.<sup>1</sup> The data covers all requirements that can potentially affect international trade for a specific product in a specific country and for a specific trading partner in one point in time. It contributes to transparency and allows statistical treatment suitable for economic analysis.

Policy makers are increasingly acknowledging the benefits of centralized information points, often called trade portals. Such portals are useful, not only for traders, but also for those responsible for developing and/or evaluating regulations such as technical requirements, which are increasingly important for trade. Technical requirements are based on non-trade related policy objectives, designed and implemented by technical departments within governments; very often without coordinating with other departments in charge of trade or economy. Although centralized registers of regulations in trade portals are very useful and enhance transparency, the TRAINS NTM database goes several steps further: it allows to access systematized information by product, measure type, countries imposing and affected and several other variables. It is therefore a valuable tool for coordinating offices and offices dealing with export promotion or small and medium size enterprises (SME) support as well as for researchers.

The TRAINS NTM database can be used to produce descriptive statistics such as incidence measures. Three basic indicators: frequency index, coverage ratio, and prevalence score, are particularly indicated to describe the use of NTMs as policy instrument in simple statistics. They provide information on how often a country uses NTMs, the most common NTM types, and the nature of the most regulated sectors.

Another feature of the UNCTAD TRAINS NTM database is the provision of detailed information about specific products or measures. Datasets are available for bulk download but should be processed or cleaned to offer more consistency for statistical analysis.

This paper provides a description of the data cleaning process and a standard methodology to build incidence measures (statistical indicators) that can be used as descriptive statistics or as variables in economic models. The indicators described here may be used to test hypothesis in economic models and thus suggest possible impact on trade, but also in other development or welfare analysis.

This publication follows previous work by UNCTAD in the area of NTMs (UNCTAD, 2012, 2013, 2015, 2016, 2017, 2018 and also World Bank, 2012) and replaces Section 5.3 of the TRAINS User Guide (UNCTAD, 2017).

The process of original data collection, data description, and available information can be found in UNCTAD (2017). The same NTMs data is published under different formats<sup>2</sup>, through:

- World Integrated Trade Solution (WITS)
- Web Application Trade Analysis Information System (TRAINS)
- STATA file for bulk download
- Global Trade Helpdesk

The paper focuses on the STATA file for bulk download (also called Researchers' file). It aims to describe in detail the nuances in the treatment of the data and share the procedures to synthesize data into indicators that provide information useful to build knowledge and derive conclusions. It describes the cleaning process of raw data and the assumptions taken for building the NTM incidence measures that are presented in the

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<sup>1</sup> This counts the European Union countries individually.

<sup>2</sup> See UNCTAD (2017), Section 5, for more details.

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downloadable STATA file available in the UNCTAD TRAINS ([trains.unctad.org](http://trains.unctad.org)) website. The same approach is used for the indicators on NTMs in WITS.

Statistical indicators (incidence measures) are computed based on a 'clean' dataset. These are also published, using the preferred options described in this report. This publication covers a wide range of issues of interest for NTM data users. Some common disaggregation is chosen (countries, sectors, chapters), others can be calculated using the Researchers' file and the approach outlined in this report.

When referring about cleaning process, we do not imply that the full / raw TRAINS data is not clean and quality controlled, but rather that it contains information (e.g. information at the tariff line level or correct measures duplications) hindering cross-country comparisons. Furthermore, it must be recalled that the inclusion in the database of NTMs derived from legal national requirements, does not imply a judgement on the legitimacy or appropriateness of these requirements. NTMs are recorded in a neutral way with the purpose of fostering transparency of the policy tools that may affect international trade.

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## 2. Data on NTMs

The collected NTM data is published through several dissemination tools, notably UNCTAD TRAINS database accessible through [trains.unctad.org](http://trains.unctad.org) and WITS ([wits.worldbank.org](http://wits.worldbank.org)). The same data is also accessible in the ITC – UNCTAD - WTO Global Trade Helpdesk, which is more catered to private sector users.

The UNCTAD TRAINS web site allows for browsing of the available NTM data. Within the page, there is a file in STATA format available for bulk download which presents the processed data at HS6 digit level for the latest available year in each country. Those data are cleaned following the process described in this document.

The classification, the data collection approach, as well as strengths and limitations of the data are described in UNCTAD (2017). The variables described in that document are the ones present in the database, aggregated at the HS6 digit level, but containing all original data, before applying the cleaning process described here.

The data made available for statistical use is in STATA format. The unit of analysis is based on the combination of:

- i. reporter country enforcing the NTM,
- ii. partner country,
- iii. product at HS6 level affected, and
- iv. NTM code at the maximum level of disaggregation (4 digits).

Each of this quadruple is listed only once in the database. There is one variable that indicates how many identical combinations were found in the original data. The name of this variable is 'nbr'. This variable reflects those cases where two (or more) different regulations with the same NTM classification code apply at the same time to a product.

This study focuses on cross section data. Specifically, the latest wave available for countries in which data were collected. It is a snapshot of NTM regulation in each of these countries at the time of the data collection.

### 2.1 CLEANING OF RAW DATA

The NTM data is cleaned to compute the NTM indicators so that the result is more meaningful for economic analysis. The analysis using 'clean' NTM data is suitable for showing a first assessment of the country's regulatory practice, through statistical incidence or prevalence of NTMs. Those analysts searching for specific products or policy tools should look into the raw TRAINS NTM data, especially if the interest is focused on the details of the requirements enacted by the laws.

The STATA file is used for general statistical analysis. It is thus constructed to serve that purpose. The cleaning of the data is the first step.

#### **Horizontal measures**

The database that is referred to in this document is cleaned of 'horizontal measures' and 'partial coverage'. Therefore, Indices in this study are computed using the occurrence of each quadruple described above, and which does not involve any horizontal measure, nor measures that apply to the products only partially.

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Horizontal measures are those that apply to all products across the board, e.g. an import license necessary for importing any kind of product, or the need to register to be an importer (Box 1). To allow a more meaningful analysis, those measures that are 'horizontal', are not considered (specifically, those single measures affecting at least 95% of the products in a country<sup>3</sup>).

If these data were not excluded, Frequency Index and Coverage Ratio would be equal to 1, even if only very few other NTMs were implemented in the country. It would therefore be impossible to see the regulatory pattern of the country beyond that (usually just one) horizontal NTM, which is usually more of an administrative nature.<sup>4</sup>

Horizontal measures may be applied to all countries in the World (these are called unilateral horizontal measures), or to some countries only, in which case they are called bilateral horizontal measures.

### Box 1. Horizontal measures in the original data from 2016

There are 53 countries in the database that use horizontal measures. They put in place 255 independent requirements. This includes NTMs regardless if they apply with partial or full coverage, or if they are bilateral or unilateral.

Half of the countries use 1, 2 or 3 horizontal measures, and only 7 countries use 10 measures or more each.

Almost 4 out of 5 horizontal measures are unilateral, i.e. applied to all trading partners. Furthermore, some of the bilateral NTMs are applied to so many countries that they could also be considered unilateral. This is the case for 7 countries applying 15 measures to more than 200 countries each. 4 other countries apply bilateral measures to 10 to 40 countries each, and 13 more apply 34 bilateral measures that affect only 1 or 2 countries each.

One of the most common types of horizontal NTMs is export measures. In general, NTMs in chapters E, F and G are more common in horizontal measures than in the rest of the data. Financial NTMs from chapter F, are most common among import unilateral NTMs, followed by those in Chapter B. Those of chapter E are more often used when considering bilateral import NTMs. Technical Barriers to Trade (TBT) measures are normally not horizontal, but when it is the case, they are always unilateral. Only five countries have horizontal Sanitary and Phytosanitary (SPS) measures.

### Partial coverage

The STATA file available for download also excludes all NTMs with partial coverage.

Partial coverage may be of two types. The first is the 'tariff line' partial coverage. It is used when a regulation affects a very specific type of product that would go beyond the national tariff line classification or cannot be defined by any precise product code, for example used cars, or chemicals that are imported to be used in a particular industry; there are no product codes that can describe this. A second type of partial coverage refers

<sup>3</sup> Horizontal measures are flagged at the level of disaggregation that is reported in the raw data, i.e. tariff line or HS6. A specific requirement within a regulation is flagged when it affects at least 95% of the products that exist at the same level of disaggregation of the reported data and for the same HS year nomenclature.

<sup>4</sup> Horizontal measures are still accessible to the user through the web application TRAINS, which is a tool designed especially for browsing and looking for specific punctual information, but less suitable for statistical bulk processing.

to measures that apply only on some (not all) tariff lines within an HS6 product, e.g. an NTM that affects the product with the tariff line 02.07.25.20, but not 02.07.25.00, nor 02.07.25.40, within the same 02.07.25.

For those countries where data is collected only at HS6 level, and not at Tariff Line level, it is impossible to differentiate between the two types of partial coverage.<sup>5</sup> For this reason, all cases of partial coverage are excluded to compute the statistical indicators.<sup>6</sup>

**Figure 1. Illustrative example of ‘partial coverage’**

Panel a. Example for countries with data collected at tariff line level					Panel b. Same example, but for countries with data collected at HS6 level					
	Codes available at TL level	NTM with Partial Coverage at the TL	NTM with Full Coverage	Partial Coverage at the HS6		No information available at TL level	NTM with Partial Coverage at the TL	NTM with Full Coverage		
010203	010203.01	X	X		010203		X	X		
	010203.02	X	X		020304		X			It is impossible to know which origin is this Partial coverage indication
	010203.03		X							
	010203.04		X							
020304	020304.01		X	Two out of three product codes	030405			X		
	020304.02		X							
	020304.03									
030405	030405.01		X		040506		X			
	030405.02		X							
040506	040506.01	X								
	040506.02									

*Note.* For a single reporter-partner

Figures 1 and 2 show 4 different products at the HS6 digit level (010203, 020304, 030405, 040506, these are not real product codes). Each of them has two or more 8 digits code products. Panel a) represents a country collected at Tariff Line (TL) level, and so the 8 digits product codes are listed in the database. Panel b) does not show the Tariff Line product codes as it was collected at HS6 level only. The third and fourth columns in each panel indicate the presence of NTMs for the products with an X. The column ‘Partial Coverage’ indicates when the products are affected by NTMs with Partial Coverage. The column ‘Full Coverage’ is used when the NTM affect the products fully. These indications are based on the description of the legal text in the corresponding regulation.<sup>7</sup>

<sup>5</sup> This is the reason why partial coverage was dropped for all countries, even when it would be desirable to keep those data where more than 50% of any HS6 code is affected by an NTM (‘coverage’ partial coverage). It would be possible to do so for countries where data was collected at Tariff Line level, but not for the ones where data was collected at HS6 level. Hence, all partial coverage data for all countries was dropped to keep consistency across countries.

<sup>6</sup> In some cases, one regulation affects ‘fully’ some HS6 level products, and ‘partially’ others. In these cases, data is not corrected. The same rule applies for these data, and those products affected ‘fully’ will be preserved, while those affected only ‘partially’ would be dropped from the database.

In some other few cases, one regulation affects ‘fully’ some tariff line products within any HS6, and ‘partially’ others (within the same HS6). In these cases, the NTM in question will be set to affect ‘fully’ all tariff line products within that HS6 product code, and data is preserved.

<sup>7</sup> For methodology of data collection please see UNCTAD 2017

In Figure 1, the third column presents the data that show partial coverage at the Tariff Line level. The first product in the list, HS6 010203, has measures both as partial and full coverage. These are stemming from different regulations but are enforced simultaneously on the same product. Each of the four 8-digits product codes within this HS6 is affected fully by an NTM (010203-01, 010203-02, 010203-03, 010203-04), and only 2 of those are also affected by measures with partial coverage (010203-01, 010203-02).

Panel b shows the same data (same NTM as examples) but for those countries that have been collected at HS6 level only, i.e. with no information at Tariff Line level. For product 020304, there is a mark for partial coverage, but we are not able to know that it comes from an NTM that affects with Full Coverage only some of the Tariff Lines within this HS6. In this case, Partial Coverage is indicated with no further information.

**Figure 2. Illustrative example of data cleaned-out after all 'partial coverage' is dropped**

Panel a. Data collected at tariff line level					Panel b. Data collected at HS6 level				
	Codes available at TL level	NTM with Partial Coverage at the TL are removed	Only NTM with Full Coverage remain	Stays in the dataset after cleaning		No information available at TL level	NTM with Partial Coverage at the TL are removed	Only NTM with Full Coverage remain	Stays in the dataset after cleaning
010203	010203.01		X	Yes	010203			X	Yes
	010203.02		X						
	010203.03		X						
	010203.04		X						
020304	020304.01		X	No	020304				No
	020304.02		X						
	020304.03								
030405	030405.01		X	Yes	030405			X	Yes
	030405.02		X						
040506	040506.01			No	040506				No
	040506.02								

Figure 2 shows how the data is cleaned. The Yes sign marks those products that still bear NTMs after the statistical cleaning, while the No marks point to those products whose NTMs are dropped. All those NTMs affecting partially the products are not considered for the calculation of the indicators, and so information in column 'Partial Coverage' is dropped entirely. It is shown in Figure 2 with an empty column. Products 010203 and 030405 are still affected by an NTM at full coverage.

The NTM for the second product, HS6 020304, is dropped. Panel a) in Figure 1 shows it only has NTMs on two of the three 8-digits product codes within this HS6. This is the case for a country that is collected at Tariff Line level. Panel b) shows the result if the same data were collected at HS6 level only. The NTM requirement is registered and the NTM information is shown as 'partial coverage', because not all the 8-digits product codes are affected, even if the regulation affects fully two of the three existing.

In principle, NTMs applying with Full Coverage could be retained, even in those cases where only some of the Tariff Line in any HS6 product is affected. The dilemma comes when information is only provided at HS6 digit level, because it is impossible to know if the partial coverage indication for any product is similar to the case of HS6 010203 or HS6 020304. The partial coverage indication for these products in Figure 1 panel b is indistinguishable. As a consequence, all 'partial coverage' is dropped from all countries, so as to have the same criteria applied to all reporters in the database.



Figure 2 shows which data is in the 'clean' STATA dataset, which is the data that is used to calculate incidence indicators. All data in the partial Coverage column is dropped, and the data in 'Full Coverage' column is preserved if there are NTMs applying to each tariff lines within any HS6 product code.

### Box 2. Partial Coverage in the original data from 2016

*Partial coverage at Tariff Line level. The data shows more than 5 million observations with Partial Coverage at the tariff line, those that cannot be defined with a product code, even the most disaggregated ('tariff line' partial coverage). This considers the data for those countries collected at tariff line level*

*Partial coverage at the HS6 level. Half a million observations are further cleaned away because the NTMs only cover some of the tariff lines within any HS6 code, reporter and partner ('coverage' partial coverage). This is also for those countries collected at tariff line level.*

*Other 4 million observations are also dropped because they were collected at HS6 level (not tariff line level), and the NTMs showed indication of Partial Coverage. For these, it is impossible to determine if they belong to the first or second group above described.*

### Bilateral dimension

The database displays measures applied to the world and those applied bilaterally to one or more countries. Some measures affect very few or just one country, and others almost all countries.

These data are used in the statistical analysis, and not dropped.

For illustration, see the example which shows two HS6 products with three NTMs in Figure 3. They are all applied by reporter 'AUS'. The first row displays an NTM with code A110 that affect all partners in the World (WLD as partner). Another NTM has the same code but only applies to partners "USA", "RUS", and "EUN", rows 2 to 4. The last NTM, takes another different code (B140) and affects a different product (HS6 020304) and only applies to imports from three different partners.

The process of computing the indicators uses all data; both NTM codes will be included in the analysis: A110 to all partners, plus B140 to some partners.

In the case that only unilateral data were retained, NTM code B140 wouldn't be considered, even if there are imports from those countries for the product under consideration.

Figure 3. Illustration of bilateral dimension of the data

Reporter	HS6	NTM code	Partner
AUS	010203	A110	WLD
AUS	010203	A110	USA
AUS	010203	A110	RUS
AUS	010203	A110	EUN
AUS	020304	B140	NZL

AUS	020304	B140	RUS
AUS	020304	B140	BRA

### Box 3. Bilateral dimension in the data from 2016

Only 14 countries have solely unilateral measures, and no bilateral ones. One reporter has bilateral measures only, and no unilateral ones. Most countries have both.

Countries with bilateral NTMs, have 10 different ones each, on average. These NTMs apply to more than 100 countries each, on average.

After removing all partial coverage data, ten reporters have between 10% and 30% of bilateral NTMs.

Many of the bilateral measures are widespread in terms of partners affected.

### Other cleaning steps

One of the first recommended steps of the cleaning process is to remove multiple occurrences of regulations affecting exactly the same reporter-partner-NTM code and set of products (not product code, but the exact same list of products affected), e.g. two regulations mentioning a quota that country A applied to country B on fresh meat products.

In fact, this was the first step in the cleaning process. There are two possible cases. First, it may reflect various alternative cases of partial coverage. For example, alternative uses of a certain chemical require a permit. The permits are to be granted only once per product imported, whenever the condition on the specific use is fulfilled. So, even if there are multiple cases in the database for permits affecting the same chemical products, it is not the case that the products need to present several permits at the same time, but only one, depending on the specific use that the shipment is said to have. All the different alternative uses of that chemical are registered separately with a partial NTM for each case, but in practice, any product under the mentioned HS code will need to present one permit because it will fall under one of the partial NTMs.

To better reflect this situation, only one measure is kept in the database, and turned to full coverage.

Secondly, removing repetitions can be used to correct possible errors. On one hand, it is possible, at least in theory, that two regulations have the same reporter, partner, NTM code and the same set of affected products, but it is also possible that data collector picked two different legal texts that refer to the same requirement, probably referenced by different ministries within a government. In these cases, the same procedure as above is applied, and all presumed erroneous duplications are removed. Still, one case of each set remains in the database (with the same reporter, partner, NTM code and list of products) so that no information is lost.

Finally, the database contains only those products not above HS code 98 00 00.

### The final 'clean' data set

The downloadable dataset shows data for 85 reporters (EUN countries are considered as one reporter). It has more than 11 million observations for the combination of reporter, hs6, NTM code, reporter. It is cross-country dataset for 2016, or earlier for some of the reporters. The list of variables is described below.

**Figure 4. The list of variables**

reporter	Alphabetical code for country imposing the NTM
NTMNomenclature	Version of the ICNTM
ntmcode	Code used to define the requirement
NomenCode	Nomenclature for the HS product codes attached to the NTM
Partner_ISO_N	Numerical code for affected partner country
partner	Alphabetical code for affected partner country
Year_DataColl~n	Year of data collection for each reporter
Dataset_id	Identification of reporters that have been collected by the same team
ntm_1_digit	Chapter code of the NTM
notTL	1 when data was collected only HS6 level, and 0 when it was collected at Tariff Line level
hs6	HS product code
nbr	Number of NTM requirements with the same reporter, partner, hs6 and NTMcode
StartDate	Year of implementation of the NTM
EndDate	Year of enforcement ending for the NTM

### 3. Incidence Measures

Incidence indicators are standard measurements of NTM used as preliminary exploration of data as an “inventory approach” (UNCTAD, 2013, 2017, 2018; WTO 2012).

Incidence measures do not indicate the restrictiveness of the NTMs because they only describe the widespread use and variety of NTMs used as policy tools but does not measure how much they would cost to exporters and importers, nor if they restrict or enhance trade, and by how much. Moreover, it may also be the case that NTMs could facilitate trade, especially when the requirement has been complied with already. Still, incidence measures, such as frequency index and coverage ratio, remain a useful initial exploration of the data.

Other uses of these indicators are related to transparency purposes. Data reveal the policy tools in place by countries. It is useful to see which sectors are (more/less) regulated, using which type of policy tool. It may also be useful to compare data from different countries, especially when considering regional integration or market access issues.

Finally, data is useful to construct variables that can be used in economic models.

A recent joint UNCTAD and World Bank publication (UNCTAD, 2018) observed that more developed countries have deeper regulatory approaches, covering more sectors and with higher number of NTM. This may aim to ensure safety or quality. In fact, chapters A and B are relatively more used by developed countries. It could be argued that less developed countries may be ‘missing’ regulations in the areas of chapters A and B, in the sense that some sectors could not be appropriately regulated.

It is interesting to study the additional trade related difficulties that may arise because of major regulatory differences between trade partners. Here, more than the scope or amount of regulations, what is relevant is the different sorts of requirements the exporters would need to comply with.

### 3.1 LIST OF INDICATORS, OPTIONS FOR THEIR COMPUTATION

The incidence indicators characterize the use of NTMs as trade control policy tools with a numerical indicator. Both Frequency and Coverage Ratio are the two basic indicators used to measure the pervasiveness of NTMs in the economy. They are constructed based on binary variables that account for the presence or absence on a measure on a product. A third indicator, the Prevalence Score (sometimes called Intensity Index), looks into the repetitive occurrence of a certain type of measure, i.e. the number of NTMs on a given product, or the average number across a group of products, for example the average number of NTMs for a given country.

The concept and formulas for each are straightforward. Still, there are alternatives for the computation of these indices that will affect the value. They are presented below. Section 3.2 lists the choices made for the computation of published results. This conveys the idea that there is no right or wrong, but that choices are made to standardize method for computing these incidence measures. The reason for the choice are also explained.

#### Frequency Index

The first, Frequency Index (FI), is essentially the percentage of products affected by one or more NTMs. More formally,

$$F_i = \frac{\sum D_s M_s}{\sum M_s} \cdot 100$$

The Frequency Index is a ratio calculated using two dummy variables in the numerator:  $D_s$ , the presence (or absence) of an NTM on the product, and the  $M_s$ , which equals to 1 for every product. The sum in the numerator is the total "affected" products, and the denominator is the sum of all products; the Frequency Index is simply the ratio between them.<sup>8</sup>

The alternatives for the computation of this index are listed below. Frequency Index can be computed by including all measures, or only a subgroup.

1. Alternatives on the countries included in the computation. The Frequency Index may be calculated over:
  - a) all NTMs, independently if they affect all partners (unilateral) or only some partners (bilateral),
  - b) only those NTMs that are imposed to all countries, i.e. excluding the bilateral NTMs
    - For example, the Frequency Index may be 45% when including all measures, but 42% if only those NTMs applied to all countries (unilateral) in the World are considered.
2. Alternatives on the set products considered in the computation. The denominator of the Frequency Index may be computed over:
  - c) The total existing number of products. If calculated at HS6, there are around 5200 products,
  - d) Only the traded lines, i.e. the count of product items 's' that are imported (or exported) and excluding those that have zero trade value.
    - For example, if a country imports only 2000 products, and has NTMs on 1000 of those products, the FI will be close to 20% if  $M_s=5200$ , and 50% if  $M_s=2000$

Once the choice is made among the above-mentioned options, the Frequency Index (Fi) can be calculated for a country i, but also for other disaggregation categories, e.g. sectors within a country, or regions comprising

<sup>8</sup> This simplified formula does not show that it also has a bilateral dimension, but the same principle applies. The products-partners affected in the numerator will equal 1, and all products-partners will count in the denominator.

several countries. For example, the FI for LDC countries may be 39% and 70% for Developed countries; or FI may be 90% for Agri-food products and 43% for manufactures for a set of countries.

3. Alternatives on the type of measures included in the computation. The Frequency Index may be calculated over:
  - e) all NTMs, or
  - f) only one or more chapters, i.e. only SPS measures.
    - For example, the Frequency Index for SPS measures may be 20% and the TBT 40% of all existing products.

There are advantages and disadvantages for each option. Alternatives (c) and (d) deal with the definition of the set of products to consider; and may have substantial impact on the computed value. Alternative (d) is more relevant economically since it focuses on actual traded products, those NTMs applied on products that are not traded do not affect the index value. It may also be more easily comparable to Coverage Ratio. On the other hand, when using only the products on the trading basket (option (d)), those countries that have a less diversified trade basket may have higher values artificially, even if a small range of products is regulated by NTMs.

The caveat on alternative (d) is that Frequency Index value could be endogenous, as certain NTMs could arguably raise costs in such a way that imports are precluded. Alternative (a) is neutral in this sense. The downside of alternative (a) is that considering traded and non-traded products alike, may render the economic meaning irrelevant.

Regarding alternatives (a) and (b), option (a) is preferred because it includes all existing NTMs. Otherwise, these valuable data would be lost. There is considerable amount of data at bilateral level.

It is to be reminded that once a quadruple (resporter-partner-HS6-NTM code) is mentioned as unilateral NTM, all partners are affected by that NTM for the selected HS6, and any additional bilateral data is, in this case, redundant for computing the indicators. On one hand, it could be argued that in some specific cases, NTMs affecting only selected countries could be the manifestation of a special advantage in regulatory compliance offered to some partner/s, rather than a new additional burden. On the other hand, many of the bilateral NTMs observed in the dataset are largely applied to a wide range of partners, so it suggests that the idea of bilateral NTMs being special advantage requirements is mostly an exception.<sup>9</sup>

## Coverage Ratio

The second measure, the trade Coverage Ratio (CR), is the share of trade subject to NTMs. It can also be computed for a country, or for a region, or a group of products. This Index is also a ratio, but trade weighted. Trade value is represented by  $V_s$ . The numerator captures the sum of the import (export) value of those traded products that are affected by an import (export) NTM. It is then divided by the total value of imports (exports).

For the Coverage Ratio, option c) is not available, because it uses trade value. But choice needs to be made over options a) or b).<sup>10</sup>

$$C_i = \frac{\sum D_s V_s}{\sum V_s} .100$$

<sup>9</sup> It is to be reminded that whenever a regulation is applied on all partners, except a few, this is properly reflected in the data with positive NTM values only for those partners that do have to comply with the regulation.

<sup>10</sup> This simplified formula does not show that it also has a bilateral dimension, but the same principle applies. The value of trade for each product-partner pair that is affected by an NTM will be counted in the numerator, and the trade value of all products-partners (all trade) will count in the denominator.

Usually, Coverage Ratio is computed using the average trade value for the last three years (bilateral and by HS6), so that there would be less zero values. This is relevant because this indicator uses traded products only; and could also be relevant for the others if this option is used.

### Prevalence Score

Prevalence Score is a third way to describe the use of NTMs. Prevalence Score (PS) counts how many measures apply to a given product. It can be used, for example, to tell what group of products is affected by the largest number of NTMs on average. For instance, it can be computed to see if agricultural products are affected by more measures, compared to industrial products, or to compare the average number of measures among different countries.

The formula is similar to the previous cases;  $D_s$  is defined above,  $N_s$  is the number of NTMs on product  $s$ , and  $M_s$  is the total number of products (those with and without NTMs).<sup>11</sup>

$$P_i = \frac{\sum D_s N_s}{\sum M_s}$$

As in the case for Coverage Ratio, choice needs to be made over options (a) or (b), but also for (c) or (d). If option (d) is chosen, only imported (exported) products will be included in the formula.

4. Alternatives on the set of products considered in the computation. The denominator of the PS may be computed over:
  - g) Only those products that have NTMs (only positive values)
  - h) The total existing products, including those that do not have NTMs (including zero values). In this case, dummy variable  $D$  is not present in the final formula.

For example, Prevalence Score may be equal 2.3 NTMs on average on all traded products, including those traded not affected by NTMs, or 5.1 when considering only products affected by at least one NTM (zero values should not be included in the average calculation).

Option (h) combined with option (a) only leads to consider bilateral trade lines with positive values.<sup>12</sup>

The advantage of including the zeroes in the average is that it shows the average 'weight' of NTM. When calculating the average tariff for a country or sector, normally all zero tariffs are also included in the calculation. It is advisable to do the same for the number of NTMs. On the other hand, the share of products with no NTMs will affect the result. In other words, the Frequency Index affects the Prevalence Score. If the objective is to look more closely into the implementation of NTMs, it could be more desirable not to include the zeroes.

At the same time, when presenting values per chapter of the NTM classification, e.g. the average number of SPS measures or the TBT measures, it is preferable not to include the zeroes. This is because the number of products affected by an SPS (or by another type of NTM) within the set of all imported products, can be small.

<sup>11</sup> This simplified formula does not show that it also has a bilateral dimension, but the same principle applies. In practical terms, it is double sum. If data is set for the triple 'reporter-hs6-partner', the Prevalence Score is the simple mean of the variable that presents the number of distinct codes for each row, considering the traded lines (rows with positive import values only).

<sup>12</sup> Example. In the case there are imports from any one country, and an NTM is imposed on a bilateral basis to another country from which there is no imports, the NTM is not counted for the indicator.

The average value of number of NTMs will be small, not because there are few SPS measures being applied, but because the number of products not having SPS measures is very large, and there are a lot of zeroes.

There is still one more option to take in the case of Prevalence Score, depending on the data available. Prevalence can be computed using each NTM code once, or including any other repetitions data may show (the variable using this type of 'repetitions' may also be called 'Full Count').

5. Alternatives on the count for repetitions of an NTM (for each reporter, partner and HS6 products code):
  - i) Each NTM code is counted once, so the Prevalence Score is the number of different types of NTMs in place, i.e. no repetition, no code is used more than once (for the same reporter, partner and product);
  - j) Every measure in each separate legal text is included in the number counting (including any repetitions that the legislation may indicate). This is 'Full Count'.

As stated above, options (i) and (j) depend on the data available. It is possible that two separate legal requirements impose an NTM that happen to fall under the same code in the NTM classification, e.g. two sanitary certifications, and affect the same product.

UNCTAD collects information on NTM based on official legal texts, and this information is shared through the TRAINS database. It is possible to see for each product how many different requirements fall under the same NTM code.

In the STATA file available for download every quadruple (reporter, partner, product, NTM code) is listed only once in the database (e.g. code A84 'inspection requirement' on product 020711 'poultry meat', applied by Country A on imports from country B). There is an additional variable indicating how many of those were present in the original dataset, so it is possible to compute PS using option (j). This additional indicator could be called "Full Count" and can be used to compare to ordinary Prevalence Score.

### Example

For illustration, consider a case where there exists only 7 products, some of them are traded, and some have one or more NTMs. There are only 10 country partners (a through j), and imports come from all existing partners when trade value is more than zero (i.e.  $J=10$ ). The following tables show how the values of the indicators may change, depending on the different assumptions.

The Frequency Index ranges from 28% to 50%. The Coverage Ratio ranges from 40% to 48%. The Prevalence Score ranges from 0.77 to 2.91 NTM on average per product. It is clear that the choices made have impact on the final result. See Table A1, A2 and A3 in Annex for full data in table format.

**Table 1. Example data**

HS6	NTM, unilateral (applying to all partners in the World)	NTM, bilateral (applying to some partners only)	Trade value \$
010101	Has 3 NTMs	Has 1 NTM to partner A	\$ 1000 for all partners (including \$100 for partner A)
010102	Has 2 NTMs	None	\$ 0
010103	None	None	\$ 400

010104	None	Has 3 NTM to partner A	\$ 0
010105	None	None	\$ 500
010106	Has 1 NTM	Has 5 NTM to partner A	\$ 0
010107	None	Has 2 NTM to partner A	\$ 600 for all partners (including \$ 200 for partner A)

**Table 2.** Frequency Index example computation, optional alternatives

Frequency Index	Option c. All existing products in the denominator	Option d. Only traded lines considered in the denominator
Option a. All NTMs including bilateral	FI = 43%	FI = 25%
Option b. Only unilateral NTMs (excluding bilateral)	FI = 42.8%	FI = 25%

**Table 3.** Coverage Ratio example computation, optional alternatives

Coverage Ratio	Option d. Only traded lines considered in the denominator
Option a. All NTMs including bilateral	CR = 48%
Option b. Only unilateral NTMs (excluding bilateral)	CR = 40%

**Table 4.** Prevalence Score example computation, alternatives in the case of no repetition (option i)

Frequency Index	Option c. All existing products in the denominator		Option d. Only traded lines considered in the denominator	
	Option g. Only those products that have NTMs (only positive values)	Option h. The total existing products, (including zero values).	Option g. Only those products that have NTMs (only positive values)	Option h. The total existing products, (including zero values).
Option a. All NTMs including bilateral	PS = 2.16	PS = 1	PS = 2.91	PS = 0.82
Option b. Only unilateral NTMs (excluding bilateral)	PS = 2	PS = 0.87	PS = 2.5	PS = 0.77



### 3.2 LIST OF INDICATORS, OPTIONS PREFERRED

This section presents the options preferred and used for the computation of the NTM indicators. These are used in the figures and tables in UNCTAD studies in general.

Frequency Index:

- Option (a), including bilateral NTMs
- Option (d), only traded lines considered

Coverage Ratio

- Option (a), including bilateral NTMs
- For Coverage Ratio, import measures are matched with import trade values, and export measures with export trade values.

Prevalence Score

- Option (a), including bilateral NTMs
- Option (d), only traded lines considered
- Option (h), including those products traded that do not have NTMs (including zero values)<sup>13</sup>
- Option (j), no repetition, no code is used more than once (for the same reporter, partner and HS6 product)

## 4. Results and Policy Conclusions

The information below is based on NTMs for the year 2016, using the preferred options indicated above. This section is not a comprehensive discussion of the NTMs data but shows some examples how the indicators can be used for policy analysis.

Figure 5 shows that agri-food products have the highest scores for frequency index and coverage ratio, and at the same time, the number of NTMs on each product is the highest, i.e. Prevalence Score is high. This calls for special attention to this group of products. Many of these cases are SPS and TBT regulations, and the ministries or departments regulating those products may not be aware that they could be affecting trade, and thus indirectly the economic performance, since their main concern is usually security, or protection of the environment, or against pests or diseases. Also, the number of measures is the highest for these products. It would be a good practice to review the coherence of all measures put in place jointly and look for streamlining opportunities.

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<sup>13</sup> The exception is the analysis by chapter, where zeroes are not included for the reason presented in the previous section

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At the same time, Figure 6 shows that developed countries impose more NTMs than other countries. The SPS Agreement allows for countries to set their own level of protection, but it requires scientific evidence that the NTM are needed for the level of risk that is tolerable in that country. Otherwise, those NTMs may be restricting trade in an undesired way.

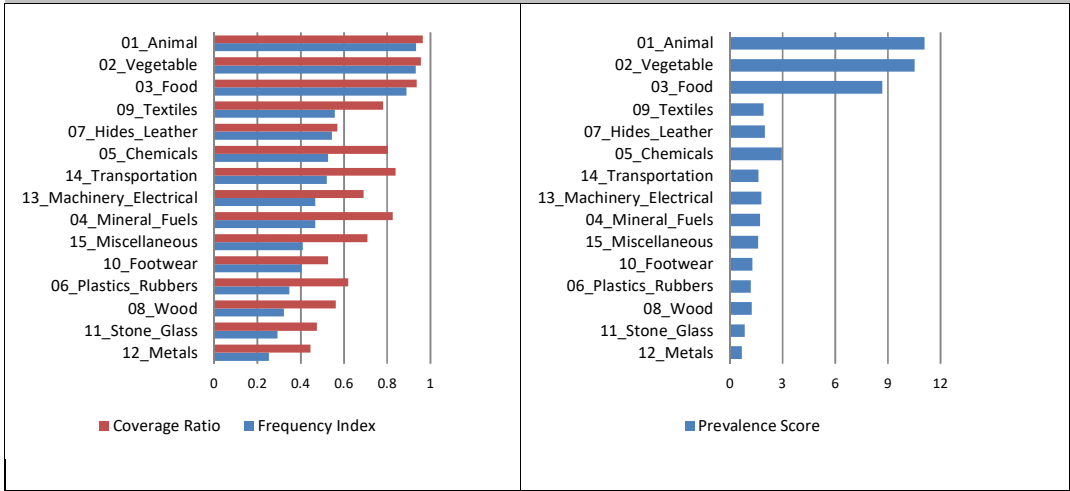
In general, more developed countries have deeper regulatory approaches, covering more sectors and with a higher number of NTMs. This may aim to ensure safety or quality. In fact, SPS and TBT requirements (chapters A and B) are relatively more used by more developed countries. It could be argued that less developed countries may be 'missing' regulations in the areas of chapters A and B, in the sense that some sectors may not be appropriately regulated.

Transparency in NTM is key to understand what measures are in place in which parts of the world and affecting which sectors (figures 7 to 9). The indicators computed and shown here are a first step in profiling the practices for NTM use that can shed light on areas which could be considered by policy makers in order to minimize trade costs. Countries may also use these results to negotiate agreements that go beyond tariffs and include provisions for NTMs.

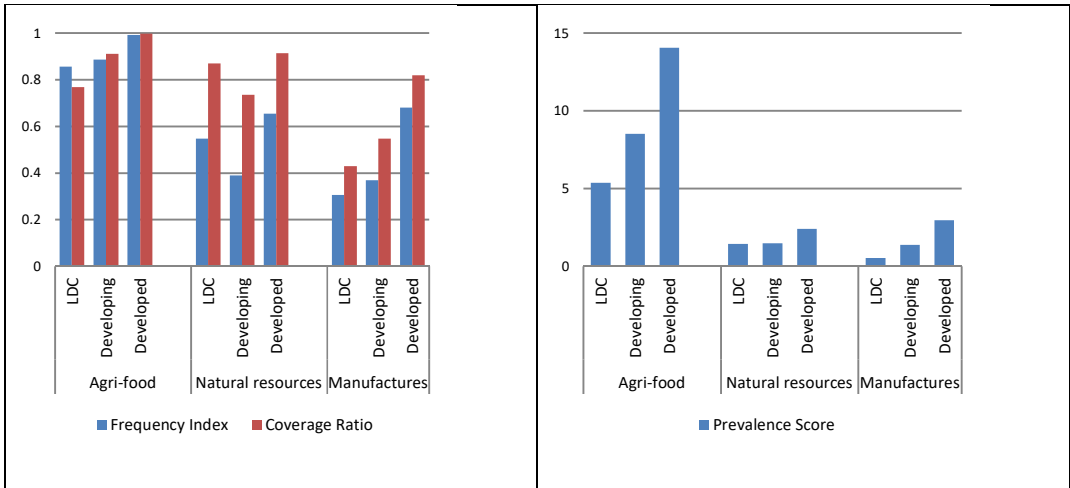
Finally, the indicators can be used as variables in other economic analysis, using disaggregation by country, or by country and sector, for example. The variables are used in gravity models. Normally, the Prevalence Score has a higher correlation with variables such as GDP and average tariffs, but the other two indicators also show positive and negative correlation, respectively. This is shown in Figures 10 and 11.

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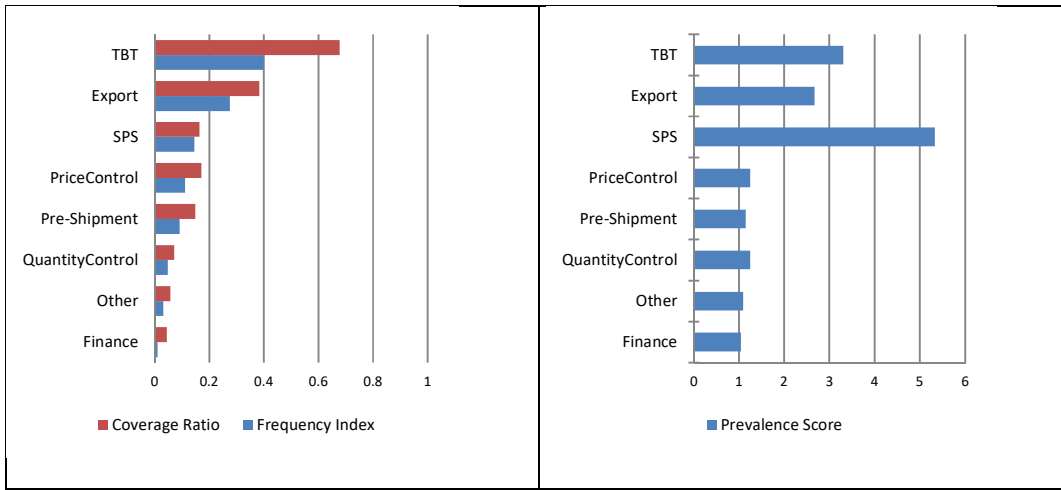
**Figure 5. Import NTMs by sector**



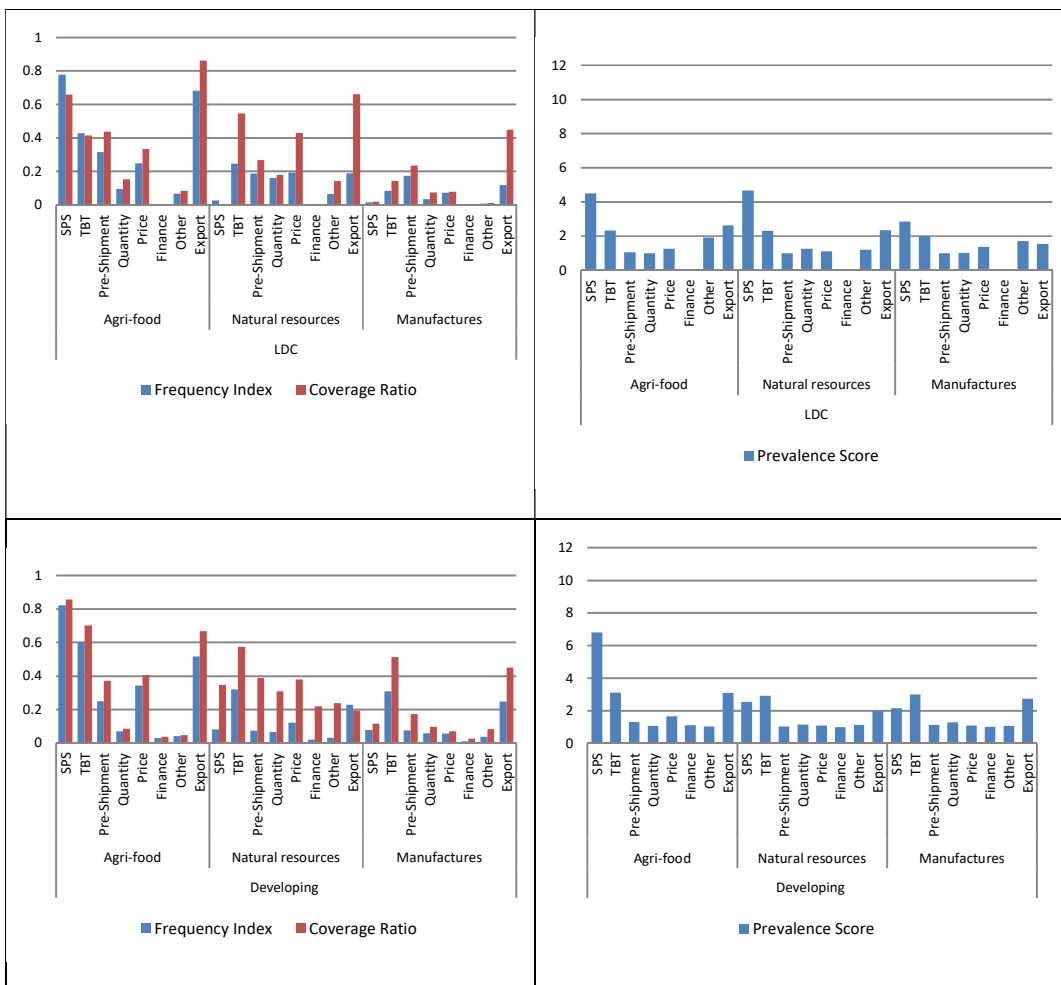
**Figure 6. Import NTMs by region and sector**

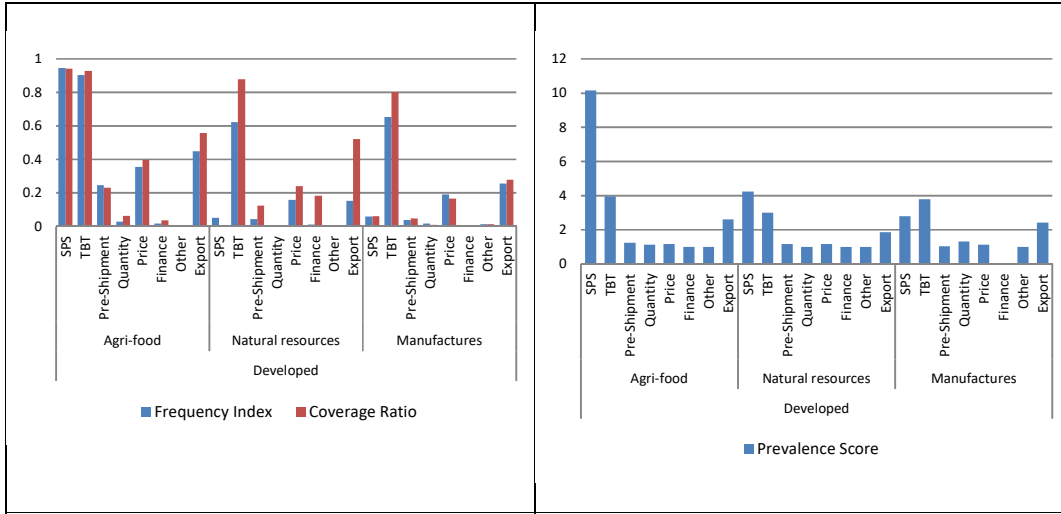


**Figure 7. NTMs by chapter**

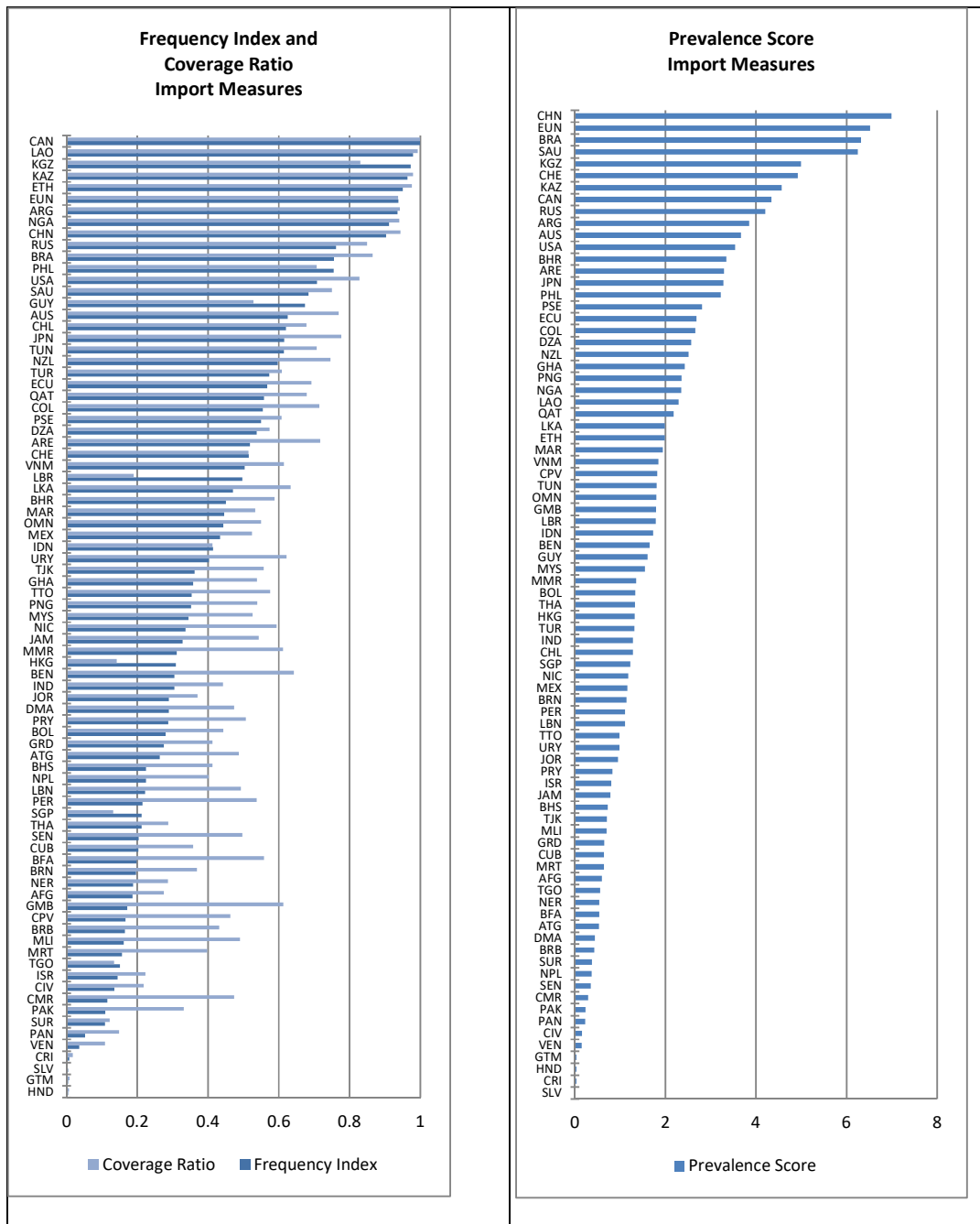


**Figure 8. NTMs by chapter, region and sector**

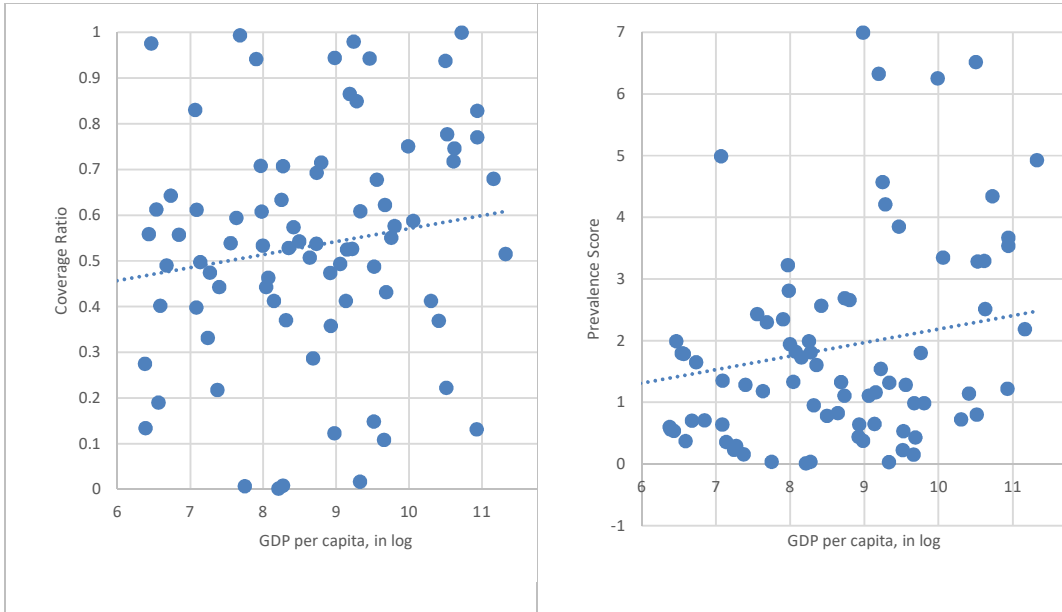




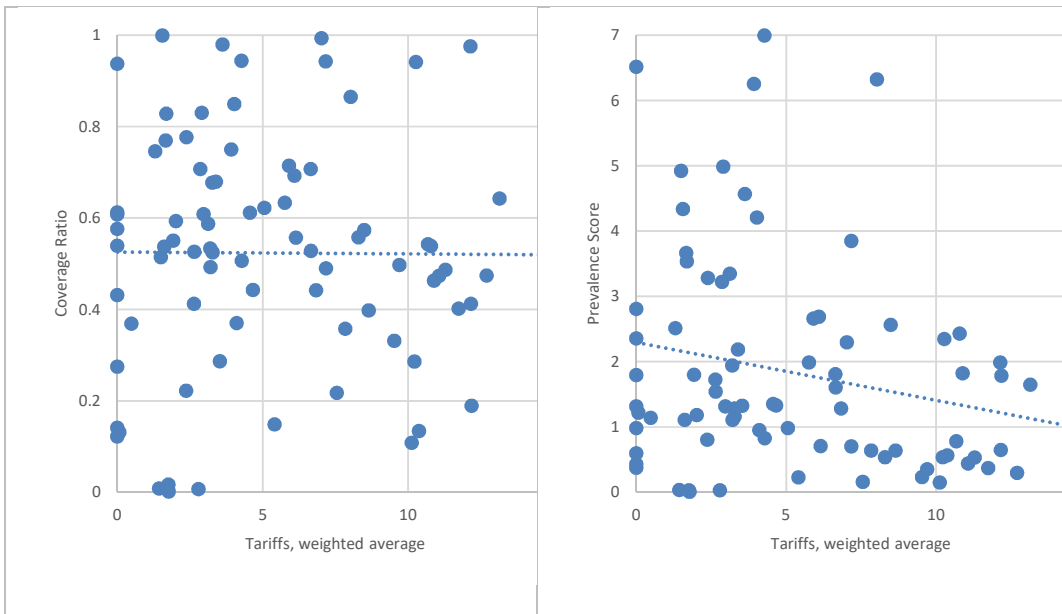
**Figure 9. Import NTMs by reporting country**



**Figure 10. Correlation between GDP per capita and NTM indicators**



**Figure 11. Correlation between weighted average for tariffs and NTM indicators**



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## Annex

Tables for example calculation of alternatives for Frequency Index, Coverage Ratio and Prevalence Score.

The information provided here appears in the database, for the first 4 columns. The others to the right are a help to compute the average number of NTM following each option:

**Table A1. Example calculation of alternatives for Frequency Index**

Reporter	HS6	Partner	Official NTM	Trade Value	NTM Option (c.a)	NTM Option (d.a)	NTM Option (c.b)	NTM Option (d.b)
BRA	10101	a	3	100	1	1	1	1
BRA	10101	b	3	130	1	1	1	1
BRA	10101	c	3	70	1	1	1	1
BRA	10101	d	3	100	1	1	1	1
BRA	10101	e	3	100	1	1	1	1
BRA	10101	f	3	50	1	1	1	1
BRA	10101	g	3	150	1	1	1	1
BRA	10101	h	3	90	1	1	1	1
BRA	10101	i	3	10	1	1	1	1
BRA	10101	j	3	200	1	1	1	1
BRA	10102	a	2	0	1		1	
BRA	10102	b	2	0	1		1	
BRA	10102	c	2	0	1		1	
BRA	10102	d	2	0	1		1	
BRA	10102	e	2	0	1		1	
BRA	10102	f	2	0	1		1	
BRA	10102	g	2	0	1		1	
BRA	10102	h	2	0	1		1	
BRA	10102	i	2	0	1		1	
BRA	10102	j	2	0	1		1	
BRA	10103	b	0	40				
BRA	10103	c	0	40				
BRA	10103	d	0	40				
BRA	10103	e	0	40				
BRA	10103	f	0	40				
BRA	10103	g	0	40				
BRA	10103	h	0	40				
BRA	10103	i	0	40				
BRA	10103	j	0	40				
BRA	10104	a	3	0	1			
BRA	10104	b	0	0				
BRA	10104	c	0	0				
BRA	10104	d	0	0				
BRA	10104	e	0	0				
BRA	10104	f	0	0				
BRA	10104	g	0	0				
BRA	10104	h	0	0				
BRA	10104	i	0	0				
BRA	10104	j	0	0				
BRA	10105	a	0	50				
BRA	10105	b	0	50				
BRA	10105	c	0	50				
BRA	10105	d	0	50				
BRA	10105	e	0	50				
BRA	10105	f	0	50				
BRA	10105	g	0	50				
BRA	10105	h	0	50				
BRA	10105	i	0	50				
BRA	10105	j	0	50				
BRA	10106	a	5	0	1		1	

Reporter	HS6	Partner	Official NTM	Trade Value	NTM Option (c.a)	NTM Option (d.a)	NTM Option (c.b)	NTM Option (d.b)
BRA	10106	b	1	0	1		1	
BRA	10106	c	1	0	1		1	
BRA	10106	d	1	0	1		1	
BRA	10106	e	1	0	1		1	
BRA	10106	f	1	0	1		1	
BRA	10106	g	1	0	1		1	
BRA	10106	h	1	0	1		1	
BRA	10106	i	1	0	1		1	
BRA	10106	j	1	0	1		1	
BRA	10107	a	2	200	1	1		
BRA	10107	b	0	10				
BRA	10107	c	0	100				
BRA	10107	d	0	10				
BRA	10107	e	0	30				
BRA	10107	f	0	50				
BRA	10107	g	0	50				
BRA	10107	h	0	50				
BRA	10107	i	0	50				
BRA	10107	j	0	50				
Sum of products/partners (numerator)					32	11	30	20
total products/partners considered (denominator)					70	40	70	40
FI					46%	28%	43%	50%

**Table A2. Example calculation of alternatives for Coverage Ratio**

Reporter	HS6	Partner	Official NTM	Trade Value	NTM Option (d.a)	NTM Option (d.b)
BRA	10101	a	3	100	100	100
BRA	10101	b	3	130	130	130
BRA	10101	c	3	70	70	70
BRA	10101	d	3	100	100	100
BRA	10101	e	3	100	100	100
BRA	10101	f	3	50	50	50
BRA	10101	g	3	150	150	150
BRA	10101	h	3	90	90	90
BRA	10101	i	3	10	10	10
BRA	10101	j	3	200	200	200
BRA	10102	a	2	0		
BRA	10102	b	2	0		
BRA	10102	c	2	0		
BRA	10102	d	2	0		
BRA	10102	e	2	0		
BRA	10102	f	2	0		
BRA	10102	g	2	0		
BRA	10102	h	2	0		
BRA	10102	i	2	0		
BRA	10102	j	2	0		
BRA	10103	b	0	40		
BRA	10103	c	0	40		
BRA	10103	d	0	40		
BRA	10103	e	0	40		
BRA	10103	f	0	40		
BRA	10103	g	0	40		
BRA	10103	h	0	40		
BRA	10103	i	0	40		
BRA	10103	j	0	40		
BRA	10104	a	3	0		
BRA	10104	b	0	0		
BRA	10104	c	0	0		
BRA	10104	d	0	0		
BRA	10104	e	0	0		
BRA	10104	f	0	0		
BRA	10104	g	0	0		
BRA	10104	h	0	0		
BRA	10104	i	0	0		
BRA	10104	j	0	0		
BRA	10105	a	0	50		
BRA	10105	b	0	50		
BRA	10105	c	0	50		
BRA	10105	d	0	50		
BRA	10105	e	0	50		
BRA	10105	f	0	50		
BRA	10105	g	0	50		
BRA	10105	h	0	50		

Reporter	HS6	Partner	Official NTM	Trade Value	NTM Option (d.a)	NTM Option (d.b)
BRA	10105	i	0	50		
BRA	10105	j	0	50		
BRA	10106	a	5	0		
BRA	10106	b	1	0		
BRA	10106	c	1	0		
BRA	10106	d	1	0		
BRA	10106	e	1	0		
BRA	10106	f	1	0		
BRA	10106	g	1	0		
BRA	10106	h	1	0		
BRA	10106	i	1	0		
BRA	10106	j	1	0		
BRA	10107	a	2	200	200	
BRA	10107	b	0	10		
BRA	10107	c	0	100		
BRA	10107	d	0	10		
BRA	10107	e	0	30		
BRA	10107	f	0	50		
BRA	10107	g	0	50		
BRA	10107	h	0	50		
BRA	10107	i	0	50		
BRA	10107	j	0	50		
Sum of products/partners (numerator)				2460	1200	1000
total products/partners considered (denominator)					2460	2460
CR					49%	41%

Table A3. Example calculation of alternatives for Prevalence Score

Reporter	HS6	Partner	Official NTM	Trade Value	NTM Option (c.a.g)	NTM Option (c.a.h)	NTM Option (d.a.g)	NTM Option (d.a.h)	NTM Option (c.b.g)	NTM Option (c.b.h)	NTM Option (d.b.g)	NTM Option (d.b.h)
BRA	10101	a	3	100	3	3	3	3	3	3	3	3
BRA	10101	b	3	130	3	3	3	3	3	3	3	3
BRA	10101	c	3	70	3	3	3	3	3	3	3	3
BRA	10101	d	3	100	3	3	3	3	3	3	3	3
BRA	10101	e	3	100	3	3	3	3	3	3	3	3
BRA	10101	f	3	50	3	3	3	3	3	3	3	3
BRA	10101	g	3	150	3	3	3	3	3	3	3	3
BRA	10101	h	3	90	3	3	3	3	3	3	3	3
BRA	10101	i	3	10	3	3	3	3	3	3	3	3
BRA	10101	j	3	200	3	3	3	3	3	3	3	3
BRA	10102	a	2	0	2	2			2	2	2	
BRA	10102	b	2	0	2	2			2	2	2	
BRA	10102	c	2	0	2	2			2	2	2	
BRA	10102	d	2	0	2	2			2	2	2	
BRA	10102	e	2	0	2	2			2	2	2	
BRA	10102	f	2	0	2	2			2	2	2	
BRA	10102	g	2	0	2	2			2	2	2	
BRA	10102	h	2	0	2	2			2	2	2	
BRA	10102	i	2	0	2	2			2	2	2	
BRA	10102	j	2	0	2	2			2	2	2	
BRA	10103	b	0	40		0		0		0		0
BRA	10103	c	0	40		0		0		0		0
BRA	10103	d	0	40		0		0		0		0
BRA	10103	e	0	40		0		0		0		0
BRA	10103	f	0	40		0		0		0		0
BRA	10103	g	0	40		0		0		0		0
BRA	10103	h	0	40		0		0		0		0
BRA	10103	i	0	40		0		0		0		0
BRA	10103	j	0	40		0		0		0		0
BRA	10104	a	3	0	3	3				0		
BRA	10104	b	0	0		0				0		
BRA	10104	c	0	0		0				0		
BRA	10104	d	0	0		0				0		
BRA	10104	e	0	0		0				0		
BRA	10104	f	0	0		0				0		
BRA	10104	g	0	0		0				0		
BRA	10104	h	0	0		0				0		
BRA	10104	i	0	0		0				0		
BRA	10104	j	0	0		0				0		
BRA	10105	a	0	50		0		0		0		0
BRA	10105	b	0	50		0		0		0		0
BRA	10105	c	0	50		0		0		0		0
BRA	10105	d	0	50		0		0		0		0
BRA	10105	e	0	50		0		0		0		0
BRA	10105	f	0	50		0		0		0		0
BRA	10105	g	0	50		0		0		0		0
BRA	10105	h	0	50		0		0		0		0
BRA	10105	i	0	50		0		0		0		0
BRA	10105	j	0	50		0		0		0		0
BRA	10106	a	5	0	5	5			1	1		
BRA	10106	b	1	0	1	1			1	1		
BRA	10106	c	1	0	1	1			1	1		
BRA	10106	d	1	0	1	1			1	1		
BRA	10106	e	1	0	1	1			1	1		
BRA	10106	f	1	0	1	1			1	1		
BRA	10106	g	1	0	1	1			1	1		
BRA	10106	h	1	0	1	1			1	1		
BRA	10106	i	1	0	1	1			1	1		

Reporter	HS6	Partner	Official NTM	Trade Value	NTM Option (c.a.g)	NTM Option (c.a.h)	NTM Option (d.a.g)	NTM Option (d.a.h)	NTM Option (c.b.g)	NTM Option (c.b.h)	NTM Option (d.b.g)	NTM Option (d.b.h)
BRA	10106	j	1	0	1	1			1	1		
BRA	10107	a	2	200	2	2	2	2		0		0
BRA	10107	b	0	10		0		0		0		0
BRA	10107	c	0	100		0		0		0		0
BRA	10107	d	0	10		0		0		0		0
BRA	10107	e	0	30		0		0		0		0
BRA	10107	f	0	50		0		0		0		0
BRA	10107	g	0	50		0		0		0		0
BRA	10107	h	0	50		0		0		0		0
BRA	10107	i	0	50		0		0		0		0
BRA	10107	j	0	50		0		0		0		0
<b>Average</b>					<b>2.16</b>	<b>1.00</b>	<b>2.91</b>	<b>0.82</b>	<b>2.00</b>	<b>0.87</b>	<b>2.50</b>	<b>0.77</b>

Note 1. J=10 is the total number of partners

Note 2. For Prevalence Score, if there is a unilateral NTM and also a bilateral NTM, it counts only once for each bilateral partner/s affected, if no repetition is chosen. All calculations here take option (i).