국제학석사학위논문

Quantification of the Intensity of Non-Tariff Measures as Trade Barriers

− A Focus on Sanitary and Phytosanitary Measures(SPS) and Technical Barriers to Trade(TBT) −

무역장벽으로서 비관세 조치의 강도 측정

: 위생및식물위생조치(SPS)와 무역기술장벽(TBT)을 중심으로

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[Abstract]

The estimation model of Technical Barriers to Trade (TBT) and Sanitary and Phytosanitary Measures (SPS) developed in this study applied frequency methods relying on inventory-data. Such approaches allowed the collection of data from readily available sources like those of the WTO or UNCTAD. However, the model enhanced the previous frequency methods by relying on multiple, rather than a single data type or source. It also included WTO's Specific Trade Concern (STC) data that reflect the conflictive factors of non-tariff measures, rather than treat all such measures equally. This was in order to assess better their trade-barrier effect.

By combining three variables which were, WTO Notification reports, STCs raised, and number of regulations from UNCTAD TRAINS database, a more comprehensive index was established to reflect the intensities of the trade-barrier effects caused by non-tariff measures. TBT intensity was reflected in the CTII, whereas SPS intensity was reflected in the CSII. Finally, the CTSI was derived as a simple average of the two indexes, as an indicator for the intensity of both TBT and SPS combined. Once the three indexes were calculated, the TBT/SPS Triangle was established as a visual indicator of the index results.

With the measurement model established, a practical analysis was done on world trade data for the years from 2013 to 2017, to examine the actual circumstances related to trade barriers formed by non-tariff measures. Results on the seven product-groups where both TBT and SPS are applied were, that the 'plants and other edible produce of plant origin' sector was faced with the most intense threat from TBT and SPS. However, the results were not generalizable to TBT since TBTs affect a much wider

scope of industries other than those examined. Therefore, as additional research, CTII was derived for all other existing industries. As a result, ‘vegetable products (HS06-15) that include ‘plants and other edible produce of plant origin’ showed high index values, even compared to all other traded industries in the world. This implied that the vegetable products have currently become a major target for non-tariff barriers, whether it be TBT or SPS. Overall, among all fifteen industries, the food and agricultural industry was found to be the focus of important non-tariff barriers to trade.

[Keywords]: Non-tariff measures, trade barriers, Technical Barriers to Trade (TBT), Sanitary and Phytosanitary Measures (SPS), quantification of non-tariff barriers, frequency method, inventory approach

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I. Introduction

1. Research Background

Non-tariff measures ("NTMs") can be divided into technical measures and non-technical measures. Among technical measures exist 'Technical Barriers to Trade ("TBT")', 'Sanitary and Phytosanitary Measures ("SPS")', and 'pre-shipment inspection and other formalities'.[1] The first two measures are especially of great concern in the current world trade agenda due to their increase in size and impact. TBT measures are measures adopted by governments to establish product requirements in order to fulfill objectives of public policies like human health or safety, environment protection, consumer information, or product quality.[2] Both domestically produced and imported goods can be applied these measures. On the other hand, SPS measures are government rules and procedures used to ensure the safety of food and beverages and to prevent pests and diseases from affecting animals and plants. Countries are now eager to identify and combat SPS barriers to their food and agricultural exports that appear to be discriminatory, unduly burdensome, unscientific, or otherwise unwarranted since they can create significant trade barriers to a country's exports.

Such NTMs are tightly linked to administrative activity. They affect the international flow of goods or services by influencing prices, trade quantity, or trade structure. Eventually, international organizations like the WTO or UNCTAD have come to formulate the term "non-tariff barriers" that indicate NTMs that act as barriers to trade.

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[1] UNCTAD (2013)

[2] http://tbtims.wto.org

Today, NTMs are one of the most significant trade issues in practice. They can be a considerable restriction on international trade. They are known to have much greater overall contribution to trade restrictiveness than tariffs.[3]

Although NTMs have become considerably broad in scope and diverse in form, methods to measure their intensity and their effects are not yet sufficient, and are in their inchoate stages. For example, there are difficulties in estimating the size and impact of non-tariff barriers such as the TBT and SPS. These two measures especially pose increasing risks to domestic exporters. Hence, ways to properly realize such estimations or assessments are a vital part of forming an effective trade policy. They are necessary not only to grasp the relevant situation, but also to be able to document the ongoing processes in order to increase transparency to the policy-making process. In effect, much more researches are needed in the relevant field. However, measuring the effect of NTMs on trade is not an easy task since it requires availability of data and specific quantitative tools. It is a task that may require a deep understanding of legal and political systems of trade, and an application of econometrics. Only when such factors are met, a stepped up monitoring of both foreign and domestic SPS and standards-related practices will be possible in order to facilitate trade of products that are safe and of high quality. On the one hand, it will allow countries to break down barriers to its exports. These measures can especially pose a big challenge to small and medium sized firms that tend to lack the resources needed to identify and address the barriers. On the other hand, it will help countries to keep track of domestic regulations and implementations so that it would not provoke complaints from foreign trading

[3] UNCTAD(2013)

partners.

2. Research Purpose

As seen above, how to measure them is one of the main questions in the study of NTMs. It is a difficult task due to the NTMs being non-transparent, their dissimilar influences, and their variety. There is a need for even more caution, when it comes to technical measures like TBT and SPS. The estimation of these measures is particularly challenging because they may rouse various economic effects that cannot all be captured in a simple increase of the prices of imported goods. However, a better understanding of NTMs is possible through their quantification that reflects adequately the trade-barrier effect. This will help policymakers direct the necessary technical and financial resources to where they are needed and formulate appropriate policy responses. It will also enable more balanced agreements in international trade and contribute to multilateral dialogue on issues regarding trade policy.

General methods for the quantification of NTMs can be put into two distinct types. One is estimating the size or intensity of the NTM itself, and the other is evaluating the NTM's impact on the economy. Generally, the former would be a pre-stage to enable the latter. This is to say that forming a proper calculation of the NTM's size or intensity is a vital and primary stage to getting at an appropriate impact analysis of the non-tariff barrier, and this is what the current research specifically proposes to do. Under these terms, it is the aim of this study to focus on a particular part of the existing estimation methodologies, that is, the "frequency method" that relies on the inventory approach. The study will concentrate on enhancing the existing frequency methods by using 'multiple' frequency data from credible sources, to combine them into establishing a more comprehensive quantification of the intensity of NTMs as barriers to trade. Using

multiple frequency data not only evades the problem of difficulty of measurement, but also compensates, to a certain extent, the flaw in relying on a single source. Specifically, this study will try to find an adequate method to i) combine different data or index to get a single comprehensive index, and ii) make use of the comprehensive index to analyze actual trends and phenomena in international trade. The index will be developed focusing on two main types of technical non-tariff measures; TBT and SPS.

II. Previous Studies

Below, existing literature regarding general NTM measurement are organized into, first, studies directly estimating the size or intensity of the NTM itself, and second, studies evaluating such NTM's impact on the economic indicators such as price, trade quantity, or resource allocation.

1. Direct measurement of Size or Intensity of NTMs as Trade Barriers

There are measurement methods that make direct use of the government measures or relevant regulations that may have trade-barrier effects to estimate the size or intensity of non-tariff barriers. The most representative method is the frequency approach. The method of measuring frequency is considered to be the most easily available and transparent one in the measurement of NTMs. It is universally used, utilizing data from sources like the UNCTAD TRAINS[4] to measure the size of the non-tariff measures as barriers to trade. Frequency measures taking inventory-based approach have advantages such as the easiness to collect data. However, these indicators have limitations in that relying on a certain source for necessary data can be biased or imperfect due to various reasons. They may also overstate the intensity or size of existing measures by giving similar weight to each NTM regulation. Although using surveys of firms may partially compensate for such drawbacks, realizing surveys may be a tiring process in itself, exposed to even more inaccuracy in conducting and interpreting the results of the process.

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[4] Trade Analysis and Information System

Previously established indexes that are frequently referred to are the 'Frequency Index' or the 'Coverage Ratio'. The model in this study will include such application of the frequency approach as variables employed to calculate the final index regarding both SPS and TBT. Only, several different forms of its application will be included together as three different variables. This will differentiate the index model of this study from that of previous research in that multiple variables are included to bring about the final frequency index, rather than rely on a single variable. For instance, the two indexes mentioned above use the number of notifications data from the single data source of the WTO IMS. However, this study includes the number of notifications data as only one of the three variables included to estimate the final index. This will not only reduce the risk of bias or error that an index may be exposed to when relying on a single data source, but also reflect qualitative aspects that a simple number of measures cannot convey.

There is also the OECD Trade restrictiveness index (OECD STRI) that quantifies the trade-barrier size of the service industries into a single digit form, ranging from 0 to 1. It utilizes information on regulations and measures of 44 countries to measure the barrier intensity in five different policy categories. Other examples like the OECD Trade Facilitation Index or the LPI of the World Bank base their calculation on the number of measures relevant to specific articles of the Agreement. Such indexes are all alike in that they use frequencies of regulations or policy measures as important foundations for estimating the final index.

Overall, the estimation model developed in this study will be an application of such frequency methods, benefiting from its advantages like the easiness to collect data, while enhancing the drawbacks that can come from relying on a certain data source or

from allocating same weight to all the reported NTMs.

2. Measurement of the Impact of NTMs on Economic Indicators

Unlike the above methods that are applied to measure the size or intensity of NTMs that may act as trade barriers, there are also methods employed to measure how NTMs affect economic indicators like product price, trade quantity, resource allocation within the country, or economic welfare. Such methods generally make use of economic equations or econometric models to calculate the effect, and they are focused on the production aspect of the economy due to limitations in available data.

There is the Trade Restrictiveness Index (TRI) first developed by Anderson and Neary (1991, 1994), providing an indicator of the overall effects of a country's trade policies on economic welfare. Later Kee, Nicita and Olarreaga (2009) developed the OTRI and MA-OTRI.[5] The Effective Rates of Assistance (ERA) and Effective Rates of Protection (ERP) reflects the effects of domestic incentives and net border structure on resource allocation.[6][7]

Price-comparison methods compare the domestic price affected by an NTM to a certain reference price. They calculate the net effects of NTMs as a whole, rather than

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[5] The indicators referred to are the overall trade restrictiveness index (OTRI) and market access OTRI (MA-OTRI). These indicators provide the overall level of restrictiveness of the trade policies imposed (OTRI) or faced (MA-OTRI) by a country and are based on the estimation of ad valorem equivalents of NTMs. They were implemented by the World Bank in its global monitoring reports.

[6] ERPs are a calculation of the change in the sectoral value added due to the protection structure, whereas ERAs measure the size of both border and domestic incentives.

[7] Deardorff, A. and R. Stern (1997)

identifying individual effects of different NTMs. These methods are intuitive in that they are similar to examining the impact of nominal tariff rates. However, the conceptual and data-related problems in having to 'estimate' tariff equivalents can be a major setback. Quantity-impact methods, on the other hand, compare the changes in import or export quantities with and without the NTM. Previous research on TBT's effect on import or export show that TBTs generally have negative effects on trade quantity, but the degree of such effects differs depending on the country, industry, firm, period, and the type of the TBT measure at issue. There are also studies on SPS such as that of Munasib and Roy (2013).

Since this study aims to establish a measurement method of the intensity of particular NTMs, that is, TBT and SPS, the above general methods on NTM impact measurement will not be discussed any further.

3. WTO IMS and UNCTAD TRAINS data differences

Information sources of NTMs like the SPS or TBT include notifications or STCs (Specific Trade Concerns) to the WTO, surveys of World Bank, UNCTAD TRAINS database, Perinorm database (on European and international standards), the I-TIP[8] of the WTO, and in addition, major countries' annual reports on NTMs like those of the US.

However, measures reported to international organizations like the WTO, UNCTAD, or World Bank are more likely to be subsets of the total stock of regulations, rather than a complete set of existing regulations for themselves.[9] Most of their data have certain limitations in their usage as a balanced and objective source for analysis. That is, there might be a lack

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[8] Integrated Trade Intelligence Portal

[9] Okun-Kozlowicki, Jeff (2016)

of periodic updates, or it may be a partial picture or some country's limited view or interest on a certain NTM that may be reflected in their database.

For instance, UNCTAD TRAINS is a information source most broadly available regarding NTMs that is frequently used in research. It covers non-tariff measures like the SPS and TBT as well as tariff measures for over 150 countries. A lot of effort and resources are invested in TRAINS for its maintenance and updates of data, perhaps more than any other database on NTMs. But there is still room for improvement. Some characteristics and limitations of TRAINS as a source of information on NTMs, however, are well specified in UNCTAD (2005). For example, it is based on information obtained from the importing country but it does not reflect that of notification complaints of exporters. It neither contains time series data, nor information on an NTM's degree of restrictiveness. In addition, it does not distinguish between measures consistent with the WTO Agreements or other international norms and those that are not. The uneven reports of countries are a cause of significant time lags in certain information, also.[10]

In the case of WTO IMS database, TBT and SPS notifications contain information specific to the measures, and cover all of the WTO members (161 as of April 26, 2015; accounted for 98 percent of global trade in 2014). In addition, it is a continuous process as an obligation of every WTO member by the relevant WTO Agreements. That is, the information of WTO notifications is important as precursor to introducing new technical measures or amending pre-existing ones. However, one of the critical problems with respect to utilizing information in the notifications is that they reflect only proposed new and to-be-revised technical measures, but not preexisting ones that act as trade barriers. In addition, they lack the information on trade restrictiveness of technical measures and their consistency with the WTO Agreements or other international norms. In fact, the information in TBT notifications appear to report on members' own declaration on proposing technical measures, rather than on verified facts. Other

[10] Ferrantino, M. (2006)

members can have opportunities to discuss and verify it in meetings of the WTO TBT Committee and bilaterally, in between committee sessions. Therefore, it is necessary to utilize the information on TBT, including WTO TBT notifications, with clear understanding of their characteristics. WTO's I-TIP[11], on the other hand, provides comprehensive policy information on trade measures. I-TIP includes information on both tariff and non-tariff measures that affect not only trade in goods but also trade in services, trade in government procurement, information on FTAs/RTAs and the accession commitments of WTO members. In I-TIP, non-tariff measures are classified and considered separately into Anti-dumping, Countervailing duties, Quantitative Restrictions, Safeguards, Special Safeguards, SPS, and TBT. However, for TBT measures, it contains information mostly based on the WTO TBT notifications and specific trade concerns raised by WTO members, by product, and year. Therefore, the I-TIP does not seem to add further information beyond WTO TBT notifications and specific trade concerns as far as TBT is concerned.

As mentioned so far, even the reliable data sources of WTO and UNCTAD have their obvious drawbacks. But when multiple types of data from different sources are combined together, many important drawbacks of one source can be compensated by another source's strength. Such comprehensive approach will be well applied in this research, when measuring the intensities of technical measures.

III. Research Method

[11] https://www.wto.org/english/res_e/statis_e/itip_e.htm

Technical measures may be specially implemented towards imported goods, but a large part of them are employed for a non-discriminatory objective towards both foreign and domestic producers, such as human health or environment protection. They come as legal requirements that products must meet, rather than as increase in prices. Therefore, their effects as barriers to trade may not be conveyed by vivid indicators like prices. In such circumstances, a tariff equivalent measure will not capture the possibly higher compliance costs of importing firms compared to domestic firms. Hence, this study will focus on the inventory approach rather than the price-gap approach. It will also concentrate on better ways to estimate the intensity of the NTM itself, rather than add on to previous literature calculating the NTMs' impact on trade or other aspects of the economy.

1. Industry Subdivision and Research Period

1-1. Industry Subdivision

Unlike TBT measures, SPS measures apply to only a limited range of industries. It deals with the dangers of plant or animal borne pests or diseases entering or spreading in domestic territory, or dangers caused by contaminants, additives, toxin, or disease-causing organisms in foods, beverages, or feedstuffs. As a matter of fact, the total number of SPS notifications in the WTO committee and the number of times relevant STCs were raised were significantly small beyond product numbers above HS code 34. Therefore, the industry of main concern in this study were reduced to those basically within the scope of HS01 to HS34, even if TBTs were applied in various other industries. As a matter of fact, UNCTAD (2009)[12] reports that SPS measures tend to be associated with agricultural goods (HS

[12] UNCTAD (2009)

1-24), whereas TBT measures tend to be associated with manufactured goods (HS 29-97). With reference to the first two of the twelve industry classifications in the TBT database of the Korean Agency for Technology and Standards (KATS), under the Korean Ministry of Trade, Industry, and Energy[13], the mentioned industries were categorized into two types; 'animal, plant, fisheries produce' and 'prepared food, pharmaceuticals, cosmetic products'. The KATS database classifies industries from the export-firm point of view, with an aim to tackle NTBs and promote exports. That is, the product groups are divided according to different material components and different types of economic activity. Hence, it is overall parallel to the HS code classification system organized logically by economic activity or other product characteristics. Hence, this research did not measure SPS and TBT intensity for the other existing industries. However, in the ‘Additional Research” section in the latter part of the study, the remaining industries will be examined for the purpose of measuring the trade-barrier intensity for TBT.

Under the two main industries, a total of seven subdivisions were made in this research according to the Section and Chapters of the HS Code system (2017)[14]. The divisions generally coincide with the 2-digit HS codes, with only partial modification for the variable *fpc2*, in order to match the KATS export industry division.

Table1. Industry Subdivision according to HS Code

[13] http://www.knowtbt.kr/main.do

[14] http://www.customs.go.kr/kcshome/getExecutive_rulings.po

Industry	**Industry Subdivision**	**HS Code**	**Product-Group Name**
1. Animal, Plant, Fisheries produce	1-A. Animals, meat, fish and other invertebrates	01-03	*apf1*
	1-B. Products of animal origin including dairy produce, eggs, honey	04-05	*apf2*
	1-C. Plants and other edible produce of plant origin	06-14	*apf3*
	1-D. Oil, fat, and wax of animal or vegetable	15	*apf4*
2. Prepared food, Pharmaceutical, and Cosmetic products	2-A. Prepared food and Beverages	16-24	*fpc1*
	2-B. Pharmaceutical and medical products	30, 9018, 9021, 9022	*fpc2*
	2-C. Cosmetics	33	*fpc3*

1-2. Research Period

This study examined the recent five years, from the year 2013 to 2017. Since the NTM indexes established in the study are annual values, it would be possible to calculate and compare the trends between any indicated year after 1995 considering the data range of our main three database; WTO TBT IMS, WTO SPS IMS, UNCTAD TRAINS.

2. The Three NTM Intensity Indexes

In this research, a total of three indexes will be derived which are, the Comprehensive TBT Intensity Index (CTII), the Comprehensive SPS Intensity Index(CSII), and the Comprehensive TBT/SPS Index(CTSI). The CTII and CSII are an estimation of the intensities of TBT and SPS as trade barriers, respectively. The last index, CTSI, will be a simple average of the first two indexes. It can provide an overall indication of the intensity of the two representative non-tariff measures that often act as obstacles to trade.

The CTII and the CSII are indexes derived through a combination of three variables. The first two variables are the number of TBT/SPS notifications and the number of Specific Trade Concerns (STCs) raised regarding TBT/SPS issues. The relevant data are extracted from the WTO Information Management System database. The third variable, on the other hand, is the number of TBT or SPS regulations reported in the UNCTAD TRAINS database. Together, the three variables can reflect better the trade-barrier intensity of the NTMs than when only one of the variables is considered.

2-1. Estimating the CTII and CSII: Linear combination of Three Variables

2-1-1. Variables as 0-100 Score

Once the variables for the estimation of each intensity-index are chosen, they are combined together to calculate the CTII and CSII. Then, CTII and CSII are put in a simple summation and division to get the final CTSI value.

The main impediment in combining the different variables is that each variable may differ in its measurement unit or the overall value range. For instance, the variable 'STCs raised' has a maximum value of two-digits, whereas the variable 'UNCTAD_TRAINS regulations' has a range up to five-digits in our research data for the recent five years. To resolve this dissimilarity in combining the variables, this study referred to Cheong(2016)'s index development method to turn raw data into scores ranging from 0 to 100, for each of the three variables used; number of notifications, number of STCs raised, and the number of regulations found in the UNCTAD TRAINS database. The values are changed into scores ranging 0-100 following the two stages of conversion below.

First, the values are synchronized in their measurement units. For this, the raw data are combined together in a single frame both by period and by product-group. The combined data are standardized primarily through conversion into Z-scores.

$$\mathrm{Xz(i,t)} = \frac{X(i,t) - \mu_X}{\sigma_X}$$

$\mathrm{X(i,t)}$: Value of variable X for product-group i , in Year t

μ_X: Average of variable X

σ_X: Standard deviation of variable X

The resulting Z-score values must be converted again into values of the same-unit, in order to make comparison and calculation between different variables possible. Thus, the conversion process is finalized once the Z-scores are put into scores 0-100 using the formula below.

$$Sx(i,t) = [\frac{Xz(i,t) - \min Xz}{\max Xz - \min Xz}] \times 100$$

minX_z: Minimum value of X_z (the Z-score of variable X)

maxX_z: Maximum value of X_z (the Z-score of variable X)

2-1-2. Estimation of the CTII and CSII

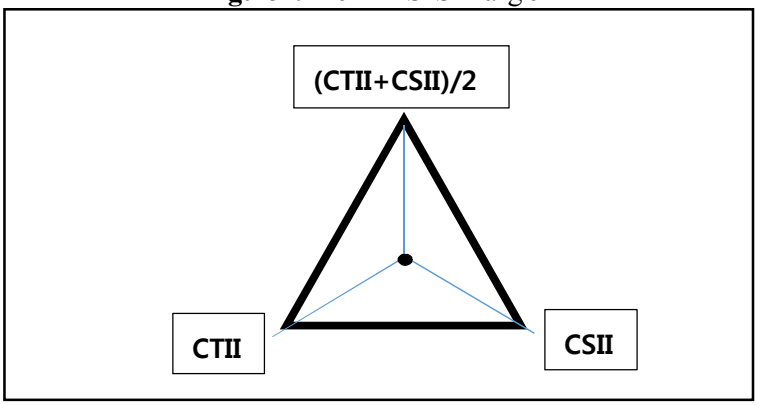
The CTII and CSII for each product-group, are calculated by simple summations of the three variables in the form of 0-100 scores, with equal weights. Although same weights were put on the variables in this particular study, the distribution of weight may be modified according to different assessment criteria. For example, to reflect more the conflictive aspects of the NTMs, variable 'STCs raised' can be allocated a relatively bigger weight than the other two variables.

2-2. Estimation of the CTSI

The CTSI is calculated as the average value of the CTII and the CSII. It simply indicates the trade-barrier intensity of the major two Non-Tariff Measures as a whole.

3. Establishment of the TBT-SPS Triangle

Figure 1. The TBT-SPS Triangle



Once the three indexes CTII, CSII, CTSI are estimated, a simple TBT-SPS Triangle can be established for any product-sector, using the size of these indexes as the length of each of its three corners from the center of the Triangle. This will enable a simplified view of both TBT and SPS intensity for a specific product-sector. The left corner will show the circumstances regarding TBT in international trade, and the right corner will show the situation regarding SPS. The height of the Triangle from its center will show the intensity of the TBT and SPS situations combined in that particular sector.

A sector that shows a triangle with a longer left corner compared to the right, or a smaller left angle than the right, is faced with a more serious non-tariff trade barrier in the TBT sector. On the other hand, if a sector shows a longer right corner than the left, it means that the sector has more serious issues regarding SPS compared to TBT. Examples will be shown in the following 'Results and Analysis' section.

IV. Results and Analysis

1. The Three Variables

1-1. TBT/SPS Notification

Below are the individual results of the number of TBT and SPS notifications made to the WTO during the period from year 2013 to 2017.

For TBT notifications, *fpc1* (Prepared food and Beverages) and *apf3* (Plants and other edible produce of plant origin) showed highest numbers overall during the recent five years. In the case of SPS notifications, *apf3* ranked the highest for most of the years and *apf1* came second, all except for the year 2017 when *apf3* was just slightly outnumbered by *apf1*.

Table2. TBT Notification, 2013-2017

TBT Notification	2013	2014	2015	2016	2017
apf1	15	8	5	11	32
apf2	16	33	7	22	23
apf3	26	47	23	56	73
apf4	6	9	2	13	19
fpc1	52	66	24	72	80
fpc2	25	33	31	37	28
fpc3	6	10	8	10	15

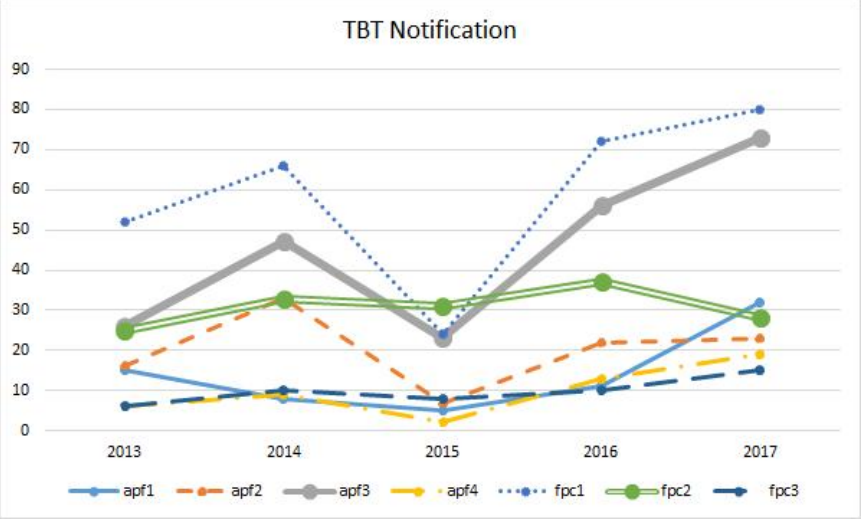


Figure 2. TBT Notification, 2013-2017

Table 3. SPS Notification, 2013-2017

SPS Notification	2013	2014	2015	2016	2017
apf1	362	393	340	383	493
apf2	239	236	250	256	313
apf3	399	560	518	425	480
apf4	64	67	75	64	61
fpc1	129	136	157	110	154
fpc2	13	20	23	17	15
fpc3	9	10	21	4	1

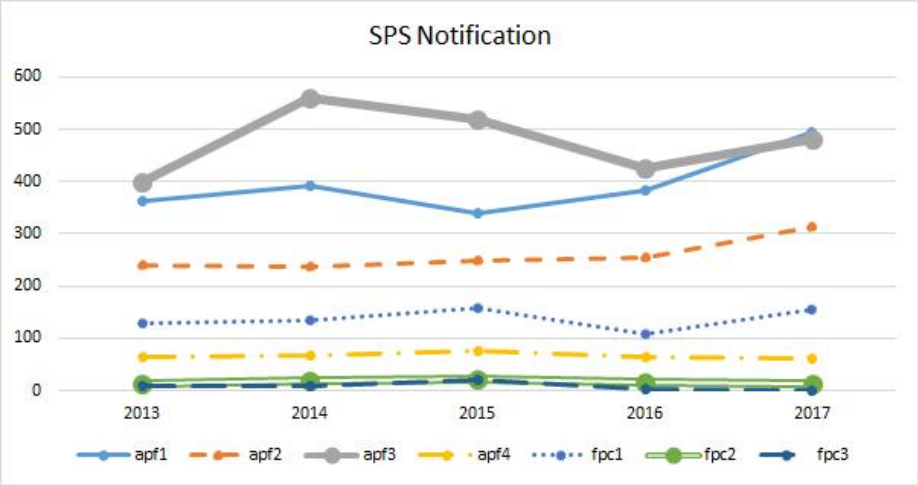


Figure 3. SPS Notification, 2013-2017

1-2. STCs Raised

Below are the individual results of the number of Specific Trade Concerns raised in the WTO committee for TBT and SPS during the period from year 2013 to 2017. It is the number of STCs first raised, or subsequently raised in the indicated year.

For TBT STC, *fpc1* (Prepared food and Beverages) had the highest number of STCs raised for all five years, while *apf1* (Animals, meat, fish and other invertebrates), *apf2* (Products of animal origin including dairy produce, eggs, honey), *apf3* (Plants and other edible produce of plant origin), *apf4* (Oil, fat, and wax of animal or vegetable), *fpc3* (Cosmetics) followed, showing similar numbers taking turns in their rankings. However, in the last two years, *apf2, apf3,* and *apf4* were relatively higher.

In the case of SPS STC, *apf1* consecutively showed highest frequencies of STCs raised, while *apf3* followed suit with the second highest in number throughout most of the years.

Table 4. STCs Raised for TBT, 2013-2017

TBT STC	2013	2014	2015	2016	2017
apf1	1	2	2	2	2
apf2	2	2	1	3	4
apf3	1	1	1	2	3
apf4	1	2	1	2	3
fpc1	4	8	6	11	10
fpc2	0	0	0	0	0
fpc3	0	2	1	1	1

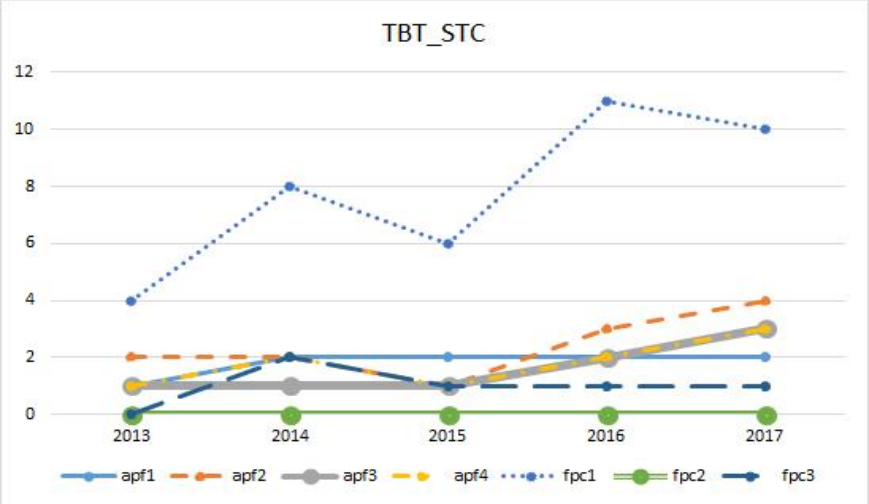


Figure 4. STCs Raised for TBT, 2013-2017

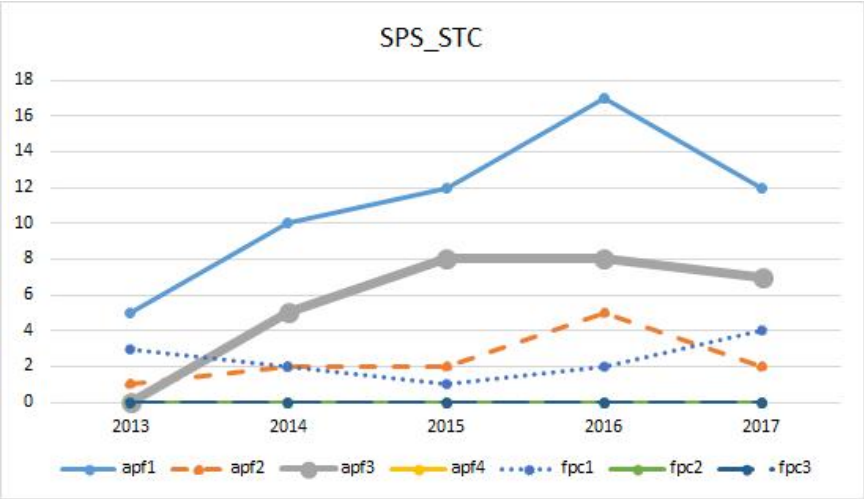


Table 5. STCs Raised for SPS, 2013-2017

SPS STC	2013	2014	2015	2016	2017
apf1	5	10	12	17	12
apf2	1	2	2	5	2
apf3	0	5	8	8	7
apf4	0	0	0	0	0
fpc1	3	2	1	2	4
fpc2	0	0	0	0	0
fpc3	0	0	0	0	0

Figure 5. STCs Raised for SPS, 2013-2017

1-3. UNCTAD TRAINS regulations

For a more comprehensive assessment of the NTB size and frequency, data from the TRAINS (Trade Analysis Information System) database of UNCTAD[15] was included to the above variables from the WTO IMS database. TRAINS is the global database on non-tariff measures. It provides systematic information on a broad range of non-tariff policy tools that may affect international commodity trade. The database includes not only technical measures like TBT or SPS that officially pursues non-trade objectives, but also traditional trade policy instruments like price controls and quotas. The data are retrieved from official sources, mainly national trade laws and regulations. The type of measures are distinguished following the International Classification of NTMs, while the classification of affected product-groups are categorized according to the HS Code system.

Below are the individual results of the number of TBT or SPS regulations reported in UNCTAD TRAINS, during the period from year 2013 to 2017.

For TBT regulations, *fpc1* (Prepared food and Beverages) and *fpc2* (Pharmaceutical and medical products) maintained in the top two product-groups with the highest value all throughout the five years. Without a significant difference, *apf3* (Plants and other edible produce of plant origin) followed as the third highest in regulation number. These three product-groups had a considerably high number of regulations compared to the rest of the four groups.

[15] http://trains.unctad.org/

In the case of SPS regulations, *apf3* had an overwhelmingly high number of regulations compared to any other product-group throughout the whole period.

Table 6. UNCTAD TRAINS TBT regulations, 2013-2017

TBT UNCTAD TRAINS	**2013**	**2014**	**2015**	**2016**	**2017**
apf1	846	882	904	902	902
apf2	1257	1341	1407	1407	1407
apf3	1957	2032	2192	2193	2193
apf4	858	884	933	939	939
fpc1	2656	2745	2836	2846	2852
fpc2	2402	2552	2784	2794	2794
fpc3	1039	1092	1184	1184	1184

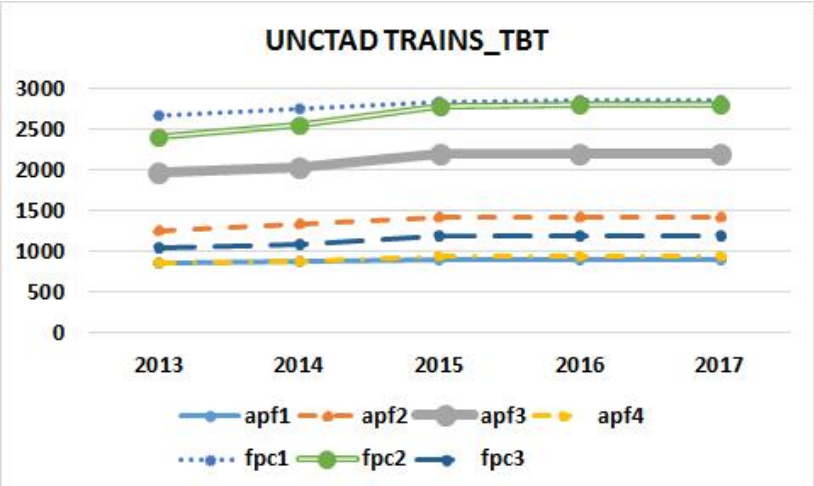


Figure 6. UNCTAD TRAINS TBT regulations, 2013-2017

SPS UNCTAD TRAINS	2013	2014	2015	2016	2017
apf1	4354	4732	4868	4891	4895
apf2	3254	3561	3692	3714	3716
apf3	11180	11880	12414	12446	12448
apf4	1447	1552	1623	1629	1631
fpc1	3440	3702	3824	3835	3837
fpc2	455	486	498	500	501
fpc3	180	186	194	192	192

Table 7. UNCTAD TRAINS SPS regulations, 2013-2017

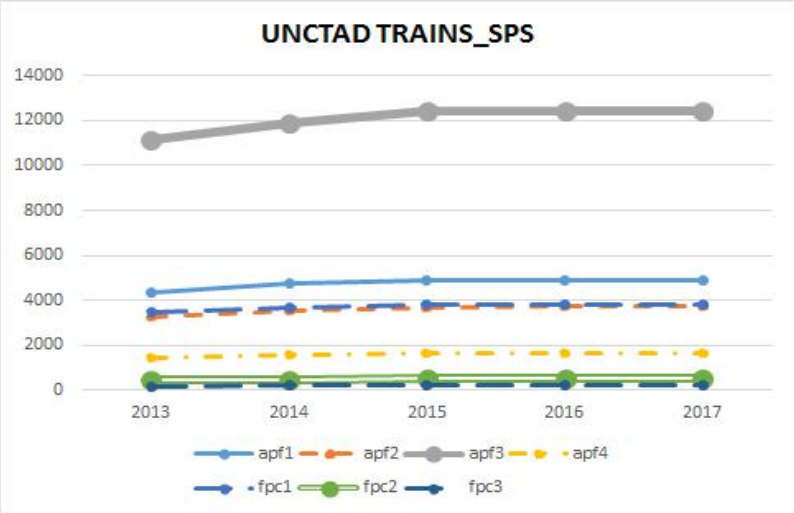


Figure 7. UNCTAD TRAINS SPS regulations, 2013-2017

2. Raw Data of the Three Variables, by Year.

Below are the three variables put together for each product-group for the recent five years. Such collection of raw data in a single chart, will be the very basis for the final calculation of the CTII and CSII.

2-1. Data Results for the Measurement of TBT Intensity

Table 8. TBT Intensity - Raw data

Year	Product Groups	TBT Notification	STC	UNCTAD_TRAINS
2017	**apf1**	32	2	902
	apf2	23	4	1407
	apf3	73	3	2193
	apf4	19	3	939
	fpc1	80	10	2852
	fpc2	28	0	2794
	fpc3	15	1	1184

2016	**apf1**	11	2	902
	apf2	22	3	1407
	apf3	56	2	2193
	apf4	13	2	939
	fpc1	72	11	2846
	fpc2	37	0	2794
	fpc3	10	1	1184
2015	**apf1**	5	2	904
	apf2	7	1	1407
	apf3	23	1	2192
	apf4	2	1	933
	fpc1	24	6	2836
	fpc2	31	0	2784
	fpc3	8	1	1184
2014	**apf1**	8	2	882
	apf2	33	2	1341
	apf3	47	1	2032
	apf4	9	2	884
	fpc1	66	8	2745
	fpc2	33	0	2552
	fpc3	10	2	1092
2013	**apf1**	15	1	846
	apf2	16	2	1257
	apf3	26	1	1957
	apf4	6	1	858
	fpc1	52	4	2656
	fpc2	25	0	2402
	fpc3	6	0	1039

2-2. Data Results for the Measurement of SPS Intensity

Table 9. SPS Intensity - Raw data

Year	Product Groups	SPS Notification	STC	UNCTAD_TRAINS
2017	**apf1**	493	12	4895
	apf2	313	2	3716
	apf3	480	7	12448
	apf4	61	0	1631
	fpc1	154	4	3837
	fpc2	15	0	501
	fpc3	1	0	192

2016	**apf1**	383	17	4891
	apf2	256	5	3714
	apf3	425	8	12446
	apf4	64	0	1629
	fpc1	110	2	3835
	fpc2	17	0	500
	fpc3	4	0	192
2015	**apf1**	340	12	4868
	apf2	250	2	3692
	apf3	518	8	12414
	apf4	75	0	1623
	fpc1	157	1	3824
	fpc2	23	0	498
	fpc3	21	0	194
2014	**apf1**	393	10	4732
	apf2	236	2	3561
	apf3	560	5	11880
	apf4	67	0	1552
	fpc1	136	2	3702
	fpc2	20	0	486
	fpc3	10	0	186
2013	**apf1**	362	5	4354
	apf2	239	1	3254
	apf3	399	0	11180
	apf4	64	0	1447
	fpc1	129	3	3440
	fpc2	13	0	455
	fpc3	9	0	180

3. Deriving the Three Intensity Indexes: CTII, CSII, CTSI

With the results of the three variables indicated above, the three indexes CTII, CSII, and CTSI will be drawn. This will be done by first, calculating CTII (Comprehensive TBT Intensity Index) and CSII (Comprehensive SPS Intensity Index) that are an estimation of the intensities of TBT and SPS respectively. Each of these two indexes can be useful in themselves, and the final CTSI (Comprehensive TBT/SPS Intensity Index) will only be an average value of the two. The CTSI will

provide an overall indication of the intensity of the two representative non-tariff measures that often act as barriers to trade.

3-1. Estimating the CTII and CSII

As mentioned previously in the study, the CTII and CSII for each product-group are calculated as a weighted average of the 0-100 score values of the three variables. In this study, equal weights were imposed on all variables.

3-1-1. The Three Variables in 0-100 Score Format for TBT and SPS

Below are the results of converting the raw data of the three variables into uniform 0-100 scores. These scores will be used in the weighted average to derive CTII and CSII.

Table 10. 0-100 Scores of the Three Variables - TBT

Year	Variable	TBT Notification	STC	UNCTAD_TRAINS
2017	**apf1**	26.154	20	0
	apf2	12.308	40	25.897
	apf3	89.231	30	66.205
	apf4	6.1538	30	1.8974

	fpc1	100	100	100
	fpc2	20	0	97.026
	fpc3	0	10	14.462
2016	**apf1**	1.6129	18.182	0
	apf2	19.355	27.273	25.977
	apf3	74.194	18.182	66.409
	apf4	4.8387	18.182	1.9033
	fpc1	100	100	100
	fpc2	43.548	0	97.325
	fpc3	0	9.0909	14.506
2015	**apf1**	10.345	33.333	0
	apf2	17.241	16.667	26.035
	apf3	72.414	16.667	66.667
	apf4	0	16.667	1.501
	fpc1	75.862	100	100
	fpc2	100	0	97.308
	fpc3	20.69	16.667	14.493
2014	**apf1**	0	25	0
	apf2	43.103	25	24.638
	apf3	67.241	12.5	61.728
	apf4	1.7241	25	0.1074
	fpc1	100	100	100
	fpc2	43.103	0	89.64
	fpc3	3.4483	25	11.272
2013	**apf1**	19.565	25	0
	apf2	21.739	50	22.707
	apf3	43.478	25	61.381
	apf4	0	25	0.663
	fpc1	100	100	100
	fpc2	41.304	0	85.967
	fpc3	0	0	10.663

Table 11. 0-100 Scores of the Three Variables - SPS

Year	Variable	SPS Notification	STC	UNCTAD_TRAINS
2017	**apf1**	100	100	38.373
	apf2	63.415	16.667	28.753
	apf3	97.358	58.333	100
	apf4	12.195	0	11.741
	fpc1	31.098	33.333	29.741

	fpc2	2.8455	0	2.5212
	fpc3	0	0	0
2016	**apf1**	90.024	100	38.347
	apf2	59.857	29.412	28.742
	apf3	100	47.059	100
	apf4	14.252	0	11.727
	fpc1	25.178	11.765	29.729
	fpc2	3.0879	0	2.5135
	fpc3	0	0	0
2015	**apf1**	64.185	100	38.249
	apf2	46.076	16.667	28.625
	apf3	100	66.667	100
	apf4	10.865	0	11.694
	fpc1	27.364	8.3333	29.705
	fpc2	0.4024	0	2.4877
	fpc3	0	0	0
2014	**apf1**	69.636	100	38.875
	apf2	41.091	20	28.861
	apf3	100	50	100
	apf4	10.364	0	11.681
	fpc1	22.909	20	30.067
	fpc2	1.8182	0	2.5654
	fpc3	0	0	0
2013	**apf1**	90.513	100	37.945
	apf2	58.974	20	27.945
	apf3	100	0	100
	apf4	14.103	0	11.518
	fpc1	30.769	60	29.636
	fpc2	1.0256	0	2.5
	fpc3	0	0	0

3-1-2. Estimation of the CTII

Below is an example of the resulting CTII indexes for the five consecutive years.

CTII	2013	2014	2015	2016	2017
apf1	14.85507	8.333333333	14.55939	6.59824	15.38462
apf2	31.4821	30.91370981	19.98108	24.20164	26.06838
apf3	43.28649	47.15659146	51.91571	52.92828	61.81197
apf4	8.554328	8.943830554	6.055901	8.30794	12.68376
fpc1	100	100	91.95402	100	100
fpc2	42.42373	44.24793776	65.7695	46.95783	39.00855
fpc3	3.554328	13.24013919	17.28303	7.865694	8.153846

Table 12. Estimation of the CTII

Overall, 'Prepared food, pharmaceuticals, cosmetic products (*fpc*)' show higher CTII than 'Animal, plant and fisheries produce (*apf*)'. However, among *apf, apf3* uniquely stands out with a high CTII. It is ranked in the top two variables with the highest score among the total of seven variables, only except for year 2015.

Among 'Prepared food, pharmaceuticals, cosmetic products (*fpc*)', *fpc1* ranks the highest in score, followed by an also high *fpc2*.

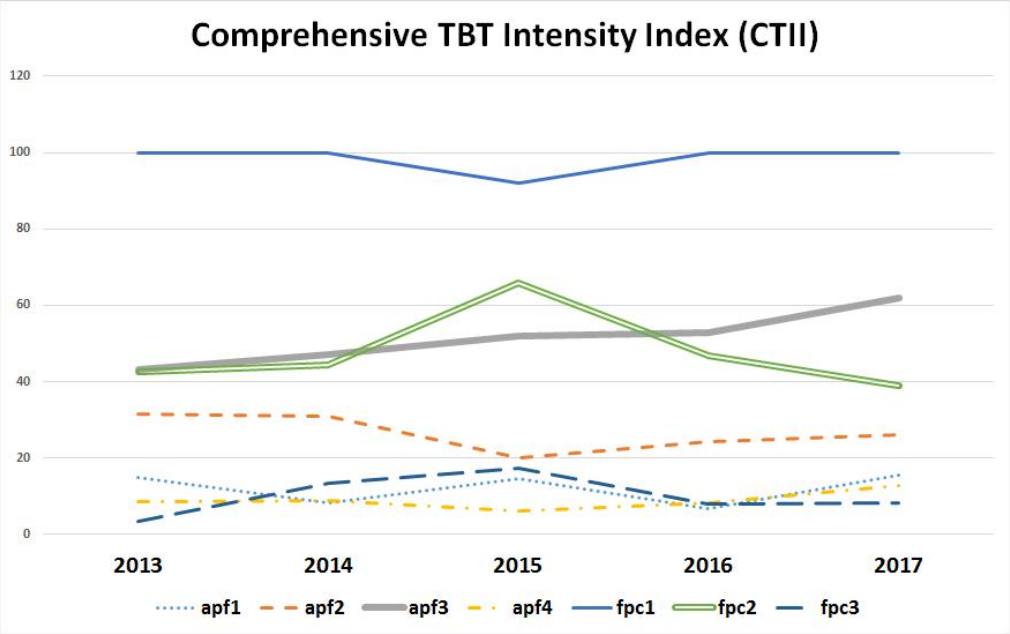


Figure 8. Comprehensive TBT Intensity Index (CTII), 2013-2017 trend

3-1-3. Estimation of the CSII

Below is an example of the resulting CSII indexes for the five-year period.

CSII	2013	2014	2015	2016	2017
apf1	76.15276	69.50366673	67.47796	76.12347	79.45768
apf2	35.63994	29.98395448	30.45611	39.33696	36.27819
apf3	66.66667	83.33333333	88.88889	82.35294	85.23035
apf4	8.540249	7.348280133	7.519712	8.659522	7.97877
fpc1	40.1352	24.32526393	21.80097	22.22397	31.39048
fpc2	1.175214	1.461199994	0.96338	1.867117	1.788914
fpc3	0	0	0	0	0

Table 13. Estimation of the CSII

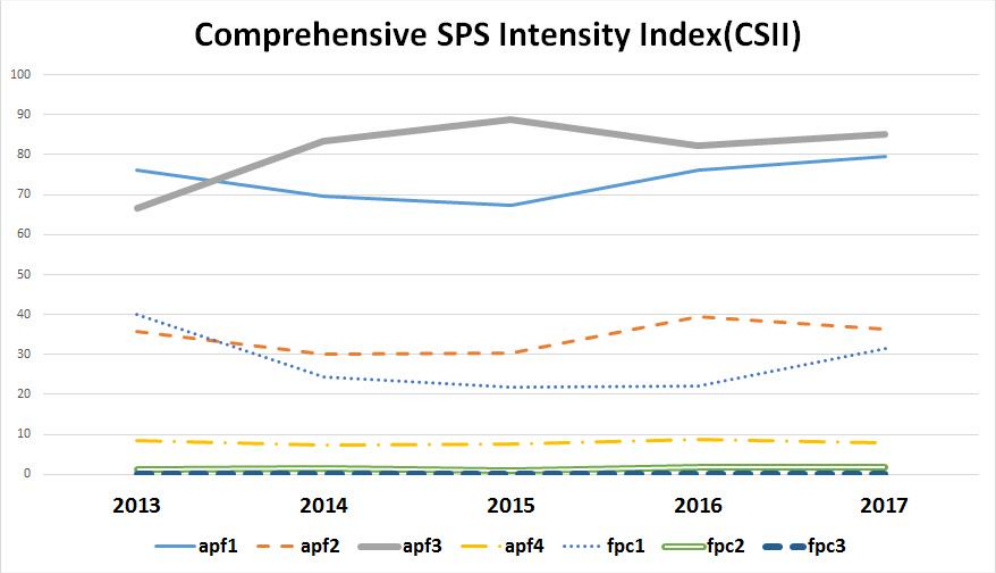


Figure 9. Comprehensive SPS Intensity Index (CSII), 2013-2017 Trend

'Animal, plant and fisheries produce (*apf*)' shows an overall higher CSII than 'prepared food, pharmaceuticals, cosmetic products (*fpc*)'. Among the *apf* products, *apf3* and *apf1* show highest CSII. Among *fpc* products, *fpc1* is highest in CSII.

3-1-4. Analysis

In the above CTII and CSII results, *apf3* uniquely stands out in both cases. That is, *apf3* ranks in the top two scores in both TBT and SPS intensity indexes. This shows that 'plants and other edible produce of plant origin' may be the biggest target of NTMs among the examined industries in international trade. 'Plants and other edible produce of plant origin' are major diet commodities that are the main source of food consumption around the world. They include, grains, cereals, wheat gluten, products of the milling industry, seeds,

fruit and fruit peels, edible vegetables and certain roots and tubers, sugar, cocoa, coffee, tea, spices, edible nuts and so on. They are also products in the food industry most subject to pesticides, antibiotics, chemical fertilizers, or GMO modification. Therefore, it can be said that special monitoring of NTMs in the *apf3* product-sector is necessary both in terms of export-facilitation, and protection of hazards from imported products.

It is indeed reflected in the research results the increase of food-safety awareness around the world. In the past, developed countries were the main promoters of food related NTMs against imports from abroad, and the exporters of the developing countries were the main targets or victims of such regulations. However, circumstances have changed. There have been an overall increase of NTMs from both developed and developing countries.

3-2. Estimating the CTSI

Refer to the column "(CTII+CSII)/2" in the below chart, for the resulting CTSI index values for the year 2017.

Product-Group	**(CTII+CSII)/2**
apf1	47.42115
apf2	31.17328
apf3	**73.52116**
apf4	10.33127
fpc1	65.69524

Table 14. CTSI – Year	***fpc2***	20.39873	Estimation of 2017
	fpc3	4.076923	

As *apf3* showed high scores in both CTII and CSII, naturally it ranks first in the estimation of the CTSI, which is a simple average of the two indexes.

4. The TBT-SPS Triangle by Product-group

Below are figures of TBT-SPS Triangles for each of the seven product-groups examined in this study. Products with a relatively bigger CTII than CSII (*fpc1*) tend to tilt towards the left corner, while products with a bigger CSII (*apf1*) tilts more towards the right corner. As is vividly shown in the comparison between products *apf3* and *fpc3*, the bigger (smaller) the size of the CTII or CSII, the bigger (smaller) the size and height of the Triangle.

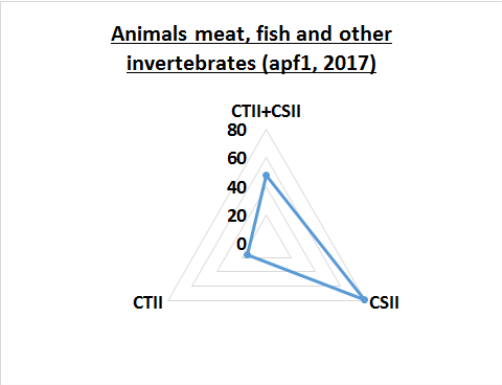


Figure 10. TBT-SPS Triangle for *apf1*, 2017

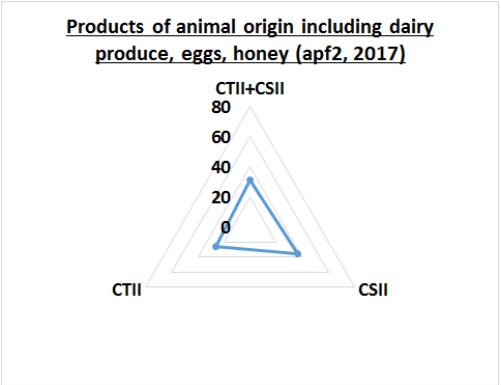


Figure 11. TBT-SPS Triangle for *apf2*, 2017

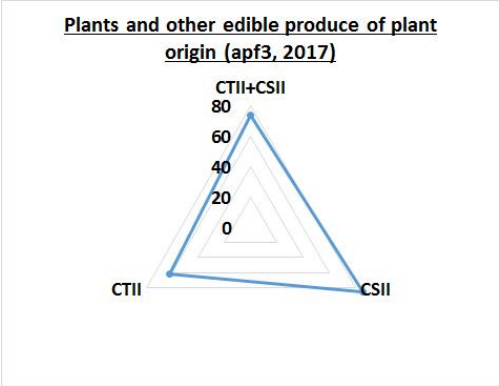


Figure 12. TBT-SPS Triangle for *apf3*, 2017

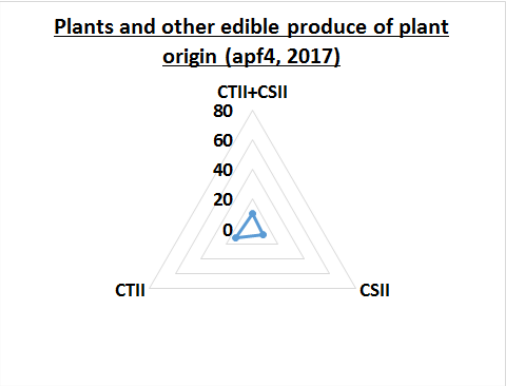


Figure 13. TBT-SPS Triangle for *apf4*, 2017

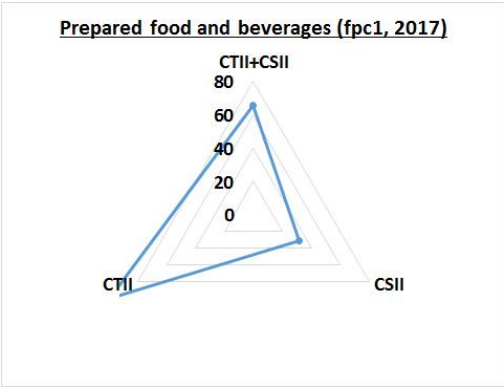


Figure 14. TBT-SPS Triangle for *fpc1*, 2017

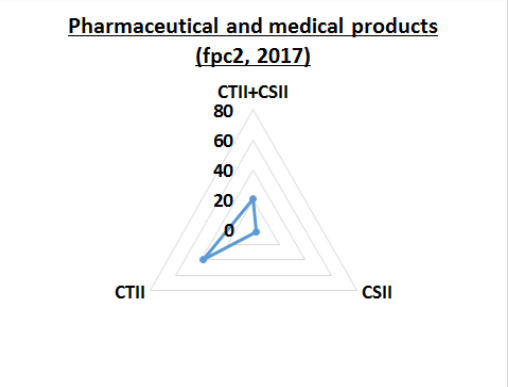


Figure 15. TBT-SPS Triangle for *fpc2,* 2017

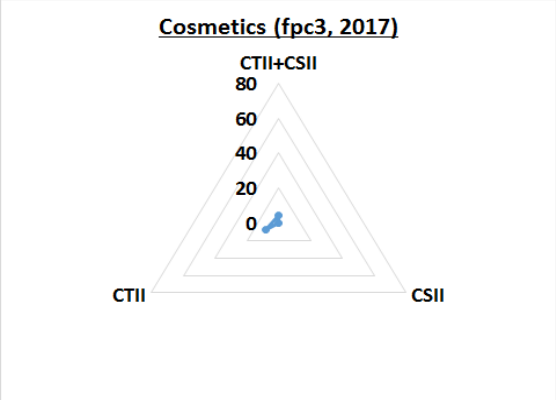


Figure 16. TBT-SPS Triangle for *fpc3*, 2017

Below are all the TBT-SPS Triangles of each product-group put together in one graph for the particular year, 2017. Again, it is evident that *apf3* has the tallest and largest triangle due to both high CTII and high CSII. This is in contrast to the small Triangles of products *apf4* or *fpc3*. However, the Triangle of *fpc1* is also considerably large in size, even though its CSII is not as big. This is because its CTII level is overwhelmingly bigger than any other product-group. On the other hand, *apf1* Triangle is also large in size, due to the outstanding value of its CSII.

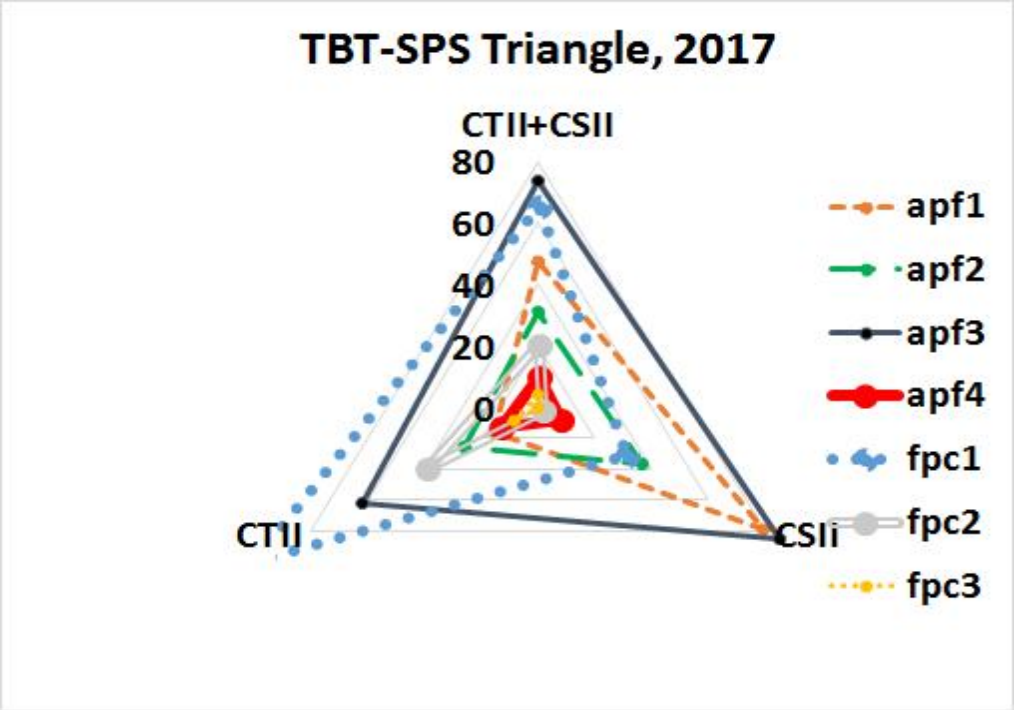


Figure 17. The TBT-SPS Triangle - Year 2017

5. Additional Research: Generalization of Results to Other Industries

The *apf3* product-group stood out with relatively high index levels for both TBT and SPS indexes. It is a major product-group within the whole food and agricultural sector, with one of the biggest consumption rates around the world. It is also one of the most

heavily traded products.[16] However, until now, the major part of this research has focused on a limited range of industries where both SPS and TBT could be found. Unlike SPS that applies almost restrictively to 'food and agricultural' sector, TBT applies to a wide range of other industry sectors traded around the world. Therefore, there would be an additional need for examination of TBTs applied to other industries before we can generalize the above results.

5-2. TBT Intensity in Other Industries: Comparison of CTII

To certify that the above results apply to other industries also, we can estimate CTII of the 'food and agricultural' sector in comparison with CTII of other existing industries in world trade

5-2-1. Industry Classification for TBT

Below is the industry division that will be used for this particular section of research. It is a categorization of all the industries traded in the world, reflected in the HS classification system. The industries are divided according to the Chapters and Headings of the HS system.

Here, the food and agricultural sector is divided into three sub-categories to reflect the industry division of the main research above. We can see that *apf3* is now under the category 'vegetable products'. Although *apf3* covers HS code 06-14, and 'vegetable products' covers HS code 06-15, the difference accorded to HS15 ('Oil, fat, and wax of animal or vegetable') only takes up a small portion of the total 'vegetable product' trade. So one can roughly assume that the two sectors are almost equivalent for the purposes of this additional research.

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[16] Food and Agricultural Organization (2013)

Table 15. Industry Classification for TBT

Industry Classification	HS 2-digit Code 2017	Relevant Variables
1. Animal and Animal Products	01-05	*apf1, apf2*
2. Vegetable Products	06-15	*apf3, apf4*
3. Foodstuffs	16-24	*fpc1*
4. Mineral Products	25-27	-
5. Chemicals and Allied Industries (excluding pharmaceutical and medical products, Cosmetics)	28-38 (excluding 30,33)	*fpc2, fpc3* NOT Included
6. Plastics and Rubbers	39-40	-
7. Raw Hides, Skins, Leather, and Furs	41-43	-
8. Wood and Wood Products	44-49	-
9. Textiles	50-63	-
10. Footwear and Headgear	64-67	-
11. Stone and Glass	68-71	-
12. Metals	72-83	-
13. Machinery and Electrical	84-85	-
14. Transportation	86-89	-
15. Miscellaneous (excluding pharmaceutical and medical products)	90-97 (excluding 9018, 9021, 9022)	*fpc2, fpc3* NOT Included

5-2-2. CTII for Year 2017

To make an exemplary comparison, CTII results for the year 2017 are indicated below.

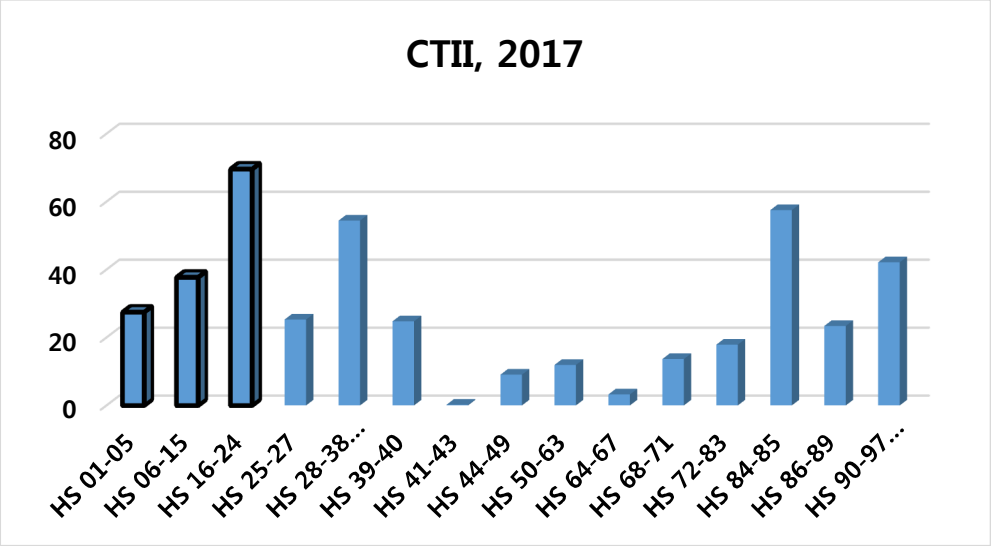
Table 16. CTII for All Industries, 2017

Industry Classification	HS 2-digit Code 2017	Relevant Variables	CTII (2017)	CTII Ranking

1. Animal and Animal Products	01-05	***apf1, apf2***	**27.4**	**6**
2. Vegetable Products	06-15	***apf3, apf4***	**37.7**	**5**
3. Foodstuffs	16-24	***fpc1***	**69.6**	**1**
4. Mineral Products	25-27	-	25.3	7
5. Chemicals and Allied Industries (excluding pharmaceutical and medical products, Cosmetics)	28-38 (excluding 30,33)	*fpc2, fpc3* NOT Included	**54.4**	**3**
6. Plastics and Rubbers	39-40	-	24.8	8
7. Raw Hides, Skins, Leather, and Furs	41-43	-	0.2	15
8. Wood and Wood Products	44-49	-	9.1	13
9. Textiles	50-63	-	11.9	12
10. Footwear and Headgear	64-67	-	3.2	14
11. Stone and Glass	68-71	-	13.6	11
12. Metals	72-83	-	17.9	10
13. Machinery and Electrical	84-85	-	**57.5**	**2**
14. Transportation	86-89	-	23.4	9
15. Miscellaneous (excluding pharmaceutical and medical products)	90-97 (excluding 9018, 9021, 9022)	*fpc2, fpc3* NOT Included	**42.1**	**4**

*CTII rounded off to two decimal places

Figure 18. CTII for Agricultural and Other Food-Related Industries, % of Total



*Highlighted groups are those of agricultural or other food-related industries

Considering each industry's CTII ranking and its relative size among the total list of industries, it can be concluded that the agricultural and other food-related industries (HS 01-24) are faced with considerable TBT risks, relative to other industries.

5-2-3. Analysis

'Vegetable Products (HS06-15)' that include 'plant and other edible produce of plant origin (*apf3*)' showed relatively high CTII among the fifteen sectors. Nevertheless, the whole food and agricultural product industry combined (HS01-24) showed even higher relative value due to an especially high CTII of 'foodstuffs (HS16-24)' sector. This all leads to the conclusion that the TBT intensity of food and agricultural products is high, regardless of the industries compared.

The additional results of CTII certify that 'plant and other edible produce of plant origin' products, or 'vegetable products' are faced with relatively severe dangers of

TBT compared to all other product-sectors, in addition to the previous results regarding SPS measures. Another important implication is that it is not only the vegetable products, but the food and agricultural industry as a whole that has become a major concern with regards to threats from both TBT and SPS.

V. Conclusion

The estimation model of TBT and SPS developed in this study applied frequency methods relying on inventory-data. It enjoyed the benefits of inventory-based frequency approaches, collecting data from readily available sources like the database of WTO and UNCTAD. In addition, it enhanced the drawbacks that many frequency methods face by relying on multiple, rather than a single data type or source. The model also included the STC data that reflected the conflictive aspects of NTMs rather than treat all NTMs equally, so that their trade-barrier effect could be measured. Using only the data on the number of regulations or notifications would have had the effect of allocating same weight on all the reported NTMs, which can be greatly misleading in terms of estimating the barrier effect of those measures.

Primarily, the estimation results were derived for seven product-sectors within the two industries, "Animal, plant, fisheries produce", and "Prepared food, pharmaceutical, cosmetic products". The CTII and CSII were calculated to show how both SPS and TBT measures resulted in considerably high index values in 'plant and other edible produce of plant origin (*apf3*)'. The sector was a major traded sector among the food and agricultural product industry (*apf*). This was followed by an additional research that was conducted solely on TBT intensity, but this time for all the other existing trade industries as well. Eventually, the food and agricultural product industry as a whole showed relatively high CTII compared to other industries exposed to TBTs. Also, the 'vegetable products' sector that included apf3 was indeed one of the main subsectors within the industry with CTII, showing that generalization of the main research results to TBT is possible. These results well reflect the current trends found in international trade. In the past, it was general for only a few developed countries to establish NTMs in the food related industries, and face complaints from the developing countries.

However, now many countries all over the world are increasingly adopting such technical measures.

The above results are more alarming, considering how world trade of agricultural produce and other edible goods is increasing each year. It may be that the increasing amount of trade is an important causation for more adoptions of relevant NTMs, but this doesn't eliminate the growing threat that the NTMs impose. Such threat may be more critical to the increasing number of countries that produce these goods more as a part of its export strategy, rather than to consume them domestically. Therefore, the importance of monitoring and reducing detrimental trade barriers is unquestionable. In this sense, the model developed in this research to make estimations of relative levels of NTM intensity across industry-sectors can provide policymakers specific guidance as to which sectors need more caution. Fortunately, nowadays it is vital for member countries to notify their newly-adopted regulations to organizations like the WTO. Such enhanced international transparency improves the utility of the inventory approaches, like those used in this study.

Despite the fact that the developed NTM quantification model allows a comprehensive, yet hands-down assessment of NTM intensity, it is still limited to dealing with the 'relative' levels of non-tariff protection. It does not provide information on how big the trade barrier is in absolute terms, drawing limits to its usage. Moreover, this model provides a primary estimation of the non-tariff barrier intensity, and not its impact on other economic factors like prices or trade volume. This will be adequate as a future research topic.

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[국문 초록]

본 연구에서 개발한 무역기술장벽(TBT)과 위생및식물위생조치(SPS)에 대한 측정모델은 WTO나 UNCTAD와 같은 기존의 활용이 용이한 데이터베이스들을 바탕으로 빈도접근 방식을 취하고 있다. 그러나 본 모델은 하나가 아닌 복수의 데이터 소스를 반영함으로써 기존 빈도 접근 방식을 개선하고자 하였다. 또한 WTO의 특정무역현안(STC) 자료를 변수로 포함하여, 모든 비관세조치들을 동일하게 취급하기보다는 해당조치들의 갈등적 요소들을 반영하였다. 이는 그 무역장벽으로서의 특성을 최종 지수에 더욱 잘 반영하기 위함이었다. 즉, WTO 통보문 수, 제기된 STC 수, UNCTAD TRAINS에 등록된 규정의 수라는 세 가지 변수를 포함시켜 더욱 종합적인 지표를 도출할 수 있었다. 무역장벽으로서의 TBT의 강도는 CTII 지수로, SPS의 강도는 CSII지수로 나타내었고, 마지막으로 TBT와 SPS의 강도를 종합한 지표인 CTSI는 이 두 지수의 단순 평균값으로 계산되었다. 마지막으로, 세 지수 각각을 삼각형 중심에서 모서리까지의 너비로 두어 지수 값들을 시각화한 “TBT/SPS 삼각형”이 구축되었다.

이렇게 개발된 측정모델은 2013년부터 2017년 사이의 세계 무역 데이터를 대상으로 한 실증분석에 이용되었다. 이를 통하여 비관세조치로 형성된 무역장벽과 관련한 실제 현황을 진찰해볼 수 있었다. SPS와 TBT가 동시에 영향 미치는 7개 산업에 대한 측정 결과, ‘식물 및 식물을 원천으로 하는 기타 식용 상품’ 부문에서 SPS와 TBT의 강도가 모두 가장

컸다. 그러나 이 결과는 앞서 추정된 7개 부문보다 훨씬 더 광범위한 산업에 걸쳐 적용되고 있는 TBT에 대하여는 일반화할 수 없었다. 따라서 추가적 연구에 의하여 다른 모든 산업부문에 대하여도 CTII가 계산되었다. 그 결과, '식물 및 식물을 원천으로 하는 기타 식용 상품'이 포함된 부문이 다른 부문에 비하여 상대적으로 높은 축에 속하는 지수를 보였다. 이는 동 산업부문이 최근 비관세 장벽의 큰 부분을 차지하는 TBT와 SPS 모두의 주요 타겟 중 하나가 되었음을 보여준다. 전체 15개 산업에 대한 측정 결과, 전반적으로 식품 및 농업 분야 제품들이 강도 높은 비관세장벽에 직면해 있음을 확인할 수 있었다.

[핵심 주제어]: 비관세 조치, 무역 장벽, 무역기술장벽(TBT), 위생 및 식물 위생조치(SPS), 계량화, 빈도 접근