New global estimates of bilateral AVEs of NTMs: Application to NTM harmonization in Asia-Pacific [working draft – please do not cite]

Introduction

Impact of tariff on trade has been subsided due to encouragement of tariff reduction through negotiation of both bilateral and multilateral agreements in past decades. Non-tariff measures (NTMs), on the other hand, play significant roles in the past decades in determining additional costs of international trade and in turns trade flows. Unlike tariff, quantifying costs of NTMs that affects trade is a challenging task.

To reduce trade costs associating with NTMs is a complex task. Many types of NTMs may directly affect international trade and reduction of such use of those measures may induce trade flows, for example, import quantity restrictions or price control measures. However, several types of NTMs are based on trading partners' domestic policies e.g. policies that accounts for domestic consumers' health and safety. Therefore, the costs of NTMs on international trade comes from the fact that each exporter need to comply with rules and regulations of their trading partners' domestic policies.

In other words, domestic public policies, in this case, indirectly affect trade costs in terms of compliances to partners' social or environment policies. Simple abolishment of NTMs may not serve original purposes of NTMs unlike reducing tariff to reduce international trade costs and in turns increase trade flows. With such significant impact on sustainable trade that affects achievement of SDGs progress, estimating such costs resulting from NTM imposition will assist policymakers in finding cost-efficient way to comply with rules and regulations and increase international market access opportunities to world market, especially in developing countries.

In recent literature, estimation of ad-valorem-equivalents (AVEs) is classified into 2 approaches: price-based and quantity-based model. This study uses price-based model to observe the effect of different types of NTMs on price, i.e. the study estimates AVEs of NTMs as a result of imposition of NTMs. Main contribution of this study to current literature is that the bilateral NTM data are used in price-based model. Most of previous literature relies on country-specific imposition of NTMs to the rest of the world. Moreover, this study takes year of imposition and abolition of NTMs into account rather than existence of NTM measures. In this study, in-depth analysis based on imposition of 2015 is examined.

The main contribution of this study to current literature is that the bilateral AVEs of NTMs are estimated, rather than country-specific AVEs of NTMs imposed on the rest of the world by each country, as is currently common in the literature. The derived estimates allow for partner and sector specific AVEs of NTMs to be incorporated into the standard GTAP model, permitting assessment of the impacts of NTM harmonization policies at bilateral, plurilateral or regional level, among other scenarios aiming to study the effects of NTMs.

NTMs at a glance

The imposition of NTMs is widely applied across sectors countries, sectors and types. NTMs under MAST classification provided by UNCTAD TRAINS, covering more than 80 economies including European Union, are used in evaluating current imposition of NTMs. Table 1 shows brief explanation of NTM classification used by UNCTAD TRAINS. The study covers only import-related measures and separates the imposition of NTMs to the rest of the world and additional NTMs each economy imposes to trading partners. This is aimed to observe if there are any differences in their NTM applications across products and economies.

From the database, SPS and TBT are intensively imposed. Under 6-digit product line SPS and TBT can be imposed up to 67 and 111 measures, respectively. By observing coverage ratio, which is the percent of trade value that is subject to NTM imposition in sectoral perspective[1], technical measures are intensively used, especially in agricultural and agro-food industry, namely, live animals, vegetable products, fats and oil, and processed food (section 1-4). Coverage ratio of technical measures imposed by economies to the rest of the world are almost at 100 percent, while bilateral imposition is ranging from 67 to 87 percent.

Table 1: UNCTAD's 2012 NTM classification[2]

Import-related measures	Technical measures	A	Sanitary and Phytosanitary (SPS) measures
		B	Technical barriers to trade (TBT)
		C	Pre-shipment inspections and other formalities
	Non-technical measures	D	Contingent trade-protective measures
		E	Non-automatic licensing, quotas, prohibitions and quantity control measures
		F	Price-control measures, including additional taxes and charges
		G	Finance measures
		H	Measures affecting competition
		I	Trade-related investment measures
		J	Distribution restrictions
		K	Restrictions on post-sales services
		L	Subsidies (excl. export subsidies)
		M	Government procurement restrictions
		N	Intellectual property
		O	Rules of origin
Export-related measures		P	Export-related measures

Source: UNCTAD (2017)

Further investigation on NTM types under technical measures finds that TBT are intensively used in all sectors (excluding art sector, coverage ratios are ranging from 80 to 99 percent for NTMs economies imposing to the rest of the world), while the SPS are mainly used in agricultural and agro-food industry (more than 90 percent). Technical NTMs are also intensively used in bilateral imposition in the less extent (ranging from 70 to 90 percent) and the results in the use across sectors are mixed (25 to 90 percent in manufacturing sector (section 6-20)). SPS are moderately used in some other manufacturing sector such as wood and hides and skins sector in both imposition bilateral and to the rest of the world.

Non-technical measures imposed to the rest of the world are intensively imposed in live animal, mineral, wood, paper, and arms and ammunition sector (more than 50 percent of trade subject to imposition of NTMs). Quantitative restrictions and price control measures are mostly applied. However, bilateral imposition of non-technical measures are actively used in some manufacturing sectors such as base metals and paper sector (more than 30 percent).

In terms of average NTMs applied to the rest of the world in each sector, measured by prevalence score, technical measures mainly play their roles, especially in agricultural and agro-food industry (exceeding 10 measures in SPS and approximately 2 measures in TBT). On the other hand, bilateral imposition across sectors are also minimal, ranging from 0 to 2.8 in technical measures and not exceeding 0.3 measures in

[1] See Appendix 2 for tables used in sectoral analysis of NTMs. Sectoral classification is based on definition of sections under Harmonized System 2012.
[2] See Appendix 1 for detailed description of NTMs

non-technical type. Average bilateral imposition of NTMs in agricultural and agro-food industry are significantly lower than those of the imposition to the rest of the world (ranging from 1.4 to 2.5 measures).

The results are similar when the study examines application of NTMs by country/economy[3]; technical measures, especially TBT, are intensively used in general imposition to the rest of the world, except in Pakistan and Thailand whose coverage ratio is less than 40 percent in technical measures. For additional bilateral imposition, only New Zealand and United States are actively using technical measures (more than 90 percent of their trade).

On average, developed economies imposes more technical NTM measures than those of developing ESCAP member countries. Imposition in developed economies is ranging between 8.1 measures (New Zealand) to 17.4 measures (United States), while imposition of technical measures in developing ESCAP countries are ranging between 1.1 measure (Pakistan) to 9.4 measures (Russian Federation). Results of non-technical measures are mixed; however, the active users of such measures imposing to the rest of the world are Australia and New Zealand (approximately 2.4 and 3 measures, respectively). Imposition of additional bilateral NTMs to specific trading partners are low across countries.

Data and Methodology

The estimation approach of AVEs of NTMs in this study is based on Cadot et al. (2018), where price-based model is applied with the use of NTM counts rather than indicator variables of NTMs.[4] One of main advantages from the estimation with price-based approach is that AVEs of NTMs are directly obtained from the coefficients of estimation without relying on the use of import demand elasticities (see Kee & Nicita, 2016 for a quantity-based approach). This study applies gravity structure as estimating model of AVEs of NTMs. Details on data and methodology are discussed as follows.

Data

(a) Prices:

Based on Cadot et al. (2018), unit value of trade, a proxy of import price, is obtained at bilateral six-digit Harmonised System (HS) level by dividing trade values by respective quantities. The data is sourced from the World Bank's World Integrated Trade Solution (WITS) platform. Furthermore, due to different methodologies used (in terms of reporting quantities) or erroneous data entry, only data with lowest 95% of unit values of imports were used.

(b) NTMs and tariff:

NTM data is obtained from UNCTAD's TRAINS database. The database contains NTM data at HS 6-digit level following HS 2012 classification (with more than 5000 product lines), including imposing economies, affected economies, and the year of in effect and withdrawal (if temporary). NTMs are classified according to MAST classification. The total number of measures for each type of NTM is derived by the summation of all 3-digit NTMs for each NTM chapter for each individual product. UNCTAD's TRAINS database documents only incidents of NTMs i.e. the database has only non-zero instances measures. As such, missing values are treated as zero if in a given reporter-partner-product combination at least 1 NTM type exists.[5] The study distinguishes between two main types of NTMs in estimation, namely, technical (Chapters A-C) and non-technical (Chapters D-O) measures.

[3] See Appendix 3 for tables used in country/economy analysis of NTMs.

[4] See Cadot and Gourdon (2015) and Cadot et al. (2015) for detailed discussion on the use of dummy variables of NTMs.

[5] The study assumes that if there exists evidence of NTMs, all NTM types in each specific product line in each country is observed. For example, if there exists 1 measure of "A" (SPS measure) that country X imposing to trading partner Y, other measure types (B-P) are filled as zero. However, if all NTM types are missing in a country pair, missing values are retained.

Unilateral and bilateral sets of NTMs are combined together and expanded into bilateral sets. The data covers 82 economies, including European Union member countries, with more than 5200 products under HS six-digit level. NTMs are expanded based on their starting date and end dates for the 2012-2015 period. The variation of this study, compared to Cadot et al. (2018), is the use of bilateral NTMs, rather than unilateral NTMs of importers imposing to all trading partners. Moreover, rather than using all existing NTMs collected in the database, this study uses NTMs based on their respective imposition/withdrawal dates. Cross-sectional data of NTMs in 2015 is used for estimation.

To control for the effects of tariffs, simple average tariff data is used, which is obtained at HS six-digit level (HS 2012 classification) from the World Bank's WITS platform and the WTO tariff download facility.[6] The primary tariff data is WITS, since it includes ad-valorem estimates of non-ad valorem duties. Where data for 2015 was missing, the latest year available was used. Next, to address missing data, the tariff data was supplemented by using tariffs from the WTO tariff download facility, from 2015 or latest year. Both WITS and WTO tariffs used the lowest of MFN and preferential data (whether due to GSP or trade agreements). In cases where tariff data was in versions other than HS 2012, HS 2012 rates were approximated by conducting a concordance between reported versions to HS 2012, and in case of multiple matching six-digit tariff lines a simple average was taken. Finally, in cases of any other missing bilateral tariff data, the highest tariff for the imposing country for a particular product was used.[7]

(c) Standard gravity variables:

Bilateral distance, contiguity, landlockedness, and common language are obtained from CEPII. Presence of regional trade agreements (RTAs) data is acquired from de Sousa (2012), with the latest data up to 2015. The data on bilateral distance, contiguity, and common language was manually expanded to fill in values missing from the dataset.

Methodology

Let index i, j, k and m be importer i, exporter j, product k, and NTM measure type m (technical or non-technical), respectively. Let p_{ijk} be unit-value of good k imported from j to i. Let NTM_{ijkm} be NTM type m on product k imposed by importer i from the exportation of trading partner j and let $tariff_{ijk}$ be tariff rate of product k imposed by importer i from the trading partner j.

To control for country- and pair-specific characteristics in the model, let, GDP_i, GDP_j, GDP_{pc_i} and GDP_{pc_j} be gross domestic product (GDP) and GDP per capita of importer i and exporter j, respectively; $dist_{ij}$, $contig_{ij}$, $comlang_{ij}$, $landlocked_{ij}$, and RTA_{ij} be distance between a pair of countries, contiguity (whether they share a common border), common official language, whether either is landlocked, and RTA that importer i and exporter j share, respectively.

Two-stage least square model to address endogeneity issues in NTMs and tariffs is employed. NTMs of type m (and tariffs) imposed on product k by five closest countries with importer i are used as an instrument. Notably, the five "closest" countries were sorted by whether they shared a border and language, followed by closeness in distance.[8] Following Cadot et al. (2018), to obtain bilateral estimates of AVEs, interaction terms of NTMs and importer's and exporter's share in world trade of good k, s_{ik} and s_{jk}, are introduced. The final model specification is as follows:

[6] http://tariffdata.wto.org/

[7] i.e. if Afghanistan had a tariff on HS 010121 for some countries but not China, in case of non-zero trade in HS 010121, the highest tariff imposed by Afghanistan for HS 010121 was used.

[8] Relying on contiguity alone would be problematic for island countries, whereas relying on distance alone would, for example, mean that Hong Kong, China's five closest countries exclude mainland China.

$$\ln p_{ijk} = \beta_0 + \beta_1\delta_i + \beta_2\delta_j + \beta_3\theta_{ij} + \sum_m \beta_{4m} NTM_{ijkm} + \sum_m \beta_{5m}(s_{ik} \times NTM_{ijkm}) + \sum_m \beta_{6m}(s_{jk} \times NTM_{ijkm}) + \beta_7 tariff_{ijk} + \beta_8(s_{ik} \times tariff_{ijk}) + \beta_9(s_{jk} \times tariff_{ijk}) + \varepsilon_{ijk}$$

where
δ is the vectors of country-specific characteristics (i.e. GDP and per capita GDP)
θ is the pair characteristics (i.e. distance, contiguity, landlocked status, common language and RTA)

Bilateral price-based marginal AVEs of NTMs is defined as:

$$AVE_{ijkm} = \left(\exp\left(\beta_{4m} + (s_{ik} \times \beta_{5m}) + (s_{jk} \times \beta_{6m})\right) - 1\right) \times 100$$

Effects of the bilateral stock of NTMs was estimated by multiplying the marginal effects of coefficients and interaction terms by the bilateral stock of NTMs of type m for product j, i.e.

$$AVE_{ijkm} = \left(\exp\left(\left(\beta_{4m} + (s_{ik} \times \beta_{5m}) + (s_{jk} \times \beta_{6m})\right) \times NTM_{ijkm}\right) - 1\right) \times 100$$

As per Cadot and Gourdon (2015), exponential transformation in AVE calculation could lead to extremely large and uninterpretable AVEs. To address this issue, this study applies hyperbolic tangent function to limit upper bound of AVEs to 100%, as well as to retain any AVE estimates whose values are between 0% and 100% minimally changed:

$$AVE_{ijkm} = \left(\tanh\left(\exp\left(\left(\beta_{4m} + (s_{ik} \times \beta_{5m}) + (s_{jk} \times \beta_{6m})\right) \times NTM_{ijkm}\right) - 1\right)\right) \times 100$$

Finally, as per UNCTAD and the World Bank (2018), negative AVEs are replaced with zeros as the estimation does not account for positive effect of NTMs on trade. The model is estimated for each product at HS 6-digit level, i.e. more than 5000 regressions are performed. As a result, the model does not allow for product-specific fixed effects. All jointly (insignificant) coefficients with p-value above 0.1 are set as zero in AVEs calculation.

Results

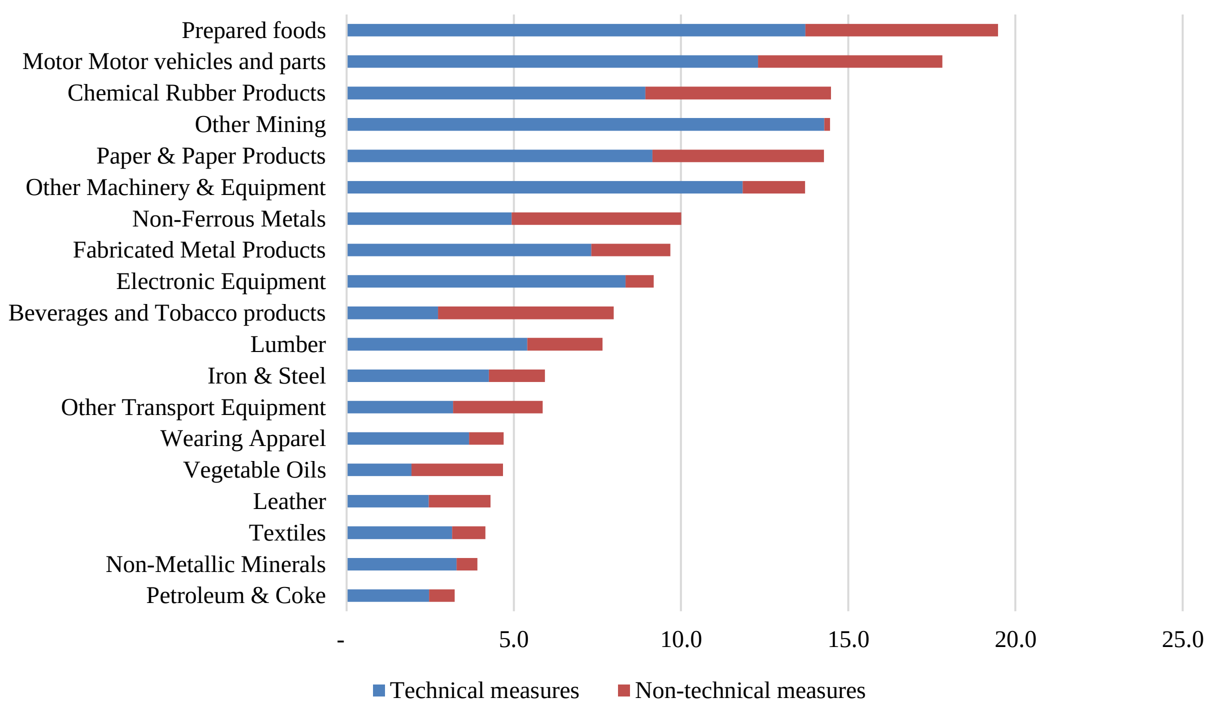
To use estimated AVEs in the GTAP framework, AVEs were aggregate according to GTAP sectors and regions. Using concordance tables[9] HS six-digit digit product codes and respective AVEs were matched with GTAP sectors, and individual economies were matched with GTAP regions. When averaging across sectors or regions, bilateral imports for each product were used as weights. Notably, as described above, jointly statistically insignificant AVEs at 10% level were assumed to be zero. Furthermore, as not all economies for which import data existed were used in estimation of AVEs (due to the lack of available NTM data). Import shares of bilateral imports used in estimation of the total bilateral imports for each sector was calculated - in cases where the share of data used in estimation was less than 30% of total bilateral imports for that particular sector, AVEs were assumed to be not representative of the bilateral imports for those sectors and removed from subsequent analysis. Notably, the trade-weighted average AVEs of NTMs

[9] https://unstats.un.org/unsd/trade/classifications/correspondence-tables.asp

across all products and regions was approximately 12%, or just under four times the average trade-weighted tariff of 3.2%

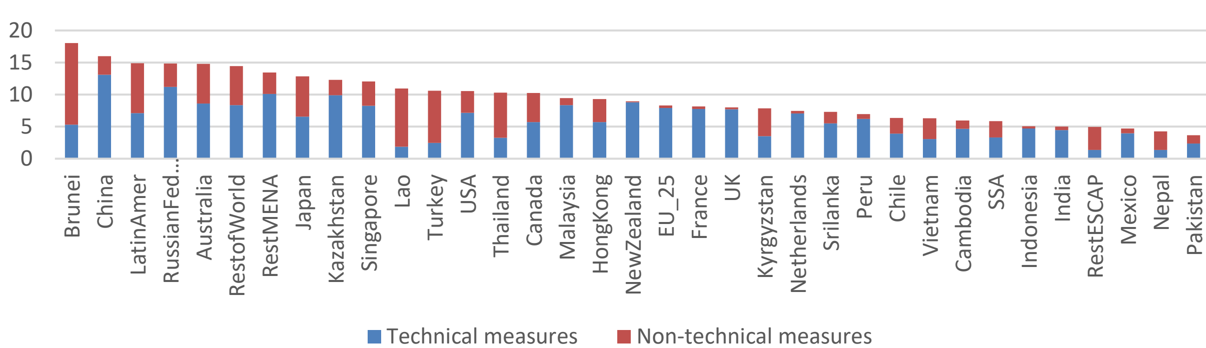
Next, aggregation was carried out across all products, to see which sectors are most affected by NTMs (see figure 1). In line with previous literature (e.g. Cadot, 2015, Nicita et al 2009), technical measures have higher AVEs in most sectors (although notably non-technical measures in beverages and tobacco are higher). Most heavily affected sectors are prepared foods and motor vehicles and parts. In terms of imposing regions (figure 2), within Asia-Pacific, Brunei Darussalam is calculated to have the highest AVEs of NTMs, though this seems to be driven by non-technical measures. In terms of technical measures, China and the Russian Federation have the highest AVEs within the region of more than 10% across sectors.

Figure 1. Average ad valorem tariff equivalents of NTMs, by sector



Source: authors' calculations

Figure 2. Average ad valorem tariff equivalents of NTMs, by imposing region



Source: authors' calculations

NTM Studies using CGE

Several CGE studies have employed different methods to capture Non Tariff Measures in trade. In this review, we summarize some of them. Broadly, there have been two different strands of literature on this:

1. Gravity-based estimation of NTMs across sectors and countries
2. Structural CGE-centric approaches to understand the features of specific NTMs

Gravity-based estimation methods have mostly followed Kee, Nicita and Ollearaga (2009). They estimate ad valorem equivalent of trade restrictiveness as a whole based on the gravity equation. These are then used as the base NTM data in the CGE model and data, and shocked for their changes as if they were tariffs. However, the limitation of treating them as tariffs is that they would be assigned revenue changes that are not practical. Therefore, to avoid this issue, several CGE papers have employed a non-tariff barrier variable; for example, in GTAP, the variable named 'ams' captures the effect of an unknown policy on prices, without any revenue implication – this is technically labeled as import-augmented technological change. Shocking it results in reduced or increased sourcing of imports from a particular exporter vis-à-vis the others. Several studies have used this approach for studying agreements such as TPP (Petri and Plummer, 2012, finding a 0.8% rise in GDP due to NTM decreases corresponding to the initial agreement before the US withdrawal), TTIP (Egger et al, 2015, which shows a change in GDP of 0.3-1% due to NTM reductions), other EU FTAs (Francois et al 2012, also suggesting less than a 1% rise in GDP due to reduced NTMs), etc. Literature on time as a barrier to trade has focused specifically on the time sensitivity of trade flows that may be part of trade barriers particularly related to procedures, rules, infrastructure etc; however, these may not be explicitly related to policy-based NTMs. There have been some further improvements in this method, such as the gravity redux method (Novy, 2013), which can determine the trade costs based on the information on Armington elasticities of substitution between domestic and imports, trade and domestic consumption, by understanding the behavior of countries to source from different countries relative to domestic demand. This study finds that the trade costs fell by 40% between 1970 and 2000 - this also corresponds to a period wherein the global trade increased manifold, indicating that the long run effects of NTM reduction can be pretty high. This has been used in studies such as Narayanan et al (2017) and APTIR 2017; these have shown an increase in GDP of ranging from 0.1% to 1.4% across the world, as a result of reduced NTMs.

The second strand of literature concerns structural methods of handling NTMs. Narayanan et al (2016) conducted an analysis of Intellectual Property regulations and environmental/labor standards in TPP, based on the structural increases in capital and labor costs that may happen due to compliance to these standards, coupled with the increased access to markets in the developed countries due to improved standards. This study found quite heterogenous responses in terms of GDP, for each of these specific standards and NTMs, varying between 2% reduction in GDP and 2% rise in GDP, in these countries. Similarly, Narayanan (2018) employed a rigorous micro-level sector-focused analysis of costs of effluent treatment in textile industry to come up with the trade costs of environmental standards in that sector, for India.

Narayanan et al (2017) followed a similar method focusing on child labor bans that may act as labor standards. This was done by developing a comprehensive dataset on child labor split from unskilled labor, and then using their productivity-wage differentials from adults from several ILO studies and reports. This paper also leveraged the Willingness to Pay method developed by Walmsley and Minor (2015), incorporating changes in consumers' willingness to pay or preference parameters, to capture the changed preference for one exporter over the other. This study suggests a reduction in GDP in varying degrees across the world as a result of banning child labor in exports, which amounts to an increase in NTMs.

Walmsley and Strutt (2018) provide a new methodology for adjusting the exporters' production costs directly. This paper also concludes that the choice of method for NTMs has a bearing on the results; while the Willingness to Pay method behaves similar to the tariff shock method, the exporters' production costs method is similar to the 'ams' method, in the short run; however, the dynamic long run effects are very different across methods. Using this method, Strutt et al (2018) applied to Comprehensive and Progressive TPP agreement, yields 0.2% increase in GDP as a result of NTM reductions.

Rules of Origin (ROO) effects, including the costs of utilising preferences, are now routinely incorporated in CGE modelling studies, but the translation of specific formulations of these rules into quantifiable impacts on trade is still largely a matter of 'guesstimation'. The effect on tradability of inputs due to ROO regionalisation escapes workable treatment. However, there have been some structural approaches on this proposed by some studies such as Narayanan and Mahate (2014), which employs a rich dataset on reexports from Dubai to understand the substitution between domestic use and re-exports, from the imports coming into the economy. Mimouni et al (2015) as well as Norberg et al (2018) have employed rich datasets on utilization of preferences to capture the tariff equivalent of barriers due to lack of compliance needed for utilizing preferences, resulting in quite small increase in GDP – about 0.1%. In other words, these methods require novel and rich datasets for rigorous analysis.

To reflect modern trade theory and to capture the effect of competition aspects of trade agreements, a rapidly growing number of models introduce firm-level heterogeneity and introduce ways to capture the pro-competitive effect of firm entry into trade. However, capturing the role of quality in affecting substitutability of imports across alternative sources is at an early stage of development (Akgul et al 2016).

In short, the first strand of literature provides a generic way to model the NTMs in a CGE framework, while the second strand provides specific ways to model different types of NTMs, as well as more rigorous methodologies to represent them. While it appears that the second strand is a clear winner in terms of the chosen methodology to model NTMs, it also requires a lot of information to be able to used effectively. The first strand is easier in terms of computation, since the datasets on NTM are either readily available (Kee et al 2009) or easy to compute on our own (Novy 2013). Since none of the methods have been validated to be more accurate than others, we might consider going with the first strand for any fresh analysis of NTMs.

Botero et al (2018) finds about 1.5% increase in GDP, due to reduction in NTMs by Colombia, using a single country CGE model, incorporating monopolistic competition and an NTM method that is similar to the 'ams' approach in GTAP. Using gravity model, Kareem (2012) finds evidence for increased trade as a result of reduced NTMs in the context of EU-Africa trade. In the context of Syria, Chemigui and Dessus (2004) estimates the positive effects of reducing NTMs on GDP as between 0.4-4.8%, using a gravity model. Dihel and Walkenhorst (2002) also presents evidence for increased GDP as a result of reduced NTMs, using a gravity model, for the EU.

Scenarios, methodology & results

The model

This study uses an augmented version of the standard Global Trade Analysis Project (GTAP) model and database (Hertel, 2017), which features sectoral and country level details for Asia and the Pacific. The database is updated to 2017, using World Bank macroeconomic data and the GTAP Adjust tool (Horridge, 2011) – see annex table B1 for the 2017 baseline values. Furthermore, a number of changes in the model are made to capture the importance of some variables related to sustainable development, discussed below.

First, although a full-fledged energy-environment model like GTAP-E (McDougall and Golub, 2010) is not employed, the model used in this analysis draws inspiration from it to compute region-specific CO2 emissions that are linked with various economic activities. Second, the differential between the growth rates of unskilled and skilled labour is used to account for inequality. Finally, the strong alternative assumptions of full employment or sticky real wages are relaxed by introducing a 45-degree labour supply elasticity curve that ensures both labour supply (employment) and real wages are endogenous in the model. This is exactly midway between the horizontal and vertical labour supply curves that are implicitly assumed in the standard GTAP model. This is consistent with the Monash model, and is supported by econometric literature on labour supply elasticities.

The economic impacts of the policy changes are captured through: (a) changes in gross domestic product (GDP) and trade levels; (b) the social impact through changes in levels of inequality and employment; and (c) the environmental impact through changes in CO_2 emissions. Trade balance is assumed to be endogenous, as are all prices and quantities, except capital, land and natural resources, which are all fixed and exogenous. Exogenous technological change variables are not shocked.

Application

To estimate the costs associated with technical NTMs, the following shocks were introduced:

1. Power of AVE (1+ave/100): let's call it AVE

2. Target Power (assuming removal of all NTBs: 1+0/100 = 1) : let's call it TP

3. Shock to ams variable: {-(TP-AVE)*100/AVE}.

The result suggests that removal of all technical NTMs could boost the global GDP by as 2%. NTMs, however, do serve important public policy objectives (such as safeguarding health and environment), and outright removal is not recommended. The estimated 2% of GDP, however, can act as a cost estimate of achieving those public policy objectives through NTMs. To lower costs associated with NTMs through policy, NTM regime harmonization is one approach [simulation forthcoming]

Conclusion and way forward

This study estimated the AVEs of NTMs using a price-based approach. One of the main advantages of using a price-based approach is that import demand elasticities are not needed and estimates are derived directly from coefficients of the model. Result of estimates show high AVEs in manufacturing sector. While the method of incorporating NTMs into the GTAP model used in this study is relatively simple, crucially any method still relies on defensible estimates of AVEs at bilateral and sector-specific level for detailed analysis. As such, this study puts forwards disaggregated estimates of AVEs together with replicable methodology that can be extended/altered according to individual needs of policy analysis using GTAP.

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Annex

Annex table A1. Absolute initial values, 2017

	GDP	Exports	Imports	CO2 Emissions
	(Billion United States dollars)			('000 metric tons)
Asia-Pacific	**35,046**	**10,438**	**9,679**	**15,261**
The Pacific	2,189	481	462	425
South-East Asia	2,945	1,737	1,668	1,140
South and South-West Asia	5,188	1,405	1,670	2,763
East and North-East Asia	21,357	5,719	5,108	9,135
North and Central Asia	3,366	1,096	771	1,799
The Pacific	2,189	481	462	425
United States	**18,778**	**2,114**	**3,183**	**5,106**
Global	**92,514**	**26,441**	**26,441**	**28,623**

Annex table A2. Asia-Pacific subregional groupings

Asia-Pacific subregions	Country groups (GTAP regions)
The Pacific	Australia; New Zealand; rest of the Pacific
South-East Asia	Brunei Darussalam; Cambodia; Indonesia; Lao People's Democratic Republic; Malaysia; the Philippines; Singapore; Thailand; Viet Nam
South and South-West Asia	Bangladesh; India; Islamic Republic of Iran; Nepal; Pakistan; Sri Lanka; Turkey; rest of Asia Pacific
East and North-East Asia	China; Hong Kong, China; Japan; Republic of Korea; Mongolia; Taiwan, China
North and Central Asia	Armenia; Azerbaijan; Georgia; Kazakhstan; Kyrgyzstan; Russian Federation; Tajikistan