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Measuring Trade Costs and Gains from Trade Facilitation in the Philippines

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Abstract
This paper provides estimates of trade costs of the Philippines with her key trading partners, and develops a framework for assessing their welfare cost. With tariff restrictions reduced significantly following several rounds of multilateral and regional trade negotiations, non-tariff barriers (NTBs) have emerged as key in slowing down trade flows. Given the proliferation of NTMs in the world today, chances are some of those are disguised NTBs. More importantly however, the inefficiencies associated with implementing legitimate NTMs such as the SPS on agricultural imports become unnecessary barriers to trade. This is the fat in trade costs that need to be eliminated through trade facilitation, while policy reforms would have to deal with redundant NTMs, whose claim to resources adds to the cost imposed by inefficient implementation of legitimate NTMs. This paper came up with a CGE model analytical structure for assessing the gains of lowering trade costs.

JEL Codes: F15; O24
Keywords: Trade costs; Economic development; Trade policy.

1. Introduction

This paper provides estimates of trade costs of the Philippines with her key trading partners, and develops a framework for assessing their welfare cost. With tariff restrictions reduced significantly following several rounds of multilateral and regional trade negotiations, non-tariff barriers (NTBs) have emerged as key factors of slowing down trade flows (World Bank, 2006). Trade costs comprise more than just the resources expended in complying with trade-related regulations. Anderson and Van Wincoop (2004) defined these costs as inclusive of "… all costs incurred in getting a good to a final user other than the marginal cost of producing the good itself" (p. 691).[2]

Three parts make up the paper. The first takes up the methodology for measuring trade costs as developed by Novy (2012). Noting the inclusive definition of trade costs by Anderson and Van Wincoop, the paper focuses on non-tariff measures (NTMs) as the a

[1] The support of the Philippine Center for Economic Development (PCED) is appreciated in undertaking the study.
[2] Anderson and Van Wincoop (2004) decomposed the typical developed country trade cost into: 21% transport costs, 44% trade barriers and compliance costs, and 55% wholesale and retail distribution costs, i.e. ((1.21)(1.44)(1.55))-1)=1.7.

generator of trade costs at the border. While claiming resources to be complied with, NTMs can raise such costs as they become virtual NTBs, and that depends on how they are implemented or whether they in the first place are legitimate regulations or not. This is followed with a discussion of trade cost estimates of the Philippines with her key trading partners on agricultural, manufacturing, and total trade flows. The estimates are obtained from the World Bank – UN ESCAP database on trade cost from 1995 to 2015 (Arvis, et al., 2013). The changes of trade costs from 1995 to 2015 are tracked. Given these estimates, the study developed a CGE model that may be used to assess the gains to the Philippine economy of lowering them.

2. Trade cost measurement

In the years when trade negotiations had focused on bringing tariff barriers down, trade cost concerns maybe regarded as largely about the wedge between world and domestic prices created by conventional customs duties. Economic models were then developed incorporating tariff or export tax measures and used to assess the consequences of distorting domestic from international prices. Trade flows had expanded which analysts had rightly attributed to the lowering or elimination of tariffs and export duties.

The present concerns are on non-tariff measures (NTMs). NTMs are mistakenly equated with non-tariff barriers or NTBs, which predated NTMs. The latter had surfaced in the literature to distinguish legitimate trade-related regulations at the border from NTBs, which have similar effect as tariff barriers: they slow down trade to protect domestic producers.[3] NTMs are relatively value-neutral. They address legitimate public interest concerns brought about by a country's participation in international trade. Identifying a measure as an NTM does not imply a prior judgment as to its actual economic effect, its appropriateness in achieving various policy goals or its legal status under the WTO legal framework or other trade agreements. Compliance with NTMs impose costs on traders but if the measures are appropriately applied without discrimination and administered efficiently, such measues do not become NTBs. The difference between the two has to do with how legitimate trade measures are implemented at the border.

Trade restrictiveness indices

In describing the deleterious effects of NTMs on trade, several studies had developed trade restrictiveness indices. One is the frequency index of NTMs, which is the share of tariff lines within a group of imports on which at least one NTM is imposed. The percentage share is computed as:

[3] Starting with the Kennedy round of trade negotiations, the GATT started to take up the rules of the trading system noting that tariff reforms could be rendered ineffective with inappropriate applications of NTBs. This rule-making role of the GATT broadened the agenda of trade negotiations, which produced agreements on the appropriate application of NTBs.

$$F_g = \frac{\sum_{\forall k} D_{k,g}}{\sum_{\forall k} L_{k,g}} 100.$$

$D_{k,g}$ is 1 (0 otherwise) if the tariff line item k within a group g of tariff lines (e.g. agricultural product group) has at least one NTM; $L_{k,g}$ is a tariff line k in group g. If the index is summed up across all mutually exclusive groups of tariff lines, the index may be used to indicate the prevalence of NTMs in the import or export portfolio of a country.

The high prevalence of NTMs is not necessarily indicative of high trade costs, which dampen trade flows. NTMs are just a component of trade cost among several items. While compliance with NTMs entails a cost to trade and slows down trade flows, the resources expended so however, may not necessarily reduce overall welfare. On the contrary, given certain conditions, NTMs may improve overall welfare.

The NTMs may generally be regarded as trade-related regulations intended to address legitimate public-interest concerns. The WTO (2012) views these measures as "often first-best policies to correct market failures". Policy makers, for example, may decide to accord monopoly rights in importing food to a government corporation to attain food security. There are potential public-interest issues that cross-border trade flows may generate, and some or the majority of these measures are designed to mitigate the adverse consequences of trade-related concerns.

The sanitary and phyto-sanitary (SPS) measures or technical barriers to trade (TBTs), give consumers the information they need about traded products, and in so doing encourage demand for the latter. The NTMs such as trademarks, labeling requirements and other disclosed information or SPS measures, which assure consumers of the quality and safety of the product they import, reduce uncertainty and thus increase demand for imports. It is from this lens that NTMs promote trade (Thilmany and Barrett, 1997; APEC 2014).

Legitimate regulations at the border, NTMs, are not equivalent with NTBs, unless they are abused to protect domestic industries or are inefficiently administered. From discussions among and in the literature, there is confusion between NTMs and NTBs. UNCTAD (2010) distinguished NTBs from NTMs as measures, other than ordinary customs duties, designed and implemented to curtail the flow of imports and/or accord price advantage to local producers. In contrast, the NTMs may be legitimate technical regulations, and may stay as such, if compliance costs with these measures are kept to their necessary minimum and both local and imported products are treated similarly by the regulation. But if authorities apply the latter arbitrarily to give artificial advantage to local over imported products, then NTMs may be no different from NTBs.

There are NTMs however, which have overly strict requirements making them difficult to comply with, and/or are administered in a way that also makes compliance overly costly. This group of NTMs has assumed protectionist or discriminatory intent, and thus may

legitimately be called the 'invisible barriers to trade' (ITC, 2010). For example, the actions of the food import monopolist could favor domestic producers rather than simply ensuring food security. The WTO sees strong potential for these measures to be used to distort trade flows is strong, making it difficult to distinguish "legitimate" NTMs from protectionist NTBs.

NTMs have been in the trade policy arena for a long period of time, but the tariff restrictions in the past may have overshadowed the urgency of reforming the use of such measures. Increasingly after the Uruguay Round and the surge of preferential trade agreements since the 1990s, the NTMs have increasingly caught the attention of policy makers as having the potential of becoming the mainstream sources of price distortions at the border (Draganov, 2012). These regulations are vulnerable to abuse particularly when importing countries see the need to protect domestic industries particularly in times of an economic crisis, or succumb to political pressures to favor domestic producers in these times when tariff bindings are already low.

Another trade-restrictive measure is the coverage ratio of NTMs. The coverage ratio is the share of trade covered by an NTM. The ratio and the frequency index of NTMs are inventory-based measures that do not necessarily convey trade restrictiveness of NTMs on their own. However, they indicate prevalence of NTMs, and may indicate high tariff barriers, which are discriminatory. WTO (2012) showed empirical evidence of the substitution between tariffs on one hand, and sanitary and phyto-sanitary (SPS) measures and technical barriers to trade (TBTs). The coverage ratio in percentage is:

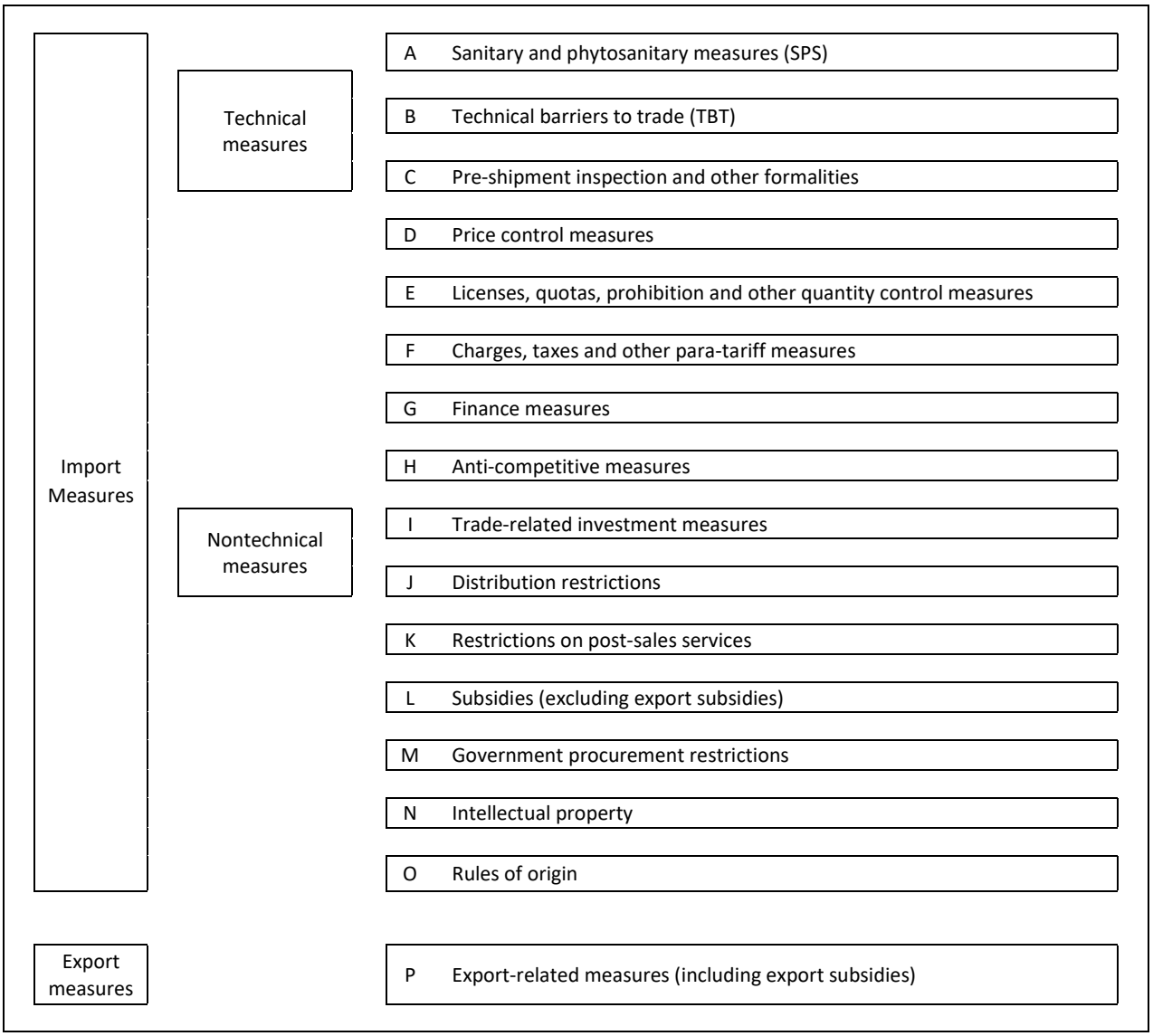
$$C_g = \frac{\sum_{\forall k} D_{k,g} V_{k,g}}{\sum_{\forall k} V_{k,g}} \, 100.$$

D is a dummy variable as defined above, and $V_{k,g}$ is the value of trade of tariff line k belonging to group g. Summing up C_g across all mutually exclusive groups, g, gives the total value of imports or exports covered by NTMs.

In 2009, UNCTAD adopted and updated classification of NTMs. They cover three categories, namely technical, non-technical measures and export-related regulations (Figure 1). Technical measures are regulations and mandatory product standards applicable to the imported commodity, which need to be complied with before authorities at the border allow its shipment to be released for commercial distribution locally.

The list of more specific NTMs has grown through the years. Table 1 shows the current version of the list. Among the more populated categories of NTMs are the sanitary and phyto-sanitary measures, technical barriers to trade, price control measures, quantitative measures, and finance measures.

Figure 1. Classification of Non-Tariff Measures



Source: UNCTAD, 2009

Table 1. List of specific Non-tariff measures

A000 SANITARY AND PHYTOSANITARY MEASURES	A100 Prohibitions or restriction of products or substances for SPS reasons; A110 Temporary geographic prohibition for SPS reasons; A120 Geographical restrictions on eligibility; A130 Systems approach; A150 Registration requirements for importers; A190 Prohibitions or restrictions of products or substances because of SPS reasons not elsewhere specified (n.e.s.); A200 Tolerance limits for residues and restricted use of substances; A210 Tolerance limits for residues of or contamination by certain substances; A220 Restricted use of certain substances in foods and feed; A300 Labelling, marking and packaging requirements; A310 Labelling requirements; A320 Marking requirements; A330 Packaging requirements; A400 Hygienic requirements; A410 Microbiological criteria on the final product; A420 Hygienic practices during production; A490 Hygienic requirements n.e.s.; A500 Treatment for elimination of plant and animal pests and disease-causing organisms in the final product (e.g. post-harvest treatment); A510 Cold/heat treatment; A520 Irradiation; A530 Fumigation; A590 Treatment for elimination of plant and animal pests and disease-causing organisms in thefinal product n.e.s.; A600 Other requirements on production or post-production processes; A610 Plant growth processes; A620 Animal raising or catching processes; A800 Conformity assessment related to SPS; A810 Product registration requirement; A820 Testing requirement; A830 Certification requirement; A840 Inspection requirement; A850 Traceability information requirements; A851 Origin of materials and parts; A852 Processing history; A853 Distribution and location of products after delivery; A859 Traceability requirements, n.e.s.; A860 Quarantine requirements; A890 Conformity assessment related to SPS n.e.s.; A900 SPS measures n.e.s.
B000 TECHNICAL BARRIERS TO TRADE	B100 Prohibitions or restrictions on products or substances for TBT reasons (e.g. environment, security); B110 Prohibition for TBT reasons; B140 Authorization requirement for TBT reasons; B150 Registration requirement for importers for TBT reasons; B190 Prohibitions or restrictions of products or substances because of TBT reasons n.e.s.; B200 Tolerance limits for residues and restricted use of substances; B210 Tolerance limits for residues of or contamination by certain substances; B220 Restricted use of certain substances; B300 Labelling, marking and packaging requirements; B310 Labelling requirements; B320 Marking requirements; B330 Packaging requirements; B400 Production or post-production requirements; B410 TBT regulations on production processes; B420 TBT regulations on transport and storage; B490 Production or post-production requirements n.e.s.; B500 Regulation on genetically modified organisms (GMO) (for reasons other than food safety) and other foreign species; B600 Product identity requirement; B700 Product quality or performance requirement; B800 Conformity assessment related to TBT; B810 Product registration requirement; B820 Testing requirement; B830 Certification requirement; B840 Inspection requirement; B850 Traceability information requirements; B851 Origin of materials and parts; B852 Processing history; B853 Distribution and location of products after delivery; B859 Traceability requirements n.e.s.; B890 Conformity assessment related to TBT measures n.e.s. ; B900 TBT measures n.e.s.
C000 PRE-SHIPMENT INSPECTION AND OTHER FORMALITIES	C100 Pre-shipment inspection; C200 Direct consignment requirement;C300 Requirement to pass through a specified customs port;C400 Import monitoring and surveillance requirements and other automatic licensing measures;C900 Other formalities n.e.s.
D000 PRICE CONTROL MEASURES	D100 Administrative pricing; D110 Minimum import prices; D120 Reference prices and other price controls; D190 Administrative pricing n.e.s.; D200 Voluntary export price restraints (VEPRs); D300 Variable charges; D310 Variable levies; D320 Variable components; D390 Variable charges n.e.s; D400 Anti-dumping measures;D410 Anti-dumping investigations;D420 Anti-dumping duties;D430 Price undertakings; D500 Countervailing measures;D510 Countervailing investigations; D520 Countervailing duties; D530 Price undertakings; D600 Safeguard duties; D700 Seasonal duties; D900 Price control measures n.e.s.

E000 LICENSES, QUOTAS, PROHIBI-TIONS AND OTHER QUANTITY CONTROL MEASURES	; E100 Non-automatic license; E110 License with no specific ex-ante criteria; E120 License for specified use; E130 License linked with local production; E140 License combined with or replaced by special import authorization ; E180 License for non-economic reasons; E181 License for religious, moral or cultural reasons; E182 License for political reasons; E190 Non-automatic licensing n.e.s.; E200 Quotas; E210 Global quotas; E211 Unallocated quotas; E212 Quotas allocated to exporting countries; E220 Bilateral quotas; E230 Seasonal quotas; E240 Quotas linked with purchase of local goods; E250 Quotas linked with domestic production; E270 Tariff rate quotas; E280 Quotas for non-economic reasons; E281 Quotas for religious, moral or cultural reasons; E282 Quota for political reasons; E289 Quotas for non-economic reasons n.e.s.; E290 Quotas n.e.s.; E300 Prohibitions; E310 Total prohibition (not for SPS or TBT reasons); E320 Suspension of issuance of licenses; E330 Seasonal prohibition; E340 Temporary prohibition; E350 Prohibition of importation in bulk; E360 Prohibition of products infringing patents or intellectual property rights; E380 Prohibition for non-economic reasons; E381 Prohibition for religious, moral or cultural reasons; E382 Prohibition for political reasons (embargo); E389 Prohibition for non-economic reasons n.e.s.; E390 Prohibitions n.e.s.; E400 Quantitative safeguard measures; E500 Export restraint arrangement; E510 Voluntary export restraint arrangements (VERs); E511 Quota agreement; E512 Consultation agreement; E513 Administrative cooperation agreement; E590 Export restraint arrangements n.e.s.; E900 Quantity control measures n.e.s.
F000 CHARGES, TAXES AND OTHER PARA-TARIFF MEASURES	F100 Customs surcharges; F340 Consular invoice fee; F350 Statistical tax; F360 Tax on transport facilities; F390 Additional charges n.e.s.;F400 Internal taxes and charges levied on imports; F410 General sales taxes; F420 Excise taxes; F430 Taxes and charges for sensitive product categories; F490 Internal taxes and charges levied on imports n.e.s. ; F500 Decreed customs valuations; F900 Para-tariff measures n.e.s
G000 FINANCE MEASURES	G100 Advance payment requirement; G110 Advance import deposit; G120 Cash margin requirement; G130 Advance payment of customs duties; G140 Refundable deposits for sensitive product categories; G190 Advance payment requirements n.e.s. ;G200 Multiple exchange rates; G300 Regulation on official foreign exchange allocation; G310 Prohibition of foreign exchange allocation; G320 Bank authorization; G330 License linked with non-official foreign exchange; G331 External foreign exchange; G332 Importer's own foreign exchange; G339 License linked with non-official foreign exchange n.e.s.; G390 Regulation on official foreign exchange allocation n.e.s.; G400 Regulations concerning terms of payment for imports; G900 Finance measures n.e.s.
H000 ANTI-COMPETITIVE MEASURES	H100 Restrictive import channel; H110 State trading administration, for importing; H120 Sole importing agency; H130 Importation reserved for selected importers; H190 Single channel for imports n.e.s.; H200 Compulsory national service; H210 Compulsory national insurance; H220 Compulsory national transport; H290 Compulsory national service n.e.s. ; H900 Anti-competitive measures n.e.s.
I000 TRADE-RELATED INVESTMENT MEASURES	I100 Local content measures; I200 Trade-balancing measures; I900 Trade-related investment measures n.e.s
K000 RESTRIC-TION ON POST-SALES SERVICES	J100 Geographical restriction; J200 Restriction on re-sellers
K000	RESTRICTION ON POST-SALES SERVICES
L000	SUBSIDIES (excluding export subsidies under P700)
M000	GOVERNMENT PROCUREMENT RESTRICTIONS
N000	INTELLECTUAL PROPERTY
O000	RULES OF ORIGIN
P000 EXPORT-RELATED MEASURES	P100 Export license, quota, prohibition and other quantitative restrictions; P110 Export prohibition; P120 Export quotas; P130 Licensing or permit requirements to export; P140 Export registration requirements; P190 Export quantitative restrictions n.e.s. ;P200 State trading administration; P300 Export price control measures; P400 Measures on re-export; P500 Export taxes and charges; P600 Export technical measures; P610 Inspection requirement; P620 Certification required by the exporting country; P690 Export technical measures n.e.s. ; P700 Export subsidies; P900 Export measures n.e.s.

Source: UNCTAD Secretariat

Table 2 shows a list of NTMs affecting agriculture, food and handicrafts that APEC and EU economies use. Clarete and Patalinghug (2016) gathered the data from the WTO's Integrated Trade Intelligence Portal (I-TIP).

The majority of the NTMs applied by APEC economies and the EU covers SPS and TBTs. Of the 6,220 measures applied by various economies and the European Union for imports of agricultural, food and handicrafts, 4,655 measures or nearly 75% of total are sanitary and phyto-sanitary measures. These are applied to agricultural imports. Technical barriers to trade follow with 797 measures or 12.81% of total.

Together SPS and TBTs account for nearly 88% of total. Tariff quotas are third with 6.45% followed by special safeguards applicable to agricultural imports having a share of nearly 5% of total. The three trade remedies, safeguards, countervailing duties and anti-dumping duties are roughly 1%. APEC (2014) showed that antidumping, SPS, and TBT measures around the world are the ones mostly affecting APEC economies. Among the most affected sectors are: meats, fruits and nuts, chemicals, iron and steel, plastic, and textiles.

Table 2 NTMs Applied by APEC Economies and the EU

NTM	Number	%
Sanitary and Phytosanitary	4655	74.84
Technical Barriers to Trade	797	12.81
Quantitative Restrictions	401	6.45
Special Safeguards	303	4.87
Anti dumping	32	0.51
Safeguards	26	0.42
Countervailing	6	0.10
Total	6220	100.00

Source: WTO ITIP as reported in Clarete and Patalinghug, 2016.

The inventory-type approach or bottom up accounting of components of trade cost using the frequency or coverage indices called for an overall measure of trade restrictiveness. Kee et al. (2009) developed such a measure (OTRI) by computing in a general equilibrium model of a country's economy the uniform tariff barrier that replicates the current level of trade.[4] However, Arvis et al. (2013) pointed out that this approach still misses other components of trade cost, such as transport costs, and differences in cultural or legal heritage between countries, which magnify the costs of doing business across borders.

Novy (2012) came up with a top-down measure of trade costs based on observable tradeflows data. The approach is more known as founded in the gravity model of trade, but

[4] Related measures are OTRI_T (tariff restrictions only); MATRI (market access trade restrictions index, covering both tariff and non-tariff measures), except this time it is the trading partner's trade measures that is summed up by the uniform tariff equivalent in a way that replicates the access to that market of a country; and MATRI_T.

Novy regards it as a generic consumer-spending model for allocating incomes to local and foreign products in the face of external and internal trade costs. Novy drew from several various micro-based theories in defining trade cost, including the gravity model of trade theory as developed by Anderson and Van Wincoop (2003); trade in differentiated products (Armington, 1969); Ricardian trade model (Eaton and Kortum, 2002) or heterogeneous firms model (Chaney, 2008; Melitz and Ottaviano (2008).

The approach in estimating trade cost is based on the gravity equation due to Anderson and Van Wincoop (2003).[5] According to equation (1), export flow of country *i* to *j* depends on the share to world income of the product of the respective national incomes of both countries; the bilateral trade cost between them (t_{ij}); and the product of the respective average export costs to the rest of the world of the exporting country *i* and its trading partner *j*, $(\Pi_i P_j)$:

$$x_{ij} = \left(\frac{y_i y_j}{y_w}\right)\left(\frac{t_{ij}}{\Pi_i P_j}\right)^{1-\sigma} \tag{1}$$

Anderson and Van Wincoop referred the average export costs as the multilateral resistance variables: Π_i for outward resistance and for inward, P_j of the exporting country *i*. The elasticity of substitution, $\sigma > 1$ is restricted to be at least 1. Accordingly, suppose it is equal to 2, then if the expression $\left(\frac{\Pi_i P_j}{t_{ij}}\right)$ rises either because the bilateral trade cost relative to the multilateral resistance variables had fallen; or the latter had risen relative to the increase in bilateral trade cost, all incomes remaining the same, bilateral exports of country *i* to *j* are scaled up by the increase of relative multilateral to bilateral trade cost.

That in turn scales down domestic trade, x_{ii}, given that $y_i = x_{ii} + x_{ij}$ as equation (2) shows:

$$\left(\frac{\Pi_i P_i}{t_{ii}}\right) = \left(\frac{x_{ii}/y_i}{y_i/y_W}\right)^{\frac{1}{\sigma-1}} \tag{2}$$

A higher $\left(\frac{\Pi_i P_j}{t_{ij}}\right)$ would tend to shift spending towards tradables away from domestic trade, i.e. (x_{ii}/y_w) falls. But this result implies a lower $\left(\frac{\Pi_i P_i}{t_{ii}}\right)$ or domestic trade cost relative to the country's trade cost with the rest of the world increases. If $\left(\frac{\Pi_i P_i}{t_{ii}}\right)$ may be used to indicate intra-national trade capacity, and $\left(\frac{\Pi_i P_j}{t_{ij}}\right)$ for international trade capacity, then a rise in

[5] Novy (2012) cited Head and Ries (2001) as pioneers for inferring trade cost from observable data. The authors however worked on increasing returns model of international trade with home market effects and a constant returns model with national product differentiation.

$\left(\frac{\Pi_i P_j}{t_{ij}}\right)$ relative to $\left(\frac{\Pi_i P_i}{t_{ii}}\right)$ indicates stronger international and weaker intra-national trade capacity.

Taking the product of the respective bilateral exports of two countries to each other results in the following expression.

$$x_{ij}x_{ji} = \left(\frac{y_i y_j}{y_w}\right)^2 \left(\frac{t_{ij}t_{ji}}{\Pi_i P_i \Pi_j P_j}\right)^{1-\sigma} \tag{3}$$

The following expression is obtained after substituting (2) into (3) and rearranging the result:

$$\left(\frac{x_{ii}x_{jj}}{x_{ij}x_{ji}}\right)^{\frac{1}{\sigma-1}} = \left(\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}}\right). \tag{4}$$

The right hand side of (4) is the proportion of the product of cross-border trade costs of both trading partners to the product of their respective domestic trade costs. Novy defined overall trade cost as the tariff equivalent rate of the proportionate wedge of international to domestic trade costs. Noting that the respective bilateral trade and domestic costs of the two countries are not symmetric and may have a wide range of values, Novy took the geometric average of the bilateral trade cost to the geometric average of domestic cost. Thus:

$$\tau_{ij} = \tau_{ji} = \left(\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}}\right)^{\frac{1}{2}} \text{-1} =$$

$$\left(\frac{x_{ii}x_{jj}}{x_{ij}x_{ji}}\right)^{\frac{1}{2(\sigma-1)}} \text{-1 .} \tag{5}$$

The measure of trade cost in (5) is "top down", in the sense that is deduced from economic theory and inferred from its observable results, the size and pattern of tradeflows. It is an "all inclusive" estimate of trade cost. Given these, Arvis et al. (2013) raised a few issues as to their interpretation. The first is that without any further work like doing a decomposition analysis of the change in trade costs, the factors contributing to the change, $\Delta ln\ \tau$, are not easily obvious. If the objective of measuring trade cost is for policies to be adjusted to reduce them, then it is important to understand the causalities. However, some of these factors are items, which policy makers cannot alter, and thus the change, if arising from such shocks, is exogenous.

It was pointed out above that NTMs are confused with NTBs, the former having legitimacy as they may address real public interest concerns such as product standards. But the compliance with legitimate regulations still impose on traders resources and time, and such costs would still be part of the all inclusive trade cost. A country facing serious threat of

Avian flu from countries exporting poultry to it would have to close its borders for such imports, reducing trade flows. Following (5), trade costs would have to increase all things remaining the same, but such change is not due to an NTB but an exercise of authorities to address a market failure situation. Thus, there are changes in trade costs that are legitimate, and without the decomposition analysis, knowledge about trade costs and their changes would be incomplete.

Arvis et al. (2013) pointed out also the interplay of changes in external and domestic trade costs, and without further analysis it is not possible to determine which of the two components had caused variations in trade costs. They pointed about the asymmetry of access to information of a country's trade-related regulations, with its potential of discriminatorily implementing legitimate measures. Foreign producers selling into a country would have the disadvantage in knowing about the importing country's regulations, unlike domestic producers. This disadvantage implies that foreign may be larger than domestic trade costs.

Trade costs are ordinarily regarded as variable and are given the 'iceberg' interpretation as in Anderson and Van Wincoop (2003). But there are fixed costs of exporting, an entry cost to internationalising one's business. Heterogeneous firms models of trade (Melitz, 2003) had given fixed export cost an important role in trade theory. Once again, Arvis et. al (2013) pointed that changes in overall trade cost may be due to changes in fixed or variable export cost, and without a decomposition analysis the change may not be attributable to variations in either of the two or both.

Lastly, the change in trade cost may reflect changes in price effects. The measure in (5), has a feature of disentangling price effects with the price indices reflecting the inward and outward multilateral resistance forces. The spending in each country is deflated by the price indices. However, Arvis et al. (2013) pointed out that if quality products are traded, changes in volume may cause trade values may increase at a different rate than output values.

3. Trade cost estimates

In this section, the study makes use of the estimates of trade costs of the Philippines of her trade with key trading partners. Following Arvis et al. (2013), the World Bank and the UN ESCAP (United Nations Economic and Social Commission for Asia and the Pacific) have maintained a database of annual trade costs from 1996 onward of three categories of trade: agricultural, manufactured, and total goods involving 208 countries.

Data used in estimation

Before taking up the estimates, the data sources of them are briefly summed up. Following equation (5), the data needed to estimate trade costs include trade data of the Philippines and her key trading partners. This is obtained from the UN Comtrade. Export data are net exports of re-exports. The database of trade costs supports only three categories of trade costs, the total goods, agricultural and manufactured.

Domestic trades are the more difficult to estimate since unlike for trade data no database of domestic trades of several countries is maintained. In filling up the missing data, Arvis et al. (2013) follow the approach used by Novy (2012), when the study estimated the trade cost of the US, following the data treatment of Wei (1996). Wei treated the total output of goods of a country as either destined for the export or local markets. Thus, if the total output is known, then domestic trade of that good is a residual.

There are countries in the trade cost database of the World Bank and ESCAP, whose gross outputs of goods, agricultural goods or manufactured goods can be obtained from the United Nations National Accounts Database. The database is maintained for 124 countries, and grouped by the International System of Industrial Classification (ISIC). Some of the countries in the trade cost database are among the 124 countries of the UN database. The respective gross output data of countries are converted to US currency using nominal exchange rates.

For the countries excluded from the UN National Accounts Database, the approach used followed Novy's. The goods GDP is grossed up to total output inclusive of intermediate goods with the average gross output to value added ratio. The estimated ratio is obtained from the countries included in the UN National Accounts Database Similar approach is applied for manufactured and agricultural goods.

Finally, as in Novy (2012) the elasticity of substitution parameter is assumed to be constant across all sectors, time, and countries. The value used by Arvis et al. is 8, which is midpoint in the range of such estimates.

Goods trade profile

In 2015, the Philippines exported $58.6 bln. and imported $70.2 bln., maintaining a trade deficit of $11.5 bln. The trade deficit had grown from the period of 2010 to 2014 (Figure 2). Export growth in that period was 5.1% while import growth in the same period turned up to be 2.4% per year. In 2015, merchandise exports declined while imports increased, raising the trade deficit of the country. The country maintained a goods trade surplus with most developed country trading partners, and deficit with her Asian trading partners. As shown in Table 3, the bulk of the trade deficit is in manufactured products. After fuel imports (SITC, 3), the deficit is largest in chemicals (SITC (5) and food and agricultural

products (SITC 0+1). Merchandise surplus is highest in machinery and transport equipment (SITC, 4). It is followed by vegetable oils (SITC and crude materials, 2+4).

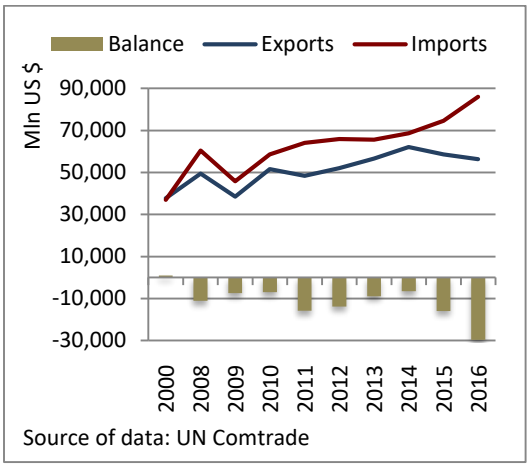


Figure 2. Aggregate Trade and Trade Balance, Philippines, 2000 to 2016

Table 3. Goods Trade and Trade Balance, Philippines, by Sector, 2015

SITC Codes	Exports	Imports	Trade Balance
All Sectors	58,648	-70,154	-11,505
0+1	3,325	-7,468	-4,143
2+4	3,885	-1,657	2,229
3	775	-8,292	-7,517
5	1,653	-7,113	-5,460
6	4,984	-7,520	-2,536
7	37,871	-34,356	3,516
8	5,704	-3,523	2,181
9	451	-227	225

Source of data: UN Comtrade

In 2015, the Philippines traded with about 200 countries at varying levels. However, her merchandise trade is concentrated in only a few partners. At least 80% of her exports is accounted for by 9 partners, also for about the same share in the case of imports by 12 countries. The top 3 trading partners are China, United States and Japan. The average shares of these destinations of the country's merchandise exports from 2013 to 2015 are 21.1% (Japan), 14.6% (United States) and 12.1% (China). All three accounted for nearly half of merchandise exports from the Philippines. On goods imports, the respective average shares of Japan, the United States and China are 14.9%, 10.3%, 8.8% or all three about 45% of her total imports. Other top trading partners include Hong Kong, China, Korea, Rep., Netherlands, Saudi Arabia, Singapore, Thailand, and United Kingdom.

Trade cost with key trading partners: manufactured products

Philippine trade costs in manufactured goods with key trading partners are relatively high with ASEAN and India (Figure 3). As expected, those with the top 3 destinations of her merchandise exports, Japan, United States and China, have significantly lower trade costs. Through the years, the country's trade cost with China had steadily declined. In contrast, the average trade cost with these trading partners had declined from 191.5% in 1996 to 130.5% in 2015 (Table 4). Trade costs with her largest trading partners and with ASEAN are less dispersed. In 1996, the standard deviation of trade costs was 34.7 compared with 27.8 in 2015.

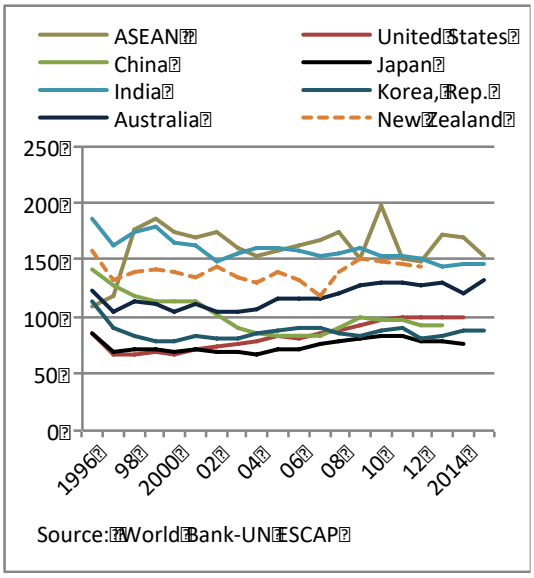


Figure 3. Philippines trade costs in manufactured products with key trading partners, 1996 to 2015 (%)

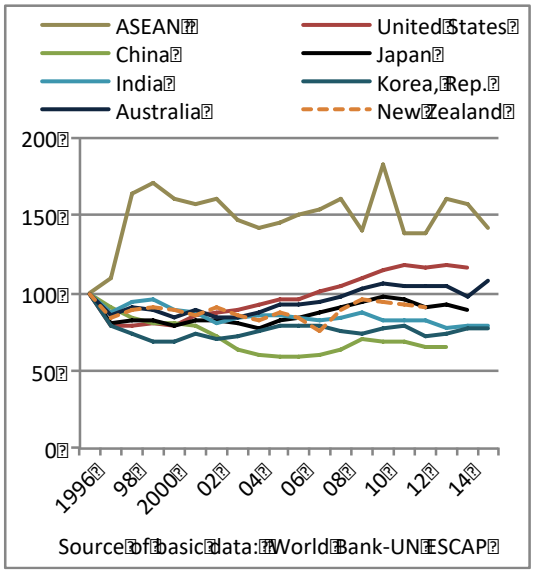


Figure 4. Trade cost indices of Philippine trade cost in manufactured products with key trading partners, 1996 to 2015 (%)

Figure 4 shows indices of trade costs of the Philippines with her key trading partners and rest of ASEAN. Except for ASEAN, United States and Australia, the trading partners included in the Figure had lower trade costs with the Philippines in 2015 compared to 1996. Trade costs with Japan fell by about 12 percentage points, and by about 35 points with China. India, although a country with among the highest trade cost with the Philippines, did slash bilateral trade cost with the country by a quarter between 1996 an 2015. ASEAN is a surprise. The country's trade cost with the rest of ASEAN had increased by 41 percentage points.

Trade costs: agricultural products

Philippine trade costs in agricultural products with key trading partners are relatively high with ASEAN and India, the same situation as in manufactured products (Figure 5). Trade cost in farm products is lowest with the United States, followed by Australia. Among the top 3 trading partners, Japan fetched the highest trade cost for agricultural products (Table 4). The Korean and Indian markets in agricultural products had taken major steps in bringing costs down. Unlike in manufactured goods, trade cost estimates with these partners had not become less and more dispersed.

Table 4. Trade cost estimates in manufactured goods, by trading partners, Philippines, 1996 to 2015, %

Trading Partner	1996	2000	2005	2010	2015
ASEAN	108.33	174.04	158.01	197.20	153.39
United States	84.90	66.91	82.11	97.09	99.23
China	141.35	114.34	83.44	97.24	93.03
Japan	86.11	68.03	70.94	83.62	76.47
India	185.69	165.40	160.12	152.37	147.22
New Zealand	157.31	138.88	138.41	148.94	144.00
Korea, Rep.	113.65	78.17	88.96	87.26	86.99
Australia	123.98	104.74	115.37	130.68	132.65

Source of basic data: World Bank - UN ESCAP

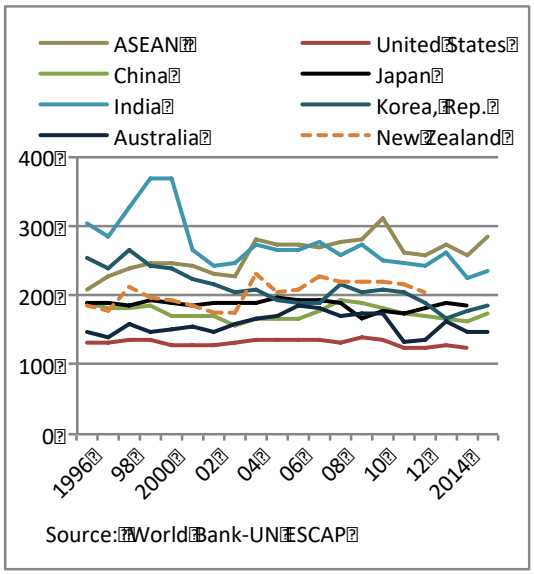


Figure 5. Philippine trade costs estimates in agricultural products, by key trading partners, 1996 to 2015 (%)

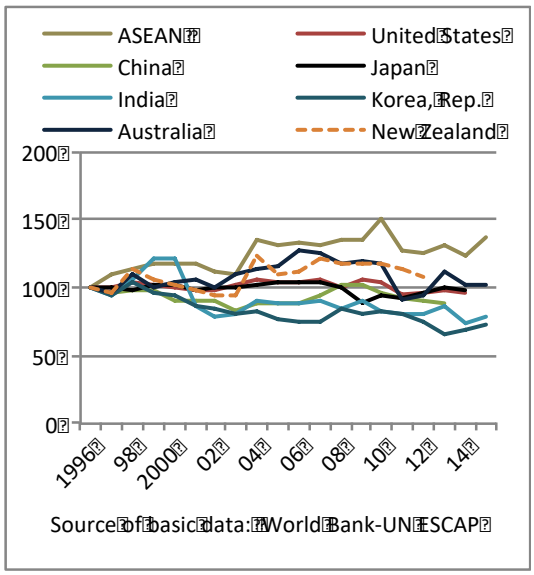


Figure 6. Trade cost indices of Philippine trade cost in manufactured products, by key trading partners, 1996 to 2015 (%)

The indices in Figure 6 confirm that the bilateral trade costs with India and Korea had declined by 23 and 28 percentage points respectively. By slightly a lower number, 12 percentage points, costs with China likewise declined. However, trade costs with Australia in agriculture hardly changed over the same period from 1996 to 2015. Relatively small declines, less than 10 points, were also registered with Japan and the United States. Interestingly, the country's trade costs with the rest of ASEAN in agricultural products increased by 36 percentage points.

Table 5. Trade cost estimates in agricultural goods, by trading partners, Philippines, 1996 to 2015, %

Trading Partner	1996	2000	2005	2010	2015
ASEAN	206.95	244.86	273.36	310.30	282.69
United States	130.39	129.84	136.32	136.70	125.19
China	188.13	168.58	166.72	181.28	172.39
Japan	187.58	190.12	196.12	176.99	185.63
India	304.37	368.15	266.84	248.63	236.81
New Zealand	187.11	191.74	204.89	221.56	203.47
Korea, Rep.	253.53	237.61	194.69	207.51	184.16
Australia	145.81	150.40	170.12	172.89	148.27

Source of basic data: World Bank - UN ESCAP

The country's trade costs in agricultural products are higher than those in manufactured goods (Figure 7). ASEAN and New Zealand had the lowest trade costs in agriculture among the key trade partners of the country. In contrast, India has the highest farm trade cost. Distance is an important factor, and may explain why trade costs are high. However, the effect of that kind of disadvantage did not show in the case of the United States. Both the country and the US have a long history of trading. Japan, Korea and China are nearer but their agricultural products are significantly high.

In manufactured products, Japan registered having the lowest trade cost among the country's top 3 trading partners. South Korea, however, had a lower trade cost compared with China and the US. ASEAN had surprisingly the lowest trade cost. New Zealand's trade cost in manufactured gods is comparable with China and lower than that of the US.

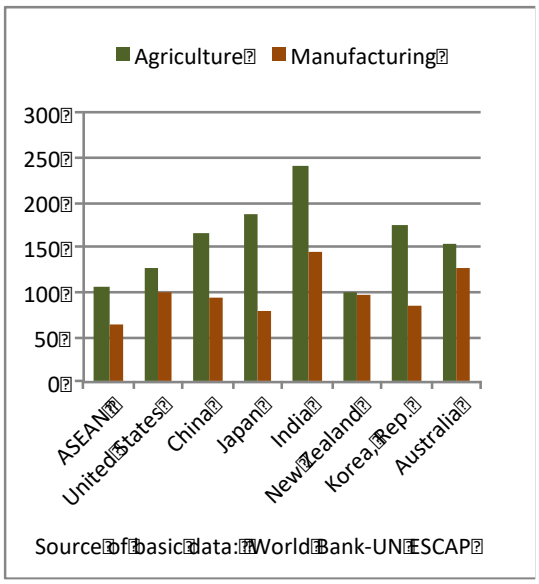


Figure 7. Comparative trade costs: agricultural vs. manufactured goods, by key trading partners Philippines, 2013-2015

Trade costs in agricultural products had declined since the second half of the 1990s with the countries in Figure 8, except ASEAN. It is another interesting observation for ASEAN: average trade cost with the rest of the region in agricultural products increased from 64.79% to 105.29%. The biggest cuts of the country's trade costs in agricultural commodities were with New Zealand and South Korea. India with the highest trade cost in farm products trade with the country, reduced trade cost by 64 percentage points.

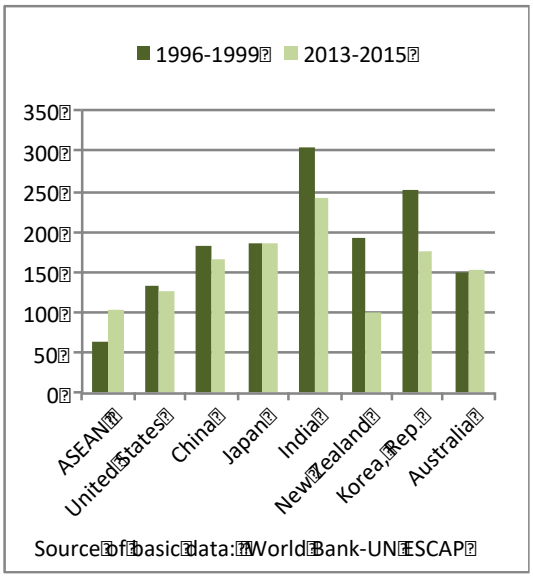


Figure 8. Trade costs in agricultural products, Philippines, 1996-1999 to 2013-2015 (%)

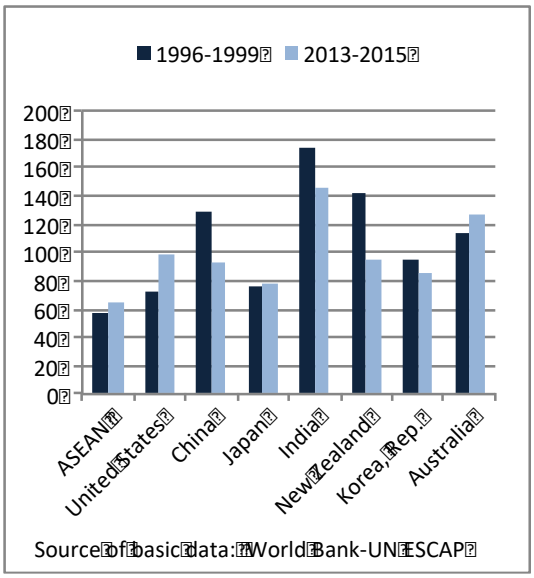


Figure 9. Trade costs in manufactured products, Philippines, 1996-1999 to 2013-2015 (%)

Bilateral trade costs in manufactured products with China, India, New Zealand and South Korea had declined (Figure 9), but increased with the ASEAN and Australia. The United States appears to have lost its competitive edge in manufactured products. The country's trade cost with the US in manufacturing increased, but that with Japan hardly changed.

Total trade costs

Total trade cost applies to all types of merchandise exported by the country. The country's top 3 trading partners had the lowest bilateral trade costs (Figure 9). Japan has consistently been among the trading partners with lowest trade costs. Even in the 1990s, Japan was second after the United States, which then had the lowest. However, the country's trade cost with the US started to rise in the first decade of the 2000s. By 2015, China's trade cost with the country was surprisingly lower compared to the US (Table 6). Just ten years back in the 1990s, the country's trade cost with China was among the highest. Another interesting observation, South Korea came out second to Japan in terms of having the lowest trade cost with the Philippines.

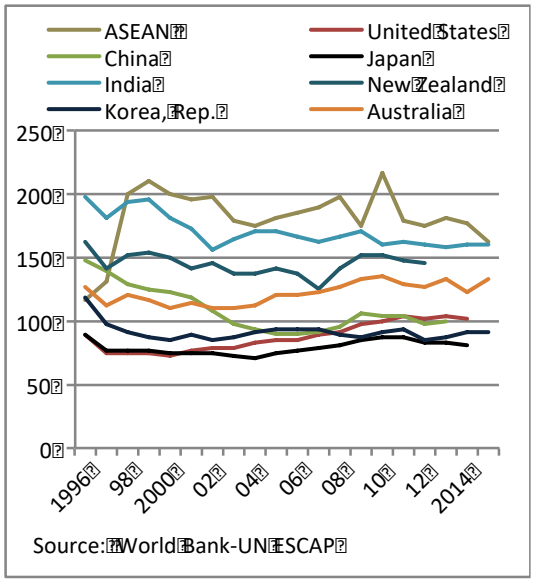


Figure 10. Philippine total trade costs with key trading partners, 1996 to 2015 (%)

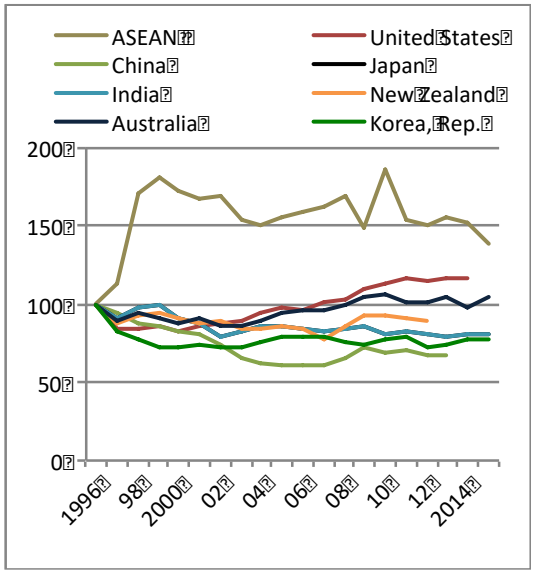


Figure 11. Philippine total trade cost indices with key trading partners, 1996 to 2015 (%)

ASEAN had the highest trade cost with the Philippines, followed by India, New Zealand and Australia.

Based on the trade indices (Figure 10), most of the trade cost estimates declined from the 1990s to the first half of the 2010s. China had the largest percentage-point drop, 49 points,

followed by India and South Korea. At the other end of the range, the ASEAN had the highest increase in total trade cost, by about 45 percentage points. The trade costs with United States, and Australia increased significantly as well.

Table 6. Total trade costs estimates, by trading partners, Philippines, 1996 to 2015, %

Trading	1996	2000	2005	2010	2015
ASEAN	116.73	200.74	180.54	216.63	162.30
United States	88.40	72.76	86.06	100.31	102.24
China	148.08	123.25	90.05	103.18	99.15
Japan	90.03	74.10	75.00	87.15	80.44
India	198.21	181.45	170.45	160.39	159.56
New Zealand	162.92	149.34	141.16	151.87	146.18
Korea, Rep.	118.70	85.13	93.30	91.27	91.06
Australia	127.33	110.88	120.93	135.17	133.79

Source of basic data: World Bank - UN ESCAP

Trade costs with ASEAN member states

The ASEAN member states' average trade costs with the Phiilipnes are high in all goods, including agricultural and manufactured comparable. These were comparable to that of India as shown in Figures 3 to 6, and Figures 9 to 10. Two countries, Brunei Darussalam and Cambodia, have pulled up the average as Figure 11 shows for total trade cost, Figure 12 and 13 for agricultural and manufactured goods respectively. Myanmar and Lao PDR, are excluded in these charts due to lack of data to compute trade cots.

The trade costs of the Philippines with the rest of ASEAN are fairly convergent. However, those costs of trade with Brunei Darussalam and Cambodia are significantly higher compared with the rest of ASEAN. Both countries' trade costs pulled up the average ASEAN trade costs.

Malaysia had the lowest trade cost in most years in the 1990s and 2000s. However, after 2008, its trade cost with the Philippines rose and stayed at a new level comparable to those of Thailand and Viet Nam. Respectively, the bilateral trade costs of Viet Nam, Thailand, and Indonesia with the Philippines declined since the 2000s, with Thailand's cost registering the lowest fall among the three trading partners. The respective trade costs of the Philippines with Singapore and Malaysian have increased.

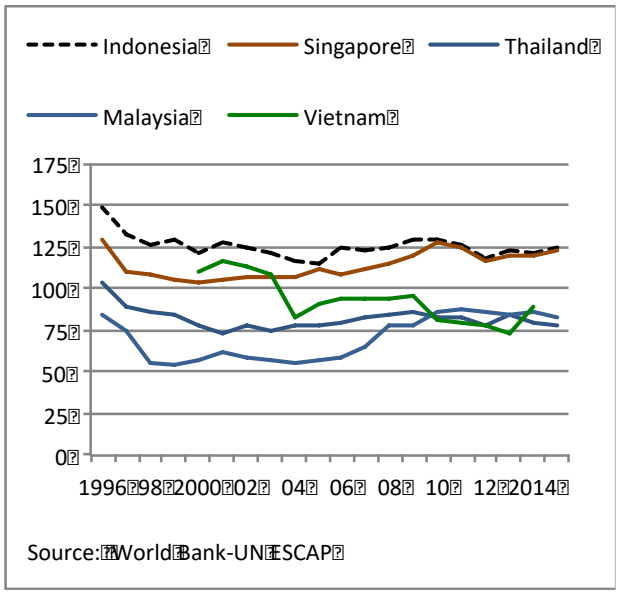


Figure 12. Philippine total trade costs with ASEAN member states, 1996 to 2015 (%)

In both agricultural and manufactured products, the trade costs with Brunei Darussalam and Cambodia pulled up the region's average trade cost with the Philippines. Except for the two, the trade cots of the remaining member states in both agriculture and manufacturing (Figures 13 and 14) are relatively close to each other, although those of agricultural products are significantly higher compared to the cost of trade in manufactured goods.

Singapore has the lowest trade cost with the Philippines in agricultural products, reflecting the country to be a regional hub in almost all types of trade including agricultural goods. Considering that rice imports of the Philippines comprise a large item in the agricultural trade portfolio of the country from Viet Nam and Thailand, the trade cost of the country with each member state did fall in 2008 to 2010. Following equation (5), the exports of Viet Nam or Thailand to the Philippines determine partly the level of bilateral trade cost. A big import of rice from these countries can bring down trade costs, and Figure 5 does show it when the country imported massively rice from the two countries following the 2008 rice crisis.

Compared to manufactured goods, the trade costs in agricultural products exhibit volatility. It may imply that the Philippines is an off-and-on trader in agricultural products. The country is known to resort to agricultural products in the event local harvest of crops is insufficient for the requirement of the country. Growing crops or raising livestock are vulnerable to climate changes, disease or natural disasters, which reduce local production. Without adequate storage, importing of farm products would have to be resorted. However, the random factors influencing production of agricultural products may also raise the level of farm output, and the country would not have any need for importing, thus the off-and-on participation of the country in agricultural trade, which in turn makes the observed trade cost in Figure 13 volatile.

Trade cost estimates for manufactured products are fairly stable (Figure 14). Malaysia and Thailand have the lowest cost in manufactured products with the country. This may capture the intra-trade among the three countries, all three being part of the global value chain in automotive and electronic products. The country exports parts of automotive products, and imports transportation equipment from Thailand. With Malaysia and other countries outside of ASEAN, the country is part of a global value chain in electronic goods.

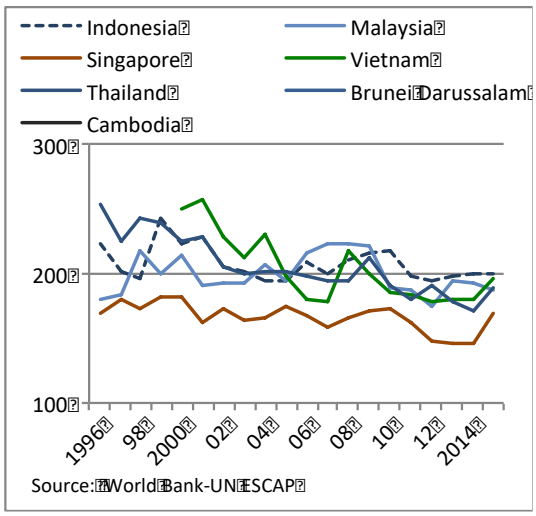


Figure 13. Philippine trade costs in agricultural goods with ASEAN member states, 1996 to 2015 (%)

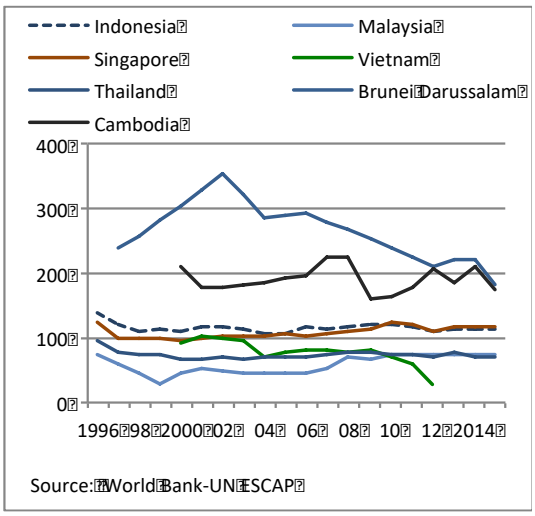


Figure 14. Philippine trade costs in manufactued goods with ASEAN member states, 1996 to 2015 (%)

4. Measuring welfare cost of trade cost in the Philippines

In this section, the paper uses an applied general equilibrium of the Philippines to measure the welfare cost implication of reducing trade cost.

Welfare implications of trade cost

Bussolo and Whalley (2002) referred to trade costs as trade-related transactions cost. They distinguished three types of trade costs as follows: (a) costs associated with moving products to the market; (b) costs associated with the lack of access to "general purpose infrastructure"[6] such as electricity, communication, water and sewerage services; and (c) costs associated with economic policies and regulations.

Non-tariff measures are among the important sources of trade costs. The implementation of NTMs drives a wedge between domestic and world prices in a small open economy, and accordingly imposes trade cost to the economy. Traders comply with product standards and technical regulations, which must be observed, whenever merchandise cross borders. In the process, they spend resources which otherwise could have been used to raise productivity. However if compliance costs are at socially necessary levels to enforce NTMs, the resources so spent secure net efficiency gains to the economy by internalizing the spillovers associated with trade or by ensuring that the public interest concern is adequately addressed. In such case, the associated trade cost acts like a Pigouvian tax as in the externality-related literature, and that is not the concern here.

The problem is the difficulty knowing what is reasonable cost to comply with NTMs. But NTMs can generate trade costs either because they should not be issued in the first place or their implementation could have been improved. Some NTMs have been abused and become disguised trade barriers, and in this case the trade costs associated with them generate economic inefficiency and must be eliminated. They effectively serve the discriminatory role of tariff barriers of the past, which raised prices of tradable products, distorted the mix of local and foreign products in the economy, altered consumption patterns as between imported and locally produced products, and reduced economic efficiency.

Other NTMs in the system are redundant, those with no public interest rationale of their issuance, or they may have had one before but the public interest concern had long been gone. The compliance cost of these measures is a waste of productive resources. These generate trade costs that can be scrubbed with regulatory reform. However, while they are in still in the system they generate efficiency-reducing trade costs.

[6] The phrase is due to Helman and Krugman

Another manifestation of abuse of NTMs is the manner they are implemented. Badly designed business processes for complying with NTMs contributing to generating the fat in trade costs. Hertel, Walmsley and Itakura (2001) documented how automation of customs clearance procedures between Japan and Singapore reduced effective prices amounting to 0.065% in Japanese imports from Singapore and 0.013% in Singaporean imports from Japan due to reduced paperwork, storage and transit expenses.

Part of the ASEAN economic community reforms is the ASEAN single window system which links various customs processes among the ten ASEAN member states using information technology. In turn each member state maintains their respective national single windows, which link the various regulatory agencies with customs authorities.[7] If implemented, the access to information about at least the permits issued and certifications, rules of origin, and related requirement would reduce the time to clear cargoes through customs in the region.

The time saved from making cargo clearance systems more efficient is increasingly important. Hummels et al. (2007) noted about the growing demand for timely delivery due to the following developments: (1) world trade shifted from bulk commodities to inherently time-sensitive complex manufactures; (2) increased willingness to pay for fast delivery from consumers with preference for precise product characteristics; and (3) global value chains.

Time saving is important to developing country exporters as it gives them better access to markets than reducing trade partners' tariffs on their exports. Savings from reduced tariff are less than time saved from faster export cargo clearances and transport. Importers also benefit from reducing time delays. Users of imported intermediate goods stand to gain when import delays are reduced. Time delays imposed on intermediate goods are particularly costly because they multiply through the value chain.

Besides regulation-related trade cost is information cost. Knowing the standards and regulations of trading partners or even in the origin country can be costly. Gathering information is particularly more costly for small businesses, which with limited scale of their respective production, raises the average cost of knowing what is entailed in exporting or importing merchandise.

As in compliance with regulations, gathering such information requires resources. Other behind the border challenges in internationalizing a business include coping with problems of lack of facilities to facilitate compliance with regulations and standards; high cost of transportation and logistics services; and where production of merchandise and services

[7] The ASEAN Single Window agreement was signed in 2005. Until now this project has yet to be completed by the ten ASEAN member states. To learn more, visit http://www.asean.org/communities/asean-economiccommunity/category/customs or send an email to aimo@asean.org. Clarete (2010) did a study on the preparedness of the Philippine government agencies for the national single window.

required to market them is fragmented, necessitating the formation of value chains the costs associated with participating in such chains, and the related costs of enforcing contracts within them are part of trade cost.

The Philippines had extensively lowered import restrictions since the 1980s and expanded trade. Ex-ante assessment of the impact of freer trade in the Philippines using models of the Philippine economy indicates net positive gains for economy and for the representative Filipino households. However, per capita income hardly changed over a period from 1980 to 2002. Clarete (2005) explain the divergence with trade-related transaction costs.

Applied general equilibrium models

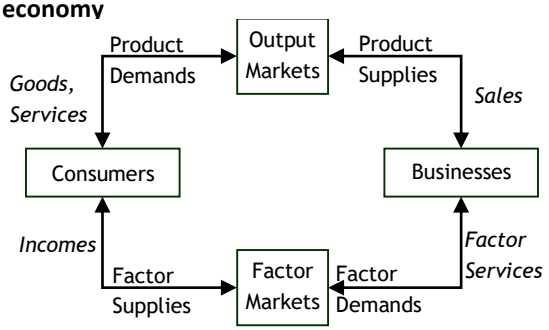
Overview of the model

The circular flow diagram of an economy provides an intuitive picture of the economy which CGE models describe (Figure 15). The production side of the economy is comprised of a set of activities producing goods and services. Each activity transforms raw materials and services into products using a production technology. All firms have equal access to production technologies, which specify the per unit output input requirement in producing a good or service. These activities generate the respective supplies of goods and services of the economy and their respective demands for materials and factor services needed in production. All firms in a given industry are assumed homogeneous, and are collectively represented by a single firm.

Representative firms decide if they produce outputs using the appropriate production activity and taken into account the going market prices of outputs and inputs. The decision to produce is taken if the owners of these business entities profit from doing so. Several activities can produce the same outputs, and some of these may not be used because doing so entails financial loss to their owners.

The general equilibrium model highlights consumption activities, which generate the final demands for the goods and services produced in the economy. These goods and services in turn are consumed and in the process determine the underlying real incomes of the consumers. Modelers regard these activities as part of the production side of the economy, except that no one else buys the economic well being that these final consumption activities produce.

Figure 15. Circular flow diagram in a closed economy



The consumers can be appropriately disaggregated to answer the relevant questions on how the reforms or other types of economics shocks affect the distribution of income and poverty situation of the

country. In standard applications of the CGE model, consumers are classified according to their income types, i.e. quartile or quintile income groups. These are representative households of such income groups.

Consumers or households are endowed with resources or factors of production. They sell the services of these resources to businesses, which use them in their respective production activities. Factor supplies come from households while demands for factor services are generated in production activities. The consumers derive incomes from their sales of their resource endowment, which they spend on final goods and services, i.e. consumers have the final demands. If the government is incorporated in the model, then the government generates an income, likely from taxes, and spends their incomes as if it was another type of consumer.

The typical general equilibrium model assumes there is perfect competition in the economy. The equilibrium conditions of the economy are: (a) there are non-positive excess demands for goods, services, and factors; (b) non-positive profits; and (c) aggregate spending is equal to aggregate income of the economy or Walras' Law. General equilibrium is attained with the set of the following endogenous variables, which meet the above conditions. The variables are: (i) non-negative product and factor prices; (ii) non-negative production levels of every activity in the model; and (iii) and non-negative incomes of all agents including the government. [8]

With international trade and the economy is a price-taker in world markets of products, the consumers and producers in the economy are buying foreign products and selling local products to the rest of the world. The typical model of an open economy is the Armington (1969) model, which treats local products as imperfect substitutes with imports, and exports differ in quality with goods destined for the home market.

The country would have to reconcile her international transactions by ensuring foreign currency inflows are matched by outflows. To attain the balance of payments condition, the exchange rate is computed which meets it.[9]

A defining feature of CGE models is the condition that aggregate spending is equal to the total income in the economy. All consuming entities spend all of their respective incomes. This property is known as Walras' Law, which is that the sum of the values of all excess demands in the economy, all excess profits, the fiscal deficit, and trade deficit is zero regardless of whether the economy is in or out of equilibrium. While Walras' law is an

[8] Auxiliary equations may be added to the model to depict departures from the standard neo-classical model such as for example price rigidities.
[9] Another way of looking at the balance of payments condition is that the rest of the world as an agent in the small-open economy has closed its transactions with the economy.

equilibrium condition, typical CGE models impose Walras' law, i.e. all agents in the economy observe it regardless of whether the economy is in or out of equilibrium.[10]

Using CGE Models

Policy analysis or tracing the effect of a shock to the economy involves comparing two of its equilibrium states. One involves calculating the sets of endogenous variables such as (i) through (iii) including the exchange rate above in a way that the benchmark information about the economy with the existing policies or before the shock is introduced in place is replicated. The second equilibrium re-calculates these variables but this time with the proposed policy reforms such as reducing trade costs. Differences of the values taken by each relevant economic variable before and after the policy reform are ex-ante effects of the policy reforms.

Before doing any policy simulations and poverty impact assessment with CGE models, the analyst needs to have a numerically specified CGE model first. These are the tasks in constructing a general equilibrium model that can be used for policy analysis:

1. Develop an analytical general equilibrium model, which can handle the types of policy instruments, project interventions, or economic shocks, in a given policy analysis situation. This involves deciding how many production sectors, consumers, factors of production, tax and other policy measures, trade and trade-related measures, and other structural features are incorporated by the model. There are no black-box CGE models that are useful. The CGE models that are developed for a given purpose of conducting policy analysis are specific to the use they are designed for.

2. The analytical model is numerically specified with data from a social accounting matrix or SAM and parameters of the model's functions[11]:.

    - A social accounting matrix or SAM is constructed that correspond to the features of the analytical model, as in the number of sectors or consumers. The SAM is a general equilibrium data set of an actual economy in a given year, i.e. the data are internally consistent and reflects the general equilibrium conditions of the economy. Assembling the SAM requires the reconciliation of independent data sets such as the input-output data, national income accounts and foreign trade data such that the SAM incorporates the general equilibrium conditions of the analytical model. The reconciliation is done using RAS or the entropy method.[12]

[10] The computational advantage of imposing Walras' law is that to solve for general equilibrium the modeler would not have any need of computing incomes of the agents, reducing the computational requirements in finding equilibrium.
[11] Mansur, A. and J. Whalley (1984) first discussed the issues and approaches to numerically specify the analytical general equilibrium model.
[12] See Robinson et al. (1998).

- The production, demand, and auxiliary functions need to have specific forms. The parameters of these functions, e.g. consumption and production substitution elasticity coefficients, are obtained from the literature

3. The numerically specified model is solved to replicate the general equilibrium data set in the SAM. The endogenous variables such as (i) through (iv) above are calculated such that conditions (a) through (d) above true and the underlying solution is consistent with the data from the SAM. The information in the SAM comprises the data about the benchmark equilibrium. Once the replication is successfully completed, the CGE model is ready for policy simulations.

    - The model is solved with an appropriate solution algorithm such as the GAMS.[13] Because the CGE model is consistent with Walras' Law, one of the general equilibrium conditions of the model is redundant.

A counterfactual equilibrium is calculated for each policy reform or shock to the economy. In developing the analytical structure of the model, the likely simulations that are done with the CGE model are key to deciding the amount of details and complexity the model to be incorporated in it.

The numerically specified CGE model is solved given that the policy change or shock occurred, and the solution is compared to the benchmark equilibrium. The changes of the variables between the benchmark and counterfactual equilibriums are attributed to the policy change or shock that was introduced in the model.

Modeling trade costs in applied general equilibrium models

The simple approach of modeling trade cost is to regard them as marketing margins mposed on trade (e.g., Bussolo and Whalley, 2002; Lofgren, Harris and Robinson, 2003). In a tariff barrier, the customs duties generate revenues, while distorting local from world prices. The revenue goes to the government, which spends it on public services. The inefficiencies that arise in the economy are caused by the price distortions.

Trade costs are modeled as tax-like policies on trade, and generate revenues. The key issue then is how does the model treat those revenues. If the revenue is given to the government or another consumer, then this would miss out an important point about trade costs, which is they cause larger inefficiencies than ordinary tariff barriers because they claim economic resources which could have been used to produce goods or services.

In Bussolo and Whalley, (2013), the revenues are used to buy transactions services. A notional industry is added which produces the service, and whoever receives the revenue in

[13] An alternative approach to solving a CGE model is to calculate for the changes in the endogenous variables, which requires inverting a matrix using the software GEMPACK. See Pearson (1991).

the model uses it to buy transactions services. It does not matter who receives them for as long as the total revenue generated by trade costs are all spent on transaction services. The services are not consumed, and so they are wasted as trade flows expand. The services sector uses resources to produce its product, and induces as waste of resources. It is going inside the production possibility set of the economy. It is similar to the revenue or rent-seeking proposition, which says that revenues seeking claims resources dissipating fully the revenues or rents generated by policies (Bhagwati and Srinivasan, 1980).

An alternative approach is to regard the impact of trade costs as the loss of output in the delivery of the good, as in a melting iceberg.[14] There are no revenues generated by modeling trade cost in this way but still there resources get wasted due to the inefficiency in shipping the product.

This paper follows the rent seeking approach of modeling trade transactions cost. In the following, the equations of the model formalizing the method are specified. Having done that, it lists down the general equilibrium conditions of the model with trade costs.[15]

The domestic prices of importables (PM) in a small open economy are specified as follows:

$$PM_i = \epsilon \overline{PM}_i (1 + \tau_i) \tag{6}$$

where ϵ is the exchange rate; $\overline{PM}_i$ is the world price in foreign currency of the imported good; and τ_i is the average trade cost between the country and all sources of the imported product.[16] There may still be other taxes that apply on the imported product, such as the customs duty and the value added tax. Since Novy's trade cost is all encompassing, then τ_i incorporates these.

The domestic prices of exportables (PX) are:

$$PX_i = \frac{\epsilon \overline{PX}_i}{(1 + \tau_i)} \tag{7}$$

τ_i is as defined in (6). Novy's bilateral trade costs between two trading partners are symmetric in both ways of trade flows.

The "revenue" of the trade costs, R_{TC}, is computed as follows:

[14] The concept dates back to Samuelson (1954) and had been used in many trade-modeling activities.
[15] The equations that follow have nothing to do with equations (1) to (5) which define Novy's trade cost above. Some symbols may be re-used in the following, but are defined accordingly in the context of the applied general equilibrium model that they help specify.
[16] If it is important in the analysis, the trade cost can be kept at the bilateral and sectoral level. The implication is to tag all imports by source in the model.

$$R_{TC} = \epsilon \left(\sum_{\forall M_i} \tau_i \overline{PM}_i M_i + \sum_{\forall X_i} \tau_i \frac{\overline{PX}_i X_i}{(1+\tau_i)} \right) \quad (8)$$

where M_i is the quantity imported of good imported good i from the rest of the world; and X_i the amount of good I that is exported.

Trade costs claim the use of resources in the economy. Clarete, Trela and Whalley (1994), a sector that produces transactions services using primary factors of production is added into the model. The value of transaction cost services produced and purchased is equal to "revenue" from trade costs in the economy. The sector, like other sectors in the economy, purchases resources to produce these services. Because the value of these resources does not eventually figure out in some consumer's income, they are wasted. The supply of transactions services, TS^S, has the following production function:

$$TS^S = g(L_{TS}) \quad (9)$$

where L_{TS} is the demand of labor in producing the TS. There is little known as to the factor intensities in producing transactions cost services. What is featured in (9) is that labor leaks out of the system by making them available to produce trade-related transactions services or due to trade costs. It may be that the activity of participating in international trade which forces traders to comply with NTMs, gather information about markets abroad, moving products across space in the domestic economy is labor intensive. But others may claim that such activity makes use also of capital.

The notional consumer receives the 'revenues' from trade costs and spends the revenues on TS. Walras' law for this consumer is:

$$R_{TC} - p_{TS} TS^D = 0. \quad (10)$$

In the evaluation of this economy's aggregate real income, the welfare of the notional consumer is excluded. This is to account for the feature that the resources 'consumed' by it are not used productively and thus represent a deadweight loss to the economy. Reducing trade cost lowers the 'revenue' from trade costs, and thus the inefficiency associated with it, increasing the aggregate income and overall welfare of the economy.

Equilibrium conditions

The trade-related transactions cost is incorporated into the standard applied general equilibrium model. The model has N sectors. There are 8 types of production activities, namely of local products for the home market; exportable products; imported products; produced capital good; and notional products such as the Armington product, utility indices of the consumers; utility index of the government sector; and of transactions cost services. I

Each has an associated market clearing condition, where excess demands in equilibrium has to be non-negative, with the complementarity condition that if excess demands are negative in equilibrium, the price of the product is zero. Three other market clearing conditions are added for (a) labor by type of skills and residence (rural or urban); (b) capital; and (c) the foreign exchange.

A second type of equilibrium condition is the set of zero profit conditions. There are 8 production activities and for each is associated a condition which says that in equilibrium the profit generated by the activity cannot be positive, with the complementarity condition that if profit is negative then production is zero.

Market clearing conditions:

$$LQ_j^{AQ} - LQ_j^S \le 0 \quad \perp \quad p_j^{LQ} \ge 0 \qquad \text{local product } j=1,2,...,N$$

$$\sum_{i=1}^{N} AQ_{i,j}^{LQ} + AQ_j^G + AQ_j^{CQ} + \sum_{h=1}^{H} AQ_{h,j}^U - AQ_j^S \le 0 \quad \perp \quad p_j^{AQ} \ge 0 \qquad \text{Armington product } j=1,2,...,N$$

$$\sum_{j=1}^{n} \bar{p}_j^{MQ} MQ_j^{AQ} - \sum_{j=1}^{n} \bar{p}_j^{XQ} XQ_j^S - FX_{ROW}^G - \sum_{h=1}^{H} FX_{ROW}^h - T_{ROW}^B \le 0 \quad \perp \quad e \ge 0 \qquad \text{balance of payments condition}$$

$$MQ_j^{AQ} - MQ_j^S \le 0 \quad \perp \quad p_j^{MQ} \ge 0 \qquad \text{imported good } j=1,2,...,N$$

$$XQ_j^{FX} - XQ_j^S \le 0 \quad \perp \quad p_j^{XQ} \ge 0 \qquad \text{exported good } j=1,2,...,N$$

$$U_h^D - U_h^S \le 0 \quad \perp \quad p_j^U \ge 0 \qquad \text{consumer utility } h=1,2,...,H$$

$$G^D - G^S \le 0 \quad \perp \quad p_j^G \ge 0 \qquad \text{government utility}$$

$$\sum_{j=1}^{N} FL_{j,k}^{LQ} + \sum_{j=1}^{K} FL_{j,k}^{TS} - FL_k^S \le 0 \quad \perp \quad wL_k \ge 0 \qquad \text{labor type } k=1,2,...,K$$

$$\sum_{j=1}^{N} FK_j^{LQ} - FK^S \le 0 \quad \perp \quad wK \ge 0 \qquad \text{capital}$$

$$CQ^D - CQ^S \le 0 \quad \perp \quad p^{CQ} \ge 0 \qquad \text{capital good}$$

$$TS^D - TS^S \le 0 \quad \perp \quad p^{TS} \ge 0 \qquad \text{transactions services}$$

Zero profit conditions:

$$\pi_j^{LQ} \le 0 \quad \perp \quad LQ_j^S \ge 0 \qquad \text{local production activity } j=1,2,...,N$$

$$\pi_j^{AQ} \le 0 \quad \perp \quad AQ_j^S \ge 0 \qquad \text{Armington production activity } j=1,2,...,N$$

$$\pi_j^{MQ} \le 0 \quad \perp \quad MQ_j^S \ge 0 \qquad \text{imported product } j=1,2,...,N$$

$$\pi_j^{XQ} \le 0 \quad \perp \quad XQ_j^S \ge 0 \qquad \text{exported product } j=1,2,...,N$$

$$\pi_h^U \le 0 \quad \perp \quad U^S \ge 0 \qquad \text{household utility index } h=1,2,...,H$$

$$\pi_h^G \le 0 \quad \perp \quad G^S \ge 0 \qquad \text{government utility index}$$

$$\pi^{CQ} \le 0 \quad \perp \quad CQ^S \ge 0 \qquad \text{for produced capital good}$$

$$\pi^{TS} \le 0 \quad \perp \quad TS^S \ge 0 \qquad \text{for transactions cost services}$$

5. Concluding Remarks

With tariff restrictions reduced significantly following several rounds of multilateral and regional trade negotiations, non-tariff barriers (NTBs) have emerged as key factors of slowing down trade flows (World Bank, 2006). Accordingly, measuring trade costs has gained importance given that NTBs are now the dominant policies affecting trade flows in the world today including the Philippines. The paper distinguishes between an NTM and an NTB, although the trade cost approach that it uses follows Novy's (2012) approach, which is inclusive of every cost of moving the product to the market (Anderson and Van Wincoop, 2004. Part of the trade costs reflects the legitimate costs associated with implementing regulations at the border. But given the proliferation of NTMs in the world today, chances are some of those are disguised NTBs. More importantly however, the inefficiencies associated with implementing legitimate NTMs such as the SPS on agricultural imports become unnecessary barriers to trade. This is the fat in trade costs that need to be eliminated through trade facilitation, while policy reforms would have to deal with redundant NTMs, whose claim to resources to get complied with adds to the cost imposed by inefficient implementation of legitimate NTMs.

This paper had not gone into a decomposition of trade costs, which is important in order to understand which of the factors contributing to it are those that policy makers ought to focus on. The paper focuses on NTMs or the trade-related regulations at the border. Behind the border are numerous impediments to trade including access of information of small and medium enterprises on the regulations of destination countries of their exports.

This study benefited from the database of the World Bank-UN ESCAP on trade costs, which are limited in its sectoral disaggregation, agriculture and manufacturing. It is important to do further disaggregation to appreciate where the heavier burden of trade costs fall. If these are combined with the decomposition of trade costs at least between border and behind border measures, future assessments on trade costs can become more useful to policy makers.

Lastly, this paper came up with a CGE model that may be used to assess the gains to the Philippine economy of lowering trade costs. The contribution is adjusting the standard model by incorporating how trade costs dissipate the productive resources of the economy. Larger numbers of efficiency gains of trade facilitation are expected compared with those from tariff reforms as reduced trade costs make more available resources for production. The important next step is to calibrate the model and undertake an actual evaluation of the welfare gain from trade facilitation.

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