University of Nottingham
UK | CHINA | MALAYSIA

research paper series

Political Economy of Globalisation

Research Paper 2017/08

Non-Tariff and Overall Protection: Evidence from Across Countries and Over Time

By

Zhaohui Niu, Chang Liu, Saileshsingh Gunessee, Chris Milner

GEP

Non-Tariff and Overall Protection: Evidence from Across Countries and Over Time

Zhaohui Niu[a], Chang Liu[b], Saileshsingh Gunessee[c], Chris Milner[d,*]

[a] *Beihang University, No. 37 Xueyuan Road, Beijing 100191, China*
[b] *School of Economics, University of Nottingham, 199 Taikang East Road, Ningbo 315100, China*
[c] *Nottingham University Business School China, 199 Taikang East Road, Ningbo 315100, China*
[d] *School of Economics, University of Nottingham, NG7 2RD, UK*

June, 2017

Abstract

This paper analyzes the evolution of the incidence and intensity of non-tariff measures (NTMs). It extends earlier work by measuring protection from NTMs over time from a newly available database and provides evidence on the evolution of NTMs. In particular, building on Kee, Nicita and Olarreaga (2009), this paper estimates the ad valorem equivalents (AVEs) of NTMs for 97 countries at the product level over the period 1997 to 2015. We show that the incidence and the intensity of NTMs were both increasing over this period, with NTMs becoming an even more dominant source of trade protection. We are also able to investigate the evolution of overall protection derived jointly from tariffs and NTMs. The results show that the overall protection level, for most countries and products, has not decreased despite the fall in tariffs associated with multilateral, regional and bilateral trade agreements in recent decades. We also document an increase in overall trade protection during the recent 2008 financial crisis. Overall, this study sheds light on an under-researched aspect of trade liberalization: the proliferation and increase of NTMs.

Key words: Non-tariff barriers, tariff equivalents, protection
JEL: F13, F14

*Corresponding author: Phone: 44 115 9515624; Fax: 44 115 9514159;
Email: chris.milner@nottingham.ac.uk.

1. Introduction

Trade reforms associated with multilateral, regional, bilateral and unilateral agreements in recent decades is often represented as having reduced the protectiveness or restrictiveness of trade policy. This viewpoint is often supported with evidence on the general reduction in tariff rates. For instance, according to the United Nations Conference on Trade and Development (UNCTAD) Trade Analysis and Information System (TRAINS) database, the average tariff rates of agricultural products worldwide have decreased from 17.9% in 1997 to 6.92% in 2012 while the average tariff rates for non-agricultural products have decreased from 8.78% in 1997 to 4.53% in 2012.

Yet, tariffs are just one facet of trade protection, with non-tariff measures (NTMs) being non-negligible protectionist trade policy measures. NTMs are defined as policy measures other than ordinary customs tariffs, that can have potentially an economic effect on international trade in goods, changing in quantities traded, or prices or both (UNCTAD, 2010).

It is important to study and measure NTMs.[1] First, with the significant reduction in tariffs, including of bound tariffs in recent decades, NTMs are an important alternative trade policy measure (see WTO, 2012). Indeed, a growing number of countries have adopted NTMs as trade protection measures. This is epitomized by the fact that the TRAINS database reports that in 1997, 1780 product lines were subject to at least one type of NTM for each country, while this number had increased to 2808 product lines by 2012. Secondly and in light of the growing significance of NTMs, we can revisit important questions such as the impact of trade protectionism on socio-economic outcomes such as trade, growth, poverty and firm productivity (Kee et al., 2009). While tariffs are impediments to trade, some NTMs types have ambiguous effects on trade. For instance, quotas and voluntary export restraints as NTMs are unambiguously seen as barriers to trade, but sanitary and phytosanitary measures (SPS) or technical barriers to trade (TBT), have a less clear cut effect (Ganslandt and Markusen, 2001;

[1] Interest in studying and measuring trade barriers goes back to the work of Balassa (1965) and Corden (1966), though with a focus in general on tariffs. See Baldwin (1991), Bora et al. (2002), Deardorff and Stern (1998) and Ferrantino (2006) on the quantification of NTMs.

Aisbett and Pearson, 2013). This is because, although SPS and TBT measures add costs to producers, they may also stimulate consumption because of the higher quality of imports.[2]

Despite the relevance and interest in NTMs, measuring their overall extent or protectiveness has received limited attention in the trade literature. This is not surprising given the challenges to identification and measurement. Indeed, most previous attempts to capture NTMs have taken the form of simple indicators not adequately grounded in trade theory or aggregate measures that fail to capture actual trade protectionist policies (Bowen et al., 2016, p.52).[3] One study that makes an attempt to define and measure NTMs, including overall trade restrictiveness indicators, is Kee et al. (2009). This study adopts quantity-based measures and ground their work in trade theory (Leamer, 1988, 1990; Trefler, 1993; Lee and Swagel, 1997). They estimate ad-valorem equivalents (AVEs) of NTMs for each country at the tariff line level. The idea is to use a common metric for alternative trade policy instruments, allowing direct comparison with tariffs and measurement of the combined or overall level of trade protection.[4] They estimate AVEs of NTM at the product level and on average for 78 developing and developed, but only one year, 2002 or the most recent year before 2002 for which the data was available . The key finding of the study is that NTMs account for a large portion of trade barriers and restrictiveness across most countries.

The obvious limitation of Kee et al. (2009) is that it provides trade protection estimates for a single year, 2002. The analysis cannot comment on the evolution of protection from NTMs and overall protection over time. For instance, with the gradual tariff reduction, what happened to NTM protection levels up to and since 2002? How has overall trade protection levels changed over time and how has NTMs changed relative to tariffs? How have these changes varied across

[2] This is the reason we prefer the term non-tariff measure (NTM) to non-tariff barrier (NTB), as non-tariff policies doesn't just act as an impediment of trade and have only negative welfare effects. Net trade effect can be positive.
[3] The most common approach used to gauge the restrictiveness of NTMs are the frequency index and coverage ratio (Bowen et al., 2016); though they lack a sound theoretical grounding (Kee et al., 2009). Other measures have taken the form of: applied general equilibrium measures, price-based measures, and gravity-based measures (see Bradford, 2003; Dean et al., 2009; Disdier and Marette, 2010). Even these measures have issues, including their lack of tight links to trade theory and precise definition of NTMs and trade restrictiveness.
[4] This follows the conceptual work of Anderson and Neary (1994; 1996) where trade distortions are captured in various ways.

countries and country groupings, and across products and product groupings? In the present work we see to offer insight on such questions, using improved data on the classification NTMs and comparing countries for specific years and over time. We are able therefore to comment on the impact of some recent changes and events, such as the 2008 financial crisis. In subsequent work Kee et al. (2013) do estimate the change in trade restrictiveness between 2008 and 2009 indices based on most-favored nation (MFN) tariff rate and antidumping measures, for a wide range of countries. They conclude that increased protection from this restricted set of trade policy instruments accounted for a very small proportion of the decline in trade in the immediate post-financial crisis period. One may legitimately be concerned about whether this conclusion is fashioned by the limited coverage of NTMs and by the shortness of the time period.

The goal of our paper is to study the evolution of trade protection level over time, in particular that of NTMs. Two questions are our main focus: *Has the level NTM barriers followed the same downward trend as tariff barriers during recent decades, or have NTM barriers actually increased?* Additionally, *how has the overall level of trade protection (i.e. from tariffs and NTMs) changed over time?*

Our ability to estimate NTM protection levels over time in a consistent manner stems from the use of a newly available dataset on NTMs. The new database is based on a new system of classification of NTMs, namely UNCTAD's Multi-Agency Support Team (MAST). Most previous studies on NTMs, including Kee et al.'s, used UNCTAD's older system of classifying NTMs, dubbed the Trade Control Measures (TCMCS).[5] Using the UNCTAD-MAST, as opposed to the UNCTAD-TCMCS, makes it possible to comprehensively analyze NTMs for different countries over time. This new data gives improved coverage of measures and captures NTMs in greater depth and breadth.

This paper estimates the AVEs of NTMs at the Harmonized System (hereafter HS) 6-digit product level for 97 countries over the period 1997 to 2015, following the methodology in Kee et al. (2009). To be precise we estimate protection levels for every three years from 1997 to 2015

[5] The following website provides information on development of NTMs by UNCTAD: http://unctad.org/en/Pages/DITC/Trade-Analysis/Non-Tariff-Measures/UNCTAD-and-NTMs.aspx.

(i.e., 1997, 2000, 2003, 2006, 2009, 2012 and 2015), making it possible to track and compare the evolution of AVEs of NTMs and tariff levels. Such information is of interest and help to both academic research and policy makers, including multilateral agencies such as the WTO, World Bank and IMF. In particular aid allocation by the latter two agencies is often conditional on trade reforms where such indicators of trade protection take a key role.

This paper is organized as follows. Section 2 sets out the methodology for estimating AVEs of NTMs, while section 3 provides information on the data sources and descriptive information on the incidence and coverage of NTMs. Then section 4 outlines the evidence on the estimates of NTM protection levels across different dimensions and the evolution of overall trade protection. Finally, we conclude in section 5.

2. Modeling Framework

This paper adopts the methodology of Kee et al. (2009) and extends it by applying it over time with country-product regressions being estimated for each year that incidence information is available and then the computed tariff equivalents and total protection levels are compared over time.[6] The methodology is in two stages: the first stage estimates how the incidence of core NTMs affects trade volume, controlling for other factors such as tariff and endowments of a country. In the second stage the quantity impact is converted into a corresponding ad-valorem price or tariff equivalent.

The base model is:

$$\ln m_{nc} - \varepsilon_{nc} \ln(1 + t_{nc}) = \alpha_n + \sum \alpha_{nk} C_c^k + \beta_{nc}^{Core} Core_{nc} + \beta_{nc}^{DS} \ln DS_{nc} + \kappa_{nc} \quad (1)$$

[6] The regressions are estimated across two dimensions (country and product) for every three years between 1997 and 2015, namely 1997, 2000, 2003, 2006, 2009, 2012 and 2015. A 3-dimensional estimation (namely country, product and year) is not adopted in order to allow comparison with the estimates of Kee et al. (2009). A three-dimension estimation also raises estimation issues that require additional assumptions such as about the standard errors.

where m_{nc} is the import volume for product *n* to country *c*.[7] The world price is assumed exogenous at unit price for all goods. Therefore, m_{nc} is the normalized import quantity. α_n is the product line intercept, which captures factors related to product *n* that do not change across countries. $Core_{nc}$ is a dummy for core NTM for product *n* in country *c*. DS_{nc} represents the agricultural domestic support reported by WTO for member countries for each product. This is measured in million dollar units.

β_{nc}^{Core} and β_{nc}^{DS} are coefficients capturing quantity effects for the presence of core NTMs and domestic support that vary by country and product. t_{nc} represents the ad-valorem tariff on product *n* in country *c* and ε_{nc} is the import demand elasticity for product *n* in country *c* and it is assumed unchanged over time. This constrained import demand function incorporates the tariff effect on import quantity on the left hand side of the equation, thereby modelling the NTM effect as the additional quantity restriction caused by the presence of the non-tariff barrier.[8] C_c^k controls for the k^{th} country's characteristics. In the regressions, the country-characteristics include GDP, labor/GDP, capital/GDP, and land/GDP as well as two gravity variables, a dummy for islands and the weighted distance to the world market. α_{nk} is the coefficient for the country-product specific characteristics. μ_{nc} is the i.i.d. error term. We use the standard White correction for heteroscedasticity and the resulting error term is defined as κ_{nc}.

To the above base model (1) we impose some structure on β_{nc}^{Core} and β_{nc}^{DS} parameters to allow for product and country variations by decomposing them into country specific factors and tariff line specific factors (i.e., the coefficients for core NTM and domestic support have country *c* and tariff-line *n* dimensions). This decomposition allows the estimation to take full advantage of the data variation without running out of degrees of freedom. This yields the following specification:

$$\ln m_{nc} - \varepsilon_{nc} \ln(1 + t_{nc}) = \alpha_n + \sum_k \alpha_{nkt} C_C^k + (\beta_n^{Core} + \sum_k \beta_{nk}^{Core} C_c^k) Core_{nc} +$$

[7] The zero trade issue arises here. In the case when the country does not report imports for a specific product, the import volume should be defined as zero. However, $\ln m_{nc}$ would not be defined when $m_{nc} = 0$. We follow Kee et al. (2009) and add 1 to all m_{nc} values recorded as having a zero import value.

[8] Where the NTM is the binding constraint it will strictly account for all of the quantity effect, but we assume that in the absence of the NTM the tariff barrier would remain.

$$(\beta_n^{DS} + \sum_k \beta_{nk}^{DS} C_c^k) \ln DS_{nc} + \kappa_{nc} \quad (2)$$

The tariff line specific factors come from β_n^{Core} and β_n^{DS} terms, while the country specific factors come from the $\beta_{nk}^{Core} C_c^k$ and $\beta_{nk}^{DS} C_c^k$ terms. C_c^k measures the kth country factor endowment. β_{nk}^{Core} measures how the kth country specific endowment affects the adjusted import volume for product *n* in country *c* when a core NTM is present. Similarly, β_{nk}^{DS} measures how the kth country specific endowment affects the adjusted import volume for product *n* in country *c* when $ln(DS_{nc})$ increases by 1%.

To tackle the endogeneity problem arising from the incidence of NTMs being influenced by import volume at the product level, exports and the change of import volume over the last period at the product level are included as instrumental variables for import volume, following Kee et al. (2009). This is based on the assumption that exports and imports from the last period are not affected by future import policy measures (tariff and NTMs) but they are correlated with the import of product in the present period. These instrumental variables have been used in other studies and are available at a disaggregated product level. They are also comparable across countries and time.

Additionally, another instrumental variable for core NTM dummy is adopted. This is the GDP-weighted average of core NTM dummy at product level for the five geographically closest countries. Similarly, the domestic support for product *n* in country *c* is also instrumented with the GDP-weighted average of domestic support for product *n* of the five geographically closest countries. This is based on the assumption that geographically close countries often have regional trade agreements and therefore the trade measures of these countries are correlated.

The possibility of sample selection bias originates from the fact that countries with available data in the NTM database may be larger and more developed countries with greater participation in international trade. Therefore, the selection of countries could be determined by the import volume and other crucial unobservable factors. The selection issue could be mitigated when instrumental variables, namely the weighted core NTMs and domestic support of five closest countries, are introduced in the estimation model. Because the relative importance of one

country in international trade should not be directly related to the importance of neighboring countries in international trade while their trade policies may be correlated.

Exponential functions to express the coefficients for β_{nc}^{Core} and β_{nc}^{DS} are applied and regressions are based on nonlinear least square methods. By doing so, the coefficients for core NTMs and domestic support are constrained to be non-positive, requiring that the imposition of core NTMs and domestic support restricts imports.

The final regression model for the first stage estimations is:

$$\ln m_{nc} - \varepsilon_{nc} \ln(1 + t_{nc}) = \alpha_n + \sum_k \alpha_{nk} C_C^k +$$

$$(-e^{(\beta_n^{Core} + \sum_k \beta_{nk}^{Core} C_c^k)} Core_{nc}) + (-e^{(\beta_n^{DS} + \sum_k \beta_{nk}^{DS} C_c^k)} \ln DS_{nc}) + \kappa_{nc} \quad (3)$$

In the second stage, the estimated coefficients for β_{nc}^{Core} are applied to quantify the AVEs of NTMs as follows

$$\text{ave}_{nc}^{Core} = \frac{1}{\varepsilon_{n,c}} \frac{\partial \ln m_{nc}}{\partial Core_{nc}} = \frac{e^{\beta_{nc}^{\text{Core}}} - 1}{\varepsilon_{nc}} \quad (4)$$

The AVEs of NTMs and domestic support are estimated for 5009 product lines for altogether 97 countries between 1997 and 2015.

3. Data and Some Descriptives

Data sources

The trade flow data comes from COMTRADE between 1995 and 2015 at HS 6-digit level. The import volume data is used to build the left-hand side variable, while the export volume data is used as one of the instrumental variables. To eliminate the year-specific shocks, trade flow data is averaged for continuous three years. The other merit of such smoothing procedure is the tendency for trade flows to trend, even though trade protection measures don't change frequently.

Trade volume is measured in 1000 dollars (units of dollar are unified into dollar in year 2015) and deflated by the Consumer Price Index (hereafter CPI) with 1997 as base year. The CPI data are obtained from the WDI database in 2016.

The tariff data is the effectively applied tariff rate obtained from the UNCTAD'S TRAINS database at HS 6-digit product level. Any non-ad valorem tariff is derived by the UNCTAD-1 estimation method. The tariff data is for the years 1997, 2000, 2003, 2006, 2009, 2012 and 2015. If the tariff data for these years are missing in the database, the data for the previous one or two years is used.

Import demand elasticities are assumed to be constant over the sample period, with data being taken from the World Bank website. Kee et al. (2008) estimate import demand elasticities at the 6-digit HS level for 117 countries.

The source for the NTM data is also UNCTAD's TRAINS. There is a newly constructed database for NTMs using a new classification, the UNCTAD-MAST classification for NTMs. The new database is consistently updated at detailed 6-digit HS product level and runs over several years. Out of the 150 types of NTM measures, the measures considered as core NTMs are: Price control measures (TRAINS M3 code F1-F3), Quantity Restrictions (TRAINS M3 code A1, B1, E1-E3, G33), Monopolistic measures (TRAINS M3 code H) and technical measures (TRAINS M3 code A, B, C).[9] The core NTM variable takes the value of 1 if any of the above measures are in place for a 6-digit tariff line level, and 0 otherwise.

The domestic support data is obtained from WTO members' notifications between 1995 and 2009 at product level. Similar to the trade flow data, the domestic support data is averaged for the span of three years at product level and measured in 1000 dollars. If there is no

[9] For the selection of core NTMs, this paper combines information from: 1) the core NTM definition in Kee et al.'s paper and the corresponding code in M3 nomenclature; 2) The statistical characteristics of the NTMs data, that is, measures take up altogether over 85% of the overall NTMs; 3) the information the author was able to get from contacting UNCTAD directly.

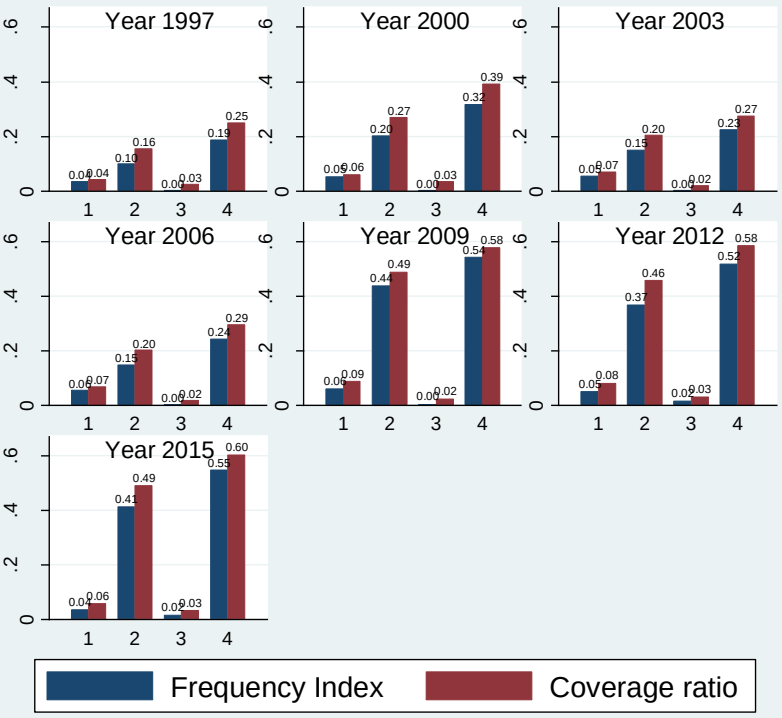
information on domestic support for a product, the data is treated as zero.[10] There are altogether 113 products at 6-digit HS tariff line with domestic support data reported by WTO members.

The country characteristics data mainly comes from the World Bank Indicators (WDI) database of the World Bank from 1996 to 2015. Variables measured in nominal term, namely GDP and capital flows are both deflated by the GDP deflator.

Summary descriptives on NTMs

We first summarize information on the incidence of NTMs from the new UNCTAD-MAST database. There are over 16 categories of different NTMs, among which this section focuses on the most influential ones, namely price control measures, quantity control measures, technical measures and monopolistic measures.

[10] This is a safe assumption as the database only covers domestic support if *in effect* and thus reported to WTO. This strategy is also applied in Kee *et al.* (2009) and Hoekman *et al.* (2004).



Source: WITS(2016)

1-Price Control,2-Quantity Control, 3-Monopolistic Measures, 4-Technical Measures

Figure 1: Incidence of different types of NTMs over time (1997-2015)

Following Nicita and Gourdon (2013), we measure frequency using the following index :

$$F_{ct} = \left[\frac{\sum D_{nct} M_{nct}}{\sum M_{nct}}\right], \tag{5}$$

where F_{ct} is the frequency index in country c at time t and M_{nct} is the dummy for the existence of non-zero import for product n in country c at time t. D_{nct} is the dummy for core NTMs meaning the existence of core NTMs for product n in country c at time t. The frequency index summarizes the percentage of products affected by at least one type of core NTMs. Measured frequency lies between 0 and 1, with higher values indicating a higher frequency of core NTMs.

Alternatively we summarize the use of NTMs using the following coverage ratio:

$$C_{ct} = \left[\frac{\sum D_{nct} V_{nct}}{\sum V_{nct}}\right], \quad (6)$$

where V_{nct} is the import volume of product n in country c at time t and the other variables are the same as before. The coverage ratio measures the share of imports subject to core NTMs, with a higher value indicating greater coverage by core NTMs.

Figure 1 reports frequency indices and coverage ratios for the four types of core NTMs for our sampled countries and years of analysis over the period of 1997 to 2015. It shows that there was an overall increase in the frequency and coverage of each type of NTMs, indicating an increasing proportion of products and imports that were subject to technical measures, quantity restrictions, price controls and monopolistic measures. In each year, technical measures (i.e. measure 4 in the graph) have the highest frequency index and coverage ratio, compared with other measures, indicating that technical measures are the most widespread used measures and with their importance growing over time. Following technical measures, the ranking of the other measures in terms of importance is: quantity control measures (measure 2 in the graph), price control measures (measure 1) and lastly monopolistic measures (measure 3). These three types of NTMs also affect a broader range of products over the period of 1997 to 2015.

Table 1: Frequency index of different types of NTMs by income group and year (1997-2015)

Income group	ISO3[11]	year	Price control	Quantity control	Monopolistic measures	Technical measures
High-income: OECD	AUS, AUT, BEL, CAN, CHL, CZE, DEU, DNK, ESP, EST, FIN, FRA, GBR, GRC, IRL, ISR, ITA, JPN, KOR, LUX, NLD, NZL, POL, PRT, SVK, SVN, SWE, USA	1997	0	0.05	0	0.27
		2000	0	0.11	0	0.31
		2003	0.02	0.01	0	0.03
		2006	0.02	0.01	0	0.04
		2009	0.02	0.48	0	0.56
		2012	0.03	0.43	0.01	0.64
		2015	0.03	0.52	0.01	0.69

[11] For the detailed country correspondence to the ISO3 code, see appendix Table A1.

High-income: non-OECD	BRN, CYP, HKG, HRV, LTU, LVA, MLT, RUS, SGP, TTO, URY	1997	0.05	0.22	0	0.30
		2000	0.04	0.28	0	0.38
		2003	0.03	0.14	0	0.2
		2006	0.04	0.18	0	0.26
		2009	0.05	0.49	0	0.6
		2012	0.03	0.47	0.01	0.65
		2015	0.03	0.58	0.01	0.75
Upper middle-income	ARG, BGR, BRA, CHN, COL, CRI, CUB, DOM, ECU, HUN, JAM, KAZ, LBN, MEX, MUS, MYS, PAN, PER, ROM, THA, TUN, TUR, VEN, ZAF	1997	0.01	0.11	0	0.17
		2000	0.07	0.28	0	0.35
		2003	0.07	0.27	0	0.32
		2006	0.07	0.28	0	0.34
		2009	0.09	0.31	0	0.38
		2012	0.1	0.29	0	0.4
		2015	0.05	0.29	0	0.39
Lower middle-income	BOL, CIV, EGY, GHA, GTM, HND, IDN, IND, LKA, MAR, NGA, NIC, PAK, PHL, PRY, SEN, SLV, UKR, VNM	1997	0.08	0.06	0	0.11
		2000	0.06	0.11	0	0.24
		2003	0.05	0.14	0	0.26
		2006	0.05	0.14	0	0.29
		2009	0.05	0.23	0	0.39
		2012	0.01	0.25	0.06	0.39
		2015	0.01	0.28	0.06	0.45
Low-income	AFG, BEN, BFA, GIN, GMB, KHM, MDG, MLI, MWI, NER, NPL, RWA, TGO, TZA	1997	0	0.05	0	0.22
		2000	0	0.20	0	0.36
		2003	0.10	0.29	0	0.5
		2006	0.14	0.28	0	0.61
		2009	0.12	0.24	0	0.53
		2012	0.09	0.37	0	0.57
		2015	0.07	0.43	0	0.52

Data Source: World Integrated Trade Solution database (hereafter, WITS) (2016, June)

As is shown in Table 1, quantity control and technical measures are largely applied in high-income OECD countries. The incidence for the two measures rose from 1997 (the frequency index is 0.05 and 0.27 respectively) to 2015 (the frequency index is 0.52 and 0.69). The incidence of these measures significantly increased after 2009, suggesting that many OECD countries turned to more protective trade policies after the financial crisis. The high-income non-OECD countries also showed a similar trend. Compared with other income groups, the high-income countries are more likely to apply technical measures.

For upper middle-income countries, technical measures are the most important and most used form of NTM, followed by quantity control measures and price control measures. Price

control measures are more influential than in high-income countries. The incidence of the four types of core NTMs generally increased from 1997 to 2012, and slightly declined in 2015.

In lower middle-income countries, technical measures were the most important NTMs and the coverage was increasing over time to nearly half of the imported products in 2015. The incidence of quantity control measures continued to decrease, while price control measures became less frequently applied. For low-income countries, the incidence of core NTMs, namely price control measures, quantity control measures or technical measures also increased over time.

Table 2 reports the coverage of different types of NTMs for different sectors and industries for our sample of countries for the whole period. Sectors are divided according to the HS code at the 2-digit level. Generally, the frequency or incidence of core NTMs was greater for agricultural products than for manufacturing goods. Whether the estimated AVEs of NTM for agricultural products are higher on average than for manufacturing products depends on the extent to which imports are restricted by NTMs in the two sectors.

The use of different types of NTMs varies across industries. For agricultural products, technical measures are most frequently applied. This is consistent with expectations, as some technical measures such as sanitary and phytosanitary measures are targeted in particular at agricultural products. About 60% of the agricultural products were affected by technical measures, while quantity control measures covered 45% of products. Price control measures such as antidumping measures and countervailing measures affected 7% of agricultural products.

Table 2: Frequency index of different types of NTMs across economic sectors (1997-2015)

Industry name	Price control	Quantity control	Monopolistic measures	Technical measures
(1)	**(2)**	**(3)**	**(4)**	**(5)**
Agricultural product (HS0 industry 1-24)				
Live animals(1-5)	0.06	0.51	0	0.6
Vegetable products(6-14)	0.06	0.5	0.01	0.61
Fats and oils(15)	0.08	0.38	0.01	0.54
Prepared Foodstuffs(16-24)	0.06	0.41	0.01	0.59
Agricultural Mean	0.07	0.45	0.0075	0.59

Manufacturing product (HS0 industry 25-97)				
Mineral Products(25-27)	0.04	0.2	0.02	0.24
Chemical Products(28-38)	0.05	0.32	0.01	0.38
Rubber and plastics(39-40)	0.05	0.18	0.01	0.31
Raw hide and skins(41-43)	0.04	0.27	0	0.37
Wood(44-46)	0.06	0.25	0	0.37
Paper(47-49)	0.05	0.12	0	0.23
Textile(50-63)	0.05	0.18	0.01	0.37
Footwear(64-67)	0.04	0.21	0	0.36
Stone and Cement(68-70)	0.05	0.16	0	0.29
Base Metals(71-83)	0.05	0.2	0	0.31
Machinery and Electrical equipment(84-85)	0.04	0.25	0.01	0.39
Motor vehicles(86-89)	0.04	0.27	0.02	0.41
Optical and medical instruments(90-92)	0.05	0.25	0.01	0.34
Miscellaneous goods(93-97)	0.05	0.18	0	0.29
Manufacturing Mean	0.05	0.22	0.01	0.33

Note: The numbers in brackets in column 1 are the coding for products at 2-digit level in HS1988/92 classification Numbers in Column 2-5 are frequency indices calculated based on equation 13. The subscription j in the equation refers to sector j in this calculation. Therefore, the number measures the probability of the sector affected by certain type of NTM. It should also lie between 0 and 1 and the higher it is, the larger proportion of products in this sector are affected by NTMs.

For manufacturing products, the distribution differs substantially. For some industries, the incidence of NTMs was quite intensive, such as Chemical products (industry 28-38), Machinery and Electrical equipment (industry 84-85), Motor vehicles (industry 86-89), technical measures cover about 40% of the import of these products and quantity control measures influence about 30% of these products. Some industries such as paper (Industry 47-49) are less likely to be affected by NTMs in general. Less than 25 % of products in these industries are affected by the technical measures, price control measures and quantity control measures.

4. Estimation Results

5009 × 6 sets of regressions based on specification (3) were run to estimate the tariff equivalent of core NTMs for 5009 imported products of 97 countries (28 EU countries are estimated separately) between 1997 and 2015. The average R^2s of these regressions was 0.46, with a

median of 0.43 and maximum of 0.99. Less than 1% of the adjusted R^2s had a negative sign. Therefore, the fit of these regressions was generally quite satisfactory.

Next, we estimate the AVEs of NTMs, using equation (4), across different dimensions. This enables us to compare the AVEs of NTMs with tariffs and overall protection, to assess the evolution of these measures over time.

Table 3: Average AVE estimates, Tariffs and Overall Protection

			Simple average			Import-weighted average		
Year (1)	Observations (2)	Country (3)	AVE (4)	Tariff (5)	Overall （6）	AVE (7)	Tariff (8)	Overall (9)
1997	128,459	37	0.20	0.12	0.32	0.22	0.10	0.31
			（0.60）	(0.26)	(0.66)	(0.10)	(0.05)	(0.11)
2000	150,905	46	0.38	0.12	0.50	0.29	0.10	0.38
			(0.77)	(0.14)	(0.79)	(0.12)	(0.07)	(0.13)
2003	317,949	83	0.27	0.08	0.35	0.32	0.11	0.43
			(0.64)	(0.21)	(0.68)	(0.26)	(0.10)	(0.26)
2006	338,830	88	0.22	0.06	0.28	0.25	0.10	0.34
			(0.64)	(0.15)	(0.66)	(0.21)	(0.10)	(0.20)
2009	342,824	92	0.52	0.05	0.57	0.51	0.08	0.58
			(0.85)	(0.15)	(0.87)	(0.24)	(0.08)	(0.23)
2012	346,694	95	0.33	0.05	0.38	0.34	0.04	0.38
			(0.71)	(0.14)	(0.73)	(0.20)	(0.03)	(0.21)
2015	332,616	92	0.57	0.05	0.62	0.51	0.04	0.54
			(0.95)	(0.14)	(0.96)	(0.24)	(0.03)	(0.25)

Note: Standard errors in parentheses

Table 3 summarizes the average estimated AVEs of NTMs and provides a comparison with the corresponding average tariff and overall protection levels for products and countries over our sample period. A comparison of columns 4-5 identifies that the average AVE of NTMs is markedly higher than the average tariff throughout the period. Tariff rates are broadly decreasing over time, with the unweighted average tariff rate falling from 12% in 1997 to 5% in 2015. By contrast, the average AVE of NTM protection was 20% in 1997, and rose (with some fluctuation over time) to 57% in 2015. Therefore, NTMs were already a more important source of protection than tariffs at the start of our sample period, and became even more important sources of trade

protection over this period. When weighted by the import volume (columns 7-8), the relative magnitudes of the AVEs and tariff vary slightly, but the conclusion about the relative importance of NTMs and tariffs in overall protection is unaltered. We can conclude from Table 3 that on average the trade barrier due to NTMs was much higher than that induced by tariffs. This echoes Kee et al.'s (2009) finding on the dominance of NTMs relative to tariffs in their estimation at one time point, but we further show that this has increased over time.

A similar conclusion about the relative importance of the two trade policy tools can be drawn from an inspection of tariffs and the AVE of NTMs at the product level. Table A.2 summarizes the percentage of product lines for each year and the full sample of countries where the tariff is greater, smaller or equal to the AVE of the core NTMs. At the start of the period, i.e. 1997, the tariff was higher than the AVE in just under 44% of product lines. By the end of the period (2015), however, this was true for only about 27% of products, with by then nearly two thirds of products being subject to higher NTM than tariff protection.

Appendix Table A1 sets out the average AVE of NTMs for each country, expressed in coefficient form, for the years for which information was available and allowed estimation. Over the period of 1997 to 2015, the average AVE of NTMs for most countries was increasing in general, though there is variation across countries. Some high income countries such as Japan, Australia and New Zealand are identified as consistently 'low protection' countries. Countries with the highest AVEs of NTM are Morocco, Burkina Faso, Argentina, China, Mali, Niger and Nigeria. All of these are low-income countries. Interestingly, however, there was a marked increase in average AVEs towards the end of the sample period for a significant number of both low and high income countries. This would appear to correspond with the post-financial crisis and the downturn in world trade.

Table 4 reports the distribution of the AVEs of NTMs for different sectors. The AVEs are generally higher for agricultural products than for manufacturing products. Generally, there was an increase in the AVEs for most sectors over the period of 1997 to 2009, though the increase is most evident in manufacturing. Protection from NTMs is shown to be consistently high within the agricultural sector, but to be much more variable across industries in the manufacturing

sector. By the end of the period, textiles, footwear, rubber & plastics, optical & medical instruments, machinery and electrical equipment are the most NTM-protected products in the manufacturing sector.

Table 4: Average AVEs of NTM for Product Groups
(Expressed in coefficient form for a balanced sample of countries, 1997-2015)

		Simple Average AVEs of NTMs in each year						
Industry	**Industry name**	**1997**	**2000**	**2003**	**2006**	**2009**	**2012**	**2015**
1-5	Live animals; Animal products	0.53	0.85	0.50	0.37	0.55	0.51	0.43
6-14	Vegetable products	0.43	0.66	0.59	0.63	0.79	0.40	0.55
15	Fats and oils	0.46	0.52	0.65	0.45	0.92	0.36	0.46
16-24	Prepared Foodstuffs	0.48	0.84	0.84	0.78	1.14	0.48	0.75
Agricultural product (1-24)		**0.48**	**0.72**	**0.65**	**0.56**	**0.85**	**0.44**	**0.55**
25-27	Mineral Products	0.20	0.24	0.36	0.29	0.43	0.37	0.51
28-38	Chemical Products	0.20	0.35	0.43	0.38	0.70	0.31	0.45
40	Rubber and plastics	0.21	0.27	0.26	0.22	0.31	0.25	0.68
41-43	Raw hide and skins	0.17	0.55	0.37	0.42	0.35	0.31	0.47
44-46	Wood	0.32	0.39	0.28	0.33	0.21	0.26	0.37
47-49	Paper	0.12	0.25	0.17	0.30	0.26	0.23	0.56
50-63	Textile	0.17	0.40	0.34	0.32	0.36	0.42	0.61
64-67	Footwear	0.15	0.37	0.39	0.59	0.75	0.58	0.60
68-70	Stone and Cement	0.12	0.25	0.33	0.22	0.31	0.27	0.39
72-83	Base Metals	0.14	0.30	0.39	0.28	0.40	0.35	0.47
84-85	Machinery and Electrical equipment	0.15	0.37	0.46	0.21	0.50	0.34	0.61
86-89	Motor vehicles	0.26	0.42	0.44	0.61	0.53	0.51	0.53
90-92	Optical and medical instruments	0.27	0.47	0.41	0.53	0.56	0.46	0.74
94-96	Miscellaneous goods	0.18	0.47	0.45	0.50	0.63	0.51	0.54
Manufacturing product (25-96)		**0.19**	**0.36**	**0.36**	**0.37**	**0.45**	**0.37**	**0.54**

Note: 1) To rule out the possible difference caused by different sample size, this summary only considers country-products with available NTM data for the whole period. Products in some country with missing AVEs of NTMs for some of the 7 panels are not considered. Therefore, there are same number of available AVEs of NTMs for each panel year; 2) The sectors are divided with the same criterion as in Table 2; 3) All the numbers are approximated to two decimal places.

The evolution of AVEs of NTMs, tariffs and overall protection can also be explored with the present results across countries, and in different regions and different income groups, as shown in Figure 2.

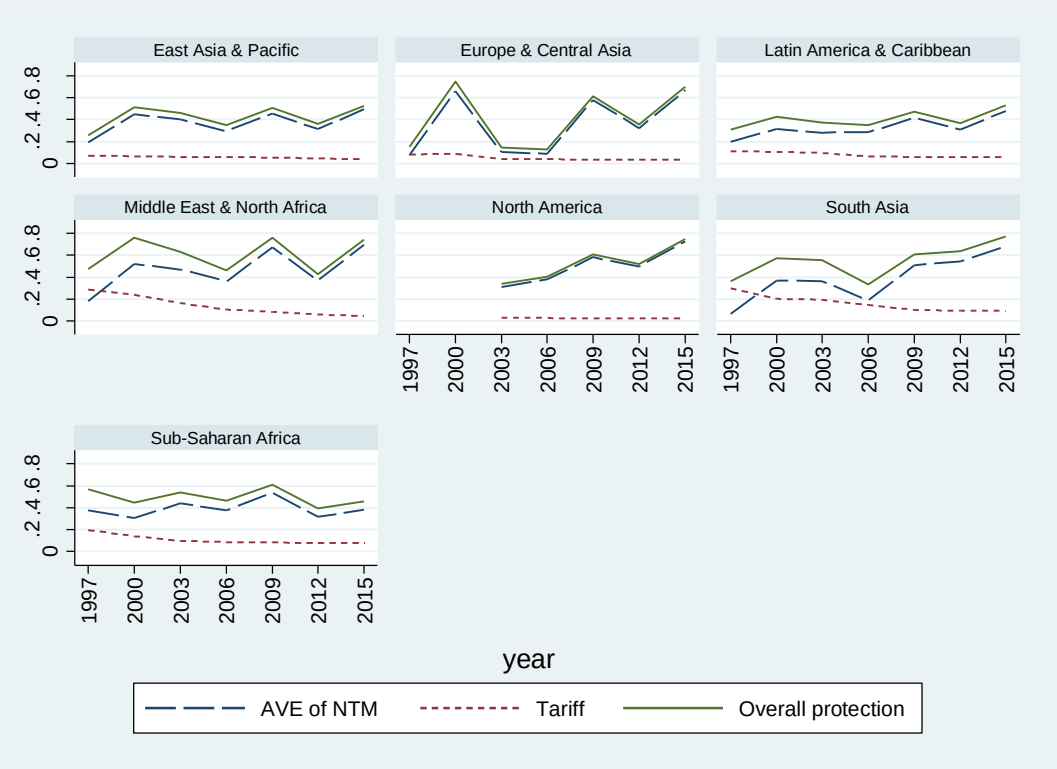


Figure 2: Evolution of tariff, AVE of NTM and overall protection by region (1997-2015)

A consistent picture is evident across all the regions; namely one of stable levels or modest declines in average tariff levels, combined with much higher levels of overall protection resulting from much higher levels of NTM than tariff protection. Indeed, the evolution of overall protection in all regions is predominantly driven by changes in NTM protection. Except for Sub-Saharan Africa, overall protection is higher in all regions by the end of the period than at the beginning, and substantially so in the case of some regions (e.g. North America and South Asia). Indeed, in the case of North America, the AVEs of NTMs and overall trade protection rose consistently after 2003. In most regions, other than North America (for which the data starts in 2003), the AVEs of NTMs tended to increase before 2003. The clear exemption to this is the Europe and Central Asia region for which a sharp fall in NTM protection is identified between 2000 and 2003. This may be due to the ending of the Multi-Fiber Agreement (MFA), and the elimination of the quantity restrictions on textiles imports from developing countries by the

developed countries. However, after 2006, NTM protection and overall trade protection rose again sharply across all regions. The estimates seem to be capturing the effects of the more protectionist trade policies adopted globally following the 2008 financial crisis. By 2012, we identify some reversal in this more protectionist stance, though NTM and overall protection generally increased again after 2012.

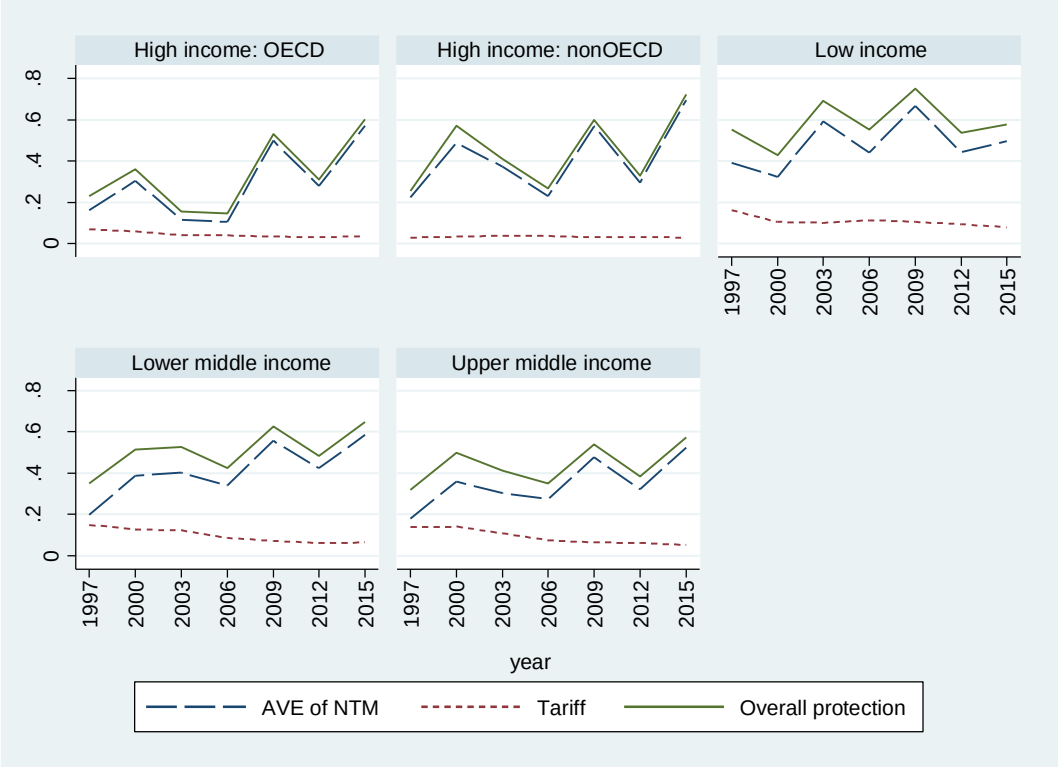


Figure 3: Evolution of tariff, AVE of NTM and overall protection by income group (1997-2015)

Figure 3 depicts the evolution of tariffs, AVEs of NTMs and overall protection using a classification of countries based on income groupings. The average tariff for high income countries is significantly lower than in the case of middle and low income countries, but the difference in overall protection between higher and lower income countries declined markedly over the period as protection from NTMs rose more sharply in high income countries (especially

the OECD countries and after 2006). Average levels of overall protection in 2015 are identified by this study to be at a tariff-equivalent of about 60% in both OECD and low income countries. Having changed relatively little over the period in the low income countries but risen sharply, from a little over 20% at the start of the period, in the case of the OECD countries. Clearly the evolution of tariffs fails completely to reflect the changing stance of trade policy in this period.

Appendix Table A3 provides the average AVEs estimates for a comparable set of countries covered by Kee et al. (2009) in their study (i.e., re-estimated here) and this present study, for estimation surrounding 2002 in the former and 2003 in the latter. There are some similarities between the two sets of results. The relative importance of NTMs and tariffs as sources of protection is a feature of both studies; NTM dominating tariff protection. This is evident from the average AVEs and tariff levels in both studies. Further, more than half of the product lines subject to core NTMs are identified as being more restricted by NTMs than tariffs in both studies. In addition, the most protected industries (or imports competing with products produced by these industries subject to most restriction) are identified to be similar in both studies. It is also the case that the individual countries with the highest level of NTM protection are identified by both studies to be generally low-income countries.

However, there are also some differences in the average levels of NTM protection across countries in the two studies, despite the common estimation method. It is evident from Table A3 that average AVEs are generally higher for the comparable sample than the present study; only for 24 countries is the average AVE higher in the present study, while it is lower in the case of 54 countries. The simple average AVE across the common set of 82 countries is 29.5% in the current study and 42.7% for Kee et al. (2009). These differences may stem from the different datasets used, and the comparison is based on simple averages. Notwithstanding this, both studies reveal the dominance of NTMs relative to tariffs and NTMs importance in determining overall protection levels.

5. Conclusions

This paper sets out to measure the tariff equivalents of NTMs over the period 1997 to 2015. Unlike previous studies, these measures are grounded in trade theory and allows direct comparison with tariffs. This is achieved by grounding our analysis on Kee et al.'s (2009) estimation of AVEs, but extend their static framework by adding a time dimension. This enables us to explore the evolution of NTMs over time, which is left unaddressed by their work. In particular, we address the questions of how the AVEs of NTMs and the overall trade protection level changed during this period, especially in light of the gradual tariff reductions over the recent decades and also surrounding the recent 2008 financial crisis. This is achieved by adopting a newly assembled database for NTMs, namely UNCAD-MAST, using a consistent classification of NTMs and consistent estimation method.

A descriptive analysis of the NTMs from this data indicates that the overall incidence of the core NTMs, namely price controls, quantity restrictions, monopolistic measures and technical measures *increased* from 1997 up to 2015. The most widely applied NTMs each year were technical measures, followed by quantity restrictions, price control and monopolistic measures.

The regression analysis derived estimates of AVEs of NTMs, which are compared to tariff measures. NTMs are revealed to be the more dominant trade barrier, with their importance growing over the sample period. Thus, overall trade protection is in fact on the *rise*, despite the apparent, gradual trade liberalization associated with tariff reductions. Further, NTM and overall protection reached peaked in 2009, in the aftermath of the 2008 financial crisis. This is suggestive of a *rise* in protectionist tendencies after the 2008 financial crisis, contrary to earlier findings of no pervasive increase in protectionism (Kee et al., 2013).

The AVEs of NTMs vary significantly across countries and industries. The evolution of overall protection in all regions of the world is predominantly driven by changes in NTM protection, while tariff levels are stable or modestly falling over time. This is also reflected when countries are grouped along income lines. Though these non-tariff protectionist measures have fluctuated over time both for regional and income groupings, there has been a tendency towards an increase in recent years. The level of AVEs of NTMs on manufacturing products is generally

lower than on agricultural products, but there is an evident *increase* over time in NTM barriers in manufacturing trade.

References

Aisbett, E. and L. M. Pearson (2013). 'Environmental and health protections, or new protectionism? Determinants of SPS notifications by WTO members', *Crawford School Research Paper* (12-13).

Anderson, J. E. and J. P. Neary (1994). 'Measuring the restrictiveness of trade policy', *World Bank Economic Review*, 8(2), 151-169.

Anderson, J. E. and J. P. Neary (1996). 'A new approach to evaluating trade policy', *Review of Economic Studies*, 63(1), pp. 107-125.

Balassa, B. (1965). 'Tariff protection in industrial countries: an evaluation', *Journal of Political Economy*, 73, 573-594.

Baldwin, R. E. (1991). 'Measuring nontariff trade policies', in (Jaime De Melo and André Sapir Eds.), *Trade Theory and Economic Reform*, Oxford: Basil Blackwell.

Bora, B. K., A. Kuwahara and S. Laird (2002). *Quantification on Non-tariff Measures*, Geneva: United Nations Publication.

Bowen, H. P., A. Hollander and J-M Viaene (2016). *Applied International Trade, 2nd edition*. Hampshire: Palgrave Macmillan.

Bradford, S. (2003). 'Paying the price: final goods protection in OECD countries', *Review of Economics and Statistics*, 85(1), 24-37.

Corden, W. M. (1966). 'The structure of a tariff system and the effective protective rate', *Journal of Political Economy*, 74(3), 221-237.

Dean, J. M., J. E. Signoret, R. M. Feinberg, R. D. Ludema and M. J. Ferrantino (2009). 'Estimating the price effects of non-tariff barriers', *BE Journal of Economic Analysis & Policy*, 9(1), 1935-1682.

Deardorff, A. V. and R. M. Stern (1998). *Measurement of Nontariff Barriers*. Ann Harbor: University of Michigan Press.

Disdier, A-C. and S. Marette (2010). 'The combination of gravity and welfare approaches for evaluating nontariff measures', *American Journal of Agricultural Economics*, 92(3), 713-726.

Ferrantino, M. (2006). *Quantifying the Trade and Economic Effects of Non-tariff Measures*. OECD Publishing.

Ganslandt, M. and J. R. Markusen (2001). 'Standards and related regulations in international trade: A modeling approach', in (Keith E. Maskus and John S. Wilson Eds.), *Quantifying the Impact of Technical Barriers to Trade: Can It Be Done?*, Ann Harbor: University of Michigan Press.

Hoekman, B., F. Ng and M. Olarreaga (2004). 'Agricultural tariffs or subsidies: which are more important for developing economies?', *World Bank Economic Review*, vol. 18(2), pp. 175-204.

Kee, H. L., C. Neagu and A. Nicita (2013). 'Is protectionism on the rise? Assessing national trade policies during the crisis of 2008', *Review of Economics and Statistics*, 95(1), 342-346.

Kee, H. L., A. Nicita and M. Olarreaga (2008). 'Import demand elasticities and trade distortions', *Review of Economics and Statistics*, 90(4), 666-682.

Kee, H. L., A. Nicita and M. Olarreaga (2009). 'Estimating trade restrictiveness indices', *Economic Journal*, 119(534), 172-199.

Leamer, E. E. (1988). 'Measures of openness', *Trade Policy Issues and Empirical Analysis*, pp. 145-204, United States of America: University of Chicago Press.

Leamer, E. E. (1990). 'Latin America as a target of trade barriers erected by the major developed countries in 1983', *Journal of Development Economics*, 32(2), 337-368.

Lee, J-W. and P. Swagel (1997). 'Trade barriers and trade flows across countries and industries', *Review of Economics and Statistics*, 79(3), 372-382.

Nicita, A. and J. Gourdon (2013) *A Preliminary Analysis on Newly Collected Data on Non-tariff Measures* 1607-8291, New York and Geneva, UNCTAD.

Trefler, D. (1993). 'Trade liberalization and the theory of endogenous protection: an econometric study of US import policy', *Journal of Political Economy*, 101(1), 138-160.

UNCTAD (2010) *Non-Tariff Measures: Evidence from Selected Developing Countries and Future Research Agenda*, New York and Geneva.

WTO (2012) *World Trade Report 2012 - Trade and Public Policies: A Closer Look at Non-tariff Measures in the 21st Century*. World Trade Organization.

Appendix Tables

Table A1: Average AVEs of NTMs for each country year (1997-2015)

		Year						
Country	ISO3	1997	2000	2003	2006	2009	2012	2015
Afghanistan	AFG					0.61	0.68	0.57
Argentina	ARG	0.47	0.53	0.29	0.40	0.63	0.64	0.77
Australia	AUS			0.01	0.01	0.01	0.01	0.01
Austria	AUT			0.02	0.02	0.55	0.24	0.64
Belgium	BEL			0.02	0.02	0.55	0.23	0.63
Benin	BEN						0.66	0.84
Burkina Faso	BFA		0.61	0.85	0.60	0.78	0.56	0.82
Bulgaria	BGR					0.61	0.33	0.70
Bolivia	BOL	0.37	0.63	0.45	0.56	0.77	0.66	0.79
Brazil	BRA	0.39	0.44	0.30	0.41	0.59	0.68	0.76
Brunei Darussalam	BRN	0.07	0.51	0.61	0.42		0.29	0.66
Canada	CAN			0.35	0.39	0.59	0.39	0.72
Chile	CHL	0.31	0.58	0.44	0.36	0.59	0.35	0.76
China	CHN	0.38	0.62	0.71	0.46	0.64	0.61	0.75
Cote d'Ivoire	CIV	0.61	0.66	0.41	0.64	0.87	0.11	0.09
Colombia	COL	0.14	0.20	0.28	0.32	0.46	0.39	0.59
Cabo Verde	CPV				0.00	0.71	0.23	0.00
Costa Rica	CRI	0.07	0.13	0.19	0.17	0.28	0.12	0.22
Cuba	CUB		0.74	0.46	0.65			
Cyprus	CYP			0.73	0.45	0.70	0.34	0.72
Czech Republic	CZE			0.02	0.02	0.55	0.26	0.65
Germany	DEU			0.02	0.02	0.54	0.34	0.67
Denmark	DNK			0.02	0.02	0.59	0.27	0.66
Dominican Republic	DOM						0.00	0.00
Ecuador	ECU	0.15	0.23	0.42	0.37	0.62	0.45	0.68
Egypt, Arab Rep.	EGY	0.05	0.54	0.62	0.53	0.69	0.58	0.71
Spain	ESP			0.60	0.44	0.62	0.38	0.70
Estonia	EST			0.01	0.02	0.58	0.24	0.64
Finland	FIN			0.02	0.03	0.59	0.25	0.70
France	FRA			0.02	0.02	0.54	0.32	0.67
United Kingdom	GBR			0.02	0.02	0.56	0.41	0.67
Ghana	GHA		0.08	0.28	0.19	0.28	0.17	0.78
Guinea	GIN				0.64	0.95		

		Year						
Country	ISO3	1997	2000	2003	2006	2009	2012	2015
Gambia, The	GMB			0.63		0.76	0.16	0.17
Greece	GRC			0.02	0.03	0.58	0.43	0.70
Guatemala	GTM	0.10	0.14	0.23	0.15	0.29	0.17	0.21
Hong Kong SAR, China	HKG	0.43	0.59	0.67	0.38	0.63	0.24	0.69
Honduras	HND	0.08	0.17	0.30	0.16	0.27	0.13	0.19
Croatia	HRV						0.29	0.67
Hungary	HUN			0.02	0.02	0.56	0.32	0.65
Indonesia	IDN	0.06	0.44	0.58	0.43	0.58	0.39	0.65
India	IND	0.06	0.06	0.12	0.12	0.23	0.66	0.74
Ireland	IRL			0.02	0.02	0.58	0.33	0.66
Israel	ISR			0.52	0.42	0.68	0.30	0.68
Italy	ITA			0.07	0.10	0.55	0.37	0.67
Jamaica	JAM			0.00	0.00	0.00	0.00	
Japan	JPN	0.04	0.07	0.04	0.06	0.07	0.05	0.05
Kazakhstan	KAZ				0.15	0.23	0.29	0.34
Cambodia	KHM			0.49	0.32	0.94	0.80	0.96
Korea, Rep.	KOR			0.05	0.06	0.06	0.05	0.05
Lebanon	LBN	0.00	0.74	0.64	0.46	0.68	0.21	0.70
Sri Lanka	LKA		0.65	0.77	0.47	0.66	0.32	0.74
Lithuania	LTU			0.01	0.02	0.63	0.32	0.69
Luxembourg	LUX			0.02	0.02	0.66	0.23	0.70
Latvia	LVA			0.02	0.02	0.62	0.26	0.69
Morocco	MAR	0.39	0.76	0.80	0.50	0.72	0.36	0.72
Madagascar	MDG		0.33	0.43	0.35	0.46	0.43	0.25
Mexico	MEX	0.10	0.17	0.24	0.27	0.43	0.35	0.46
Mali	MLI	0.51	0.02	0.80	0.63	0.79	0.87	
Malta	MLT			0.11	0.12	0.66	0.31	0.00
Mauritius	MUS	0.15	0.37	0.48	0.27	0.46	0.15	0.21
Malawi	MWI	0.29	0.20	0.34	0.22	0.33	0.19	0.23
Malaysia	MYS	0.10	0.54	0.51	0.38	0.59	0.33	0.66
Niger	NER			0.65	0.66	0.80	0.62	0.82
Nigeria	NGA				0.57	0.77	0.88	0.80
Nicaragua	NIC	0.09	0.18	0.28	0.15	0.28	0.14	0.18
Netherlands	NLD			0.02	0.02	0.54	0.27	0.64
Nepal	NPL		0.56	0.85		0.73	0.49	0.77
New Zealand	NZL			0.01	0.01	0.01	0.01	0.01

		Year						
Country	ISO3	1997	2000	2003	2006	2009	2012	2015
Pakistan	PAK			0.01	0.01	0.50	0.59	0.55
Panama	PAN	0.09	0.16	0.30	0.28	0.43	0.26	0.00
Peru	PER	0.16	0.31	0.35	0.36	0.55	0.39	0.70
Philippines	PHL	0.42	0.52	0.67	0.54	0.70	0.65	0.76
Poland	POL			0.02	0.02	0.56	0.35	0.66
Portugal	PRT			0.54	0.41	0.62	0.36	0.67
Paraguay	PRY	0.31	0.62	0.55	0.51	0.75	0.70	0.78
Romania	ROM					0.59	0.33	0.70
Russian Federation	RUS				0.03	0.61	0.50	0.70
Rwanda	RWA	0.31	0.21	0.39	0.33	0.47	0.24	0.35
Senegal	SEN		0.61	0.80	0.55	0.75	0.50	0.81
Singapore	SGP	0.06	0.61	0.70	0.44	0.65	0.25	0.69
El Salvador	SLV	0.08	0.14	0.20	0.14	0.27	0.16	0.20
Slovak Republic	SVK				0.02	0.57	0.27	0.66
Slovenia	SVN			0.02	0.02	0.60	0.26	0.66
Sweden	SWE			0.02	0.02	0.57	0.25	0.65
Togo	TGO	0.38	0.55	0.74	0.60	0.80	0.11	0.12
Thailand	THA		0.19	0.29	0.21	0.62	0.41	0.73
Trinidad and Tobago	TTO		0.00	0.00	0.00	0.00	0.00	
Tunisia	TUN	0.04	0.07	0.10	0.11	0.60	0.36	0.72
Turkey	TUR	0.08	0.66	0.39	0.43	0.63	0.47	0.73
Tanzania	TZA					0.49	0.38	0.37
Ukraine	UKR			0.01	0.03	0.63	0.47	0.71
Uruguay	URY	0.40	0.60	0.45	0.46	0.69	0.39	0.82
United States	USA			0.27	0.37	0.57	0.61	0.74
Venezuela, RB	VEN	0.07	0.12	0.12	0.14	0.20	0.14	0.28
Vietnam	VNM				0.51	0.71	0.58	0.78
South Africa	ZAF			0.01	0.01	0.01	0.00	0.00

Table A2: Percentage of product line with tariff greater, equal to and smaller than AVEs of NTMs for products subject to core NTM, by year

Year	Tariff>NTM	Tariff=NTM	Tariff<NTM
1997	43.87%	4.65%	51.48%
2000	26.81%	3.16%	70.03%
2003	20.72%	2.06%	77.22%
2006	35.27%	6.58%	58.15%
2009	17.86%	1.69%	80.45%
2012	28.15%	5.17%	66.68%
2015	27.27%	6.31%	66.41%

Table A3: Comparison with Kee et al.'s (2009) estimates

ISO3	Year	Observations	Simple average of AVEs of NTM	
			Own estimates	Kee et al.'s estimates
ARG	2003	4,131	0.31	0.41
AUS	2003	4,631	0.00	0.45
AUT	2003	4,755	0.00	0.50
BEL	2003	4,788	0.88	0.47
BFA	2003	1,313	0.58	0.49
BOL	2003	2,796	0.29	0.46
BRA	2003	4,378	0.38	0.46
BRN	2003	3,870	0.26	0.35
CAN	2003	4,774	0.42	0.32
CHL	2003	3,934	0.53	0.38
CHN	2003	4,617	0.33	0.49
CIV	2003	2,317	0.26	0.36
COL	2003	4,126	0.54	0.38
CRI	2003	3,488	0.01	0.20
CUB	2003	3,447	0.01	0.47
CYP	2003	3,703	0.00	0.49
CZE	2003	4,651	0.50	0.44
DEU	2003	4,809	0.38	0.46
DNK	2003	4,725	0.00	0.33
ECU	2003	4,085	0.01	0.48
EGY	2003	3,646	0.00	0.52
ESP	2003	4,805	0.01	0.44
EST	2003	4,561	0.52	0.44
FIN	2003	4,650	0.00	0.56
FRA	2003	4,807	0.40	0.40
GBR	2003	4,798	0.52	0.33
GHA	2003	2,618	0.89	0.54
GMB	2003	1,564	0.01	0.33
GRC	2003	4,711	0.45	0.48
GTM	2003	3,951	0.14	0.42
HKG	2003	4,898	0.00	0.57
HND	2003	3,374	0.10	0.48
HUN	2003	4,317	0.04	0.39
IDN	2003	4,491	0.39	0.21
IND	2003	4,039	0.56	0.45
IRL	2003	4,670	0.84	0.34
ISR	2003	4,449	0.01	0.40
ITA	2003	4,807	0.01	0.44
JAM	2003	4,125	0.65	0.13
JPN	2003	4,791	0.02	0.48
KHM	2003	2,879	0.28	0.36

ISO3	Year	Observations	Simple average of AVEs of NTM	
			Own estimates	Kee et al.'s estimates
KOR	2003	4,627	0.82	0.52
LBN	2003	3,802	0.48	0.47
LKA	2003	3,494	0.73	0.53
LTU	2003	4,470	0.43	0.34
LUX	2003	3,653	0.70	0.50
LVA	2003	3,727	0.01	0.47
MAR	2003	3,696	0.00	0.40
MDG	2003	2,476	0.36	0.40
MEX	2003	4,570	0.54	0.41
MLI	2003	1,217	0.00	0.37
MLT	2003	3,406	0.37	0.52
MUS	2003	3,542	0.54	0.55
MWI	2003	1,951	1.02	0.65
MYS	2003	4,836	0.69	0.52
NER	2003	895	0.60	0.39
NIC	2003	3,503	0.14	0.47
NLD	2003	4,793	0.01	0.40
NPL	2003	1,841	0.01	0.44
NZL	2003	4,532	0.43	0.44
PAK	2003	3,751	0.00	0.41
PAN	2003	3,592	0.17	0.41
PER	2003	3,606	0.39	0.39
PHL	2003	4,086	0.01	0.45
POL	2003	4,287	0.42	0.45
PRT	2003	4,734	0.22	0.41
PRY	2003	2,749	0.21	0.36
RWA	2003	971	0.01	0.34
SEN	2003	2,128	0.80	0.52
SGP	2003	4,876	0.70	0.39
SLV	2003	4,049	0.20	0.47
SVN	2003	4,399	0.02	0.40
SWE	2003	4,716	0.02	0.44
THA	2003	4,349	0.29	0.44
TTO	2003	4,079	0.00	0.41
TUN	2003	3,712	0.10	0.41
TUR	2003	4,476	0.39	0.39
UKR	2003	3,958	0.01	0.45
URY	2003	3,151	0.45	0.45
USA	2003	4,757	0.27	0.41
VEN	2003	4,234	0.12	0.36
ZAF	2003	4,651	0.01	0.34