
Quantitative methods for assessing the effects of non-tariff measures and trade facilitation

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Draft introductory chapter

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Non-tariff measures are pervasive. In the area of merchandise trade, although tariffs have fallen worldwide, there has been no shortage of bureaucratic imagination in conceiving new non-tariff measures, or in turning existing regulatory instruments to protectionist ends. In the area of services trade, there is also a growing realisation that domestic regulatory regimes designed to address legitimate market failures may have incidental but unwarranted effects on services trade.

Non-tariff measures are difficult to quantify. Tariff levels are published in tariff schedules, and while these can be large, cumbersome and difficult to read, the numbers are there. Furthermore, they are there in an economically significant form. Tariff levels give the extent to which import prices have to rise, and if the domestic good and the import are perfect substitutes, they also give the extent to which the price of the domestic good can rise. By contrast, non-tariff measures are often regulatory, with no immediate ‘number’ attached that captures their economic significance.

Non-tariff measures are politically sensitive. To the extent that such measures may arise through the lobbying activity of vested interests, these interests benefit from a lack of scrutiny. Measures that are difficult to quantify may also be less transparent, which helps to avoid public discussion. When such measures do receive public attention, their direct impact on trade may be less clear to the public than for easily quantified measures such as tariffs. This makes it more likely that ideas such as

‘fairness’, ‘self-sufficiency’ or ‘legitimate cultural interests,’ which do not always have measurable counterparts, will take a relatively large role in the public discussion of such measures, while analysis of their economic effects takes a back seat.

The purpose of this volume is to bring together the ‘state of the art’ in quantifying non-tariff measures. The aim is to facilitate the hard economic analysis that will help to facilitate public understanding of the effects of these measures. One payoff will be that when costs and benefits are discussed, the interests of consumers as well as producers will be taken into account. Another payoff is that when the liberalisation of non-tariff measures is discussed in domestic or international forums, the discussion can focus on what is important, not just on what is easily measurable.

Most of the chapters of the book show how particular techniques can be used to analyse particular non-tariff barriers or trade facilitation measures. This material includes both results pertaining to the effects of public policies and analytical material. The final section of the book is devoted to ‘aids to methodology’, and contains more detailed material which goes in-depth into certain of the practical techniques involved in preparing quantitative analyses of trade policy and conveying them to policymakers.

The remainder of this chapter describes how the quantification chapters are organised. In the process, it gives some overall guidance as to which quantification techniques are likely to be fruitful for analysing which sorts of non-tariff or trade facilitation measures.

In his introductory chapter, **Bijit Bora** notes that the key analytical problem is (i) identifying non-tariff measures and (ii) developing a tractable taxonomy that allows for a coherent and robust analysis of their effects. His analytical conclusion is not optimistic — non-tariff measures cannot readily be defined, and existing taxonomies and databases are not helpful. Yet his policy prescription is both pragmatic and pertinent — focus on what is known, choose the appropriate response (eg lay down principles that encourage transparency and predictability, or ask for higher level obligations), and choose the appropriate forum (eg multilateral or otherwise).

The approach to selecting the policy content for this volume has been equally pragmatic. The selection has been based on available analysis of the non-tariff policy topics that are currently being negotiated in

multilateral and regional forums. The net has been cast widely, and the policy topics include:

- quantitative restrictions;
- trade facilitation;
- anti-dumping;
- rules of origin;
- services trade barriers;
- domestic regulatory regimes; and
- technical measures (eg standards).

The techniques used to analyse these non-tariff measure range from the descriptive to the highly analytical:

- data sources;
- frequency counts or coverage ratios;
- price gap measures;
- quantity measures (eg gravity model measures);
- partial equilibrium modelling;
- computable general equilibrium (CGE) modelling.

The geographical focus of the papers is generally, but not exclusively, on the Asia-Pacific region.

In many cases, the most time-intensive part of the analysis is simply obtaining the necessary qualitative information about the non-tariff barriers or trade facilitation measures that apply. However, there are several relatively comprehensive databases of qualitative information about non-tariff measures affecting both goods and services trade, including the National Trade Estimate Report on Foreign Trade Barriers, prepared annually by the Office of the U.S. Trade Representative, the European Union's Market Access Database, and the World Trade Organization's (WTO) Trade Policy Reviews. In part I, the paper by **Diane Manifold** and **William Donnelly** shows how this information can be harvested in a systematic manner into a single database, with a consistent classification of products and trade measures, for use in subsequent economic analysis. The resulting database contains information on formal government regulations (eg customs regulations, import licensing, quotas and prohibitions) and policies (eg investment-

related measures, services trade barriers), as well as informal barriers and practices (eg non-transparency, arbitrary enforcement, corruption). The resulting database is text-based, but can be interrogated to produce frequency counts of different types of measures affecting particular goods or services categories. In the section on methodological aids, **Robert Koopman** describes the key principles for successfully using this type of data and its subsequent analysis (including via modelling) to inform the policy-making process.

Also in the section on methodological aids, a related presentation by **Vlad Manole** describes the World Integrated Trade Solutions (WITS) software, developed by the World Bank. This software is a user-friendly way of accessing and combining four types of data on merchandise trade — import and export flows, applied tariffs, WTO tariff bindings, and some qualitative information in non-tariff barriers. These underlying data come from the Comtrade database on trade flows developed by the UN Statistics Division, the TRAINS database of trade flows, applied tariffs and non-tariff barriers developed by UNCTAD, the WTO's Integrated Database of applied tariffs and trade, and the WTO Consolidated Tariff Schedules, which contain tariff bindings. The non-tariff measures in the UNCTAD TRAINS database include price and quantity control measures (including export restraint arrangements), automatic licensing measures (including import monitoring), monopolistic measures (eg a single channel for imports) and technical measures (eg sanitary and phytosanitary measures, standards). The user must obtain access to the underlying databases independently, but the WITS software for accessing and interrogating the data can be downloaded without charge from <http://wits.worldbank.org>. The presentation shows in detail how to use the software.

Firm-level surveys are another way of obtaining raw qualitative information about non-tariff or trade facilitation measures. The paper by **Ronald Fischer** ably demonstrates some of the strengths and weaknesses of this approach. He surveyed the executives responsible for exports in a representative sample of 15 Chilean agricultural and manufacturing firms. He found that even though the executives had experienced non-tariff barriers, they were unable to compute the effect of those barriers in reducing the margins on their exports — indeed, they were barely able to do an ordinal comparison of the effects of non-tariff barriers in different countries. Nevertheless, the paper yielded some interesting policy insights. One was that administrative procedures are, from the point of

view of exporters, one of the most effective barriers to trade. Another is that Chilean exporters found Brazil significantly more protectionist than other Latin American countries, even though Chile is an associate member of Mercosur, a preferential trade area that includes Brazil. These findings suggest that trade facilitation may be even more important than reducing non-tariff barriers, from the perspective of merchandise exporters. They also demonstrate that a preferential trading agreement need not neutralise the non-tariff barriers imposed by a particular member.

Several papers use techniques to quantify the benefits of trade facilitation measures. The paper by **John Wilson, Catherine Mann and Tsunehiro Otsuki** looks at four different dimensions of trade facilitation — port efficiency (both water and air transport), the customs environment (prevalence of hidden import barriers and bribes), the regulatory environment (transparency and control of corruption), and what they call services sector infrastructure (Internet access and use). Index measures of these policy dimensions of trade facilitation were available from existing studies. The authors entered these index measures into a gravity model of bilateral merchandise trade flows between countries, in order to estimate econometrically the link between trade facilitation and trade flows, holding other factors constant. Consistent with a standard gravity model specification, key other factors were the sizes and per capita income levels of the exporting and importing countries, and the geographic distance between them. The authors also controlled for the effects of preferential trade arrangements, language similarity and adjacency. In a separate presentation, **Tsunehiro Otsuki** explains the methodology in more detail. The results suggest that a country can expand its exports significantly, not just from the trade facilitation efforts of its partner countries, but also from its own trade facilitation efforts. The paper elaborates on the WTO initiatives in place to further these trade facilitation efforts.

The paper by **Peter Walkenhorst and Tadashi Yasui** instead uses multiregional computable general equilibrium analysis to quantify the economy-wide gains in various regions from trade facilitation efforts in specific sectors. The authors undertake a wide-ranging and thorough review of the recent literature that reports measures of the size of trade transactions costs (TTCs) in different sectors. This review is of interest in its own right. The size of the estimates are not always linked explicitly to particular policy measures, as was the case in the previous paper. But the size of these overall estimates define the scope of potential trade facilitation efforts (ie they define the size of the shocks to the CGE

model). Importantly, the authors distinguish two kinds of effects. They argue that indirect trade transactions costs, such as longer border waiting times, are best thought of as resulting in a wasting away of the product being shipped (the so-called ‘iceberg’ representation of TTCs). But the direct transactions costs, such as form-filling, while being a cost to the exporter or importer, are a source of income for the form fillers. These costs are best modelled as being tax-like, a recognition that they have a large transfer component rather than a wastage component. The distinction is crucial, because costs that lead to wastage will have much larger economy-wide effects than costs with a large transfer component (a point that is also highly relevant to CGE modelling of services trade barriers). Accordingly, they argue that previous CGE results of the effects of trade facilitation may have been overstated. Their distinction also has direct implications for where policy priorities in trade facilitation should lie, namely, in reducing the indirect costs.

The difficulties of obtaining raw qualitative information about non-tariff measures are arguably more acute in services than in goods. The best single database of services trade measures is the WTO’s database of services trade commitments made by members under the General Agreement on Trade in Services (GATS). However, the GATS agreement takes a positive list approach to scheduling commitments, which means the database contains useful information about the trade barriers that member countries wish to retain only in those services sectors that the member countries chooses to list. Other services sectors may be rife with barriers, but if they are not listed, then there is no requirement for members to reveal information about them. The paper by **Philippa Dee** describes other useful sources of qualitative information about services trade barriers.

Services also differ from (at least some) goods in another important respect — services are typically highly differentiated, and there can be no presumption that the services produced by domestic firms are perfect substitutes, either for services traded cross-border (whether literally cross-border, or via the temporary movement of either the producer or the consumer to the territory of the other), or for services provided domestically by affiliates of foreign firms. Were these services perfect substitutes, price differences between them would reflect artificial barriers to trade. Because they are not perfect substitutes, the domestic-import price comparisons that are sometimes used in goods trade as overall measures of the effects of all trade barriers (tariff and otherwise) cannot

be used. Instead, the counterfactual — what the price of domestic services would be in the absence of trade barriers — needs to be constructed from an econometric model of what determines domestic prices. The paper by **Alan Deardorff** and **Robert Stern** shows theoretically what the challenges are in implementing this research strategy. The papers by **Philippa Dee** and **Duc Nguyen-Hong** show, in increasing detail, how the strategy has been implemented in practice. First, qualitative information about services trade barriers and associated domestic regulatory regimes is converted into a quantitative index of trade restrictiveness. Then a sector-specific partial equilibrium model of what determines price (or some other measure of domestic economic performance) is constructed, and used to estimate econometrically the effects that the index of trade restrictions or regulations has on performance, holding all other factors constant. In one sense, this is a generalisation, for a single services sector, of the gravity model approach to quantifying trade impacts for the economy as a whole. The paper by Dee also discusses the extent to which such econometric work can yield information about whether the services trade barriers or regulatory measures create rents (with associated transfers from consumers to producers) or add to real resource costs. This is a similar issue to whether trade transactions costs are transfers or wastage.

As noted, services may be traded in a number of ways, one of which is via the services supplier moving temporarily to the territory of the consumer. This mode of services trade poses particular policy challenges, because of its relationship with domestic immigration and employment policies — policies that have traditionally been seen as the sole prerogative of domestic governments, and not the subject of trade negotiation. Yet many in the developing world are convinced that there would be significant ‘gains from trade’ to be had by the temporary movement of either skilled personnel (eg computer programmers) or unskilled personnel (eg agricultural workers, construction workers or maids) from developing to developed countries. The paper by **Soumodip Sarkar** describes the main barriers affecting such trade. These include Economic Needs Tests and labour certification tests, as well as requirements for visas and work permits. The paper employs back-of-the-envelope calculations using estimates of current wage differentials to quantify the gains from an expansion in the temporary movement of workers in the ICT industry. Critical to the estimated size and distribution of such gains is the assumptions made about the productivity levels of the workers before and after they move, and the remittances they make while they are away. In

Sarkar's paper, the gains from a relatively small expansion in such trade are very large.

Several papers use techniques to quantify the effects of import or export quotas. The paper by **Ronald Babula, Suchada Langley, Agapi Somwaru** and **Shiva Makki** examines the effects of a wheat import quota (similar to that applied to imports of certain Canadian wheat into the United States during the year ending 11 September 1995) on the US markets for wheat and wheat products. The authors note that while structural partial equilibrium models are well-equipped to compare the static equilibria before and after a shock, they are not well-equipped to address the speed or direction of the dynamic path from one to the other. Vector autoregression (VAR) methods involve econometrically estimating a reduced form system with a rich dynamic specification. While this does not give direct estimates of the structural supply and demand elasticities that determine the way that shocks are passed down the production chain, it does give a clear picture of the resulting dynamic adjustment. A drawback of traditional VAR methods is that, while they allow for a rich lag structure, they do not allow for contemporaneous correlation among the endogenous variables. The authors combine Bernanke's structural VAR approach, which uses prior notions of causality to impose structure on the contemporaneous correlations, with directed acyclic graph (DAG) analysis, which is a statistical way of choosing among competing alternatives. After estimating the resulting system, the authors find that each percent decline in the quantity of wheat would elicit a 0.7 per cent rise in the wheat price and a 0.3 per cent rise in the flour price, without having much effect on the markets for bread, cookies, mixes or cereals further downstream.

By contrast, the paper by **Joseph Francois** and **Dean Spinanger** takes a structural approach to evaluating the effects of the export quotas on textile and clothing trade that are currently in place under the Agreement on Textiles and Clothing (ATC, the successor to the MultiFibre Arrangement). Beginning with a standard import demand system, and using bilateral trade data on textile and clothing trade, underlying tariffs, and quota coverage under the ATC, the authors develop non-linear least squares estimates of the tax equivalents of ATC quota restrictions on bilateral trade. They compare these estimates to earlier estimates for the years since the inception of the ATC, to gauge the extent to which the ATC has actually led to quota liberalization.

Three papers provide quite different examples of the use of price comparison techniques for quantifying the effects of non-tariff measures. **Mitsuyo Ando** estimates the tariff equivalents of both core and non-core non-tariff measures using price differentials between the CIF price of imported goods and the domestic producer price of the domestic substitute at the 4 digit level. This contrasts with other approaches that make comparisons at other points in the distribution chain (eg comparing the domestic retail price with an overseas reference price of the same good). Core non-tariff measures are price and quantity control measures, and non-core measures are automatic licensing measures, monopolistic measures and technical measures (based on the UNCTAD classification system). The authors use the price comparisons (net of tariff levels) to estimate overall tariff equivalents of both types of non-tariff measures across a range of commodities and countries. They then econometrically estimate a relationship between these overall tariff equivalents and by-type frequency ratios (with other control variables), and use this estimated relationship to decompose the overall tariff-equivalents into price effects by type of measure. The authors find that both core and non-core measures afford some degree of protection. In particular, developed countries with low general tariffs, or with low preferential tariffs under a number of free trade agreements, tend to use non-core measures significantly to protect domestic producers.

Judith Dean, Robert Feinberg, Michael Ferrantino and Rodney Ludema examine NTMs using city-level retail price data. Thus, their price comparisons take place at a later point in the distribution chain than those in Ando's paper. In their theoretical discussion, these retail prices are considered to be composites of the prices of imported and domestically produced goods. Further, the prices include distribution costs (e.g. wholesale and retail margins) and transport costs. A number of simplifying assumptions permit the theoretical model to be estimated using the available data. The model is estimated using a vector of city-specific characteristics that are expected to influence markups, exploiting the fact that markup activities involve labor-intensive services whose price characteristics across countries can be measured. Additional variables include measures of distance (to proxy transport costs), tariffs, country-specific dummy variables to control for the presence of non-tariff measures, and product-specific dummy variables to control for unobservable product-specific effects. The method yields estimates of the tariff-equivalents of non-tariff measures which vary across sectors and regions.

Finally, **Jungho Yoo** shows how price comparisons can be used to calculate nominal and effective rates of protection afforded by tariffs and non-tariff barriers together. The paper gives a good outline of these concepts. The nominal rate of protection is essentially the same as a tariff-equivalent. The effective rate recognises that the protection afforded a domestic industry by a tariff or non-tariff barrier on its output can be eroded by tariffs or non-tariff barriers on its inputs, and corrects the measure of protection accordingly. The author describes a major initiative undertaken within the Korean bureaucracy to estimate nominal and effective rates in a way that captured both tariffs and non-tariff barriers. It involved a survey of producers in 6,547 establishments about the domestic and border prices of 766 products (defined at the 8 digit level) in the mining and manufacturing sectors. Producers were asked to pick three specifications of a product they produced and to supply both the domestic price (before indirect taxes) and a border price (a c.i.f. price for import-competing goods, or an f.o.b. price for export goods). The author reports that the effective rates of protection were found to differ widely across industries, and for some they were negative. The author wonders whether the large protective tax in place at the time was worth the resulting incentive structure, which could have been far from what was intended. The paper demonstrates how a research program can be organised to undertake a comprehensive quantification of tariffs and non-tariff barriers, with major implications for the transparency of domestic policy-making.

The paper by **Antoni Estevadeordal** and **Kati Souminen** addresses an issue that is of increasing importance as preferential trading arrangements proliferate. Rules of origin (RoOs) establish criteria by which a commodity will be treated as ‘originating’ within the area, and hence eligible for preferential treatment (though RoOs are also required to establish origin in non-preferential trade). If no preferential RoOs were established, there would be an incentive to bring commodities into the area through the country with the lowest external tariff, and then transship them duty-free to other parties as ‘originating’ products. Preferential RoOs are designed to prevent such trade deflection. If the criteria to be ‘originating’ are set very tightly, a substantial amount of content from within the area may be required before a product qualifies as ‘originating’. This may diminish the trade-enhancing effect of the preferential treatment. It may also distort input choices away from third parties in order to ensure compliance with the rules of origin. Finally, the combination of effects may distort foreign direct investment choices. The paper does not go as far as quantifying these trade- and investment-distorting effects. But it

gives a comprehensive discussion of the issues, describes the different RoOs now in common use, and identifies which characteristics of them are likely to reduce their distorting effects. The authors demonstrate that the extent of distortion does not necessarily follow from the complexity or simplicity of the measures. Further, there are important interactions — despite the apparent convergence towards a few ostensibly similar models for preferential RoOs, even slight differences between them can have important implications for firms' outsourcing and investment decisions, and potentially lead to the rise of exclusive trade- and investment-distorting hubs. The authors argue that the current Doha Round of WTO multilateral negotiations presents a timely opportunity to attack the problems, eg through harmonisation of non-preferential RoOs, and commitments to harmonise non-preferential RoOs.

The paper by **Tianshu Chu** and **Thomas Prusa** documents the rise of another form of non-tariff protection, through anti-dumping action. The paper notes that the number of anti-dumping cases targeting China's exports is high both in absolute terms and relative to the value of China's exports, that the cases cover a wide range of sectors, and that many of these cases are associated with high levels of duty. The paper analyses some of the institutional characteristics of these cases. A simple econometric analysis suggests an association between anti-dumping cases filed on Chinese exports and inward FDI flows into China.

The final three papers are CGE studies that use as inputs some of the available estimates of the direct, first round impact of non-tariff measures on prices or other aspects of performance, and quantify the flow-on effects and overall implications for the economic well-being of producers, consumers, and economies as a whole. **Scott Bradford** uses price gap measures as his overall measure of the height of tariff and non-tariff barriers on OECD economies. The discussion in this section of the paper complements that in the above papers on price gaps measures. The work that Bradford draws on uses retail price data, along with direct data on distribution margins, transport costs and indirect taxes from input-output sources, and uses a level of product classification where perfect substitution is more likely to be a reasonable assumption, in order to generate estimates of overall price gaps between goods in different countries. Finally, it corrects for the effects of tariffs in order to have a measure of the tariff equivalent of non-tariff barriers. Bradford concludes this section with a discussion of the strengths and weaknesses of the resulting estimates, a comparison with other studies, and a discussion of

the trade policies that are likely to lie behind the price gaps. Finally, Bradford reports on the welfare results from eliminating non-tariff barriers in a CGE model that allows for increasing returns to scale and dynamic adjustment of the capital stock. Bradford assumes that all non-tariff barriers are tax-like, rather than creating waste or adding to the real resource cost of doing business. Accordingly, he treats them in the same way as tariffs. He considers their removal on a unilateral, multilateral and preferential basis. He finds that in most cases, the extra gains from removing non-tariff barriers would outweigh the gains from tariff removal, so that the total gains from including non-tariff barriers are generally more than twice the gains from just removing tariffs. Removing non-tariff barriers generally also bestows significant extra gains on trading partners. Bradford concedes that complete opening may not be an option politically, particularly given the negative impact on the owners of fixed factors (land and natural resources). The analysis is not a recipe for reform, but does show the potential gains from deeper integration.

While Bradford's paper focuses on non-tariff barriers to goods trade, the paper by **Thomas Hertel, Terrie Walmsley and Ken Itakura** examines some of the 'new age' issues outside of the goods area that were being considered for a preferential trade agreement between Japan and Singapore. The first such element they model is customs automization. They find estimates of the saving in direct costs of reduced paperwork, storage and transit expenses, along with the saving in indirect time costs. A second element is security and harmonisation measures designed to make e-commerce between the two countries safe and acceptable to consumers. They find estimates of the corresponding reductions in wholesale-retail margins from greater penetration of e-commerce. A final element is liberalisation of services trade. They use available estimates of the tariff-equivalent of services trade barriers for business and construction services. Note that, in contrast to the previous paper, all these measures are treated as creating waste and adding to real resource costs, rather than as being tax-like. The authors quantify the welfare effects of these measures, along with conventional preferential tariff cuts, using a dynamic CGE model with capital accumulation and international capital mobility. Not surprisingly, given their treatment of non-tariff measures, they find significant gains from liberalisation. They also find that the e-commerce and customs automization initiatives do not produce trade diversion in the same way as the preferential tariff cuts do (this is likely also to be a result of their treating the new age measures as reducing

waste). Their paper is one of the first CGE studies to tackle these new age issues.

The final paper by **Soamiely Andriamananjara**, **Michael Ferrantino** and **Marinos Tsigas** uses new estimates of the price gaps created by non-tariff measures on merchandise trade, obtained using the procedures documented in the earlier paper by Dean, Feinberg, Ferrantino and Ludema. The authors use these estimates in a conventional multiregional CGE model to quantify the global welfare effects from liberalising the non-tariff barriers. One important contribution of their paper is that the authors model the barriers in three different ways — as import tax wedges (for footwear), as export tax wedges (for apparel), and as what they call ‘sand in the wheels’, or waste (for processed foods). This does not allow a comparison of the effects of the different treatment on the same commodity, but it is based on careful consideration of the types of non-tariff measures applying in each sector. For each sector, they find that liberalisation of non-tariff measures leads to a substantial jump in world trade, and improved global welfare, though at the expense of global production of the good being protected. And most of the gains accrue to the liberalising region, in the form of lower prices to consumers. Most other regions experience at least some welfare gains due to increased market access. Estimated welfare losses are unusual geographically, and negligible in value when they occur.

Finally, a short summary paper by **Robert Scollay** draws together some of the research and policy implications from this collection of papers.

Acknowledgments

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The editors would also like to commend to readers the work of Johannes Moenius in quantifying the effects of technical standards. His excellent

work in this area was represented at the workshop, but unfortunately could not be included in this conference volume.