Chapter IX

Methodological approaches to the quantification of non-tariff measures

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It has been widely remarked that in a world where tariffs have been reduced by recent trade rounds and bilateral free trade agreements (FTAs), pressures for protection against imports are more likely to take the form of non-tariff measures (NTMs). This has led to an intensified interest both in monitoring such measures and in the quantification of their economic effects. In the current global trade collapse, direct increases in tariffs, such as was observed in the 1930s, have been virtually non-existent, giving further salience to the potential role of non-tariff policies for restricting imports.

The purpose of this paper is to review recent progress in the quantification of the economic effects of non-tariff measures, and to express some personal views as to the most important issues that have emerged in this endeavour. Some of these points have been raised elsewhere, while others have been clarified as the result of recent studies the author has participated in at the United States International Trade Commission (USITC). The main points may be grouped under several headings, as follows:

1. NTMs are closely related to trade facilitation and the economic analysis of NTMs is similarly related to that of trade facilitation.

This point ought to be self-evident, but is not always. NTMs make trade harder, and removing them makes trade easier. Trade facilitation makes trade easier, by removing problems that make trade harder. Thus, NTMs and trade facilitation are in fact mirror images of each other. Removal of NTMs can often be considered “trade facilitation” by another name, and vice versa.

In the legal language of negotiations and FTAs, NTMs and trade facilitation are often dealt with as separate subject matters. In particular, sanitary and phytosanitary (SPS) and technical barriers to trade (TBT) measures are often dealt with under the rubric of NTMs (as, for example, in the non-agricultural market access (NAMA) negotiations in the Doha Round) while customs matters are often considered under the heading of trade facilitation.

Nonetheless, when quantifying the effects either of trade facilitation measures or of removing NTMs, similar issues arise. Are trade flows smaller than they might

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126 Many of the arguments set forth briefly here are elaborated further in Ferrantino (2006), which rests squarely on Deardorff and Stern (1998).
otherwise be? Are import prices higher than they might otherwise be? If the policy were changed, what would be the follow-on effects on trade, economic welfare, GDP, production, or employment? Thus quantitative tools such as price gaps, gravity modeling and other econometric tools, and simulation methods (partial equilibrium or computable general equilibrium (CGE)) are deployed to study both sets of problems, with the details of implementing the tools often being very similar in practice.

2. The economic effects of NTMs and trade facilitation are potentially very large.

For example, Andriamananjara and others (2004) estimated that removal of certain categories of NTMs could yield global welfare gains of $US 90 billion in 2001. This estimate involved several steps – identifying particular policies of interest, quantifying their effects on prices using econometric methods, and simulating the effects of the resultant price gaps in a CGE model. In another widely cited result, Wilson, Mann, and Otsuki (2005) estimated that trade facilitation in developing countries could raise global merchandise trade by $US 377 billion (9.7 per cent) in 2000-2001.

There are relatively few quantitative analyses that compare the effects of NTMs and tariffs. Fugazza and Maur (2008) report that in 14 of 26 global regions, the ad valorem tariff equivalent of NTMs calculated using the results of Kee, Nicita and Olarreaga (2004) is higher than the average tariff. In studies focused on particular products and markets, the impact of NTMs is often found to be as high as, or higher than, that of tariffs. For example, the impact of SPS measures on United States beef exports from 2004-2007 ($11 billion) has been estimated to be almost twice the impact of tariffs and tariff-rate quotas (TRQs) ($6.3 billion) (USITC (2008)). In another study focusing on United States agricultural exports to India, the effects of removing India’s NTMs on United States exports were found to be of approximately the same order of magnitude as those removing India’s tariffs (USITC, 2009), although the role of NTMs for a single product (wheat) accounted for most of the NTM effects.

3. The distortions from NTMs can be measured as price gaps or quantity gaps. In many applications, price gaps are preferable.

Restraints on imports, if they are effective in practice, are likely to reduce the quantity of imports, increase their price, or both. In some cases, the quantity or price effect of import restraints is of interest for its own sake. One may also wish to introduce measures of the distortion into a simulation model to estimate effects on welfare, GDP, or inter-industry effects.

For purposes of simulation modeling, it is often convenient to express these effects as “price gaps” or “tariff equivalents.” The difference between the high price of imports induced by NTM and the lower or “world” price that would prevail in the absence of distortions can be treated as a tariff equivalent. Tariff equivalents have the advantage that they enable easy comparison with NTMs and tariffs. Also, the removal of NTMs can be simulated in a partial equilibrium or CGE framework using familiar methods for simulating the effects of tariff changes.
One can also measure the quantity or value effect\textsuperscript{127} of NTMs or other import restraints as the difference between the observed (lower) imports under the NTM and the higher level of imports that would have been observed without NTM. This requires the analyst to come up with a level of “normal” imports in the absence of NTM. One widespread technique for doing this is gravity modeling. It is well known that a high degree of the variation in the value or volume of trade between partners can be explained by the size of the partners’ economies (more trade between partners with higher GDPs) and by the economic distance between partners (less trade between more distant partners, more trade between partners sharing a common border or a common language). Estimates of the gravity model can be used to generate out-of-sample estimates of what “normal trade” would be between country pairs for which the trade value is usually lower.

There are several reasons for preferring price gaps to quantity gaps in most cases. First, price gaps measure the difference between two observed values, a distorted (NTM-ridden) price and a non-distorted price. Quantity or value gaps measure the difference between an observed (distorted) value and an estimated “normal” value of trade, and are thus influenced by the quality of the estimated value, which is subject to the various uncertainties surrounding econometric specifications. Even when price gaps are “mass-produced” using an econometric framework (e.g. Dean and others, 2009) the econometric properties of these estimates are likely to be preferable to estimates of quantity gaps, since there is generally less cross-country variation in prices than in trade flows (Ferrantino, 2006, p. 20 and Annex 2).

Quantity gaps may be preferred in cases where NTM is prohibitive and stops trade altogether. In such cases, there is no price of imports on which to base a price gap. They may also be used in cases where trade data is relatively abundant and prices are difficult to measure, for example for highly differentiated products of the same general type.

4. Analysis should focus on cases where there is both a policy of concern and an observed economic effect.

Quantitative analysis of NTMs can be approached either from the policy side or from the data side. On the one hand, the analyst can begin with a list of one or more products subject to policies that are of potential concern, and then attempt to find out if they have any economic effects, i.e. positive price gaps or quantity gaps. Alternately, one can begin with price and quantity data on a variety of products and go looking for evidence of distortions. Ideally, the reported results should focus on the intersection of the products of concern on policy grounds and the products which show empirical evidence of distortions.

\textsuperscript{127} While ideally one would like to contrast “quantity gaps” with “price gaps”, in practice what are often estimated as quantity gaps are really “value gaps,” in which the analyst contrasts the dollar value of imports constrained by an NTM with a normal value. This is no doubt because data on trade values are more easily obtained than data on trade quantities (e.g. number of units, kilograms, etc.) Since value = quantity*price, analysis based on values may be influenced by variations in the level of prices, across trading partners or across time. Analysis based on values is often reported as if it were based on quantities, making the unstated assumption that prices are constant in the relative dimension.
If one begins with a list of products of policy concern, it will sometimes be the case that economic effects on imports are not observed. This may be the case, for example, with regulatory policies that impose relatively small costs. On the other hand, the literature contains examples of studies that focus entirely on anomalies in prices, quantities, or values without linking these to any particular policy. Such studies may produce impressively large estimates of the effects of NTMs but are of relatively little practical use to policymakers.

5. Sources of information about NTM policies can be either official, or based on complaints and concerns of traders. The former tend to exclude less transparent measures, while the latter are often not specific about the measure involved.

Earlier analyses of NTMs relied heavily on the UNCTAD TRAINS database (see also chapter IX in this publication). One main advantage of TRAINS is that it provides data on policy measures line-by-line according to the Harmonized System of tariff and trade nomenclature, often including detail on products defined at the national level in categories finer than the internationally standardized HS6 subheading level. Providing line-level information enabled analysts to calculate coverage ratios, expressing either the percentage of lines or the percentage of trade covered by notified NTMs. Frequent criticisms of the coverage ratio approach include the fact that the economic effect of measures is likely to vary widely on a line-by-line basis, and the possibility that countries with more transparent reporting of measures will look more restrictive on the basis of a coverage ratio. Still, when a new line-by-line inventory of NTMs becomes available, coverage ratios can be a useful way of developing preliminary stylized facts about the pattern of NTM incidence (e.g. Ando and Obashi, 2009 (or Chapter I in this volume), for NTMs in ASEAN).

Other inventories of NTMs rely directly or indirectly on concerns or complaints registered by traders. These concerns may be determined by direct surveys of traders, such as in the Pilot Project surveys and Trade Barrier Reporter (http://ntb.unctad.org), or they may be collected by an intermediate party, such as a national government. The WTO, in its Trade Policy Reviews (TPRs), combines official information as collected by the Secretariat and provided by members under review, with concerns of traders expressed indirectly by means of other members’ queries in the review process. The CoReNTM database of Martinez, Mora and Signoret (2009) provides a useful assembly of entries gathered from the European Union’s Market Access Database, the United States Trade Representative’s National Trade Estimate, and the WTO TPRs.

One advantage of gathering data on NTMs based on concerns and complaints is that traders can identify not only policies of concern, but difficulties in administering a policy. Policies that are arbitrary, inefficient, costly, time-consuming, non-transparent, or corrupt may have economic effects greater than those administered honestly and efficiently. The inclusion of the category of “Procedural Obstacles” in the Pilot Project surveys and Trade Barrier reporter is a significant step forward in gathering information of this type. Similar information is contained in many of the entries in CoReNTM. A downside of information based on concerns and complaints is that traders are sometimes not able to identify the specific policies of concern, or misidentify them. For example, surveys often report concerns with “customs procedures” which on further examination refer to a variety of border and behind-the-border measures not in fact administered by the customs authorities, but by other agencies of government or private actors in ports of entry.
The global downturn in trade in 2008 gave rise to a new effort to collect information on state policies that potentially limit trade. The Global Trade Alert project (http://www.globaltradealert.org/), coordinating the resources of a variety of institutions under the direction of Simon Evenett at the Centre for Economic Policy Research (CEPR), gathers real-time information both on proposed new trade policy measures and measures actually implemented. The data include both trade-restrictive and trade-liberalizing measures, and can be searched both by implementing countries and by countries affected.

6. There are a variety of data sources on import and export prices and quantities available for the analysis of NTMs. These vary in terms of detail and convenience.

In some cases, the analysis of NTMs focuses on very specific products and markets. Special-purpose data on these products and markets can sometimes be obtained from industry or official sources. In many cases, it will be more convenient to refer to a comprehensive source of trade data. The most widely used source is the United Nations Commodity Trade Statistics Database (COMTRADE) data published by the United Nations Statistics Division. These can be accessed either by a direct subscription (http://comtrade.un.org/) or through the WITS system maintained by the World Bank in collaboration with UNCTAD (http://wits.worldbank.org/witsweb/).

Since large downloads can be made from COMTRADE, it is convenient for comparisons across time and across countries. Analysis can be made using either data reported by countries themselves or “mirror” data from partners, i.e. country Y’s reported exports to country X can be used as a proxy for country X’s imports from country Y, though there are often discrepancies between reporter data and partner data. Since units of measurement are available, it is possible to divide values by units of measurement and obtain unit values for price gap comparisons.

Unit values in general should be used with caution. At the HS6 level, many products are still highly differentiated, and the average unit value may not be representative of any particular transaction. As a rule of thumb, unit values obtained from trade data are more likely to be reliable for agricultural goods than for manufactures, and for goods measured in kilograms rather than goods measured by number (count). A further difficulty is that some unit values in COMTRADE are imputed based on global averages, and cannot be used to represent import prices for a specific country. There is a data flag in COMTRADE to indicate which unit values are imputed; at present, this flag is not available in the WITS version of COMTRADE.

Alternately, global trade data can be obtained from the private firm Global Trade Information Services, GTIS (http://www.gtis.com/). GTIS acquires trade data directly from approximately 70 countries, filling in the gaps with COMTRADE data, and sells it in a variety of products such as World Trade Analyzer (individual country reporter files) and Global Trade Analyzer (all countries together). Since the unit values have not been imputed or transformed, they are more reliable for the purpose of NTM analysis. Besides the additional costs associated with obtaining privately-sourced data, there is a limitation on the size of the feasible download. This is less of a problem for analyses with a narrow focus, but more problematic if the analysis is to cover many products and countries simultaneously.
7. The best estimates of NTM effects are crafted with detailed knowledge of products and markets, one product and country at a time. However, policymakers often want to know about many products and countries at once. This leads to a tradeoff between “handicraft” and “mass-produced” estimates of NTM effects, with a corresponding tradeoff between quality and quantity.

Ideally, an analysis of NTM effects is able to focus on a very small number of policies, products and markets. Careful analysis of a single NTM price gap should incorporate as much information as possible about the actual policies involved, the procedures by which they are implemented and whether they have changed over time, the exact products covered, and so on (Deardorff and Stern, 1998). Such information is important for making a correct assessment of the quantitative impacts of such policies.

However, policymakers often want to know about many products and countries at once. They may ask questions such as, “Which countries are imposing the biggest non-tariff barriers to my country’s exports? Which of my country’s export products are most impacted by NTMs? What are the top NTM issues our trade negotiators should be focusing on?” The answers to such questions imply that many countries and products are to be surveyed at the same time. Thus, there arises a contrast between “handicraft” estimates which are specialized for particular cases and “mass-produced” estimates (Ferrantino, 2006). Associated with this contrast is a tradeoff between higher quality of handicraft estimates and broader coverage of mass-produced estimates.

Some attempts to generate NTM estimates for many countries and products have replaced the arithmetic calculation of individual price gaps with econometric methods. In such methods, the price gap is estimated as a residual or dummy-variable estimate, representing the difference between an actual price and the price one would expect in a given market, given systematic differences in such factors as non-traded goods prices (e.g. Dean and others, 2009). Econometric estimates of this type are subject to limitations similar to gravity model estimates of quantity gaps. The estimates of the gap are only as good as the econometric specification. While they may provide general estimates of the price anomalies associated with NTMs, readers familiar with specific cases and markets will often find individual product-by-country estimates to be unrealistic.

The attempt to combine the precision of handicraft estimates with the coverage of mass-produced estimates is an important area of research in NTM quantification at present. If price data are abundant and there are reasonable methods to impute such factors as transport costs, it is sometimes possible to produce something such as handicraft estimates for dozens or even hundreds of products simultaneously (USITC, 2009). These can be aggregated by product categories for convenience in modeling.

8. Appropriate price comparisons for NTM analysis require the identification of a point in the supply chain where prices are to be compared. When there are multiple policies present, a single estimated price gap summarizes their effects but does not provide information on the effects of individual policies. Supply chain analysis is particularly useful for trade facilitation problems.

The movement of goods from the exporter to the ultimate consumer involves numerous transactions costs, which take the form of mark-ups. Anderson and van Wincoop (2004) suggest that the “typical” cost increase for developed-country exports
between the factory and the retailer is approximately 170 per cent, which may be decomposed as follows: 21 per cent transportation costs, 44 per cent border related trade barriers and 55 per cent retail and wholesale margins \((2.7 = 1.21^*1.44^*1.55)\). The 44 per cent may include tariffs, NTMs, and “natural” barriers (such as different languages, information costs, and the cost of using different currencies). In many cases the mark-up from factory to consumer may be even higher. Feenstra (1998), citing Tempest (1996), reports data which imply the mark-up on Barbie dolls produced in China and sold in the United States is approximately 900 per cent.

Thus, any comparison of distorted and non-distorted prices needs to specify at what point in the supply chain the price comparison is being made. If the non-distorted “world” price is measured at a different point in the supply chain than the distorted price affected by NTMs, corrections need to be made for those transport costs, tariffs, and wholesale and retail markups which are added at each point of the movement of products. Products move from the farm or factory to the port of exportation, are loaded onto ships or planes, moved internationally by ocean or air, are unloaded at the port of importation, pass through customs where tariffs may be charged, and move into the internal distribution system in the importing country where they are subject to wholesale and retail markups. Some formula that can be used for breaking down the various markups in the supply chain can be found in Ferrantino (2006, Annex 1), which follows closely Deardorff and Stern (1998, Appendix 3).

A common basis for comparisons for NTM price gaps is the CIF (cost-insurance-freight) price, which is the price in the importing country inclusive of insurance and freight but not including tariffs. The unit values in most countries’ trade data are reported on a CIF basis. Retail price comparisons have also been used (e.g. Bradford, 2005). These are problematic, since the values of wholesale and retail margins are often imprecisely measured and apply to aggregate product categories. One can also use the farm gate or factory gate in the exporting country as a basis for comparison. The literature on measuring the effects of agricultural policy distortions takes this approach in the form of “import reference prices” and “export reference prices” (Anderson and Martin, 2009).

It is often the case that the difficulties faced by traders attempting to export or import goods consist of multiple policies applied to the same transaction, or to a mix of official and private practices (see Tilton, 1998) for a case study of Asian cement trade). Such situations may be particularly frustrating for traders; if one policy is negotiated away, another may pop up to have the same restrictive effect in the marketplace.\(^{128}\) The classic price gap or tariff-equivalent method is only able to express the summary effect of all policies in place, and is not able to apportion the effect among multiple policies. Indeed, it may not even be appropriate to think of several policies accounting for different percentages of a single price gap. They may all operate as constraints, and it may be necessary to remove all of them before any change in market outcomes is observed.

A supply chain perspective can help in the analysis of multiple NTMs. By isolating the individual locations in the supply chain where different policies can take

\(^{128}\) In United States policy circles, this is often referred to as the “whack-a-mole” problem, after the child’s arcade game in which the player attempts to smash down mechanical rodents with a large mallet before they can pop up again.
place, it may be possible to obtain a better understanding of which policies act as absolute constraints and which are not constraining, but may increase costs. Breaking down the supply chain is especially useful for the analysis of trade facilitation as well. For example, the process of importation in a seaport can be broken down into a number of steps (Londoño-Kent and Kent, 2003). Survey instruments can also be designed from the perspective of costs or time associated with different parts of the supply chain.

9. The problems involved in making price comparisons for differentiated products remain a significant challenge for the analysis of NTMs.

Unless special-purpose data are available, price comparisons for traded goods are likely to be made using internationally comparable unit value data at the HS6 level. However, it is now well-established that products defined at the HS6 level are not homogeneous, particularly not in the case of manufactures. Some products do not even have internationally standardized units of measure (e.g. beverages may be measured in liters in one country, kilograms in another, and dozens of bottles in a third). Moreover, different countries exporting the same HS6 product tend to charge different unit values, suggesting that there is product differentiation at a level finer than HS6, or even at the nation-specific statistical reporting categories (HS9 or 10).

Since it is always possible that the two prices compared in a price-gap calculation are for products that are not identical, some part of the price gap may represent quality differences rather than the effects of NTMs. How big a problem is this? Taken to the extreme, it could place all estimates of price gaps under a cloud of skepticism. The situation is not quite as bad as all this. In many cases, even when there are quality differences they are not likely to be very large or to fall within a reasonable range, so that large price gaps at HS6 may still reasonably be associated with policies. Another possibility is to do price comparisons that take into account that different suppliers of imports are likely to be selling different quality products, so that the import price is averaged out among source countries, each of which has its own benchmark price calculated on the basis of that country’s exports to the world as a whole (USITC, 2009).

10. Simulation models provide a tool to estimate the effects of NTMs on trade flows, production, employment, GDP and welfare. They range from simple methods, implementable on a spreadsheet, to complex tools, linking partial- and general-equilibrium models at the frontiers of current research.

Simulation models have long been used to analyse the effects of tariff changes, for example as associated with global trade rounds or free trade agreements. Such models are useful tools for organizing economists’ thinking about trade, since they embed tariffs (or tariff equivalent measures of NTMs) in a framework based on economic theory, which allows multiple variables to adjust when trade policies are changed. Thus, simulation models can be used to assess the effects of NTMs, or their removal, on trade flows, production, employment, GDP, and welfare. Both price gaps and quantity gaps can be used as “policy shocks” in simulation models.

129 Examples of this include the “Trading across borders” component of the World Bank’s Doing Business surveys (http://www.doingbusiness.org) and the survey of logistics impediments in USITC (2005).
130 For example, Schott (2008) and Fontagné, Gaulier and Zignagno (2008).
Simulation models come in various degrees of complexity. Partial-equilibrium (PE) models consider individual markets (for example, the market for a particular agricultural good or variety of steel), and assume that many other things, such as wage rates, are held constant since the trade policy only has a second-order effect on them. PE models can thus be used to give trade and welfare effects for single products. They are good for analysing narrowly defined products, and can often be implemented with simple computational tools such as spreadsheets. Computable general equilibrium (CGE) models take into account the linkages between different industries. In global CGE models, such as GTAP, all industries in all countries are interlinked by a combination of trade relationships and input-output relationships in production. Use of CGE models thus has the advantage that the effects of policies applied to one product or industry to the situation in other industries can be investigated, often yielding unexpected results that are grounded in economic reasoning. One tradeoff involved in CGE modeling is that the definition of products tends to be more aggregated than in PE modeling. In addition, there is often significant investment both in training and in software and databases involved in performing CGE modeling at a useful level of proficiency.

Some of the most advanced applications of simulation modeling to NTMs involve linkages between PE and CGE modeling. This approach enables one to capture both the ability of PE modeling to represent narrowly defined products, and the strength of CGE modeling in capturing inter-industry linkages. These sophisticated approaches operate by passing information back and forth between models operating at different levels of detail, and sometimes by iterating between models to converge on a solution. Examples are USITC (2008) for global beef trade and USITC (2009) for United States agricultural exports to India.

11. There are an increasing variety of resources for analysts doing quantitative work in NTMs, and a growing community of researchers pursuing such work. A significant and growing body of this work pertains to the analysis of regulatory policies, such as SPS and TBT policies.

One place to access current research on the quantification of NTMs is at NTM Network (http://i4ide.org/NTMnetwork) and NTM Wiki (http://i4ide.org/NTMwiki). These websites contain links to databases, methodology papers, research and analysis from many sources (academics, GTAP, OECD, USDA-ERS, USITC, World Bank, WTO, etc). The information is both qualitative and quantitative, and covers NTMs, trade facilitation, and liberalization of services. The open-architecture nature of the Wiki format enables researchers to add resources on their own, as well as to provide comments and discussions related to currently existing resources.
References


