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Preliminary

Comments Welcome

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Abstract

As multilateral negotiations focus more on reductions and removal of non-tariff barriers, the importance of quantifying the impact of these barriers has increased. While progress has been made recently, direct estimates of the impact of NTMs on prices has not been possible. This paper makes two contributions. First, price effects of NTMs are estimated directly, for many products in many countries. Second, explicit data on NTM incidence are drawn from two complementary databases—UNCTAD TRAINS data and a new NTM database compiled by the USITC. A simple differentiated product model of retail prices is developed to specify the direct relationship between NTMs and prices. From this model, a price gap specification is derived and estimated using retail price data for about 115 cities and 47 consumer products from the EIU CityData for 2001. The estimation yields both cross-country averages and country-specific estimates of the effects of NTMs, for more than 60 countries and four product groups in which NTM protection is of major importance: fruits and vegetables, bovine meats, processed food, and apparel.

ESTIMATING THE PRICE EFFECTS OF NON-TARIFF MEASURES

1. Introduction

With the steady decrease in world-wide tariffs accomplished in the various rounds of multilateral trade negotiations over the past several decades, the attention of both policy-makers and economists has turned to the role played by non-tariff measures of protection (NTMs). Especially for the purpose of negotiations, it is important that the impacts of these NTMs be quantified. Yet this has proven difficult. Variation across countries in product prices is due to many factors of which NTMs are just one. In addition, the many types of NTMs—quotas, non-automatic licensing, bans, prior authorization for protection of human health, local content requirements, among others—defy the development of a simple uniform method to convert the effect of these quantity controls into tariff-equivalents.

Ferrantino (2006) surveys many of the important contributions which catalogue NTM types and incidence, and which estimate the impact of NTMs on prices and welfare. Estimating the "price gap" due to an NTM requires a comparison between the price of a product before and after the imposition of an NTM markup takes place. The observed difference in price is then used to derive the rent attributable to the NTM. But this derivation requires corrections for the many factors that influence price at various stages in the production process. The foundational study by Deardorff and Stern (1998) provides a clear guide to methodological approaches to this problem of quantification. It gives a detailed exposition of the calculation of the tariff-equivalent of NTMs using data on individual product prices, and allows for different types of NTMs, market competition, and product substitutability. As Ferrantino (2006, p. 6) notes, "[T]his method requires a good deal of fairly precise information on prices, transport and distribution costs, tariffs, taxes, and/or subsidies at the product-specific level, and in some cases information on quality differences between products." It also requires knowledge of the incidence and type of NTMs imposed on a product. Unfortunately, this amount of cross-product, cross-country data is not usually available.

Recent studies surmount some of these problems, to yield cross-product, cross country estimates of NTMs. Bradford (2003, 2005) attempts to estimate the levels of protection from both tariffs and NTMs in

eight OECD countries. Using cross-country retail price data from the OECD, and retail margins and export margins from input-output tables, he derives producer prices for a large number of final goods. These producer prices are compared to the calculated minimum producer price (plus transport costs). If this ratio exceeds the country's tariff on a product, then this premium is taken to represent the aggregate effect of both tariffs and NTMs on price. The impact of the NTM is the difference between this premium and the tariff. Bradford finds that, overall, the US is the most open of the eight countries in the sample, with the EU and Japan having the highest levels of protection.

In the spirit of Anderson and Neary (1992) and related papers, Kee, Nicita, and Olarreaga (2006, 2004) try to derive aggregate measures of overall protection for many countries. As part of this effort, they use econometric methods to estimate the *ad valorem* equivalents (AVEs) of non-tariff barriers. Kee, *et al.,* provide estimates for a much larger group of developed and developing countries than Bradford, starting with a much more finely defined product level (HS 6-digit), and using explicit data on NTM incidence (from the UNCTAD TRAINS database). However, they do not have price data at this level of aggregation. Thus, they first estimate the impact of price and quantity control measures and domestic agricultural price supports on trade flows, using a specification based on the Heckscher-Ohlin trade model. Recognizing that NTMs are often endogenously determined, they use a Heckman two-stage procedure to first explain the incidence of NTMs, and then estimate the impact of NTMs on trade flows. These quantity effects are then translated into price effects using their own separately estimated import demand elasticities (Kee, *et al.*, 2004). Kee, *et al.*, find that NTMs add an average of 70 percent to the trade restrictiveness imposed by a country's tariffs. In 21 out of 91 countries, NTMs contribute more to the overall level of protection than tariffs.

These two studies make major steps toward providing country and/or product specific estimates of the price impact of NTMs. Both approaches yield estimates of the *ad valorem* equivalent of trade protection for a large number of products, which can be aggregated into country-level averages. Bradford's approach uses internationally comparable product price data, potentially allowing direct estimation of the impact of NTMs. However, Bradford does not rely on actual data on NTM incidence. As a result, the effect of NTMs on price must be derived indirectly from an unexplained residual. Kee *et al.* use very detailed NTM

incidence data at the tariff line level. However, without price data at the same level of aggregation, the impact of NTMs must again be derived indirectly, using quantity effects and elasticity estimates.

This paper makes two contributions. First, price effects of NTMs are estimated econometrically, using price data for many products in many countries. Second, explicit data on NTM incidence are drawn from two complementary databases—the UNCTAD TRAINS data and a new NTM database compiled by the USITC (Donnelly and Manifold, 2005). A simple differentiated product model of retail prices is developed to specify the direct relationship between NTMs and prices. From this model, a price gap specification is derived and estimated using retail price data for about 115 cities and 47 products from the EIU CityData for 2001.[1] As in Kee, *et al.*, the endogeneity of NTMs is incorporated. The estimation yields both cross-country averages and country-specific estimates of the effects of NTMs, for more than 60 countries and four product groups in which NTM protection was of major importance: fruits and vegetables, bovine meats, processed food, and apparel.

Results suggest that, on average, NTMs on fruits and vegetables and meats raised the retail prices of these products in 2001 by 141 percent and 93 percent, respectively. NTMs on these products appeared to be relatively less restrictive in Sub-Saharan African, Eastern European and some Middle Eastern countries, and relatively more restrictive in the EU, US and some Southeast Asian countries. While somewhat less restrictive than the NTMs on agricultural products, the average price increases due to NTMs on processed food and on apparel were still fairly high at 87 percent and 21 percent, respectively. The OECD countries tended to have below average NTM premia on processed food, and (as is well known) above average premia on apparel products.

2. The Incidence of NTMs

To assess the incidence of NTMs globally, we collected information from two datasets: UNCTAD TRAINS (using WITS) and a new NTM database compiled by the ITC. Data for TRAINS are collected from publicly available sources, such as official governments, and other commercially available publications, and

[1] See http://www.eiu.com/site_info.asp?info_name=ps_cityData&entry1=psNav&page=noads.

are reported in detail at the tariff line level. In contrast, the ITC database is constructed largely from the EU's Market Access Database and the USTR *National Trade Estimate Report on Foreign Trade Barriers,* with additional information from the WTO's *Trade Policy Reviews.*[2] The first two sources document complaints from the EU and US private sector, respectively, about impediments to trade in other countries. Hence, the data are less detailed and often reported in terms of broad product categories or broad types of restraints.

We focus on core NTMs only, such as import quotas, prohibitions, import licenses, and VERs.[3] Table 1 shows the incidence of these NTMs for 67 of the countries and 97 of the consumer goods in the EIU CityData. Eleven broad categories are listed, with the number of individual products in that category indicated in parentheses.[4] While the TRAINS and ITC NTM measures are chosen to reflect similar types of NTMs, the databases are likely to reflect different, and perhaps complementary, information. TRAINS includes a much more finely defined, longer list of NTMs, so is more likely to record the presence of an NTM on a product. Since some of these may have no binding effect, the TRAINS database may overstate the incidence of significant NTMs. In contrast, the ITC database largely records an NTM only if there is a complaint about it by the EU or US private sector. This may yield a better sense of the NTMs which the private sector finds most restrictive. However, it may understate

NTM incidence for at least three reasons: complaints about EU or US NTMs by other countries are not likely to be included; NTMs which do not elicit complaints are generally unrecorded; NTMs which are known to exist may be taken into account by exporters, and thus give no rise to complaints.

Table 1 shows that, in general, the incidence of NTMs is widespread across countries and products.[5] According to TRAINS, more than 60 percent of the products in bovine meat and meat products, 50 percent of dairy and 46 percent of fruits and vegetables are covered by NTMs. About 30 percent of products in

[2] EU's Market Access Database (http://mkaccdb.eu.int); USTR's National Trade Estimate Reports (http://www.ustr.gov/Document_Library/Reports_Publications/2002/2002_NTE_Report/Section_Index.html); WTO's Trade Policy Reviews (http://www.wto.org/english/tratop_e/tpr_e/tpr_e.htm).
[3] The Quantity Control Measures designated as 6100-6900 in the TRAINS database, in WITS.
[4] Appendix I shows the classification of products into groups and the mapping of each EIU CityData product to an HS 6-digit code or HS 4-digit code.
[5] TRAINS includes 7 countries not covered in the ITC database: Bahrain, Cote d'Ivoire, Jordan, Peru, Saudi Arabia, Senegal, and Sri Lanka. The ITC database includes Azerbaijan which is not covered in TRAINS.

processed food and beverages and tobacco products are covered by NTMs. Tunisia and India show the highest NTM coverage across the 97 products. As anticipated, the ITC database shows many fewer NTMs than TRAINS. With a few exceptions, the ITC distribution of NTMs across countries for a given product shows little (and sometimes negative) correlation with the TRAINS distribution. This may be because TRAINS records the existence of NTMs which cause no reason for complaint. It may also be because few complaints are lodged against countries which constitute smaller markets. According to the ITC database, NTM coverage in 10 of the 11 product groups is below 20 percent. The only exception is apparel, where the ITC database records a much higher incidence of NTMs across products and across countries than TRAINS. Mexico and Turkey show the highest NTM coverage across these 97 products, according to the ITC database.

3. Conceptual Framework

As noted by Deardorff and Stern (1998), calculating the impact of an NTM on the price of any good *x* is difficult when the only data available are the home and foreign country retail price of *imported x*. Even if we assume:

A1. *x* is a homogeneous good
A2. *x* is produced under perfect competition
A3. only the home country imposes a (non-prohibitive) quota on imported *x*
A4. there are no tax differences between the home and foreign country other than tariffs,

the specific NTM rent (q) will be the retail price gap between home country i and foreign country i^*, $(P_i^{Rm} - P_{i^*}^{Rm})$, adjusted for differences in local distribution markups (μ), transport costs (d), specific tariffs (t), and shipping costs from factory to ship or plane (s) :

$$q_i = (P_i^{Rm} - P_{i^*}^{Rm}) - (\mu_i^m - \mu_{i^*}^m) - (d_i^m - d_{i^*}^m) - (t_i^m - t_{i^*}^m) - (s_i^m - s_{i^*}^m), \quad (1)$$

where superscript *m* indicates the *import* good.[6]

In the case of the EIU CityData, we do not have retail prices of the same imported product consumed

[6] Transforming this NTM rent into an *ad valorem* equivalent tariff would require division of q by the c.i.f. price of *imported x* in country *i*.

in different cities. Many of the goods are differentiated products (e.g., apparel, shoes), and are produced under monopolistic competition. Thus, A.1 and A.2 do not hold. The data do distinguish between "department store" price and "chain store price" (where the latter is likely to be relatively more homogeneous), and an attempt is made to include only prices of goods of internationally comparable quality. However, ultimately, these retail prices are averages.[7] Thus, our price data are likely to be averages of the domestic and imported varieties of *x* being sold in a particular city. If varieties are distinct by quality, style and source, then (1) will require further adjustment for differences in the baskets of *x* consumed in each city. In many cases a large number of countries have multiple types of NTMs on a given product, thus violating A.3. There are also likely to be tax or other regulatory differences between countries, implying that A.4 will not hold. Each of these violations will require additional adjustments to (1) in order to isolate the rent from the NTM.

To address these complexities, suppose that the EIU CityData price of a good *x* in city *i* is the simple average of all of the varieties of good *x* found in retail stores in city *i*. Let the number of varieties consumed in city *i* and produced in city *j* be n_{ij}. Then the average price of the varieties from city *j* (consumed in city *i*) will be

$$P_{ij} = \frac{1}{n_{ij}} \left[\sum_{k=1}^{n_{ij}} (P_{j(k)} + \mu_{ij(k)} + d_{ij} + t_{ij} + q_{ij}) \right], \tag{2}$$

where $P_{j(k)}$ denotes the "ex factory" price of variety *k* produced in city *j*, $\mu_{ij(k)}$ denotes the retail markup in city *i* on variety *k* produced in city *j*, and $d_{ij,}$, t_{ij}, and q_{ij}, are the transport cost, specific tariff and NTM rent, respectively, on imports from *j*. (These latter are assumed to be the same across varieties from the same source city, hence no *k* subscript).

Let N_i be the total number of varieties consumed in city *i*, and let *M* be the total number of cities. Then the EIU price of good *x* in city *i* can be written as a weighted average of the average prices from each

[7] See http://eiu.enumerate.com/asp/wcol_HelpPrices.asp

source city *j*:

$$P_i^R = \sum_{j=1}^{M} \theta_{ij} P_{ij}, \tag{3}$$

where the weights $\theta_{ij} = (n_{ij} / N_i)$ are the share of total varieties consumed in city *i* from each source *j*. Substituting equation (2) into equation (3) yields:

$$P_i^R = \frac{1}{N_i} \sum_{j=1}^{M} \sum_{k=1}^{n_{ij}} (P_{j(k)} + \mu_{ij(k)} + d_{ij} + t_{ij} + q_{ij}). \tag{4}$$

If all cities consume the same varieties, then $n_{ij} = n_j, N_i = N$. Given this assumption, equation (4) can be written as:

$$P_i^R = \overline{P} + \overline{\mu}_i + \sum_{j=1}^{M} \theta_j (d_{ij} + t_{ij} + q_{ij}), \tag{5}$$

where $\overline{P} = \frac{1}{N_i} \sum_{j=1}^{M} \sum_{k=1}^{n_{ij}} P_{j(k)}$, $\overline{\mu}_i = \frac{1}{N_i} \sum_{j=1}^{M} \sum_{k=1}^{n_{ij}} \mu_{ij(k)}$, and $\theta_j = n_j / N$.

Equation (5) specifies the relationship between the retail price in city *i* and the NTM rent premium earned on trade between city *i* and every other city.

4. Econometric Specification

To arrive at our econometric specification, let us rewrite equation (4) using simpler notation as

$$P_i^R = \overline{P} + \mu_i + D_i + T_i + Q_i, \tag{6}$$

where D_i, T_i, and Q_i stand for the weighted averages of their lower-case counterparts. Following Deardorff and Stern, a price difference equation can be written from equation (6) to consider all possible pair-wise comparisons. Specifically, the "price gap" for any pair of cities (i, i*), can be expressed as

$$PG_{ii^*} \equiv P_i^R - P_{i^*}^R = \mu_i - \mu_{i^*} + D_i - D_{i^*} + T_i - T_{i^*} + Q_i - Q_{i^*}. \tag{7}$$

After allowing for slope coefficients, a constant term (to not force the regression intercept to be zero), and a disturbance term, this leads to our basic estimating equation:

$$PG_{ii^*} = \alpha + \beta(\mu_i - \mu_{i^*}) + \gamma(D_i - D_{i^*}) + \delta(T_i - T_{i^*}) + \sigma(Q_i - Q_{i^*}) + \varepsilon_{ii^*}, \quad (8)$$

where α, β, γ, δ and σ are parameters to be estimated. This specification attempts to explain the observed price gaps (or deviations from the law of one price) given observed differences in local markups, transport costs, and differences in tariff and non-tariff trade barriers; plus some random, unexplained factors subsumed in ε. Equation (8) delivers an estimate of the average price premium (σ) across all countries due to a more restrictive NTM.

An alternate, more flexible specification of (8) would allow possible interaction effects between NTMs and GDP per capita, and NTMs and tariff rates. [8] Theory itself suggests that the price effects of a tariff and an NTM on a product may differ from the effects of either barrier alone.[9] For example, in the presence of a tariff high enough to eliminate imports, a non-prohibitive quota is redundant. Similarly, in the presence of a binding quota, a tariff may have no impact on price. Empirical evidence suggests that NTMs have been used to replace tariff protection negotiated away in GATT rounds, as well as to supplement tariff protection on consumer goods and agriculture, in particular.[10] The interaction with GDP per capita should indicate whether there is any systematic difference between the restrictiveness of poorer vs. richer countries' NTMs.

Allowing for these interaction terms, the price gap specification in equation (8) would now depend on NTMs as follows:

$$\begin{aligned} PG_{ii^*} &= \beta(\mu_i - \mu_{i^*}) + \gamma(D_i - D_{i^*}) + \delta(T_i - T_{i^*}) + \\ &\sigma_0(Q_i - Q_{i^*}) + \sigma_1(Q_i\tilde{Y}_i - Q_{i^*}\tilde{Y}_{i^*}) + \sigma_2(Q_i\tilde{T}_i - Q_{i^*}\tilde{T}_{i^*}) + \varepsilon_{ii^*} \end{aligned} \quad (9)$$

where $\tilde{Y}_i$ and $\tilde{T}_i$ are deviations from mean GDP per capita and mean tariffs, respectively. The coefficient σ_0 indicates an average price premium due to NTMs akin to σ in equation (8). Using the predicted parameters for σ_0, σ_1, and σ_2 in equation (9), we can assess how the conditional average impact

[8] The remaining observables present variation at the city level, and we do not see immediate reasons for interacting them with the NTMs.
[9] See for example, Vousden (1990).
[10] See, for example, Ray and Marvel (1984).

of NTMs on retail prices varies along different values of $\tilde{Y}_i$ and $\tilde{T}_i$. These parameters can then be used to construct country-specific estimates of the price premium due to a more restrictive NTM.

5. Data[11]

Data on 47 products and 115 cities are used to estimate equation (8) and (9).[12] Some countries have multiple city observations in the CityData, suggesting a panel estimation approach, by country-pair and product, with country-pair effects and corrections for clustering. However, for many developing countries in the sample, there is only one city observation for a given product. This renders estimation with fixed or random effects problematic. To address this issue, the products are grouped into four "sectors"—fruits and vegetables, bovine meat, processed food, and apparel (see appendix I)--and estimation is done separately for each sector.

The dependent variable is retail price in 2001, corresponding to the year of the ITC NTM database. Price data designated as "supermarket" or "chain store" are used rather than "mid-priced" or "branded store," to minimize the price differential due to brand name or quality differences. Data were converted to US dollars by EIU CityData using 2001 market exchange rates.

No data are available on city level markups for local distribution costs. However, in general, we expect retail markups to be higher in countries with more expensive services. Based on availability across cities, we proxy these non-traded service costs using service wages (the hourly wage for maid service) and housing costs (the rental on a 1-bedroom furnished apartment).[13] Since countries with higher per-capita income often have higher non-traded service costs in general (the so-called Balassa-Samuelson effect (Balassa (1964), Samuelson (1964)), we also include GDP per capita[14] as an additional control. Table 2 lists

[11] All variable definitions and data sources are listed in appendix II.
[12] Product groups are given in appendix I. Some countries drop out of the sample due to missing wage or rent data: Bangladesh, Cameroon, Gabon, Pakistan, Panama, Senegal, and Vietnam. Occasionally price data will be unavailable for a specific city for an individual product within a product group.
[13] Rental on commercial property is available widely for industrial countries only. In some developing countries these rentals may not be representative of the costs of doing business locally. Sensitivity tests were run for alternate proxies, such as rental on 3-bedroom furnished apartments, and monthly wages for maid service. The results appear insensitive to the choice of proxies for retail markup.
[14] City income per capita is only readily available for the United States. Hence GDP per capita is calculated at the country level data.

the countries included in the sample, ranked by GDP per capita in 2001. For each country, the table shows the number of cities for which data are available and average values for the wage and rent variables in 2001. While there is a generally positive correlation between GDP per capita, wage and rent, the correlations are far from perfect. This suggests that each of these indicators will strengthen our ability to capture differences in local distribution costs across countries.

Our specification calls for weighted average transport costs, weighted average tariffs, and weighted NTM rents for city i, where the weights represent the shares of varieties produced in each city j, θ_{ij}. We assume that a country which exports a relatively large share of the world's exports of a product is likely to produce a relatively large share of the world's varieties of this product. Thus, θ_{ij} is simply a country's share of global exports of each of the 47 products included in the sample.

The ideal variable for estimating the impact of NTMs in equations (8) and (9) would be NTM rents by country by product. Since these data are not available, we take advantage of the two NTM dummy variables described in section 2. The TRAINS dummy variable takes a value of 1 if any of the NTMs designated "Quantity Control Measures" are present for a given product.[15] The ITC dummy variable takes a value of 1 if the ITC database records an import restriction, import quota, prohibition, or import license. Since these two incidence measures potentially provide complementary information regarding the existence of NTMs, equations (8) and (9) are estimated using a composite of the two. A single NTM dummy variable is constructed that takes a value of 1 if either TRAINS or the ITC database indicates the presence of an NTM. This composite NTM dummy is then weighted by θ_{ij}.

Following some of the gravity literature, we proxy transport costs with remoteness, where remoteness in our analysis is defined as the export-share-weighted sum of the great circle distance from each city to all other cities in our sample.[16] Tariffs are measured using MFN (*ad valorem*) tariff data from

[15] These measures include: non-automatic licensing, prior authorizations, quotas, prohibitions, export restraint arrangements (e.g., VERs, OMAs, the Mulitfibre Arrangement), ent), enterprise-specific restrictions (e.g., selective approval of importers; enterprise-specific quotas).
[16] Export weights are constructed for each product group.

TRAINS via WITS.[17] Where countries are members of a customs union (e.g., Mercosur) or economic union (e.g., the EU), the *ad valorem* common external tariff (CET) is used.[18] Table 2 shows average tariffs as well as import shares, by country and by product group. Average tariffs on fruits and vegetables, processed food and apparel tend to be higher in poorer countries, while average tariffs on bovine meats are higher in richer countries. Only in apparel is there a strong positive correlation between import shares and GDP per capita.

6. Estimation and Results

Column (1) in Tables 3 through 6 shows the estimation of equation (8) by least squares for four of the product groups with high NTM coverage: fruits and vegetables, bovine meats, processed food, and apparel. For organizational purposes we focus the discussion of our results on the fruits and vegetables sector (Table 3), and then comment on their generality. As column (1) in Table 3 shows, many of the estimated coefficients are estimated with the expected sign. The wage and rent variables have positive and significant coefficients, as we would have expected from their roles as proxies for markups. The estimated coefficient for GDP per capita is also positive, supporting the stylized observation that consumer prices are higher in richer countries. Distance has a positive significant impact on retail price, as we would expect if it serves as a proxy for transport costs. Tariffs also have a positive and significant impact on price, with an average impact below one as expected.[19]

The estimated coefficient for NTMs, however, is notably against our expectations. As column (1) in Table 3 shows, for the fruits and vegetables sector, the average effect of NTMs is unexpectedly estimated at -0.23. This parameter would suggest that a higher NTM, on average, *decreases* the price of fruits and vegetables by 23 percent. Although it may be conceptually possible to conceive of cases where the existence of big players may actually induce prices to fall from protection, we believe this negative point estimate has more to do with some important empirical problems. Thus, several different estimation procedures are

[17] Some countries apply specific and or compound tariffs to particular HS lines. We were able to use the recent ad valorem equivalent option in WITs to convert these to AVEs in some sectors. We plan to update the remaining sectors.
[18] However, preferential tariffs toward FTA partners (e.g., NAFTA) were not used, because they were available for only some countries and some FTAs.
[19] The positive relations for GDP per capita, distance and tariff does not hold in all sectors and regression models.

subsequently explored.

We want to try to account for a number of possible confounding factors that would bias the results and preclude any causal inference on the impact of NTMs on prices. A first concern would be that some of the observed variation in PG_{ii*} may be due to country-specific unobserved heterogeneity, such as shipping costs (from factory to ship or plane), taxes and other regulations. To address this, column (2) in Table 3 shows the estimated parameters after incorporating country-pair random effects into regression equation (8).[20] Introducing country pair effects into the regression framework seems to affect the point estimate for NTMs significantly. Indeed, the estimated coefficient for NTMs increases substantially, but remains negative at -0.15. Clearly, though helpful in controlling for country-level unobservables, the incorporation of country-pair effects is not enough to overcome the identification issues that might be induced by other channels of endogeneity at the product level.

We attempt to handle these potential identification issues by implementing an instrumental variables approach that would allow us to separate the effects of NTMs *per se* from the confounding effects of reverse causality, selection and measurement error. In this approach, we take all other controls in equation (8) as exogenous. Particularly, following some previous literature (Trefler, 1993, Lee and Swagel, 1994), we take the tariff variable as being predetermined, with their existence and levels restricted by WTO commitments. However, we allow NTMs to be endogenous.

Our instrument, *w*, varies by country and product, and is defined as the share of each country's total exports attributable to product *x*. If a product is a major export for a particular country, we expect that a country is less likely to implement an NTM on that product. Recall that our prices refer to retail prices indexing a possible composite of domestic and foreign products. Thus our identification strategy argues that these export shares do not affect city retail prices directly, but only through the effect that they have in determining the existence of NTMs. Under this assumption, *w* is a valid instrument and the estimation of our

[20] Fixed effect estimation gives comparable results. Also, given the hierarchical structure of the data, we considered the estimation of nested country-pair and city-pair effects. This approach, however, was computationally demanding and did not provide significantly different results.

model can be conducted by two-stage least squares, where the first stage entail the estimation of NTMs using the exogenous variables and instrument w_i (Angrist and Imbens, 1995; Angrist and Krueger, 2001).

Column (3) in Table 1 show the estimated parameters for a regression with country-pair effects where the NTM variable is treated as endogenous and estimated using the instrumental variable approach just described. As these results show, this estimation approach has a large impact on the parameter for NTMs, which is now positive and significant. Based on these new estimates, NTMs raises prices of fruits and vegetables by about 163 per cent, on average. Given the especially widespread use of NTMs in this sector, we believe that this average premium, although high, may lie within a plausible range.

The remaining columns in Table 3 deal with the estimation of the alternate specification in equation (9). Column (4) estimates such model allowing for country-pair effects, while column (5) additionally considers treatment for endogeneity through instrumental variables. As in Heckman and Vytlacil (1998), the instrumental variables estimation of column (5) proceeds by predicting NTMs based on the exogenous variables and the instrument and plugging in these projections to the terms of equation (8).[21] In terms of the parameter for the NTMs variable, as before, treating NTMs as endogenous makes a lot of difference. In fact, the average effect of NTMs in the fruits and vegetables sector using the extended specification (8) is estimated at -0.08 *vis à vis* 1.41, cf. columns (4) and (5), depending on whether or not an instrumental variables approach is used.

The interaction terms in column (5) show how the price premium from NTMs varies for countries according to their existing tariff rates and their GDP per capita. These results suggest some substitution (as opposed to complementarity) between the impact of tariffs and NTMs on prices.[22] That is to say that, all else equal, the price effect of NTMs in the fruits and vegetables sector declines with the country's tariff barriers. The interaction with GDP per capita, meanwhile, suggests that the price premium from NTMs declines as incomes rise, after controlling for other factors.[23]

[21] See Wooldridge (2003) for a proposed variation.
[22] Interestingly, this is the case in all sectors, except for apparel.
[23] This seems to vary more across sectors and estimation procedure.

Of the regression models considered, the ones that provide us with an expected positive sign for the average effect of NTMs are those where an instrumental variables approach is conducted. The other specifications suggest a considerable downward bias in the NTM coefficient estimate, if NTMs are wrongly taken as exogenous. This downward bias may be a reflection of several factors. We expect that products restrained by NTMs have higher prices. However, it may be that products facing heavy import competition—hence relatively low prices—are more likely to have an NTM. This two-way causality would likely bias the impact of NTMs downwards. It may also reflect that countries with NTMs in certain products may have had low prices even in the absence of the NTMs, because of uncontrolled characteristics correlated with the NTM variable, which would contaminate our results from selection bias. Moreover, given the particular difficulty of measuring NTMs, the correction may be reflecting attenuation bias due to a poorly measured NTM variable. Because of these potential issues, we favor an instrumental variables approach. Column (5) is, thus, our preferred econometric model for the fruits and vegetables sector.

In the estimations for the bovine meat and processed food sectors, we observe similar results. Estimation of equation (8) by OLS leads to an unexpected negative price premium of NTMs. Accounting for country-level unobserved heterogeneity through random effect estimation seems helpful in bringing this point estimate upwards, but it seems insufficient to correct for other sources of bias. Moving to an instrumental variables approach, however, brings the estimates of the average price effects of NTMs closer to our priors. This estimate for the bovine meat sector would be 0.97 or 0.93 depending on whether specifications (8) or (9) are used; cf. columns (3) and (5) in Table 4. For the processed food sector, the point estimate would 0.84 or 0.87 depending on the specification; cf. columns (3) and (5) in Table 5. As for the case of fruits and vegetables, due to the more flexible specification and its handling of possible endogeneity issues, the regression in column (5) is our preferred econometric model for these sectors.

For the apparel sector, it seems appropriate to treat the NTMs in 2001 as exogenous. Since the completion of the Uruguay Round, these barriers were under a scheduled phase-out described in the Agreement on Textile and Clothing (ATC). The ATC had specific regulations on the loosening of existing quantity limits and the rate at which these limits were eliminated altogether. As Table 6 shows, the

estimation of equation (8) by least squares and by random effects, columns (1) and (2) respectively, does not seem to alter the coefficient for NTM. If anything the random effect estimation seems to help correct some bias in the coefficient for the tariff. Moving to an instrumental variables approach in column (3) does not seem to change in any significant way the estimated parameters of equation (8). Particularly the estimated coefficient for NTM remains about the same level as before, although it is estimated with less statistical precision and the parameter is not significant. Similarly the estimation of equation (9) via instrumental variables does not yield a significant parameter for the NTM variable. For this reason, the simpler random effect estimation of equation (9), column (4) in Table 6, is the preferred model for the apparel sector.

Drawing on the estimated parameters of specification (9), we can derive country specific estimates of the average effect of NTMs on prices by country and by sector, under the restriction that countries with similar tariff barriers and standards of living exhibit, on average, similar NTMs premiums. These estimates are presented in Table 7. NTMs on the agricultural products appear to be relatively less restrictive in Sub-Saharan African, Eastern European and some Middle Eastern countries, and relatively more restrictive in the EU, US and some Southeast Asian countries. The OECD countries tend to have below average NTM premia on processed food products, and (as is well known) above average premia on apparel products. The country-specific premia for apparel seem to fall reasonably within the range of estimates found in the large literature on the export tax equivalent of apparel NTMs. That literature suggests large premia (roughly 20-40%) for the EU, US and Canada and low or no premia for many developing countries (many of which are global suppliers). Informal discussions with USDA colleagues suggest that the estimates for agricultural products are also reasonable. However, these estimates and those for processed food products require further corroboration.

7. Conclusions

This paper attempts to estimate the price effects of NTMs estimated directly, for many products in many countries, using detailed data on retail prices and on core NTMs. The EIU CityData allowed us to estimate city pair "price gaps" for 47 consumer products and approximately 115 cities in more than 60

countries. The NTM incidence data were drawn from two complementary databases—UNCTAD TRAINS data and a new NTM database compiled by the USITC. While the first contains data which is self-reported by country governments, the second contains data that is largely collected from private sector complaints regarding market access. These databases show both the widespread nature of NTMs as well as their concentration in certain product and countries.

Overall, these results suggest that NTMs are still highly restrictive in many countries and for many consumer goods. Thus, further emphasis on NTM reduction in multilateral trade talks is warranted. The results also suggest that the endogeneity of NTMs is indeed likely to understate their impact on prices. Thus, better estimates of NTM restrictiveness will require methods that incorporate this endogeneity explicitly.

References

Anderson, J. and P. Neary (1992). "Trade Reforms with Quotas, Partial Rent Retention and Tariff," *Econometrica*, 90 (1), 57-76.

Andriamananjara, S., J. M. Dean, R. Feinberg, M. Ferrantino, R. Ludema, M. Tsigas (2004). "The Effects of Non-Tariff Measures on Prices, Trade, and Welfare: CGE Implementation of Policy-Based Price Comparisons," USITC Economics Working Paper No. 2004-04-A.

Angrist, J. and G. Imbens (1995). "Two-Stage Least Squares Estimation of Average Causal Effects in Models with Variable Treatment Intensity," *Journal of the American Statistical Association*, 90 (430), 431-442.

Angrist J. and A. Krueger (2001). "Instrumental Variables and the Search for Identification: From Supply and Demand to Natural Experiments," *Journal of Economic Perspective*, 15 (4), 69-85.

Balassa, B. (1964). "The Purchasing Power Parity Doctrine: A Reappraisal," *Journal of Political Economy*, 72 (4), 584-596.

Bradford, S. (2005). "The Extent and Impact of Final Goods Non-Tariff Barriers in Rich Countries," in P. Dee and M. Ferrantino, eds. *Quantitative Methods for Assessing the Effects of Non-Tariff Measures and Trade Facilitation,* Singapore: World Scientific Publishing.

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

Dean, J. M., R. Feinberg, M. Ferrantino and R. Ludema (2005). "Estimating the Tariff Equivalent of NTMs"in P. Dee and M. Ferrantino, eds. *Quantitative Methods for Assessing the Effects of Non-Tariff Measures and Trade Facilitation,* Singapore: World Scientific Publishing.

Deardorff, A. and R. Stern (1998). *Measurement of Non-Tariff Barrier,* University of Michigan Press.

Donnelly, W. and D. Manifold (2005). "A Compilation of Reported Non-Tariff Measures: Description of the Information," Working Paper EC2005-05-A, US International Trade Commission.

Economics Intelligence Unit (2002). EIU CityData., available at http://www.eiu.com.

Francois, J. and D. Spinanger (2000). "The Cost of EU Trade Protection in Textiles and Clothing," manuscript.

Ferrantino, M. (2006). "Quantifying the Trade and Economic Effects of Non-Tariff Measures," OECD Trade Policy Working Paper No. 28.

Heckman J. and E. Vytlacil (1998). "Instrumental Variables Methods for the Correlated Random Coefficient Model," *Journal of Human Resources*, 33 (4), 974-987.

Kee, H., A. Nicita, and M. Olarreaga (2006). "Estimating Trade Restrictiveness," World Bank Policy Research Working Paper No. 3840.

_____ (2004). "Import Demand Elasticities and Trade Distortions," World Bank Policy Research Working Paper No. 3452.

Kathuria, S., and A. Bhardwaj (2001). "The Export Tax Equivalents of Quota Restrictions in the Indian Textile and Garment Industries," World Bank Working Paper.

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.

Ray, E. J. and R. Marvel (1984). "The Pattern of Protection in the Industrialized World," *Review of Economics and Statistics*, 66 (3), pp. 452-58.

Samuelson, P. (1964). "Theoretical Notes on Trade Problems," *Review of Economics and Statistics*, 46 (2), 145-154

Trefler, D. (1993). "Trade Liberalization and the Theory of Endogenous Protection: An Econometric Study of U.S. Import Policy," *Journal of Political Economy*, 101 (1), 138-160.

USITC (2002). *The Economic Effects of Significant Import Restraint, Third Update, 2002,* US International Trade Commission Publication No. 3519.

Vousden, N. (1990). *The Economics of Trade Protection.* Cambridge: Cambridge University Press.

Wooldridge, J. (2003). "Further Results on Instrumental Variables Estimation of Average Treatment Effects in the Correlated Random Coefficient Model," *Economic Letters*, 79 (2), 185-191.

Yang, Y. (1994). "The Impact of MFA Phasing Out on World Clothing and Textile Markets," *The Journal of Development Studies*, 20 (4), 892-915.

Table 1. Incidence of NTMs on Selected Products,[1] 2001

	Fruits & Vegs. (10)[2]		*Bovine Meat (10)*		*Processed Food (15)*		*Apparel (12)*		*Meat Prod. (6)*		*Dairy (4)*		*Bev./ Tob. Prod. (16)*		*Shoes (4)*		*Paper Prod., Bks, Jrls (6)*		*Chem/Plastic Prod. (10)*		*Electric Prod.(4)*	
	TRNS[3]	ITC[4]	TRNS	ITC	TRNS	ITC	TRNS	ITC	TRNS	ITC	TRNS	ITC	TRNS	ITC	TRNS	ITC	TRNS	ITC	TRNS	ITC	TRNS	ITC
Argentina	7		10		3		9		6		4		1		4	4	3		5	2	1	
Australia	10		10		15				6		4		16						3		3	
Azerbaijan	na		na		na		na		na		na		na		na		na		na		na	
Bangladesh									2				11	4					1	1		
Bahrain		na	7	na		na		na	2	na		na	2	na		na	2	na		na		na
Brazil	6		10		2		2		6		4		5						4		1	
Cameroon													1						1			
Canada	10	10	10		7		12	12	6		4										1	
Chile	6	4	7		2	1			4			4					1		1			
China				10						6			5	4					1			
Colombia	10		10		15	1		12	6	2	4	1	15	1			1		9			
Costa Rica			10						6											2		
Cote d'Ivoire		na	10	na	4	na		na	4	na	1	na	2	na		na	2	na		na	1	na
Czech Rep.	4		7		3				4		4		11						3		1	
Ecuador		4						12	4		4	4	3	4	1				4			
Egypt										2		4		9								
EU-15	1	7	10	10	7	3	12	12							4					1		
Gabon																						
Guatemala					1												4		7		1	
Hong Kong			10						6		3								1	2		
Hungary	9		10		4			12	6		4		15		4	4			3			
Iceland	2			10						2		1										
India	9		3		11		12		6		4		16		4		2		6		4	
Indonesia	7		10	10	5				6	6	4		11	11						1		
Israel				10				12		6				13						1		
Japan		6			1			12								4		4		1		
Jordan		na	10	na		na	12	na	5	na		na		na	4	na		na	1	na	4	na
Kenya																						
Korea (South)				4										6				4		1		1
Malaysia		6	10		2	3			4				3	2					3	2		
Mexico		4		10	4			12	2	6	4	1	2	12		4			1			
Morocco			7		1				2						1							
New Zealand	10		10		15				6		4		2		4				8		4	

Table 1. Incidence of NTMs on Selected Products,[1] 2001

	Fruits & Vegs. (10)[2]		*Bovine Meat (10)*		*Processed Food (15)*		*Apparel (12)*		*Meat Prod. (6)*		*Dairy (4)*		*Bev./ Tob. Prod. (16)*		*Shoes (4)*		*Paper Prod., Bks, Jrls (6)*		*Chem/Plastic Prod. (10)*		*Electric Prod.(4)*	
	TRNS[3]	ITC[4]	TRNS	ITC	TRNS	ITC	TRNS	ITC	TRNS	ITC	TRNS	ITC	TRNS	ITC	TRNS	ITC	TRNS	ITC	TRNS	ITC	TRNS	ITC
Nigeria				10	1					6			3	2					1	1		
Norway	10	10	10		15				6		4		16		4				1		1	
Pakistan				10													1		1	1		
Panama																						
Paraguay	10		10		6			12	4				1	3					1			
Peru	10	na	10	na	9	na		na	6	na	4	na	1	na		na	4	na	1	na		na
Philippines	4		10		1			12	6		4			9					1	2		
Poland	10	10	10		14			12	6		4		13	13					4	1		
Romania	10		10		3				6		4		13						9			
Russian Fed.								12														
Saudi Arabia		na		na		na		na	4	na		na	7	na		na		na	2	na		na
Senegal		na		na		na		na		na		na		na		na		na		na		na
Singapore		10	7						4									4		2		
South Africa	10		7			1	7			2	4		2	3					4			
Sri Lanka		na		na		na		na		na		na		na		na		na		na		na
Switzerland	6		10	10	8				6	6	4		6						3			
Taiwan	10		10		12		12		6		4		14		4				7			
Thailand	10		10		15				6		4									1		
Tunisia	9		10		15				6		4		16		4		3		8		2	
Turkey		7		10		1		12		6				11		4						
United States	10		10		9		12	12	6		4		11	13	3	4			6		1	
Uruguay	10				3	1					1		4						1			
Venezuela	10	6	10		3			12	6	4		4							1			
Vietnam													1	12			0	4	1	0		
Zimbabwe	10		10		3		12		6		3		12									

Notes: [1]Appendix I shows products classified in each group.
[2] Number of products in group in parentheses.
[3] Indicates presence of NTMs designated 6100-6900 in the TRAINS dataset in 2001 or nearest available year.
[4] Indicates import restrictions, quota, prohibitions, licenses, surcharges, or customs measures considered impediments in the ITC dataset in 2001, or nearest available year.

Table 2. Descriptive Statistics

					Fruits/Veg.		Bovine Meat		Processed Food		Apparel	
	Cities[1] (#)	GDP PC[2] (USD)	Wage[1] (USD)	Rent[1] (USD)	Tariff[3] (%)	Import Share[3] (%)	Tariff[3] (%)	Import Share[3] (%)	Tariff[3] (%)	Import Share[3] (%)	Tariff[3] (%)	Import Share[3] (%)
Nigeria	1	318	4.44	1500	40.0	0.00	25.0	0.00	39.1	0.19	50.0	0.01
Kenya	1	339	0.67	506	35.0	0.04	35.0	0.01	27.3	0.39	35.0	0.08
India	2	463	0.53	381	22.0	0.02	10.0	0.00	30.3	0.06	40.0	0.03
Cote d'Ivoire	1	634	0.73	482	20.0	0.37	20.0	0.05	19.3	0.26	20.0	0.36
Indonesia	1	695	0.36	929	5.0	0.23	5.0	0.08	4.1	0.25	17.5	0.01
Azerbaijan	1	701	1.72	450	12.9	0.51	10.5	0.07	14.0	0.57	15.0	0.11
Zimbabwe	1	706	0.45	90	40.0	0.08	40.0	0.00	33.4	0.09	65.0	0.05
Sri Lanka	1	873	1.11	222	27.0	0.72	25.0	0.02	23.7	0.08	10.0	0.32
China	5	911	3.00	1550	20.3	0.06	34.3	0.01	28.2	0.03	23.7	0.25
Philippines	1	912	0.97	311	19.8	0.06	10.3	0.29	16.4	0.17	20.0	0.02
Morocco	1	1156	0.66	527	50.9	0.03	297.5	0.01	49.2	0.32	49.5	0.37
Paraguay	1	1285	5.74	391	11.4	0.25	12.3	0.01	14.8	0.47	21.7	0.55
Ecuador	1	1396	5.66	250	16.9	0.33	20.0	0.01	21.5	0.28	22.5	0.35
Egypt	1	1525	3.05	411	28.0	0.08	5.0	0.92	30.9	0.17	39.5	0.37
Jordan	1	1755	5.63	309	26.9	0.64	10.7	0.94	23.7	0.73	28.3	0.20
Guatemala	1	1766	2.54	1930	15.0	0.21	15.0	0.28	13.7	1.00	21.6	0.39
Romania	1	1772	1.16	205	25.8	0.34	33.6	0.10	23.0	0.63	30.0	0.52
Thailand	1	1876	1.04	404	44.5	0.08	47.9	0.00	31.3	0.07	42.6	0.08
Colombia	1	1939	2.15	237	15.0	0.32	20.0	0.02	19.5	0.45	20.0	0.24
Peru	1	2051	1.48	862	19.8	0.00	30.0	0.00	22.6	0.00	20.0	0.00
Tunisia	1	2071	1.39	194	43.0	0.12	29.5	0.00	39.1	0.19	42.8	0.58
Russian Federation	2	2141	3.61	700	11.5	1.34	15.0	1.39	13.1	0.90	27.1	0.43
Turkey	1	2154	2.31	512	48.2	0.15	165.0	0.00	46.9	0.08	13.0	0.17
South Africa	1	2620	1.77	648	7.2	0.00	40.0	0.08	17.1	0.15	37.3	0.32
Brazil	2	2915	2.46	455	11.9	0.09	12.8	0.11	19.1	0.15	22.5	0.14
Malaysia	1	3678	3.95	237	3.3	0.20	0.0	0.20	11.8	0.08	18.1	0.04
Chile	1	4126	3.00	360	8.0	0.22	8.0	1.03	8.0	0.35	8.0	1.33
Costa Rica	1	4171	1.66	400	19.4	0.11	14.0	0.07	12.4	0.55	13.9	2.23
Poland	1	4518	1.90	600	21.3	0.58	39.0	0.00	28.7	0.48	19.7	0.45
Venezuela	1	5012	3.69	900	15.0	0.18	20.0	0.07	19.5	0.30	20.0	0.60
Hungary	1	5140	1.96	285	40.2	0.15	72.2	0.02	38.4	0.28	11.2	0.76
Uruguay	1	5483	3.73	477	11.9	0.50	13.0	0.00	16.5	0.93	22.5	0.82
Czech Republic	1	5519	9.25	925	5.7	0.33	61.4	0.01	9.1	0.35	0.7	0.51
Mexico	1	6214	4.29	1269	40.8	0.15	18.8	0.57	23.7	0.12	35.0	0.84
Argentina	1	7170	5.50	450	10.9	0.52	11.8	0.09	15.5	0.50	21.5	0.69
Saudi Arabia	3	8711	6.67	1037	12.0	0.76	0.0	0.58	10.9	0.86	12.0	0.87
Korea, Republic of	1	9748	5.43	1550	39.3	0.12	28.5	0.56	19.7	0.20	13.0	0.89
Portugal	1	10822	3.68	606	11.5	0.41	82.4	0.17	21.1	0.58	12.6	2.45
Greece	1	10986	5.28	713	11.5	0.41	82.4	0.17	21.1	0.58	12.6	2.45
Bahrain	1	12289	5.26	684	4.8	1.14	5.0	0.29	5.0	1.09	10.8	0.42
New Zealand	2	12543	7.43	491	0.0	0.33	0.0	0.18	3.2	0.75	15.0	0.90
Taiwan	1	12549	11.54	813	33.5	0.09	26.7	0.20	21.2	0.09	13.1	0.39
Spain	2	14046	7.24	632	11.5	0.41	82.4	0.17	21.1	0.58	12.6	2.45
Israel	1	17350	8.74	699	3.7	na	0.0	na	9.2	na	32.9	na
Italy	2	18826	8.13	534	11.5	0.41	82.4	0.17	21.1	0.58	12.6	2.45

Table 2. Descriptive Statistics

					Fruits/Veg.		Bovine Meat		Processed Food		Apparel	
	Cities[1] (#)	GDP PC[2] (USD)	Wage[1] (USD)	Rent[1] (USD)	Tariff[3] (%)	Import Share[3] (%)	Tariff[3] (%)	Import Share[3] (%)	Tariff[3] (%)	Import Share[3] (%)	Tariff[3] (%)	Import Share[3] (%)
Australia	5	19011	9.38	465	0.5	0.03	0.0	0.00	3.0	0.48	24.1	1.20
Singapore	1	20733	7.14	1200	0.0	0.11	0.0	0.05	0.0	0.17	0.0	0.47
Canada	4	21787	12.57	705	4.1	0.36	9.5	0.25	4.4	0.62	18.2	0.74
France	2	22010	9.78	614	11.5	0.41	82.4	0.17	21.1	0.58	12.6	2.45
Belgium	1	22129	6.69	647	11.5	0.41	82.4	0.17	21.1	0.58	12.6	2.45
Germany	5	22759	10.41	773	11.5	0.41	82.4	0.17	21.1	0.58	12.6	2.45
Austria	1	23210	6.54	549	11.5	0.41	82.4	0.17	21.1	0.58	12.6	2.45
Netherlands	1	23379	8.16	816	11.5	0.41	82.4	0.17	21.1	0.58	12.6	2.45
Finland	1	23513	22.70	530	11.5	0.41	82.4	0.17	21.1	0.58	12.6	2.45
Sweden	1	23624	28.44	664	11.5	0.41	82.4	0.17	21.1	0.58	12.6	2.45
United Kingdom	2	23917	11.40	990	11.5	0.41	82.4	0.17	21.1	0.58	12.6	2.45
Hong Kong	1	24074	8.33	2564	0.0	0.21	0.0	0.07	0.0	0.16	0.0	3.43
Ireland	1	26357	7.44	858	11.5	0.41	82.4	0.17	21.1	0.58	12.6	2.45
Iceland	1	26744	10.07	504	18.0	0.36	30.0	0.00	5.1	1.21	15.0	1.85
Denmark	1	30382	12.14	910	11.5	0.41	82.4	0.17	21.1	0.58	12.6	2.45
Japan	2	33418	16.22	2911	8.1	0.29	35.0	0.69	13.2	0.50	11.2	2.75
Switzerland	2	34209	19.35	881	60.5	0.25	111.9	0.11	0.0	0.42	7.7	2.16
United States	16	35649	23.58	1171	2.8	0.25	11.3	0.26	3.1	0.36	12.1	2.99
Norway	1	36662	11.30	847	33.7	0.45	215.7	0.06	0.7	0.66	15.5	1.91
Luxembourg	1	44903	7.80	780	11.5	0.41	82.4	0.17	21.1	0.58	12.6	2.45

[1] Data are from EIU CityData. See appendix II for definitions.

[2] Data are from World Bank, World Development Indicators. Definition in appendix II.

[3] Data are from TRAINS using WITS. Share of total imports in 2001 or nearest available year. EU import shares are shown for the fifteen EU member countries. Definitions are in appendix II.

Table 3. Estimation Results for the Fruits and Vegetables Sector

	Fruits and Vegetables				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
GDP-PC	0.11	0.08	-0.22	0.07	-0.07
	10.15	*9.27*	*-15.01*	*7.14*	*-3.71*
Wage	0.17	0.17	0.22	0.14	0.22
	12.61	*14.49*	*19.11*	*11.89*	*19.3*
Rent	0.18	0.11	0.47	0.11	0.44
	17.09	*16.32*	*28.39*	*16.24*	*26.81*
Dist	0.14	0.08	-0.35	0.06	-0.31
	14.28	*10.45*	*-19.47*	*7.37*	*-17.19*
Tariff	0.49	0.45	-0.07	1.04	2.53
	11.01	*9.62*	*-1.40*	*14.63*	*13.01*
NTM	-0.23	-0.15	1.63	-0.08	1.41
	-16.20	*-9.76*	*24.54*	*-5.85*	*20.96*
NTM*Tariff				-1.12	-3.67
				-14.07	*-14.2*
NTM*GDP-PC				0.10	-0.16
				9.5	*-7.75*
Constant	-0.05	-0.08	-0.07	-0.08	-0.06
	-5.14	*-10.14*	*-7.14*	*-10.2*	*-5.84*
Country Effects	No	Yes	Yes	Yes	Yes
IV	No	No	Yes	No	Yes
N	52129	52129	52129	52129	52129
R-sq	0.37	0.36	0.32	0.37	0.32

Notes: All variables but NTM are measured in logs. All terms refer to pairwise differences. Country effects refer to country-pair effects, modeled as random effects. Estimated standard errors corrected for unknown heteroskedasticity and clustering. Estimated parameters and t-statistics (in italics) shown in upper panel. R-sq for columns (2) to (5) are pseudo R-squares.

Table 4. Estimation Results for the Bovine Meat Sector

	Bovine Meat				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
GDP-PC	0.16	0.20	0.17	0.24	0.12
	12.06	*16.74*	*14.79*	*12.7*	*6.29*
Wage	0.03	0.08	0.03	0.08	0.02
	1.38	*4.39*	*1.58*	*4.29*	*1.3*
Rent	0.31	0.11	0.29	0.11	0.29
	20.30	*15.03*	*13.71*	*15.16*	*13.54*
Dist	-0.17	-0.07	-0.19	-0.09	-0.18
	-5.23	*-2.97*	*-6.9*	*-4.14*	*-6.41*
Tariff	0.45	0.37	0.18	0.56	0.56
	11.32	*10.17*	*3.83*	*10.79*	*2.96*
NTM	-0.10	0.04	0.97	0.03	0.93
	-3.93	*1.88*	*8.18*	*1.07*	*7.82*
NTM*Tariff				-0.29	-0.44
				-5.35	*-2.13*
NTM*GDP-PC				-0.05	0.07
				-2.38	*2.73*
Constant	-0.08	-0.10	-0.09	-0.10	-0.10
	-5.96	*-9.54*	*-9.28*	*-9.11*	*-9.76*
Country Effects	No	Yes	Yes	Yes	Yes
IV	No	No	Yes	No	Yes
N	37412	37412	37412	37412	37412
R-sq	0.49	0.43	0.47	0.43	0.48

Notes: All variables but NTM are measured in logs. All terms refer to pairwise differences. Country effects refer to country-pair effects, modeled as random effects. Estimated standard errors corrected for unknown heteroskedasticity and clustering. Estimated parameters and t-statistics (in italics) shown in upper panel. R-sq for columns (2) to (5) are pseudo R-squares.

Table 5. Estimation Results for the Processed Food Sector

	Processed Food				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
GDP-PC	-0.08	-0.05	-0.16	-0.06	-0.14
	-9.79	*-9.9*	*-21.04*	*-10.53*	*-16.67*
Wage	0.14	0.11	0.08	0.10	0.08
	16.10	*14.96*	*10.57*	*13.17*	*10.66*
Rent	0.19	0.12	0.26	0.12	0.27
	24.88	*20.69*	*28.26*	*20.25*	*31.09*
Dist	0.08	0.10	-0.15	0.09	-0.16
	3.70	*7.58*	*-8.55*	*7.2*	*-9.02*
Tariff	0.46	0.20	-0.16	0.21	-0.03
	11.04	*5.16*	*-3.59*	*4.88*	*-0.44*
NTM	-0.13	-0.06	0.84	-0.07	0.87
	-12.52	*-5.07*	*21.85*	*-6.66*	*21.7*
NTM*Tariff				-0.03	-0.45
				-0.31	*-2.28*
NTM*GDP-PC				0.05	-0.08
				4.93	*-4.31*
Constant	-0.02	-0.02	-0.01	-0.02	-0.01
	-3.08	*-3.59*	*-1.46*	*-3.92*	*-1.17*
Country Effects	No	Yes	Yes	Yes	Yes
IV	No	No	Yes	No	Yes
N	65080	65080	65080	65080	65080
R-sq	0.16	0.16	0.14	0.16	0.14

Notes: All variables but NTM are measured in logs. All terms refer to pairwise differences. Country effects refer to country-pair effects, modeled as random effects. Estimated standard errors corrected for unknown heteroskedasticity and clustering. Estimated parameters and t-statistics (in italics) shown in upper panel. R-sq for columns (2) to (5) are pseudo R-squares.

Table 6. Estimation Results for the Apparel Sector

	Apparel				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
GDP-PC	-0.05	0.02	0.03	-0.04	0.12
	-5.05	*1.91*	*2.25*	*-3.53*	*7.92*
Wage	0.16	0.17	0.15	0.17	0.18
	10.44	*9.1*	*6.28*	*8.99*	*7.59*
Rent	0.23	0.10	0.10	0.09	0.10
	18.12	*9.56*	*9.41*	*8.97*	*8.92*
Dist	-0.04	0.01	0.01	0.02	-0.04
	-3.52	*1.21*	*0.88*	*2.74*	*-2.89*
Tariff	-0.22	0.55	0.53	0.23	-0.10
	-2.36	*5.87*	*3.75*	*2.33*	*-0.33*
NTM	0.12	0.13	0.11	0.21	-0.13
	7.00	*8.04*	*1.19*	*10.45*	*-1.32*
NTM*Tariff				0.62	1.24
				3.74	*2.85*
NTM*GDP-PC				0.16	-0.23
				11.82	*-9.58*
Constant	0.00	0.00	0.00	0.00	0.00
	-0.35	*-0.42*	*-0.01*	*-0.25*	*-0.13*
Country Effects	No	Yes	Yes	Yes	Yes
IV	No	No	Yes	No	Yes
N	59982	59982	59982	59982	59982
R-sq	0.25	0.20	0.19	0.20	0.24

Notes: All variables but NTM are measured in logs. All terms refer to pairwise differences. Country effects refer to country-pair effects, modeled as random effects. Estimated standard errors corrected for unknown heteroskedasticity and clustering. Estimated parameters and t-statistics (in italics) shown in upper panel. R-sq for columns (2) to (5) are pseudo R-squares.

Table 7. Country Estimates by Sector

	Fruits/Veg.	Bovine Meat	Proc. Food	Apparel
Argentina	1.48	0.97	0.87	0.20
Australia	1.68	1.09	0.84	
Austria	1.47	0.90	0.79	0.32
Azerbaijan				
Bahrain		1.03		
Belgium	1.48	0.90	0.80	0.31
Brazil	1.59	0.90	0.94	0.05
Canada	1.54	1.06	0.82	0.36
Chile	1.66	0.94	0.95	
China		0.74		
Colombia	1.56	0.84	0.97	-0.03
Costa Rica		0.92		
Cote d'Ivoire		0.76		
Czech Republic	1.69	0.80	0.92	
Denmark	1.43	0.92	0.77	0.36
Ecuador	1.54			-0.07
Egypt				
Finland	1.47	0.90	0.79	0.32
France	1.48	0.90	0.80	0.31
Germany	1.47	0.90	0.80	0.32
Greece	1.59	0.85	0.86	0.20
Guatemala			1.00	
Hong Kong		1.10		
Hungary	0.70	0.76		0.09
Iceland	1.07	1.00		
India	1.60	0.77	1.05	-0.17
Indonesia	2.05	0.82	1.12	
Ireland	1.45	0.91	0.78	0.34
Israel		1.08		0.39
Italy	1.50	0.89	0.81	0.29
Japan	1.33		0.75	0.39
Jordan		0.87		0.00
Kenya				
Korea, Republic of		0.93		
Luxembourg	1.36	0.95	0.74	0.43
Malaysia	1.84	0.97	0.94	
Mexico	0.91	0.93	0.85	0.23
Morocco		0.28	0.91	
Netherlands	1.47	0.90	0.79	0.32
New Zealand	1.76	1.06	0.87	
Nigeria		0.69	1.05	
Norway	0.64	0.64	0.79	
Paraguay	1.73	0.84	1.02	-0.08
Peru	1.40	0.81	0.95	
Philippines	1.56	0.82	1.05	-0.15
Poland	1.24	0.84	0.86	0.11
Portugal	1.59	0.85	0.86	0.20
Romania	1.24	0.77	0.96	
Russian Federation				0.02
Saudi Arabia				
Singapore	1.68	1.09		
South Africa	1.77	0.80	0.95	0.10
Spain	1.55	0.86	0.84	0.24
Sri Lanka				
Sweden	1.47	0.90	0.79	0.32
Switzerland	0.11	0.81	0.80	
Taiwan	0.72	0.96	0.80	0.24
Thailand	0.73	0.75	0.93	
Tunisia	0.74	0.81	0.90	
Turkey	0.68	0.50	0.89	-0.05
United Kingdom	1.46	0.91	0.79	0.33
United States	1.51	1.10	0.79	0.41
Uruguay	1.49		0.89	
Venezuela	1.40	0.91	0.89	0.13
Zimbabwe	0.99	0.70	1.00	0.01

Note: Country-specific effects from estimated equation (9). In all sectors but Apparel, NTMs are treated as endogenous. Blanks refer to countries with no NTMs for the sector.

Appendix I. EIU CityData Products and HS Classification

	EIU CityData Product	HS
Fruits and Vegetables	Apples (1 kg)	80810
	Bananas (1 kg)	80300
	Carrots (1 kg)	70610
	Lemons (1 kg)	80530
	Lettuce (one)	70511
	Mushrooms (1 kg)	70951
	Onions (1 kg)	70310
	Oranges (1 kg)	80510
	Potatoes (2 kg)	70190
	Tomatoes (1 kg)	70200
Bovine Meat	Beef: ground or minced (1 kg)	0201, 0202
	Beef: roast (1 kg)	0201, 0202
	Beef: stewing, shoulder (1 kg)	0201, 0202
	Beef: filet mignon (1 kg)	0201, 0202
	Lamb: chops (1 kg)	204
	Lamb: leg (1 kg)	204
	Lamb: Stewing (1 kg)	204
	Beef: steak, entrecote (1 kg)	0201, 0202
	Veal: chops (1 kg)	0201, 0202
	Veal: roast (1 kg)	0201, 0202
Processed Food	Cocoa (250 g)	180500
	Cornflakes (375 g)	190410
	Drinking chocolate (500 g)	180610
	Frozen fish fingers (1 kg)	160420
	Flour, white (1 kg)	110100
	Ground coffee (500 g)	901
	Instant coffee (125 g)	901
	Orange juice (1 l)	2009
	Peaches, canned (500 g)	200870
Processed Food	Peas, canned (250 g)	200540
	Sliced pineapples, canned (500 g)	200820
	Spaghetti (1 kg)	190219
	Tea bags (25 bags)	90230
	Tomatoes, canned (250 g)	200210
	White bread, 1 kg (mid-priced	190590
Apparel	Socks, wool mixture	6115
	Tights, panty hose	6115
	Women's cardigan sweater	6110
	Boy's jacket, smart	620331-620333
	Business suit, two piece, med. weight	620311, 620312
	Boy's dress trousers	620341, 620343
	Child's jeans	620342
	Dress, ready to wear, daytime	6204
	Girl's dress	6204
	Business shirt, white	620520. 620530
	Men’s raincoat, Burberry type	620112, 620113
	Women's raincoat, Burberry type	620212, 620213
Meat Products	Bacon (1 kg)	21012
	Chicken: fresh (1 kg)	207
	Chicken: frozen (1 kg)	207
	Ham: whole (1 kg)	21011
	Pork: loin (1 kg)	203
	Pork: chops (1 kg)	203
Dairy	Butter, 500 g	40510
	Cheese, imported (500 g)	406
	Milk, pasteurized (1 l)	40120
	Yoghurt, natural (150 g)	40310

Beverages and Tobacco Products	Beer, local brand (1 l)	220300
	Beer, top quality (330 ml)	220300
	Cognac, French VSOP (700 ml)	220820
	Liqueur, Cointreau (700 ml)	220870
	Scotch whisky, six years old (700 ml)	220830
	Vermouth, Martini & Rossi (1 l) 1	220510
	Wine, common table (1 l)	220421
	Wine, fine quality (700 ml)	220421
	Wine, superior quality (700 ml)	220421
	Gin, Gilbey's or equivalent (700 ml)	220850
	Coca-Cola (1 l)	220210
	Mineral water (1 l)	220110
	Tonic water (200 ml)	220210
	Cigarettes, local brand (pack of 20)	240220
	Cigarettes, Marlboro (pack of 20)	240220
	Pipe tobacco (50 g)	240310
Shoes	Child's shoes, dresswear	640420
	Men's shoes, business wear	640420
	Child's shoes, sportswear	640411
	Women's shoes, town	640420
Paper Products, Newspapers, Books	Toilet tissue (two rolls)	481810
	Facial tissues (box of 100)	481820
	Daily local newspaper	490210
	International foreign daily newspaper	490210
	Paperback novel (at bookstore)	4901
	International weekly news magazine	490290
Chem. & Plastic Products	Dishwashing liquid (750 ml)	340220
	Insect-killer spray (330 g)	380810
	Laundry detergent (3 l)	340220
	Soap (100 g)	340111
	Aspirins (100 tablets)	291822
	Hand lotion (125 ml)	330430
	Lipstick (deluxe type)	330410
	Shampoo & conditioner in one (400 ml)	330510
	Toothpaste with fluoride (120 g)	330610
	Kodak colour film (36 exposures)	370231
Electrical Products	Batteries (two, size D/LR20)	8506
	Electric toaster (for two slices)	851672
	Light bulbs (two, 60 watts)	853922
	Compact disc album	852432

APPENDXI 2: Data Definitions and Sources[1]

Variable	definition	units	source
Price	Retail price per unit	2001 US dollars	EIU CityData
Wage	Maid's hourly wage	2001 US dollars	EIU CityData
Rent	Rent on 1 bedroom furnished apartment	2001 US dollars	EIU CityData
Per capita income	GDP per capita	2001 US dollars	World Bank, World Development Indicators
Weight	Share of global exports of product	percent	Constructed from Comtrade export data in WITS
Distance	Export-share-weighted great circle distance	miles	Calculated using great circle distance and export shares constructed from Comtrade export data in WITS
Tariff	ad valorem or AVE	percentage points	UNCTAD TRAINS, via WITS.
NTM	=1 if TRAINS indicated an NTM (as defined in UNCTAD category 6000), or ITC database indicated an NTM (defined as import quota, prohibition, license, or surcharge) =0 otherwise	Dummy variable	UNCTAD TRAINS, via WITS. ITC database[2]

[1] For all variables, 2001 data were used, or nearest available year.

[2] See http://hotdocs.usitc.gov/docs/pubs/research_working_papers/EC200505A.pdf for a detailed description.