Discussion Paper: Do Non-Tariff Measures on Agricultural Trade Reduce Food Security?

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Abstract

There has been increasing economic commentary on the global trend towards deglobalisation. Furthermore, food supply shortages following the war in Ukraine have nudged some countries towards protectionism. This latest trigger is due to concerns that liberal trade policy reduces food security. As liberalisation, in some instances, becomes unfashionable, this research considers the effects of technical non-tariff measures (NTMs) on food security via changes to agricultural trade.

This paper considers the effect of Technical Barriers to Trade (TBTs) and Sanitary and Phytosanitary (SPS) measures on agri-food prices. Price data from the International Comparison Program (ICP) dataset and frequency ratios of technical NTMs from the Trade Analysis Information System (TRAINS) database are used to explore an estimation strategy controlling for country-specific and product-specific factors.

This discussion paper seeks to promote discussion on the design of a specification that yields estimates robust enough to incorporate in general equilibrium modelling of NTM liberalisation. Findings on the effects of NTM liberalisation on food availability and affordability could inform trade policy for countries where food security is of political importance.

Keywords Agricultural Protection; Agricultural Trade; Food Trade; International Trade; Econometric Modeling

JEL code Q17; C51

1. Introduction and Literature

Agricultural products were among the first goods traded in economic markets (Bavel, 2016). Still, many governments across the world intervene in the availability of, and access to, food to achieve "food security" for their citizens.

One of the primary reasons for this is geopolitics, which can trigger changes in states' trust in the sustainability of their food supply chains. For example, in the two months following Russia's invasion of Ukraine in 2022, 13 countries imposed export restrictions further contraction in global agricultural markets in addition to the reduction in grains exported by war-torn Ukraine (Glauber, et al., 2022). Another factor is shifting weather patterns (including the increased frequency and intensity of extreme weather events) induced by global warming, which may make food supply more volatile (IPCC, 2022). Meanwhile, the necessity of sufficient food access for economic development in low and middle income countries (LMIC) and the social, environmental, and economic significance of agricultural land ownership in high income countries (HIC) ensure 'food security' remains topical in domestic and international political debates.

The balance between reliance on domestic production and imports to obtain long-term availability and access to food is the crux of the debate around food security. However, this can be easily lost in the noise of wider geopolitical and political economy trends which can influence trade policy – such as the increasingly noticeable trend towards de-globalisation (Irwin, 2020). In the light of all of the above, this research considers how effective the use of agri-trade policy is to achieve food security objectives.

The research focuses on a specific subset of agri-trade policy, so-called 'non-tariff measures' (NTMs). According to the WTO, NTMs are

"*policy measures other than ordinary customs tariffs that can potentially have an economic effect on international trade in goods, changing quantities traded or prices or both"* (WTO, 2022)

This broad set of policies ranges from regulations on intellectual property to quantitative and price restrictions on the trade of products. This research focuses on two types of technical NTMs which regulate the standards of products being traded. It considers Sanitary and Phytosanitary (SPS) measures, which are regulations that cover food safety, and Technical Barriers to Trade (TBTs), which consider the physical characteristics, functionality, and performance of products (EC, n.d.). It focuses on NTMs because these are increasingly being favoured for liberalisation over tariffs in trade agreement negotiations (Berden & Francois, 2015). Furthermore, NTMs can be complex due to the volume and variety of measures, and the variation in interpretation of measures across different countries. This makes them more complicated to analyse than tariffs and, perhaps because of this, such analysis is less prominent in the literature. Furthermore, NTMs are also more resource-intensive to negotiate during trade negotiations than tariffs – thus policymakers may require a greater proof of benefits of liberalisation before pursuing negotiations.

When they create additional costs to production in source countries, technical NTMs on agri-food goods, such as SPS measures and TBTs, can increase prices and reduce imports. This could be due to manufacturers changing production processes to comply with the regulations; increased delays due to border checks; or increased labour costs for completing compliance documentation.[1] For net-importing countries this can reduce the supply of food and increase prices for consumers (Hernandez, 2019) (Stern & Deardorff, 1997, pp. 9 - 10). This can reduce the availability of and access to food. However, increased agri-food prices could, over the longer term, incentivise greater domestic production(subject to resources) mitigating reductions in availability, pushing prices back down and improving self-sufficiency.

However, Beghin and Xiong point out this theoretical mechanism may not hold when the costs of complying with regulations and standards targeted by NTMs are greater for domestic producers (in which case the measures incentivise imports over domestic production) or when the cost of complying are equal between foreign and domestic producers (Hernandez, 2019) (Beghin & Xiong, 2018, pp. 159-187). Furthermore, as summarised by Hernandez, technical NTMs can improve welfare which could, in some cases, more than off-set increased costs for producers. Measures that ensure better quality in consumption, for example, can reduce asymmetric information between exporting producers and importing consumers which can increase trust in goods and thus may increase demand. This is particularly relevant for SPS checks which improve food safety. Furthermore, measures that target environmental and social damage can force producers to internalise these external costs thus improving societal welfare. Hernandez is critical of Computable General Equilibrium (CGE) assessments of trade agreements that do not incorporate these positive welfare effects of NTMs.

This research will investigate the relationship between agri-trade policy and food security in three stages.

First, a relationship will be established between technical NTMs and agri-trade. In stage one, a relationship is econometrically estimated between NTMs on, and prices of agricultural goods. As well as being of interest in and of itself, this will then be utilised in a CGE model later in the research.[2] As outlined by Berden and Francois in 2015, a price-based approach can be considered preferable to a quantity-based approach because it considers both observed prices that *are*, and observed prices that *are not* distorted by NTMs, whereas quantity-based approaches compared observed values to gravity-estimated values (Berden & Francois, 2015).[3] However, data limitations can make price-based approaches challenging at scale – including in the current research. This paper takes Cadot and Gourdon’s 2014 approach to regress prices on NTMs as well as country-specific, product-specific and country-product-specific factors (Cadot & Gourdon, 2014). Despite using a dataset with just 30 countries, they mitigate against these data limitations by the inclusion of 42 product groups. This paper focuses on three product groups, which creates significant estimation issues despite the data being more geographically expansive.

Gebrehiwet outlines the price-wedge method as one of seven approaches to quantify NTMs identified from the literature (Gebrehiwet, 2004). The price-wedge method considers the price raising effect of NTMs as the difference between the price, exclusive of tariffs, of a domestic good and a similar, imported good. To incorporate the estimated relationship between NTMs and prices in agri-food sectors, the second stage of this research uses the

[1] Note for fixed costs, such as one-off changes to the production process, compliance with NTMs may not raise prices by much and/or only raise them temporarily.
[2] The GTAP CGE model already has a link between prices and NTMs so it is easier to modify to incorporate an empirical relationship between the two variables than between NTMs and trade.
[3] Gravity models typically use geographical distances to estimate trade flows between bilateral trading partners.

price-wedge method as a basis to make minor modifications to the GTAP CGE model. The modification enables a mechanism where changes in NTMs affect export prices which in turn affects import prices relative to the price for domestically produced substitutes in the importer country. This affects trade and production and has general equilibrium implications.

The final stage is to use this modified CGE model to investigate the impact of NTM liberalisation on food security indicators. NTMs are liberalised between countries within a hypothetical free trade agreement (FTA) scenario. Analysis is then undertaken on outputs relating to food availably, affordability, production and trade.

This paper focuses on the methodological approach and issues in the first stage. It outlines results emerging from experimental regressions of agri-food prices on NTMs. It appears SPS measures reduce prices by a small magnitude, which could be due to the composition of countries in the dataset. There is some evidence to show SPS measures are associated with greater imports in low income countries. This is likely due to harmonisation of standards with high income countries allowing easier trade facilitation. This could reduce prices as imports from sources with comparative advantage may be cheaper than domestic substitutes (Santeramo & Lamonaca, 2022). There also appears to be a different relationship between technical NTMs and prices for vegetable products than for animal-related and other food products. More importantly, this paper proposes and invites discussion on solutions to mitigate against the significant estimation issues resulting from the smallness of the dataset underpinning the econometrics for when this work is reviewed later in the year.

The paper is organised as follows: *Section 2* explains the data and methodology and the issues surrounding these. Experimental results are presented in *Section 3* along with discussion and proposed next steps to improve estimation are presented in *Section 4*.

2. Data and Estimation Strategy

Estimation of the relationship between NTMs and agri-food is based on Cadot and Gourdon's "simple treatment-effect" approach, in which prices are described as being "treated" by NTMs. It controls for country-specific, product-specific and country-product-specific factors. The final cross-sectional dataset consists of 58 countries and three agri-food product groups. This research, like Cadot and Gourdon's, utilises the World Bank's International Comparison Program (ICP) and UN Conference on Trade and Development (UNCTAD)'s TRAINS datasets (Cadot & Gourdon, 2014).

The frequency ratios of SPS measures and TBTs are used in estimation. This inventory-based approach to quantifying NTMs uses the TRAINS dataset and measures the proportion of tradable products within a product group which have at least one NTM applied to them (World Bank, n.d.). At the time of writing, frequency ratios for just three broad, agri-food product groups were obtained: Animal-related agri-food goods (HS 01 to HS 05); Vegetable-related agri-food goods (HS 06 to HS 15); and Food Products (HS 16 to HS 24). This severely limits the number of observations in the dataset. Although frequency ratios do not give any assessment of the costs or welfare benefits of NTMs applied, these series are the most comprehensive sources of global NTMs publicly available and can be easily interpreted in a policymaking context – i.e. they can demonstrate the effect on prices of reducing the number of products which have SPS measures applied to them. [descriptive statistics to be inserted]

Food prices are from the price level indexes (PLIs) series in the ICP dataset. This considers countries' 2017 prices of comparable quantities of comparable products in their domestic currencies adjusted by market exchanges such that prices can be directly compared across countries.[4] Obtained food, beverage and tobacco prices were split between 12 product groups which were then aggregated using ICP's expenditure PPP data to map onto the three product groups in the NTM data.[5] These sectors could not be accurately mapped to international classifications as they are created on a bespoke basis for each country within the ICP dataset depending on the make-up of the country's expenditure (World Bank, 2005). Therefore, the sectors were mapped based on their names and HS chapter-level descriptions. Generally, lower income countries have lower PLIs than higher income countries. This is because lower income countries' consumption baskets contain a greater proportion of goods (relative to services). These are a greater proportion of tradeable inputs (relative to non-tradeable inputs). Tradeable inputs tend to be cheaper due to the effects of international trade and specialisation on prices. [descriptive statistics to be inserted]

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[4] PLIs are purchasing power parity (PPP) ratios divided by nominal market exchange rate.
For example, let the PPP between Barbados and the world for meat be BDs$3.1. This would mean, on average, to purchase 1kg of meat somewhere in the world it would cost 1 "world dollar" and to purchase it in Barbados, it would cost 3.1 Barbados dollars.
If the nominal, market exchange rate BDs$2 to one "world dollar", after exchanging a world dollar in a bank to Barbados dollars, you would not have enough money to buy a kilogram of meat in Barbados despite, on average, you could have purchased it elsewhere in the world when you cash was still in "world dollars".
Therefore, on average, prices for meat in Barbados are higher than elsewhere in the world.
The calculation described would give Barbados a PLI of 155 (100*(3.1/2)) meaning the price of meat in Barbados is 55% higher than elsewhere in the world.
For further explanation see (Rao, 2013)

[5] There are 211 ICP basic headings, the most disaggregated level of sectors, under there 12 sectoral categories

The *figure* shows there is no correlation between the SPS measures and TBTs and prices for agricultural goods. This may be because variation in prices is dependent on other more influential factors than these technical measures. [to expand]

Also included in the draft specification are controls that are both specific to countries and the broad agri-food product groups, these are tariff rates and reliance on imports.

Generally, tariffs raise the price of the imported products that they are applied to and thus raise the composite price of those products within the importers' domestic market. Most Favoured Nation (MFN) tariffs, the lowest rates that can be applied on imports by a WTO member from another WTO member, from the International Trade Centre's Market Access Map database, at HS chapter level, are chosen. This is a second-best solution as these are not the rates that are applied in practice. Applied rates may be lower for countries which have free-trade deals covering most of their trade. One desirable extension to this would be to aggregate *applied* tariffs across trade partners for each country. Tariff data is matched to the NTM frequency ratio data by chapter level HS code using a simple weighting.[6] [descriptive statistics to be inserted]

The greater the proportion of imports in a country's domestic supply of a given product, the greater the importance of tariffs in determining domestic composite prices. Furthermore, imports tend to have greater transport costs, thus a country more reliant on imports could face higher costs if all else is equal. An average across all available years (2010 to 2020) of the quantity of imports is taken from the Food and Agriculture Organisation of the United Nations' (FAO) Food Balance Sheet (FBS) dataset.[7] This is taken as a proportion of the quantity of domestic supply (from the same source).[8] Unfortunately, there is there is no mapping between these product categories and other internationally recognised product classifications so they are mapped to HS chapter level by their item name and HS-6 descriptions using quantity of supply as weights. [descriptive statistics to be inserted]

The following were used to control for differences between countries:

- PLI transport costs from the ICP database;
- 2017 average monthly earning (labour costs) in purchasing power parity for the agriculture, forestry and fishing sector, from the International Labour Organisation's Wages and Working Time Statistics database;
- 2016 fuel pump prices, from the World Bank's World Development Indicators' database;
- an average of 2012 to 2017 GDP per capita (in constant prices), from the World Bank's World Development Indicators' database;
- 2017 Human Development Index (HDI) ranking from the UN Development Programme.

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[6] With more resource, aggregating the tariff data by value of imports across HS codes could provide aggregated tariff rates that are closer to those applied in actuality. Time allocated to this research has prevented this being done thus far.

[7] An average is taken due to inconsistent missing data

[8] Domestic supply is only as reliable as the individual components that compromise it. For a small number of observations, imports are greater than domestic supply most likely due to negative changes in stocks (FAO, 2020)

Some of these series required ad-hoc workarounds to mitigate against missing data.[9] Alternative energy price data by country as well as data relating to capital in country's agricultural industry and food aid imports were not publicly and freely available for the desired set of countries.

The initial draft specification is as follows:[10]

$$\ln AgriFood\ Prices_{ir} = \beta_0 + \beta_1 lnTBTFreqRatio_{ir} + \beta_2 lnSPSFreqRatio_{ir} + \delta_{ir} + \delta_r + u_{ir}$$

Where, i denotes individual agri-food sectors and r denotes individual countries such that δ_{ir} are country and sector specific variables (i.e. logged MFN tariff rate and proportion of products that are imports) and δ_r are country specific variables (i.e. agricultural labour cost, logged fuel price, transport costs, logged GDP/capita and logged HDI).

This is intially estimated using the Ordinary Least Squares (OLS) estimator with an attempt to correct for heteroscedacity using robust standard errors. This paper is presented part way through an experimental phase where the specification is incrementally modifed as diagnostic tests are undertaken. So far, the robustness of regressions have suffered from a small dataset compromising of between 52 and 160 observations.

Variables in the experimental models are always jointly significant and explain between 55% and 63% of the variation in observed agri-food prices across product groups and countries.

Regressions tend to satisfy zero conditional mean of error and error terms from regressions tend to be normally distirbuted. However, countries' product groups which are at least 15% cheaper than the world average tend to be overestimated by models.[11]

There is mixed evidence as to whether model parameters are linear. Non-linearity could be due to a variety of reasons not limited to: omitting important variables (perhaps food aid or energy prices), inclusion of irrelevant variables, measurement issues (including ad-hoc data fixes to some of the control variables and using MFN tariff rates instead of effective rates). Furthermore, the relationship could actually be non-linear. When investigating their dataset, Cadot and Gourdon presented non-linear relationships between GDP/capita and prices.

Moderate imperfect collinearity tends to be present when both HDI and GDP per capita and when an interaction between imports and tariffs as well as the imports variable are included. The former is likely due to Gross National Income being a component of HDI. Choosing one of each of these pairs does not reduce explanatory power.[12]

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[9] For two countries with no agricultural labour costs in the source data, agricultural labour costs were assumed to be 70.4% of the average of economy-wide monthly earnings – based on the observed relationship between agriculture and economy-wide monthly earnings in the data. For countries with no labour costs at all in the source data, an average of monthly earnings was taken of economically similar countries. For a small number of countries with no 2016 fuel price data, data from 2014 or 2010 was used instead.

[10] Expanded to: $\ln AgriFood\ Prices_{ir} = \beta_0 + \beta_1 lnTBTFreqRatio_{ir} + \beta_2 lnSPSFreqRatio_{ir} + \beta_3 lnMFNTariff_{ir} + \beta_4 Imports_{ir} + \beta_5 LabourCosts_r + \beta_6 lnFuel\ Pump\ Price_r + \beta_7 TransportCosts_r + \beta_8 lnGDPperCapita_r + \beta_9 lnHDI_r + \beta_{10} AnimalDummy_i + \beta_{11} VegetableDummy_i + u_{ir}$

[11] The observed price variable is not normally distributed.

[12] However, the coefficient on logged GDP per capita can become insignificant when logged HDI is not.

Experimental models show strong evidence of hetroscedasticity. The observed TBT and SPS frequency ratio series are heavily negatively skewed. This causes a much greater variation in residuals at the upper end of the TBT and SPS series (for observations representing a high proportion of products within product groups are affected by at least one measure) as this is where most of the observations are grouped.

Is is likely that measurement issues witin the data (in addition to outliers) are causing estimation issues. 9% of observations in an experiemental model, that only included the ‘animal’ and ‘food products’ product groups, had leverage points signialling these observations have heavily influence the estimation. Of particuarly concern is United Arab Emirates’ (UAE) 0.06 DEFITS value for its ‘animal’ product group. This implies this observation is not only having influence on estimated parameters but could be distorting the estimation in order to account for this observation. This is most likely due to a moderate price index of 124.14, a very high SPS frequency ratio and reliance on imports but very a low TBT frequency ratio. Maddala suggests removing this observation may be benefital – it could alter the magntiude of these coefficients and reduce their standard errors (Maddala, 1992).

3. Preliminary Results and Discussion

The estimation issues arising smallness of the dataset, such as potential relationships between explanatory variables, and data limitations, such as tariff rates divorced from reality, mean models may mislead on the existence or absence of relationships between NTMs and prices. Therefore, the preliminary results described in this section must only be treated as further exploration into specification rather than definitive findings.

The coefficient on the frequency ratio of SPS measures is consistently small and negative in experimental models. It is typically more likely to be significant than the coefficient on TBT frequency ratios, which is usually small and positive.

Cadot and Gourdon highlighted a positive relationship between SPS frequency ratios and prices in their baseline regression (Cadot & Gourdon, 2014).[13] However, this is dependent on GDP per capita. Countries with lower incomes were estimated to have this positive relationship, whereas countries with income levels of above around $7,000 PPP (around the average for lower middle income countries) had an increasingly negative relationship (World Bank, 2022). There were similar findings for experimental models presented in this paper with an interaction variable between HDI and SPS frequency ratios. They showed countries with a HDI of greater than 0.5 had a positive relationship between SPS frequency ratios and prices whereas countries with higher HDI rates were estimated to have a negative relationship (note, countries with a HDI below 0.55 are classified as the least developed countries in the world). Though Cadot and Gourdon estimated a much stronger relationship.

At first glance this appears to contradict the theory presented in *Section 1* utilising Santeramo and Lamonaca work in 2022. There, it was implied that less developed countries face a negative relationship between SPS measures and agri-food prices, due to measures increasing trade facilitation. However, lower income countries with small trade flows may be subject to step changes in the cost burden of new regulation, including SPS measures, when implementing new trade deals. For example, if these trade deals are with higher income countries, the lower income trade partners may need to adhere to higher standards to export their products, increasing costs of production and thus prices in these countries. Further, there may be little to no similar effect on the high income country, as it would have already implemented these standards in previous trade deals. In essence, greater SPS measures may coincide with a general increase in regulations and standards, in lower income countries, which may increase prices. This could be tested by interacting the SPS frequency ratio with an export intensity variable to see if the relationship between SPS measures and prices are the same for lower income countries that export a smaller or greater amount of a product group. Alternatively, this could be tested by interacting the SPS frequency ratio with tariff rate variable – although there is reason to believe this variable is currently problematic.

The coefficient on the tariff variable is mostly negative in experimental models and is always insignificant. This is almost definitely due to the measurement issues described in *Section 1*. While, attempts could be made to use trade-weight tariff rates, the best solution will be the resource-intensive aggregation of effective tariff rates across exporting countries. However,

[13] Note Cadot and Gourdon's estimation strategy and interpretation is more complicated than that of this research as they estimated AVEs, so this paper draws a comparison between their findings rather than raw coefficient values.

this is no guarantee that this will yield a significant estimates given Cadot and Gourdon obtain a positive and insignificant tariff coefficient in their baseline.

Often, the coefficients on the Human Development Index variable and GDP per capita variables are significant and of opposing signs (where HDI is negative, and GDP is positive). The latter is expected and consistent with the literature for the reasons explained in *Section 2* but the negative relationship between HDI and SPS frequency ratios is not. This would imply a combination of better health and educational outcomes of a population outweighs upwards pressure on prices by income levels (the third component of HDI). One explanation could be better health and educational outcomes improve labour productivity which reduces labour costs and thus prices assuming cet. par. However, the coefficients on monthly wages were insignificant in every experimental model implying that labour productivity is not a key factor in determining prices.

Another surprising recurrence in experimental models is the positive coefficient on countries' reliance on imports for a given product group. [to be expand]

In regressions utilising observations from all three product groups, the coefficient on the vegetable product group dummy is consistently significant. There are two striking differences between regressions only considering vegetable products and those considering animal and food products together.[14] First, coefficients on the frequency ratios of SPS and TBT frequency ratios are insignificant in vegetable products only regressions. Second, coefficients on labour costs are significant in experimental models only considering observations on vegetable products but not in models considering the other product groups. This second finding is likely a consequence of the data used. Labour costs data is for primary agriculture (as well as forestry and fishing) so it likely to be a bigger proportion of costs for less processed foods groups like vegetables (compared to the 'food products' product group). Furthermore, labour costs are a greater proportion of horticultural farming costs than farming for other products like meat - in England in 2021/22, labour costs were 34% of horticulture compared to 11% for all farms.[15]

[14] The lack of significant product group dummy in animal and food product regressions imply these can be estimated together.
[15] Authors calculations based on the UK Department for Environment, Food and Rural Affairs' Farm Accounts in England dataset.

4. **Next steps**

Given the methodological and data issues and preliminary findings outlined in this paper there is clearly scope to improve the robustness of these results.

The most promising development opportunity for this work will be to expand the number of product groups including in the analysis. However in the absence of this, the specification's degrees of freedom can be improved by:

- Removing variables where there is appropriate evidence that they are irrelevant
- Replacing the tariff variable with an interaction between the SPS frequency ratio and tariff variables
- Replacing the SPS and TBT frequency ratios with a single interaction variable between the two
- Replacing the imports reliance variable with an interaction between imports and tariffs
- Choosing to include either the HDI or GDP per capita
- Attempting to add a time dimension to the dataset to increase observations

It will also be important to investigate any possibilities of endogeneity in specifications. Changes in composite prices of product groups in countries will affect the value of imports. This may affect the demand for imports as well as aggregate tariff AVEs which incorporate specific taxes. [16] Thus, both reliance on imports and aggregate tariff rates may be endogenous to prices.

As mentioned earlier in this paper, there is a possibility to enhance estimation by refining tariff rate data to better reflect reality and removing outliers when there is evidence that this is beneficial.

The paper is presented to the 2023 AES conference in Warwick to stimulate discussion on data and methodological improvements when this first stage of work is reviewed in the summer.

[16] Specific taxes contribute to aggregate tariffs AVEs as a proportion of the value of imported goods so are affected by price changes.

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Appendices

A. List of Countries

Algeria
Antigua and Barbuda
Argentina
Australia
Bahrain
Barbados
Benin
Bolivia
Brazil
Burkina Faso
Cambodia
Cameroon
Canada
Chile
Colombia
Costa Rica
Côte d'Ivoire
Ecuador
El Salvador
Ethiopia
Gambia, The
Ghana
Grenada
Guyana
Honduras
India
Indonesia
Jamaica
Japan
Liberia
Malaysia
Mexico
Morocco
Myanmar
Nepal
New Zealand
Nicaragua
Niger
Nigeria
Oman
Panama
Paraguay
Peru
Philippines
Qatar
Russian Federation
Senegal
Sri Lanka
Switzerland
Tajikistan
Thailand
Trinidad and Tobago
Tunisia
Turkey
United Arab Emirates
United States
Uruguay
Vietnam

B. Mapping of 'Item' categories for price data to NTM 'Product Groups'

NTM 'Product Groups'	Chapter Level Harmonised System Codes	Price 'Items'
Animal Products	HS 01 to HS 05	Meat [1101120] Fish and Seafood [1101130] Milk, Cheese and eggs [1101140]
Vegetable Products	HS 06 to HS 15	Vegetables [1101170] Fruit [1101160] Bread and cereals [1101110] Oils and fats [1101160]
Food Products	HS 16 to HS 25	Sugar, jam, honey, chocolate and confectionary [1101170] Food products n.e.c. [1101190] Non-Alcoholic Beverages [1101200] Alcoholic Beverages [1102100] Tobacco [1102200]

C. Example of Results from an Experimental Model on Logged Prices - which excluded Vegetable Products observations

Variable	**Coefficient**	**Standard Error** [significance at 5%]
Constant	2.697	*0.578 [sig]*
$lnTBTFreqRatio_{ir}$	0.041	*0.018 [sig]*
$lnSPSFreqRatio_{ir}$	-0.059	*0.024 [sig]*
$lnMFNTariff_{ir}$	-0.005	*0.035*
$Imports_{ir}$	0.127	*0.070*
$(lnMFNTariffs * Imports)_{ir}$	-0.005	*0.025*
$LabourCosts_r$	-0.011	*0.030*
$TransportCosts_r$	0.006	*0.002 [sig]*
$lnFuel\ Pump\ Price_r$	0.050	*0.099*
$lnGDPperCapita_r$	0.143	*0.058 [sig]*
$lnHDI_r$	-0.538	*0.312*
$AnimalDummy_i$	0.031	*0.048*