

# TRADE AND PRICE EFFECT OF NON-TARIFF MEASURES IN FRUITS TRADE

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## Abstract

This paper uses two different approaches of the gravity model (value and price approach) in order to investigate the effects of non-tariff measures (NTMs) in international fruits trade. Through the value approach, we obtain information on the trade value impact of NTMs. Through the price approach, we derive directly the trade cost effect of these NTMs. The difference between both approaches allows understanding any market creating effect of NTMs.

**Keywords:** non-tariff measures, gravity equation, value & price approach, fruits

## Introduction and objectives

NTMs are defined as 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 (UNCTAD, 2015). There are two scenarios where NTMs either positively or negatively affect trade. The first one is seen when compliance with the NTMs provides security guarantees that encourage demand in importing markets to meet or exceed supplying costs, whereas the second scenario reflects the opposite, compliance costs are higher than demand for meeting the externality, thus decreasing supplies (Cadot, Gourdon, & Tongeren, 2018). Our objective is to estimate the trade value and price effect of NTMs and calculate their tariff equivalent (AVE). Finally, we evaluate how this information can help explain market creation effects of NTMs

## Material and methods

To capture NTM's trade effect we use the fruit sector as a case study and build a five-year (2012-2016) panel database composed of trade values and prices for 76 importers, 193 exporters, 72 products at 6-digits of the Harmonized System classification (HS).

We make use of two different approaches, the value approach, and the price approach. For both, we estimate a gravity model (Tinbergen, 1962).

It is difficult to claim that time-invariant unobserved components are unrelated to regressors. For our international trade of fruit market, for instance, we would have to believe that the (possible) endogenous trade policy variables (such as NTMs or RTAs in force) are unrelated to the national policies, institutions, and exchange rates of the trading countries (Agnosteva, Anderson, & Yotov, 2014). For such reason we make use of importer-exporter-product fixed effect (FE)<sup>1</sup>, thus we do not make use of the usual time-invariant explanatory variables (i.e. bilateral distance, border contiguity, common official language, colonial ties, north south hemispheres, etc.).

For the first approach, we specify a non-linear value equation model (e1), using the Poisson Pseudo Maximum Likelihood (PPML) estimator (Silva & Tenreyro, 2006). The dependent variable ( $M_{it}$ ) is yearly import values in millions USD.

$$M_{it} = \exp(\beta_0 + \beta_{GDP}GDP_{srt} + \beta_{RTA}RTA_{srt} + \beta_{Fq\_NTM}Fq\_NTM_{it} + \beta_{i\_FE}i\_FE_{it} + \varepsilon_i + \varepsilon_{it}) \quad (e1)$$

For the second approach, we specify a log-linear price equation (e2) using the within estimator (Cadot et al., 2018). The dependent variable ( $P_{it}$ ) is the logarithm of the trade unit value.

$$P_{it} = \beta_0 + \beta_{GDP}GDP_{srt} + \beta_{RTA}RTA_{srt} + \beta_{Fq\_NTM}Fq\_NTM_{it} + \beta_{i\_FE}i\_FE_{it} + \varepsilon_i + \varepsilon_{it} \quad (e2)$$

In both equations, the individual ( $i$ ) is identified as importer ( $s$ ), exporter ( $r$ ) and product ( $h$ ); ( $t$ ) denotes time in years; ( $\beta$ ) refers to the parameter to estimate; ( $\varepsilon_i$ ) refers to the unobserved time-invariant component of the error

<sup>1</sup> We perform a Hausman and Mundlak test in order to verify whether a random effect (RE) or a FE model is more suitable, and in both tests, the FE model is preferred.

term; ( $\varepsilon_{it}$ ) refers to the unobserved time-varying component of the error term. The following are the time varying explanatory variables:

- $GDP_{rst}$  Log product of Gross Domestic Product of importer and exporter;
- $RTA_{rst}$  Identifies if the importer and exporter form part of a Regional Trade Agreement;
- $Fq\_NTM_{it}$  Counts the number of measures (Regulatory Intensity – RI) applied within each individual, divided into 3 levels (L):
  - o L1 - Overall NTMs
    - L2 - Technical NTMs
      - L3 - Category A – Sanitary and Phytosanitary (SPS)
      - L3 - Category B – Technical Barriers to Trade (TBT)
      - L3 - Category C – Pre-inspection measures
    - L2 - Non-Technical NTMs

We calculate trade costs (Gross AVE) by simply multiplying the NTM coefficient estimations ( $\beta_{Fq\_NTM}$ ) of the second approach with the mean RI.

NTMs data comes from the Trade Analysis Information System (TRAINS) accessed through the World Integrated Trade Solutions (WITS) portal. GDP data come from the World Bank Development Indicators. RTA data come from Egger & Larch (2008). Trade Values used in the value approach come from UNComtrade database. Trade Unit Values used in the price approach come from CEPII database (Berthou & Emlinger, 2011).

## Results

We perform 6 estimations, 3 for each approach. The first and second column in Table 1 present the coefficient results of the estimations of the value approach and price approach respectively. The third column presents the mean RI of the NTMs in the sample. The last column presents the Gross AVEs for each group of NTMs.

NTMs positively affect traded values and prices. Dividing by type of NTMs, technical measures have a positive effect on traded values, compared to the negative effect of non-technical measures. These results make sense considering that technical measures increase welfare by reducing information asymmetries (Xiong & Beghin, 2014) (e.g. labelling requirements) and abating supply and demand negative externalities (Li & Beghin, 2014) (e.g. maximum residue limits). Likewise, technical measures contribute to build up confidence in the source country by signalling quality (Bureau, Marette, & Schiavina, 1998). On the other hand non-technical measures refer to traditionally used instruments of commercial policy (e.g. quotas, price control, exports restrictions, or contingent trade protective measures, etc.), thus a trade impeding effect is economically viable. Gross AVEs show cost increasing effects for both groups.

When looking at the 2-digit level NTMs within the Technical Measures, we note a dual trade value effect (i.e. positive and significant effect for type A (SPS) and type B (TBT) and negative effect for type C (pre-inspection) measures. Gross AVE show cost rising effect of NTMs for all types except for Pre-Inspection measures (Type C), nevertheless this result is not significant.

## Conclusions

Overall, NTMs have a trade promoting effect in the fruit sector, increasing traded values, as shown from the positive and significant coefficients of the value approach, partly explained from the price increasing effect evidenced through the price approach. Additionally, we can observe a market creating effect of NTMs, considering that value coefficients are higher than price coefficients, which could be due to demand enhancing effects that overcome compliance costs faced by foreign and domestic producers (Cadot et al., 2018).

The challenge becomes identifying those specific NTMs that increase costs above needs, requiring action from policy makers streamlining trade-obstructing NTMs. This requires evaluating NTMs at the most detailed disaggregation level from a specific bilateral and sector perspective.

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## Tables

**Table 1** Estimation and AVE results

	Value approach coefficient	Price approach coefficient	Mean RI	Gross AVE
L1. Any NTM	0.00189**	0.00132***	26	3.37%
L2. Technical NTMs	0.00487***	0.00108***	25	2.70%
L3. Cat. A (SPS)	0.0104***	0.00310***	20	6.15%
L3. Cat. B (TBT)	0.0114**	0.000244	6	0.14%
L3. Cat. C (PRE.INSP.)	-0.0884**	-0.00823	2	-1.29%
L2. Non-Tech. NTMs	-0.144***	0.0257***	3	6.90%
GDP	0.479***	0.296***	-	-
RTA	0.149***	0.01043	-	-
Observations	368,853	135,666	-	-
R2	0.980 <sup>1</sup>	0.950	-	-
FE (importer x exporter x product)	Included	Included	-	-

Notes: \*\*\*, \*\* and \* mean significance at 1, 5 and 10% respectively. We perform a separate estimation for each level of NTMs (L1, L2, and L3) and we merge them in a single column for each approach, considering that explanatory variables (GDP, RTA) observations number and R2 do not change within the same approach. <sup>1</sup>The coefficient represents the correlation between actual and fitted values.

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