

BATModel

better agri-food trade modelling for policy analysis

Theoretical knowledge and empirical analysis of Geographical Indications (GIs) and Non-Tariff Measure (NTMs) in trade context

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NTBs are well-known to be

- **Pervasive** because regulations designed to address legitimate market failures **may have incidental but unwarranted effects on trade**.
- Difficult to quantify since they are **not published in tariff schedules** and they are not expressed in simple “metrics”, such as percentage or monetary values.
- **Politically sensitive** because the fact that they address legitimate concerns helps to avoid public discussion; then when such measures do raise concerns, the fact that they are difficult to quantify make their direct impact on trade less clear to the public.

NTMs vs. NTBs

- **Non-tariff measures (NTMs):** policy interventions other than tariffs that potentially affect trade of goods
 - Changes on quantities traded
 - Changes on prices
 - Changes on both quantities and prices
- **Great diversity:** SPS, TBTs, licenses, price controls, etc.
- **NTMs vs. NTBs (Non-tariff barriers)**
 - NTMs include a wider set of measures than NTBs
 - NTBs: usually used to describe discriminatory (protectionist) measures
 - NTMs: do not necessarily reduce trade or welfare. May also be trade/welfare enhancing



- **NTMs and the trade liberalization**
 - NTMs: New obstacles to developing countries (DCs)' exports?
 - NTMs can dilute or even nullify the tariff liberalization (in particular trade preferences granted to DCs)
- **Impact evaluation of NTMs: ambiguous & politically sensitive**
 - 1) Facilitate trade** – Increasing demand for foreign products:
Better quality of products
Reduction in informational asymmetries btw. domestic consumers and foreign producers
 - 2) Eliminate trade** – NTM may:
Exclude some (non-complying) varieties from the market
Exclude some firms (e.g. small DCs' producers) from the market (additional cost: NTM compliance cost)
Effect exacerbated if NTMs differ among countries & if they are implemented in a way that favors national industry
→ Difficult to distinguish “legitimate” from protectionist motivations for NTMs



The economic literature attempting to estimate the magnitude and direction of the effects of NTMs on international trade is characterized by *two main methodological choices*:

- **Ex-post estimations:** Focus on observed trade impact (main approach)
- **Ex-ante simulations:** Predictions of potential & yet unobserved trade effect

Limits

- **Ex-post studies**
 - Do not capture the dynamic responses of producers to changes in NTMs
 - Do not disentangle supply & demand shifts
- **Trade quantification:** Do not disentangle the impact on each agent (consumers, producers,...) → welfare analysis

Conversion problem

NTMS take many different forms: we need to convert the different instruments into a common metric to be able to:

- Assess if a protectionist impact policy does exist;
- Rank different instruments according to their degree of restrictiveness;
- Guarantee a consistent scaling of all degrees of restrictiveness.

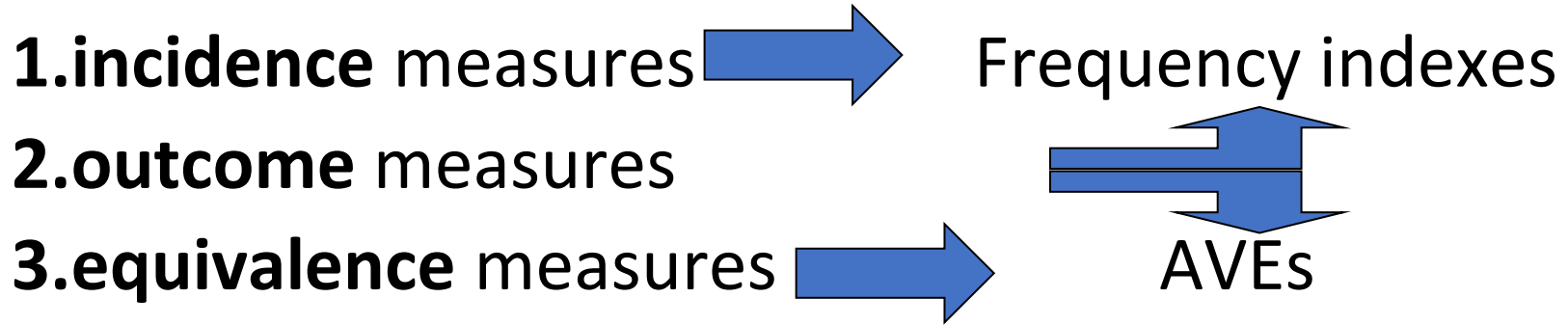
Examples of questions to be addressed:

- Which countries have the most stringent NTMs?
- Which are the most affected products?
- Which are the most affected exporters (given their export structures even if NTMs are usually unilateral measures)?



NTMs measurement typology

We classify the approaches followed in the literature using 3 categories:



- They are only based on the intensities of the policy instruments. They measure the level of protection without considering the rate at which the level of protection is translated into market (economy) specific trade distortions.
- The most common incidence measures are frequency-type measures based on inventory listings of observed NTMs that apply to particular countries, sectors, or trade categories.

No information on trade barriers effects on prices, production and trade: they do not take account of the different importance of the barrier across sectors and products, since they do not assess how restrictive each barrier is.



- Share of products affected by one or more NTMs
- Formally, frequency index of NTMs imposed by country j:

$$F_j = \left[\frac{\sum D_i M_i}{\sum M_i} \right] * 100$$

- where D_i : dummy variable reflecting the presence of one or more NTMs on product i ; M_i : dummy variable indicating whether there are imports of product i

Drawbacks

- Accounts only for the presence of NTMs
- No information on the value of trade affected by NTMs



- This ratio captures the average number of NTMs affecting an imported product M
- Formally, prevalence ratio for NTMs applied in country j :

$$P_j = \left[\frac{\sum N_i M_i}{\sum M_i} \right] * 100$$

where N_i : number of NTMs on product i , and M_i : defined as previously



Outcome measures

They are based both on policy and observed data – such as trade, production or consumption shares, GDPs, etc. – to be used in the computation:

1. Coverage ratio(s) = frequency of occurrence of NTBs can also be expressed in weighted terms based on the relative value of affected products (usually, the weights used are percentage of imports covered by NTBs or by certain types of NTBs): Inventory approach
2. AVEs = The price wedge is equal to the difference between the domestic price of a good which is protected by NTBs and the reference (usually the world) price of a comparable good: Handicraft approach

Some economic effects of existing policies are taken into account, though these indexes remain “a-theoretic” since they are not computed according to some “equivalence criteria” (e.g., import price, volume of imports).



- Share of imports affected by one or more NTMs in total imports
- Formally, coverage ratio of NTMs applied in country j:

$$C_j = \left[\frac{\sum D_i V_i}{\sum V_i} \right] * 100$$

where D_i : defined as previously, and V_i : value of imports in product i

Drawbacks

- Endogeneity: If NTMs reduce imports, coverage ratio downward-biased
- No indication on the effects of NTMs on prices, production of exporters and on international trade



AVEs of NTMs

Definition ad valorem equivalents (AVEs)

AVE: tariff equivalent which has the same impact on trade

NTMs affect trade flows and consequently prices

AVE: gap btw. product's price with and without the NTM

Ex: price without NTM: 100. AVE: 5% => price with NTM: 105

Tariff equivalent of a NTM can be written as:

$$TE_{BNT} = (p_d / p_w) - (1 + \tau + c)$$

- p_d : domestic price (without retailers' margins)
- p_w : world price (without producers & exporters' margins)
- τ : ad valorem tariff
- c : ad valorem transport & insurance costs (CIF/FOB margin)

Why do we compute AVE?

Quantification of NTMs' effects difficult: diversity of NTMs; no simple metric; few data => AVEs solve (partially) these issues



- AVE: gap on domestic market btw. product's price with & without NTM)
- Product's price without NTM: not observable => Use of alternatives
 1. World/border price of the same good (or comparable good)
 2. Potential adjustments can be made on world price using quantities, prices, supply/demand price elasticities
 3. Need to account for all other factors influencing prices (tariffs, transport costs, etc.)

Drawbacks

- Detailed price data not always available
- Quality differences btw. domestic & imported goods not included



Price gap: simple method but difficult to implement

- Availability & quality of price data: Retail prices often used (more easily observable) but not available for all primary & intermediate products & include retailers' margins and transaction costs
- Domestic production & imports not always available in the same classification
- Even at a disaggregated level, classifications often include several products (prices for product mix)
- Imperfect substitutability btw. domestic & foreign varieties (quality differences)
- If more than one NTM on a product, AVE: global measure and not specific to each measure



- These indexes are defined so that the result is equivalent to the original data in terms of the information we are interested in. The greatest advantage of this class of measures is that they are unequivocal because their definition is predetermined: the economic interpretation of each index is strictly linked to its definition.
- In principle, the effects of non-tariff import barriers may be quantified by estimating the tariff that would produce the same overall impact. The problem is that the impacts of NTMs are multidimensional and there is not a measure that gives an equivalence in all dimensions: “full equivalence” (in terms of all relevant economic effects) is almost never valid (Bhagwati, 1965).
- It is necessary to establish an equivalence criterion and to quantify the effects of NTMs with respect to the dimension we are interested in. In this perspective, there is a growing literature using econometric models to estimate changes in prices, trade flows and economic performances due to the introduction of NTMs.



Comparison btw. predicted trade flows (without NTMs) & observed flows (with NTMs)

Gravity implemented at industry/product level

General specification of gravity model

$$\ln x_{sijt} = \phi_{sijt} \ln(1 + tar_{sijt}) + \gamma' NTM_{sijt} + \beta' z_{ij} + fe_{si} + fe_j + fe_t + \varepsilon_{sijt}$$

s : sector, i : exporting country, j : importing country, t : year

tar : applied tariff

NTM : dummy, frequency ratio, coverage ratio

z : bilateral gravity variables (distance,)

fe : set of fixed effects

Other way to control for zero flows: **PPML estimator** (Santos Silva and Tenreyro, 2006)

- Dependent variable in levels, but estimated coefficients could be interpreted as elasticities

Drawbacks of gravity estimations

- Predicted trade flows sensitive to model assumptions



The aggregation procedure answers the following question: What is the equivalent tariff that would have the same impact on imports?

Price-based models look for evidence that NTBs cause the domestic price of certain goods to be higher than it otherwise would be, identifying the extent to which higher domestic prices may be attributable to NTBs

Quantity-based models look for evidence that NTBs cause trade in certain goods to be smaller than it otherwise would be:

- Estimation (gravity equations) in which information on NTBs is introduced as explanatory variables (e.g., frequency or coverage indexes): comparison between predicted and actual trade flows.
- The quantity impact is converted into an AVE using import demand elasticities.



- The main shortcoming is that they require explicit model structures and/or estimated parameters for their implementation, since they are based on a *counterfactual* assessment of what outcome would have been if the actual trade policy would have been replaced by a uniform policy (either in the price or the quantity space). Consequently, these indexes, are not only based on observed data (as in the case of the outcome measures), but they require some maintained assumptions in terms of model/methodology.
- Price or quantity models?
 - Using “quantities” (trade data are often value rather than pure quantity data), though, there are two sources of statistical uncertainty: from the analysis of trade flows itself and from the separate analysis in which the elasticities necessary in order to transform the effects on trade flows into AVEs are estimated
- NTBs are likely to be endogenous to imports. Indeed the political economy literature suggests that these may be determinants of NTBs. This endogeneity may bias the estimated impact of NTBs on imports and therefore the *ad valorem* equivalent.



- To assess empirically the degree of trade restrictiveness in GVCs induced by existing NTMs (ex-post analysis)
- Differently from Ghodsi et al. (2017) we compute backward and forward indices of GVCs trade by applying the Borin and Mancini 2019's decomposition method and using trade in value added data from EORA dataset.
- Specifically, by combining the panel structure of NTM data at HS 6-digit product level from the WTO Integrated Trade Intelligence Portal (I-TIP, subsection "I-TIP Goods",) & TRAINS with EORA data for trade in value added, we are able to estimate partial elasticities of NTMs trade restrictiveness' "chain effect" for a panel of 188 countries worldwide from 1995 to 2015.



Results

- Our results show **strong negative impact of NTMs** on the **participation of agriculture and food sector** in **GVCF** and **GVCB**.
- The estimated coefficients exhibit a positive and significant effect of the RTAs on the participation of agriculture and food sector in GVCF and GVCB.
- The RTAs also show ambiguous relationship with the participation of agriculture and food sector in GVCF and GVCB

The assessment of the impact of *specific* NTMs on trade in value added by applying quasi-experimental methods, Silvia Nenci, Davide Vurchio

Aim

The idea is to apply quasi-experimental methods to assess the impact (i.e., *trade hampering and trade enhancing*) of different NTMs categories on GVC trade (GVC backward and forward indicators computed using trade in value added)

Originality/value

Adoption of a quasi-experimental approach to the NTMs-GVC trade relationship disentangling different NTMS

Method

Quasi-experimental methods (i.g. matching econometrics) in order to address issues such as *non-linearities* and *self-selection bias* that can affect trade flows (*it is unlikely that NTMS are randomly chosen rather share the same characteristics used by the gravity equations to explain trade flows*)

Data

NTMs: UNCTAD-TRAINS database, WTO database; *GVC sectoral trade (2 digits)*: EORA if worldwide, WIOD or TiVA if focused on EU

Possible channels (variables to be inserted/calibrated) **to remove/decrease NTMs:**

- a) **AVE tariff:** it decreases the importer's price causing a substitution towards that good and an increase in quantity demanded.

Easier to introduce than to remove

What about the welfare impact of the tariff revenue-rent (cfr. 'phantom-tariff')?

- b) **Willingness to pay:** this method, developed in Walmsley and Minor (2020), represents that case where consumers derive more utility from a good and are thus willing to pay more for them because they meet certain quality or health and safety standards.

However, from a firm's perspective, the increased quantity of goods imported is equivalent to a technological change to the importing firm, akin to a reduction in the production costs.

Possible channels (variables to be inserted/calibrated) **to remove/decrease NTMs:**

c) Trade cost

- Import/export-augmenting technological shocks to imports/exports of consumption goods
- Technological shocks to imports/exports of intermediate goods

Substitution effect (it reduces the importer's price, causing a substitution towards that good and an increase in quantity demanded) vs. Expansion effect (it reduces the amount that needs to be imported to satisfy a given level of demand).

Walmsey and Strutt (2021) point out that many NTMs raise the costs of production of the exporting firm

Ex-ante simulations using a Computable General Equilibrium model incorporating GVC-linkages (e.g., GTAP-VA), based on the GTAP-MRIO DB (10A)

“Phantom tax” modelling approach for NTMs: no tax revenues gains/losses from AVEs (Aguiar et al., 2016).

NTMs for goods: **non-FTA** and **with-FTA** estimates from Cadot and Gourdon (2016): average tariff equivalents 8.0% for UK exports to the EU and 8.4% for UK imports from the EU.

NTMs for services: DTC (Developing Trade Consultants, 2019) estimates using a full structural gravity models on a series of services sectors + adjusted Fontagné, Mitaritonna and Signoret (2016) estimates for missing services: averages ad valorem tariff equivalents 15.7% for UK exports and 14.7% for UK imports.

Assessing the impact of NTMs on EU GVC trade

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Focus on GVCs (intermediate vs. final goods)

Combined use of estimation and simulation models:

- **Estimation:** NTM measures estimated using a state-of-the-art gravity model
- **Simulation:** NTM impact computed using an MRIO-based CGE model allowing to distinguish the value added components of gross trade flowsdisaggregate trade flows in terms of value addedd.

2 steps approach:

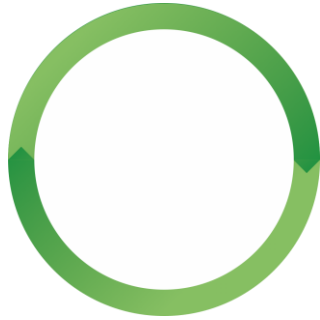
1. Use a **panel sectoral gravity model** of intermediate goods to obtain econometric estimates of the effect of different types of NTMs on both imports and exports of EU countries.
2. **Introduce these estimates in the Global Trade Analysis Project - Value Added (GTAP-VA)** model to examine the impact of eliminating NTMs on EU GVC trade.

1. **Gravity model estimation** provide:
 - **Agent-specific Armington elasticities** for the EU countries
 - **Volume impact** of different NTMs: the choice of the NTM types depends on the CGE modelling choice (AVEs, preferences, trade costs, exporters costs)
2. **Calibration**
 - **Replace the GTAP elasticities** with our estimates
 - **Simulate** the CGE variables equivalents of the volume changes sector by sector
3. **Simulation** of the NTMs changes (removal) for all the sectors and importers (since we are dealing with the EU) with the CGE model
4. Analysis of the **results** in terms of ‘traditional’ **outcomes** (e.g., welfare, GDP, output, trade flows) and **TVA structure** (e.g., backward and forward integration)

Who gains?

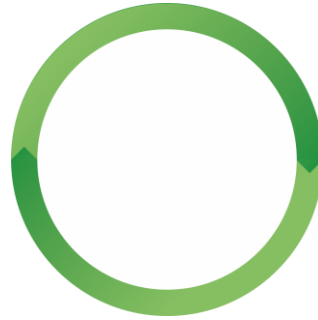
- *Importer or exporter? Matters for GDP and welfare results → NTMs imposed vs. faced*
- *Where do the gains come from? Matters for GDP and welfare results (productivity; terms of trade; allocative efficiency; preferences)*

Other results



“The moderating effect of regulatory similarity and experience on NTM induced trade costs: The case of international dairy trade”

Ana I. Sanjuán and George Philippidis



“Regulatory heterogeneity of technical NTMs and PTA provisions: Trade effects at and behind the border”

Achim Vogt



Harmonization vs. mutual recognition

Harmonization: common standards in both countries

Mutual recognition: reciprocal acceptance of the standards applied in both countries

Both assumed to be trade-enhancing: scale economies & more efficient resource allocation (Chen & Mattoo, 2008)

Harmonization is expected to boost trade more than mutual recognition

Common standards → Higher homogeneity & substitutability between products

Higher compatibility btw. imported & domestic products

Common standards lower information costs & increase confidence about imported products' quality



Harmonization vs. mutual recognition (cont'd)

But, harmonization can have a negative impact on trade that can be avoided through mutual recognition

Harmonization reduces number of varieties

Harmonization may generate compliance costs that vary for different countries

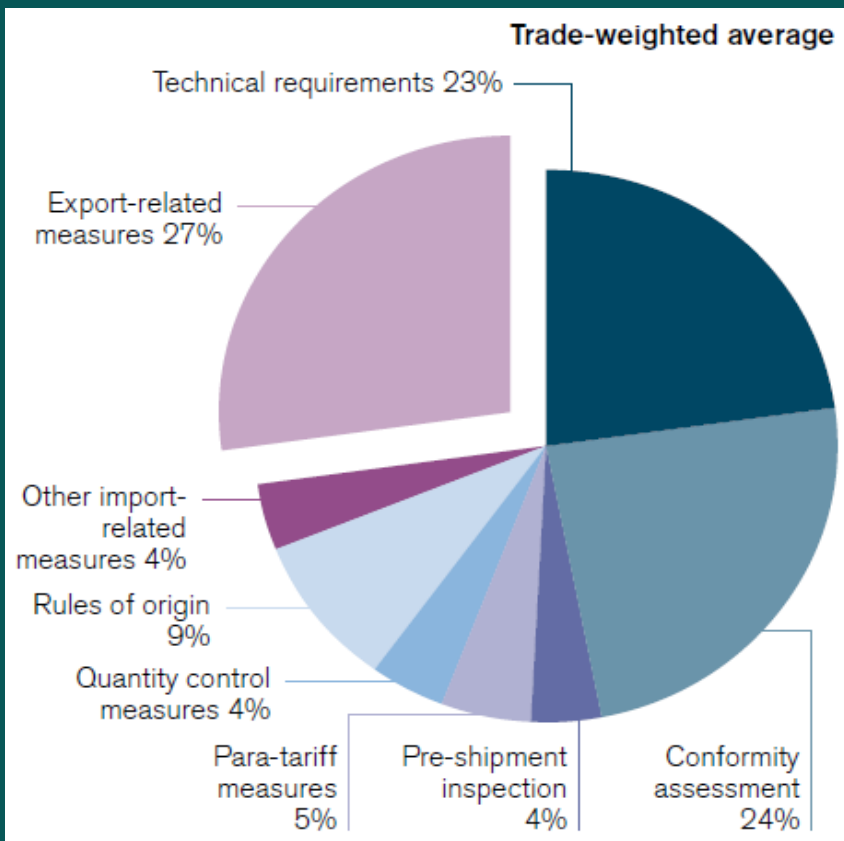
→ Harmonization's gains not equally distributed among countries

Mutual recognition

Equal distribution of gains from removing NTMs among countries

No adaptation costs → If these costs are high, mutual recognition should boost trade more than harmonization





Based on ITC business surveys. Sample: 11 DCs and LDCs. Data for 2010. Burdensome NTMs include NTMs applied both by importing countries and by the home country (Source: WTO, 2012)



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Thank You!

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Links

<https://scholar.google.it/citations?user=bfbfz3AAAAAJ&hl=en>

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