A Systematic Approach to Regulatory Heterogeneity applied to EU AgriFood Trade

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Introduction

This research is part of the EU project "NTM impact" which has the overall objective to collect and analyse new data on non-tariff measures (NTMs), particularly those related to technical and sanitary standards-related measures and regulations that prescribe the conditions for importing agri-food products into the EU market and into a selection of major players that define the international market .

Trade negotiations have been expanding not only in terms of the number of countries involved in multilateral and regional agreements, but also due to the incorporation of nontariff policy issues that are relevant to assure practical results. In this context, sanitary, phytosanitary and technical requirements became distinctive aspects in the policy negotiation framework, both for multilateral and regional trade negotiations. However, the appropriate way for approaching requirements that are seemingly protectionists has been constrained by data limitations as well as instruments that are adequate to express their impacts upon trade.

Interesting insights for policymakers regarding the relative importance of regulations and standard-related measures arise from econometric analysis considering dissimilarity and heterogeneity indexes. These have been used in several applied research to deal with additional costs for exports due to divergent NTMs regulations between countries that establish trade relations (Cantore et al, 2008; Berden et al., 2009; Sunesen et al., 2009; Achterbosch et al, 2009; Vigani et al., 2010). In particular, Rau et al. (2010) introduce the Heterogeneity Index of Trade (HIT) by focusing on the substance of the requirements and how to measure them in terms of regulatory heterogeneity.

Objective

The objective of this paper is to introduce the Heterogeneity Index of Trade (HIT) and the complementary Directional Heterogeneity Index of Trade (DHIT) and subsequently applied them to the case of food safety limits related to maximum residue levels (MRLs) of pesticides.

Methods

Heterogeneity Index of Trade (HIT)

Based on the Gower index of (dis)similarity, the HIT index is defined as follows:

(1)

$$\mathrm{HIT}_{jk} = \frac{\sum_{i=1}^{n} w_{ijk} DS_{ijk}^{HIT}}{\sum_{i=1}^{n} w_{ijk}}$$

where j and k respectively denote the importing and exporting country, i denotes an import requirement, w_{ijk} is the weight that captures different importance of a requirement and DS_{ijk}^{HIT} is a (dis)similarity measure, which is defined as:

$$\mathrm{DS}_{ijk}^{\mathrm{HIT}} = \frac{|x_{ij} - x_{ik}|}{\max(x_i) - \min(x_i)} \qquad (2)$$

where x_i is the observation on requirement i (which may be binary, ordered or quantitative information), and $\max(x_i)$ and $\min(x_i)$ are, respectively, the maximum and minimum value for requirement i across all countries considered. The HIT is calculated on a bilateral basis by comparing import requirements for each trading pair. The index depends on the benchmark for comparison, which is always the exporting country.

The values of the HIT range between zero and one. An index value of zero indicates that there is no difference in requirements between importing and exporting countries, and a value of one indicates maximum dissimilarity in regulations.

Directional Heterogeneity Index of Trade (DHIT)

The DHIT index developed in this section allows one to consider relative stringency from quantitative information such as maximum residue limits (MRLs).

Similar to the formulation indicated in equation (1), the DHIT index also applies a weighted average value of the dissimilarity measure as follows:

$$\mathrm{DHIT}_{jk} = \frac{\sum_{i=1}^{n} w_{ijk} DS_{ijk}^{DHIT}}{\sum_{i=1}^{n} w_{ijk}} \qquad (3)$$

The difference from the HIT is that the calculation involves a pre-selection of the dissimilarity measures to express only the relatively more stringent measures directed to exporters. For that purpose, the dissimilarity measure for the DHIT is calculated as:

$$\mathrm{DS}_{ijk}^{\mathrm{DHIT}} = \frac{x_{ij} - x_{ik}}{\max(x_i) - \min(x_i)} \qquad (4)$$

The calculated values of the DS are selected to compose the DHIT measure following specific procedures. A negative value for the dissimilarity measure ($\mathrm{DS}_{ijk}^{\mathrm{DHIT}} < 0$) indicates that the requirements presented by the importing country j are stricter for a given set of characteristics i than those of the exporting country k. Then, these values are included in the DHIT calculation. All non-negative dissimilarity measures ($\mathrm{DS}_{ijk}^{\mathrm{DHIT}} \geq 0$) are not summed in the DHIT calculation.

Methods

Data base

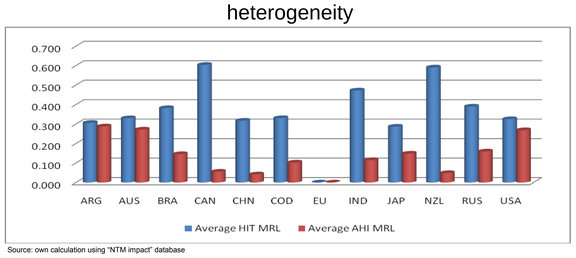
The MRL database used for the index calculation in this paper is part of the initiative of the EU project "NTM impact", which has already been mentioned above and aims at providing comparable information of import requirements across countries .

In general, MRLs are product-specific, and the products covered in the "NTM impact" database include the following products: cheese, beef, pig meat, potatoes, tomatoes, apples and pears, aubergines, peppers, maize, barley and rape seed. Focusing on these products, the database respectively provides the MRLs for the EU27 and ten trade partner countries (Argentina, Australia, Brazil, Canada, China, Japan, New Zealand, Russia India and the US).

Information about MRLs that are internationally agreed upon and known as the Codex Alimentarius has also been collected.

Results

Figure 1: HIT and DHIT index for pesticides by countries, EU requirements taken as benchmark for comparing regulatory heterogeneity



Source: own calculation using "NTM impact" database

Table 1: HIT index by countries and selected agri-food products

	Apples	Aubergines (eggplant)	Barley	Bell pepper	Beef	Cheese	Maize/ Corn	Pears	Pork	Potatoes	Rape seed	Tomatoes
ARG	0.32	0.32	0.35	0.32	0.26	0.22	0.3	0.32	0.27	0.31	0.36	0.32
AUS	0.35	0.34	0.34	0.34	0.3	0.24	0.33	0.33	0.3	0.34	0.36	0.37
BRA	0.38	0.35	0.37	0.43	0.33	n/a	0.36	0.44	0.39	0.4	n/a	0.37
CAN	0.56	0.56	0.6	0.57	0.65	0.73	0.6	0.56	0.66	0.6	0.57	0.58
CHN	0.39	0.42	0.4	0.39	0.1	n/a	0.4	0.4	0.2	0.21	0.21	0.35
COD	0.3	0.39	0.37	0.34	0.31	n/a	0.34	0.33	0.34	0.28	0.32	0.32
JAP	0.32	0.36	0.31	0.35	0.21	0.14	0.3	0.32	0.17	0.29	0.32	0.35
NZL	0.53	0.55	0.6	0.57	0.63	0.72	0.58	0.55	0.65	0.58	0.58	0.55
RUS	0.31	0.47	0.49	0.5	0.33	0.42	0.41	0.34	0.38	0.36	0.31	0.36
USA	0.33	0.34	0.37	0.34	0.28	0.28	0.32	0.33	0.28	0.33	0.36	0.34
Average	0.38	0.41	0.42	0.42	0.34	0.39	0.39	0.39	0.36	0.37	0.38	0.39

Source: own calculation using "NTM impact" database

Table 2: DHIT index by countries and selected agri-food products

	Apples	Aubergines (eggplant)	Barley	Bell Pepper	Beef	Cheese	Maize/ Corn	Pears	Pork	Potatoes	Rapes seed	Tomatoes
ARG	0.29	0.31	0.33	0.31	0.25	0.21	0.26	0.29	0.25	0.29	0.36	0.3
AUS	0.28	0.29	0.34	0.3	0.18	0.24	0.25	0.28	0.19	0.29	0.33	0.29
BRA	0.22	0.31	0.12	0.21	0	n/a	0.08	0.09	0	0.16	n/a	0.27
CAN	0.06	0.09	0.08	0.1	0.02	0.01	0.03	0.07	0.02	0.04	0.05	0.1
CHN	0.05	0.03	0.1	0.04	0.08	n/a	0.01	0.06	0.05	0	0	0.03
COD	0.05	0.22	0.15	0.1	0.05	n/a	0.05	0.05	0.05	0.12	0.17	0.11
JAP	0.14	0.15	0.17	0.15	0.11	0.14	0.13	0.14	0.17	0.15	0.19	0.14
NZL	0.05	0.08	0.07	0.09	0.03	0.01	0.04	0.05	0.02	0.04	0.04	0.07
RUS	0.17	0.14	0.21	0.2	0.19	0.11	0.08	0.18	0.17	0.15	0.17	0.13
USA	0.27	0.28	0.32	0.27	0.21	0.23	0.26	0.27	0.22	0.28	0.32	0.28
Average	0.16	0.19	0.19	0.18	0.11	0.14	0.12	0.15	0.11	0.15	0.18	0.17

Source: own calculation using "NTM impact" database

Conclusions

This research applied regulatory heterogeneity indices (HIT and DHIT) to a database denominated "NTM Impact" which provides comparable data information about import requirements across a group of 9 countries plus the EU and the Codex Alimentarius for a set of twelve products selected.

The results indicated that there can be a substantial gain in analytical power by approaching the NTM in agri-food regulations with an instrument delineated specifically to capture differences in regulatory heterogeneity. This seems to be an important advance compared to the notification counting used in inventories commonly used in studies that have been approaching SPS and TBT implications for trade.

A distinctive feature of these indices is that they provide quantitative measures that express how different and how stringent are trading countries in terms of their regulations taking a chosen country's (or group of countries) regulations as a benchmark. The analysis presented in this paper considered the EU regulatory framework as the reference for calculating the magnitude of heterogeneity. Another important feature of the heterogeneity indicators is that they allow for identification and combination of countries that present seemingly more heterogeneous regulations compared to those applied in the benchmark. This can be relevant to developed guidelines for trade negotiations and strategy development to deal with barriers resulting from technical and sanitary requirements.

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