A Systematic Approach to Regulatory Heterogeneity applied to EU Agri-Food Trade

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Objectives

- Introduce indices constructed to systematically assess the impact of regulatory heterogeneity upon trade.

- Illustrate the application of indexes to evaluate MRLs for pesticides under the perspective of the EU.

- Evaluate the analytical potential provided by two complementary indexes related to the analytical purpose:
  - Heterogeneity Index of Trade (HIT)
  - Heterogeneity Index of Trade for (regulatory) Strictness (HITS)

Definitions

- HIT index: Are regulations of partner countries similar or dissimilar?

HIT: weighted average of a dissimilarity measure given as:

$$HIT_{jk} = \frac{\sum_{i=1}^{n} w_{ijk} \; . DS_{ijk}^{HIT}}{\sum_{i=1}^{n} w_{ijk}}$$

where: ***i***: requirement; *j*: importing country; *k*: exporting country

w_{ijk}: weight of the characteristic or requirement i;

DS: dissimilarity measure: $DS_{ijk}^{HIT} = \frac{|xij - xik|}{\max xi - \min xi}$

HIT $\in$ [0 , 1]

HIT_{jk} = 0 no difference in requirements between importer and exporter(EU)

HIT_{jk} = 1 no similarity between requirements (max heterogeneity)

Heterogeneity Index of Trade (regulatory) Strictiveness: HITS

HITS index: omits any case where the exporter regulation is stricter than that in the importing country .

$$HITS_{jk} = \frac{\sum_{i=1}^{n} w_{ijk} \ . DS_{ijk}^{HITs}}{\sum_{i=1}^{n} w_{ijk}}$$

where:

i: characteristic or requirement; j:importing country; k: exporting country

w_{ijk}: weight of the characteristic or requirement i;

DS^{HITS} is the a modified dissimilarity measure - the numerator is not in absolute value:

$$DS_{ijk}^{HITS} = \frac{xij - xik}{\max xi - \min xi}$$

Indexes (cont.2)

Exporter more (or similar) stringent than importer => no compliance cost

The index assumes values such as:

When $x_{ij} \geq x_{ik}$; $DS_{ijk}^{HITS} > 0$

HTIS = 0

Importers have equal or lower standards requirements than exporter

Importer more stringent than exporter (trade compliance cost)

The index assumes values such as:

When $x_{ij} < x_{ik}$; $DS_{ijk}^{HITS} < 0$

Assume:

$$HITS_{jk} = \left|DS_{ijk}^{HITS}\right|$$

HTIS $\geq$ 1

HITS =1 (Highest dissimilarity)

Hypothetical Example

Pesticide	MRLs Exporting Country A	MRLs Importing Country B	HIT	HITS
P1	7	7	0	0
P2	10	5	0.5	0.5
P3	5	10	0.5	0

Assuming

$(max_{xi} - min_{xi}) = 10$

Methodology

- Heterogeneity Index of Trade (HIT)
  - Allows comparison between requirements (product and process standards) and conformity assessment measures.
  - Provides a combination of binary, ordered and quantitative information.

- Heterogeneity Index of Trade for Strictness (HITS)
  - Developed based on the assumptions that differences in standards and regulations do not always cause compliance costs (and thus trade costs) for exporters.

Methodology

Database:

- NTM-IMPACT database presents information about MRL for several types of residues **allowed** in agri-food products from different sources (domestic and international) for the set of countries included in the study.

This information is about residue limits for:

- Veterinary drugs,
- Microbiological criteria,
- Contaminants
- Food additives,
- ***Pesticide MRLs: have been chosen for this paper.***

Methodology

Database (cont.):

- In general, MRLs are product-specific:
  - Agri-food products covered in the "NTM impact" database: cheese, beef, pig meat, potatoes, tomatoes, apples and pears, eggplant, peppers, maize, barley and rape seed.

- The database provides MRLs for the EU27, 9 trade partners (Argentina, Australia, Brazil, Canada, China, Japan, New Zealand, Russia, and the US) and Codex Alimentarius (COD).

- EU MRLs for pesticides is the benchmark for the calculation and analysis based on the heterogeneity indexes.

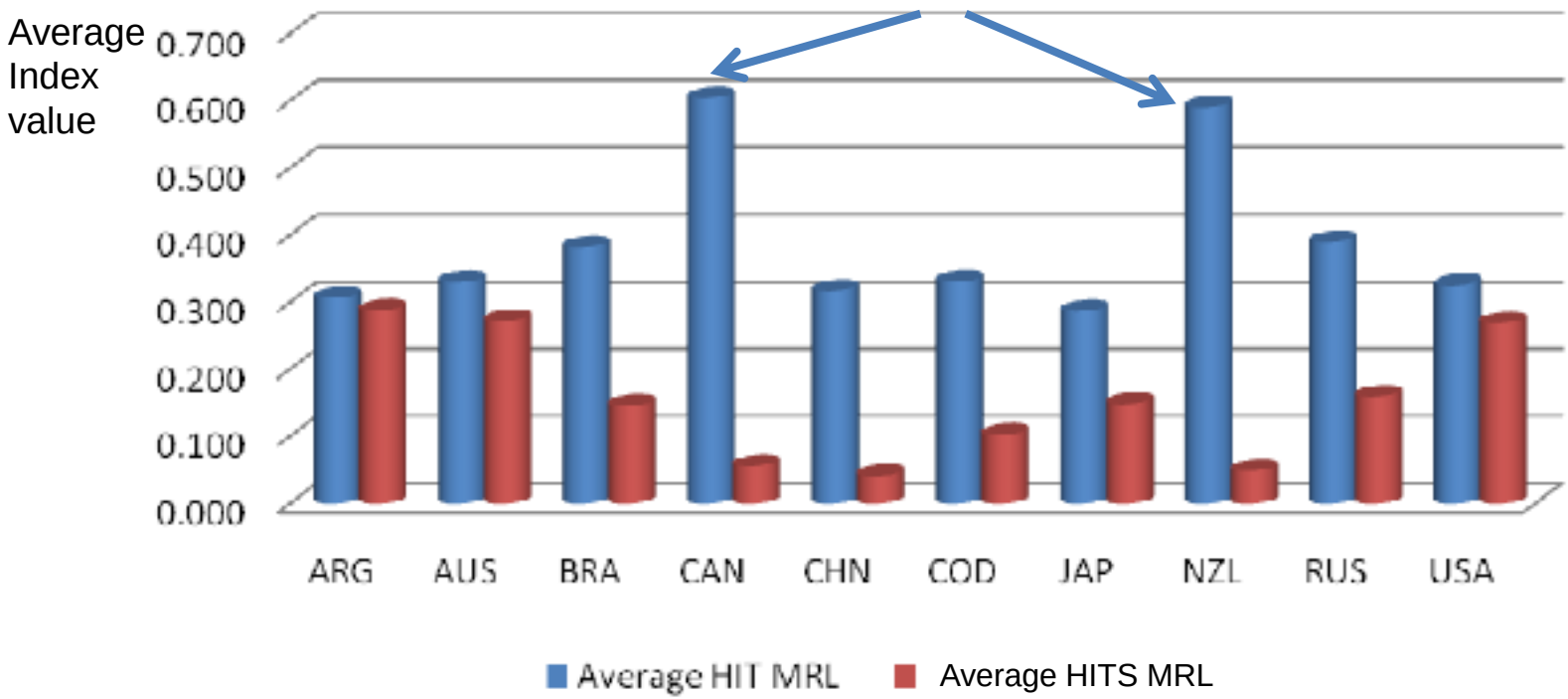
Results – Database

Table 2 – Number of MRL regulations applied by country and product presented in the NTM-impact database

	Country													
Products	ARG	AUS	BRA	CAN	CHN	COD	EU	JAP	NZL	RUS	USA	MAX	MIN	AVE
Apples	127	117	41	76	45	81	430	261	82	394	108	430	41	160
Aubergines	42	74	10	19	25	24	432	277	25	394	87	432	10	128
Barley	75	30	15	36	16	61	427	254	61	392	75	427	15	131
Bell Pepper	58	59	14	16	25	32	427	273	32	394	100	427	14	130
Beef	48	238	10	71	0	106	323	227	107	394	146	394	0	152
Cheese	99	1	0	9	0	0	316	0	0	394	37	394	0	78
Maize/Corn	100	119	58	16	28	59	427	277	59	396	94	427	16	148
Pears	108	94	9	51	39	70	430	258	71	394	99	430	9	148
Pig	47	223	7	44	1	89	322	0	89	394	110	394	0	121
Potatoes	102	79	55	51	5	73	427	258	74	393	102	427	5	147
Rapeseed	32	61	0	31	6	32	428	235	32	393	97	428	0	122
Tomatoes	107	104	58	58	31	76	429	292	78	394	115	429	31	158
MAX	127	238	58	76	45	106	432	292	107	396	146	-	-	-
MIN	32	1	0	9	0	0	316	0	0	392	37	-	-	-
AVE	79	100	23	40	18	59	402	218	59	394	98	-	-	-

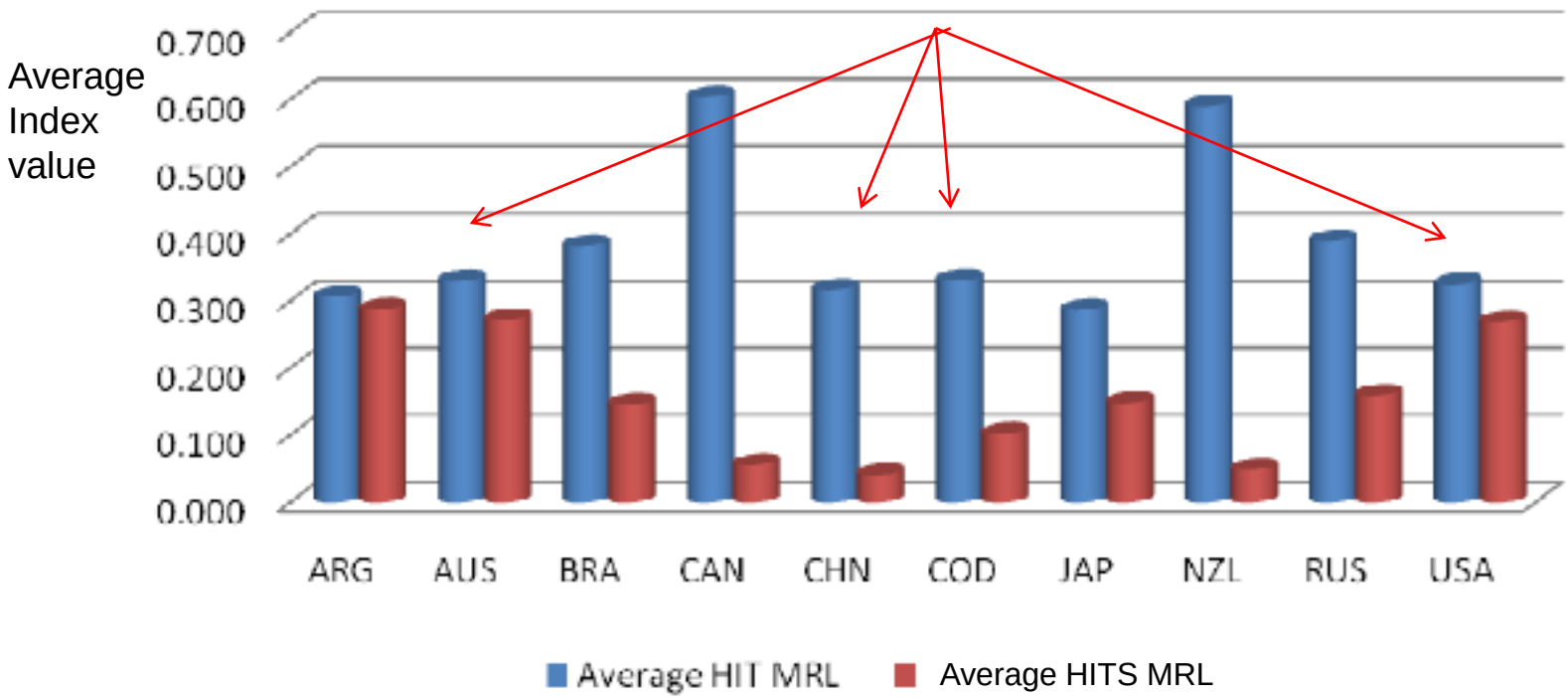
Results

Figure 1 – HIT and HITS for MRL pesticides by country with EU requirements as benchmark



Results

Figure 1 – HIT and HITS for MRL pesticides by country with EU requirements as benchmark



Results

Table 2: 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

Note: n/a means that we could not calculate the index due to missing information. The information about the MRLs was not collected and/or not publically available.
Source: own results using the NTM impact database.

High values of HIT: highest dissimilarity relatively to EU benchmark values

Products with highest Average HIT value: barly and bell pepper

Products by country: Cheese and pork requirements by Canada and by Japan relative to EU requirements

More results – HITS values

Products with highest Average HIT value: barley and eggplant

Products by country:
Barley requirements by Argentina and Australia
Rapeseed requirements by Argentina and Australia
relative to EU requirements

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Table 3 - HITS index by countries and selected agri-food products; 2010

	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	0.38	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

Note: n/a means that we could not calculate the index due to missing information. The information about the MRLs was not collected and/or not publically available.
Source: own results using the NTM impact database.

More results

Table 2 – HIT index by countries and selected agri-food products; 2010

	Apples	Aubergines (eggplant)	Barley	Bell pepper	Beef	Cheese	Maize/ Corn	Pears	Pork	Potatoes	Rape seed	Tomatoes
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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

Note: n/a means that we could not calculate the index due to missing information. The information about the MRLs was not collected and/or not publically available.
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Table 3 - HITS index by countries and selected agri-food products; 2010

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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

Note: n/a means that we could not calculate the index due to missing information. The information about the MRLs was not collected and/or not publically available.
Source: own results using the NTM impact database.

Results - Summarizing

HIT:

- By products: those with more **dissimilar** MRLs are:

  barley = bell pepper> eggplant> rapeseed
- Products by country: Cheese by Canada (0.73) and NZ (0.72) also show large differences relative to the EU MRLs.

HITS:

By products: products with **highest cost for adjusting**: rapeseed, barley, eggplant, bell pepper and rapeseed

Observation: Cost – only for compliance MRL => there are other costs such as conformity assessment, labeling (which also need other complementary instruments to be evaluated)

Conclusions & Discussion

- Indexes application: there seems to be gains in terms of interpretation of regulatory information compared to inventory methods (frequency count).

- The lower the index value, the lower the compliance costs faced by the EU (benchmark) in a given market (product and country): deserves more careful evaluation - *applies for all products or is due to the weight assumption?*

- Regarding indications for defining a negotiation strategy:

  – The highest values assumed by the HIT are associated to the lowest values obtained for the HITS (NZL and AUS) suggesting that there could be a misinterpretation whenever the binding cost due to regulation is not taken into account.

  – The results suggest that it can be important to extend the HIT analysis: in general terms it seems relevant to consider, **whenever possible, which are the requirement differences that can imply in relatively high or low cost for the exporter (EU as the benchmark).**

Conclusions & Discussion

- The HIT values calculated by country and commodity are often high, showing little harmonization between EU and partners in terms of MRL pesticides.

- EU does not seem to be having problems with agri-foods exports regarding regulations with this set of countries, considering the these have the highest number of regulations (- maybe due to harmonization process between EU countries).
- EU seems to be presenting stricter restrictions as an importer where there are are indications that the regulations could have actual cost implications to compliance.
- Even in CODEX standards the HITS are considerably lower than the HIT, suggesting that EU exporters have less to worry about these requirements in other countries.
- Regulation seems to be positive for EU consumers and “negative” for producers in the exporting countries.

Conclusions & Discussion

- Products subject to highest number of regulatory requirements are not always those that trade regulation imply in lower trade due to higher cost for appropriate regulatory imposition and compliance.

- If there are higher number of regulations – does not mean it is more subject to trade restrictions. One can get closer as the effectiveness of introducing the requirement upon trade control is verified.

- Correlation with other trade variables – should be clarified.

- Thank you!

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