DIFFERENCES OF IMPORT REQUIREMENTS IN AGRI-FOOD TRADE – AN EXPLORATIVE ANALYSIS OF NEW DATA

(in German: UNTERSCHIEDE IN ANFORDERUNGEN IM INTERNATIONALEN AGRARHANDEL - EINE EXPLORATIVE ANALYSE NEUER DATEN)

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Abstract

This paper presents an analysis of requirements in international agri-food trade by applying new data collected in the EU project "NTM impact". For the analysis, an index of regulatory heterogeneity in trade is developed so as to combine binary, ordered and quantitative information contents of different types of requirements. The results of the index analysis shed light on which requirements differ between pairs of trade partner countries and show which products are regulated more than others. In a second step, the results will be set into the context of trade indicators such as trade flows for example. The analysis of differences of requirements between countries can provide useful insights for policy-makers when deciding on convergence, harmonisation or equivalence of requirements or when solving market access issues due to regulatory heterogeneity.

Keywords

International agri-food trade, import requirements, non-tariff measures, regulatory heterogeneity, index analysis

Zusammenfassung

Der Beitrag beinhaltet die Analyse von Anfoderung an Importprodukte im internationalen Agrarhandel, wobei neue im EU Forschungsprojekt „NTM impact" erhobene Daten zur Anwendung kommen. Für die Analyse wurde ein Heterogenitätsindex, in dem binäre, geordnete sowie numerische Daten kombiniert werden können, entwickelt und mittels der neuen Daten errechnet. Die Ergebnisse zeigen auf, welche Anforderungen von Ländern sich unterscheiden und welche Produkte mehr oder weniger betroffen sind. In einem zweiten Schritt sollen die Ergebnisse in Bezug auf Handelsindikatoren, wie zum Beispiel Handelsströme, untersucht werden. Solche Informationen können einen nützlichen Beitrag in der Poltikberatung leisten und sind besonders relevant für Verhandlungen von Handelsvereinbarungen über die Harmonisierung und/oder das gegenseitige Anerkennen von unterschiedlichen Anforderungen, um mögliche Handelshemmnisse durch heterogene Regulierungen aufzuheben und den Marktzugang in Partnerländern zu verbessern bzw. den heimischen Markt für ausländische Produkte zu öffnen.

Schlüsselbegriffe

Internationaler Agrarhandel, Anforderungen an Importprodukte, nicht-tariffäre Massnahmen, heterogene Regulierungen, Index

1 Introduction

This paper present an analysis of requirements in international agri-food trade by applying new data collected within the EU project "NTM impact"[1]. The requirements that importing countries impose on foreign products constitute an important category of non-tariff measures (NTMs). With a growing number of issues about food safety but also incidences of plant and animal health problems (for example pests and invasive species), import requirements for agri-food products are of great importance in international trade. They have been widely discussed (see for example WTO, 2012), and research has brought forward a large body of case studies on specific requirements and issues. It is generally argued that import requirements lead to costs for exporters and can therefore restrict trade between countries, while there are of course clear benefits in terms of ensuring food safety and protecting plant and animal health.[2] In this paper, we do not deal with the costs and benefits of NTMs and also do not conduct an impact assessment of specific requirements.

The goal of the analysis in this paper is to identify differences in regulations that could be further analysed in detailed case studies and quantification efforts. Information about difference in import requirements provides clues about regulatory difference between trade partner countries, thereby indicating possible incidences where NTMs could cause market access issues and hamper trade. Such clues seem to be useful in (bilateral or multi-lateral) trade negotiations, in which countries increasingly try to address NTM issues and include sanitary and phytosanitary (SPS) requirements. Most importantly, information about regulatory differences could be used to bring forward agreements on common requirements and/or equivalence, with the latter referring to the situation where requirements of trade partner countries are not that far apart and result in the same outcome as desired. To policy makers, the analysis of differences of requirements could deliver advice for focusing on certain requirements, prioritising and solving market access issues due to the regulatory heterogeneity.

This paper first introduces the concept of regulatory heterogeneity from the perspective of international trade. Note that, only governmental requirements as opposed to the requirements by the private sector are considered.[3] This is followed by the presentation of an index of regulatory heterogeneity in trade. The index is applied by using the information provided in the new database of the EU project "NTM impact", henceforth referred to as the "NTM impact" database.

2 Regulatory heterogeneity in the trade context

At the international level, the relation between requirements for domestic and foreign products is organized by the WTO trade rules in the Agreement on Sanitary and Phytosanitary Measures (SPS) and the Agreement on Technical Barriers to Trade (TBT). The SPS Agreement and the TBT Agreement apply to product standards, but production and process requirements also fall under the agreements if production methods can be used to distinguish

[1] "NTM impact" Project, FP7 project, No. 227202, Assessment of the impacts of non-tariff measures - NTM on the competitiveness of the EU and selected trade partners, project webpage: www.ntm-impact.eu.

[2] BEGHIN et al. (2012)**,** for example, develop a cost-benefit analysis framework for NTM research; for more practical applications of case studies see VAN TONGEREN et al. (2010).

[3] Governmental requirements are referred to in national food law (and/or international rules) and can thus become legally mandatory. Due to their formulation in legal documents, they have often been regarded as mandatory while the requirements by the private sector are voluntary per definition. However, governments may also endorse voluntary standards, and private standards can become quasi-mandatory if a large share of suppliers or retailers requires compliance with them.

final products. The SPS agreement holds for production and process requirements if it can be shown that the final product generated according to a specific method is harmful or risky for human, animal and plant health. While maintaining the sovereign right and obligation of countries to set their own standards, countries are encouraged to base their import requirements on internationally agreed standards such as the Codex Alimentarius Committee of the World Health Organization (WHO) for food safety.[4]

The provisions under the SPS and TBT Agreement aim to ensure that standards are not misused as disguised protectionist measures. Requirements for foreign products are not to be more stringent than those for domestic products and foreign products should be generally treated like corresponding domestic products (with the same use and tariff classification). In order to impose different (and possibly tighter) requirements on foreign products importing countries are required to provide scientific risk assessments, thereby justifying the necessity of the respective requirements. Furthermore, requirements have to be commensurate with their objectives and least trade-distorting for achieving the objective aimed at. Importing countries can either uniformly impose requirements on imports from all exporting countries or require that products from different countries satisfy different requirements in order to control for export specific risks. In the latter case, products from certain countries may need to be specifically treated and checked before importing so as to reduce the risk of introducing pests that are endemic in the particular exporting country but not in the importing country. Therefore, regulatory heterogeneity tends to be specific to pairs of trading partners.

From the exporters' point of view, the requirements for supplying the domestic market and foreign export markets matter. Firms have to satisfy the requirements of importing countries in order to sell their products on foreign markets. The concept of regulatory heterogeneity looks at the differences of requirements, whereby the emphasis is on the relative differences. Regulatory heterogeneity between exporting and importing countries means trade costs. At the firm level, meeting stricter import requirements obviously leads to compliance costs, and those firms that wish to sell their products on different foreign markets tend to face even higher costs because they have to comply with several standards according to the export destination. It can be argued that complying with the most demanding requirement opens the markets of countries that demand more lenient requirements. However, lenient foreign requirements could also involve costs if changes in products and/or the production process were necessary to comply and if compliance needs to be proved by costly conformity assessment. That is, the mere fact that requirements differ between countries causes costs for exporters, and this is an important main idea behind the concept of regulatory heterogeneity. Ideally, the requirements for selling on the domestic market and those for selling on the foreign market should be compared, but a comparison of import requirements is also possible, considering that import requirements reflect the domestic requirements according to WTO rules.

[4] The Codex Alimentarius refers to food standards, guidelines and codes of practice recommended under the Joint FAO/WHO Food Standards Programme. The International Pant Protection Convention (IPPC) and the World Organization for Animal Health (OIE) respectively promote international standards and guidelines to prevent the introduction and spread of plant and animal pests.

3 Analyzing regulatory heterogeneity

3.1 Index of regulatory heterogeneity in trade

This section briefly introduces an index of regulatory heterogeneity in trade, henceforth referred to as the HIT index. RAU et al. (2010) derive the HIT index in detail and also elaborate on its properties, practical application and interpretation. The idea behind the HIT index is to compare different requirements, which are relevant in agri-food trade and which range from product and process standards to firm-level conformity assessment measures and country requirements. The HIT index is especially constructed so as to combine binary, ordered and quantitative information, which has been extracted from documents about the respective requirements in the data collection effort of the "NTM impact" project. Table 1 presents examples of the different types of information contents.

Table 1: Different information types for NTMs covered in the HIT.

	Binary	**Ordered**	**Quantitative**
Type of measure	Rule based calculation	Rank based qualitative or quantitative information	Numerical elements
Example	EU regulates (1) and Australia does not regulate (0)	EU imposes the tightest labelling requirements (5). The labelling requirement set by the US is average (3) and Mexico has the most lenient requirement (1).	Maximum residue levels of a specific substance for a specific product

Source: RAU et al. (2010) amended.

Based on the index of (dis)similarity developed by (GOWER, 1971), we define the HIT index as follows:

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

where *j* and *k* respectively denote the importing and exporting country, and *i* refers to the characteristics or rather requirements looked at. Some characteristics or requirements can be more important than others, and this is captured by the weight $\mathrm{w_{ijk}}$. DS_{ijk}^{HIT} refers to a dissimilarity measure, which is defined by the following equation:

$$\mathrm{DS_{ijk}^{HIT}} = \frac{|\,\mathrm{x_{ij} - x_{ik}}|}{\max(\mathrm{x_i}) - \min(\mathrm{x_i})} \quad (2)$$

where *x* refers to the binary, ordered or quantitative information of the characteristic or requirement, which the exporting and importing country respectively impose.

The HIT index is specific to pairs of trading partner countries, and thus defined and calculated on a bilateral basis by comparing standards and regulations set by an importing and an exporting country. As a consequence, the index depends on the benchmark for comparison, which is always the exporting country, and the values between trading pairs are not necessarily symmetric. The HIT index assumes values between 0 and 1. For $\mathrm{HIT_{jk}} = 0$, there is no regulatory difference between the importing and exporting country. For $\mathrm{HIT_{jk}} = 1$, requirements are very different. The value of the HIT index is increasing with differences in regulations. It is important to keep in mind that the HIT index provides information about (dis)similarity of regulations across countries and does not measure the costs that exporters could incur when selling their products on foreign markets. The link between difference in regulations in trade and compliance and/or trade costs is not analysed. Applying the HIT index in a gravity estimation however generates estimates about the trade effect, see for example WINCHESTER et al. (2011).

3.2 The new NTM database

The "NTM impact" database provides comparable data information about import requirements across countries for a set of products selected. The data was collected in a concerted effort of international partners within the EU project "NTM impact". The database is described in detail by SHUTES and MRAZ (2011). The data was collected in 2009-2010, and the database is thus a snapshot of requirements for that period. The contribution of the project partners in the data collection is much appreciated. [5]

The "NTM impact" database contains the respective information about countries, products and measures. The countries are as follows: Argentina, Australia, Brazil, Canada, China, the EU member states (in most cases treated as a single entity), India, Japan, New Zealand, Russia[6] and the US. The import requirements covered in the database include product, process and presentation requirements, conformity assessment and country-level requirements concerning food safety, animal health and plant health. Table 2 provides an overview of the requirements included and also gives examples.

The information about requirements is available for twelve products that refer to commodities according to the classification of the harmonised system (HS) of trade data. The products (HS 4-digit codes) are as follows: beef (0201), pig meat (0203), cheese (0604), potatoes (0701), tomatoes (0702), fresh vegetables (0709), other vegetables (0710), apples and pears (0808), barley (1003), maize (1005) as well as rape and colza seed (1205). These products have been selected as being most relevant in international trade between the EU and main trade partners and potentially subject NTM issues according to certain trade data indicators.

Table 2: Categories and measures of import requirements covered in the new NTM database of the project "NTM impact".

Categories	Measures
Product requirements/food safety limits	Maximum residue limits (MRLs) for additives, contaminants, microbial criteria and veterinary drugs
Process requirements	Hygiene, quarantine, treatments and traceability
Presentation requirements	Labelling Publicity/marketing
Conformity assessment requirements	Approved third countries Approved businesses (pre-listing) Certification Border inspection Laboratories, sampling and analysis
Country-level requirements	Pre-export checks on equivalence Equivalence agreement on control system Monitoring hazards Animal health and plant health control

Source: based on RAU et al. (2010).

[5] Project partners in alphabetical order of country: Instituto Nacional de Tecnologia Agropecuaria (INTA) (Argentina), University of Sydney (UNSYD) (Australia), University of Sao Paulo (USP) (Brazil), Laval University (ULaval) (Canada), Institute of Geographical Sciences and Natural Resources Research, Chinese Academy of Sciences (CCAP) (China), Rheinische Friedrich-Wilhelms-Universitaet Bonn (Germany), Research and Information System for Developing Countries (RIS) (India), Otsuki and Kimura (Japan), Landbouw-Economisch Instituut (LEI) (The Netherlands), University of Otago (Otago) (New Zealand), Institute for Agricultural Market Studies (IKAR) (Russia), Slovak Agricultural University (SAU) (Slovakia), Virginia Polytechnic Institute and State University (VT), (United States).

[6] Regulatory reforms of requirements for agri-food products have been taking place in Russia. During the data collection period, the Russian requirements were in flux. This not all requirements were known, but those for which information was available were reported and considered in the analysis.

3.3 Application of the NTM database to calculate heterogeneity indices

The HIT index is calculated for types of requirements that comprise specific measures or regulatory elements. For aggregating, each measure is assigned an equal weight. Unequal weights are not considered as assigning different weights requires expert knowledge about specific characteristic of the substances and production methods (compare equation 1). In the case of qualitative information about requirements, values are assigned in order to obtain binary or ordered type of information; see table 1 above for examples. In the index calculation, bans of products or substances are considered to be most stringent regulation. On the other hand, the absence of a requirement specified elsewhere is considered to be the least stringent regulation. In the case of no information available, which differs from the situation of no regulation, the respective requirement is not included in index calculations.

Table 3 lists the indices calculated by using the "NTM impact" database. The sets of measures included in the respective indices are presented in column 3. Note that some indices, especially those containing provisions in text format and other information, may not be mutually exclusive, as in some cases measures appear in the different indices. Column 4 gives the number of data points that refer to the observations, the items regulated or the information contents provided. Information was collected for each country and product included in the database. The database covers a large number of data points for the different measures, 12 agri-food products and 11 countries (with the EU as one entity).

Table 3: Indices of regulatory heterogeneity (HIT)

Name	**Overview of measures included**	**Scope**
Heterogeneity index for additives (MRLs)	Number of additives: colours, preservatives, antioxidants, sweeteners, emulsifiers, stabilisers (count data)	326 additives
Heterogeneity index for contaminants (MRLs)	Combination of counts and numerical information	24 contaminants
Heterogeneity index for pesticide (MRLs)	Numerical residue limits	610 MRLs
Heterogeneity index for veterinary drugs (MRLs)	Numerical residue limits	130 veterinary drugs
Traceability requirements index	Tracking and tracing, documentation, record-keeping	1674 data points
Product requirements index	Product approval, packaging, vaccination	1770 data points
Process requirements index	Hygiene, quarantine, treatments to prevent and combat diseases and pests	919 data points
Monitoring requirements index	Monitoring hazards, bans, Laboratories, sampling and analysis	397 data points
Labelling requirements index	Country of origin, information provided, specific claims, info about daily allowance	279 data points
Conformity assessment index	Pre-export checks, equivalence agreement, animal and plant health control, border controls	1779 data points
Certification requirements index	Testing, inspection, auditing, certificates, establishment approval (pre-listing)	1105 data points
Plant requirements index	Phyto-sanitary export certificates, pest-free status, invasive species	1077 data points
Veterinary requirements index	Veterinary export certificates, disease-free status	278 data points

Source: SHUTES et al. (2011) amended.

4. Illustrative results of the index analysis

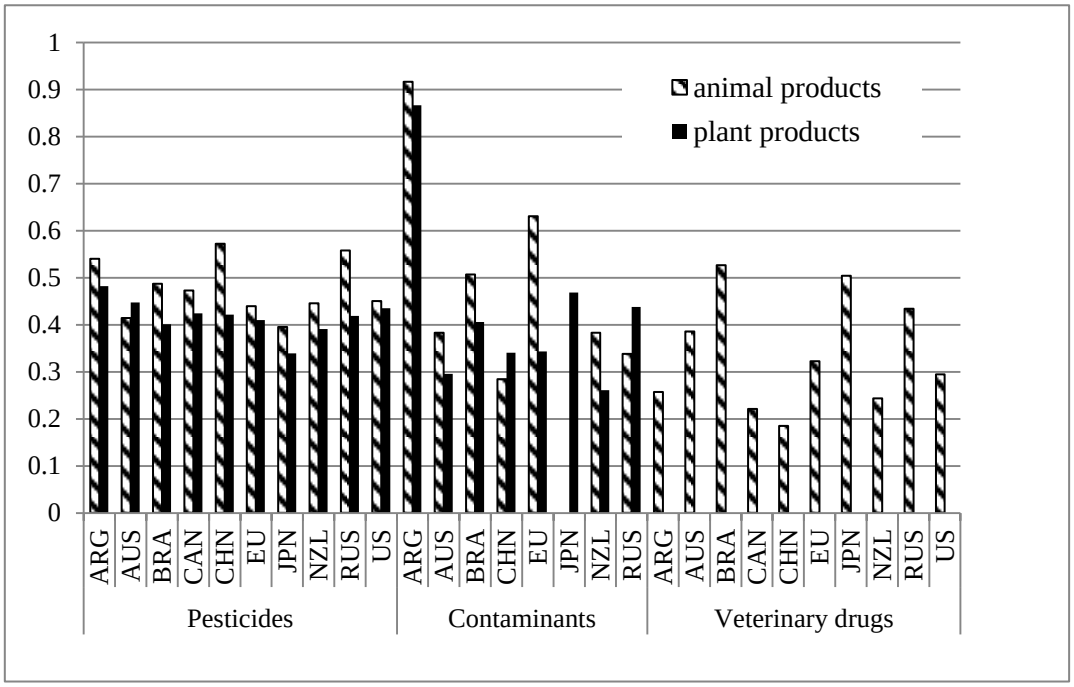
In this section, the results of a preliminary analysis are provided. The HIT index is separately calculated for animal and plant products. The index values are average values for each importing country denoted on the x-axes of the figures below.

HIT values for maximum residue limits (MRLs)

Figure 1 shows the average value of the HIT index for maximum residue limits (MRLs) for additives, pesticides, veterinary drugs and contaminants from the perspective of the importing country. In the index calculation, we included only those MRLs for which the requirement of the importuning country was stricter than the requirement of the exporting country. Thus, the focus is on a subset of MRLs that actually matter for exporting: Setting strict MRLs, exporting countries automatically fulfill the lenient MRLs set by the importing country.

A high average value of the HIT index indicates a large difference between regulations for the respective importing country (presented on the x-axis) and regulations in other countries. As illustrated, there are more differences in pesticide and contaminant MRLs for animal products than for plant products; except for pesticide MRLs by Australia and contaminant MRLs by China and Russia. Looking at plant products, for example, the index values of pesticide MRLs are relatively high for Argentina, Australia and the US. For veterinary MRLs, Brazil, Japan, Russia and Australia score high index values. Overall, the index value for Argentina for both plant and animal products are considerably higher than in other countries. The index value of contaminant MRLs for animal products by the EU is also rather high, pointing towards a large difference in comparison to the requirements demanded by other countries.

Figure 1: Indexes of regulatory heterogeneity (HIT) for maximum residue levels, average residue level by country.



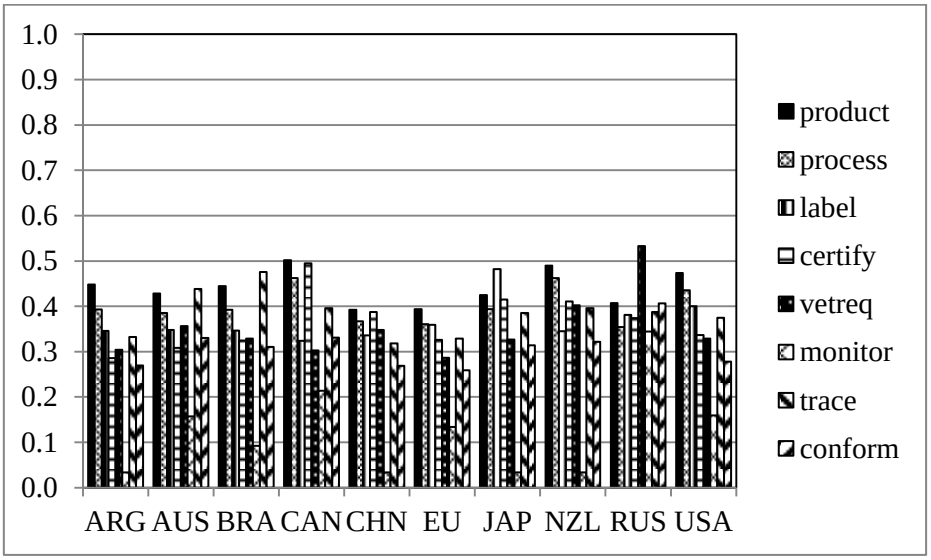
Note: The index for contaminants for the US (plant & animal products), for Canada (plant & animal products) and Japan (animal products) could not be calculated due to missing information. Veterinary MRLs only apply to animal products, but pesticide MRLs are relevant for both plant and animal products. For example, pesticide MRLs are specified for some animal products due to residues coming from fodder.

Source: calculation using NTM-Impact database.

HIT values for other non-numerical requirements

Figures 2 and 3 presents the average values of the HIT index for requirements other than MRLs (compare table 3). Again, we look at animal and plant products separately and present the average from the perspective of the importing country. Most index values range between 0.2 and 0.4. The largest index values are observed for Russia for plant products, indicating that there are relatively large differences between Russian regulations and regulations in other countries (see figure 3). Overall, the difference between MRL requirements seems to be greater than the difference in non-numerical requirements, but note that this is also due to a certain overlap of measures included in the respective indices of non/numerical requirements.

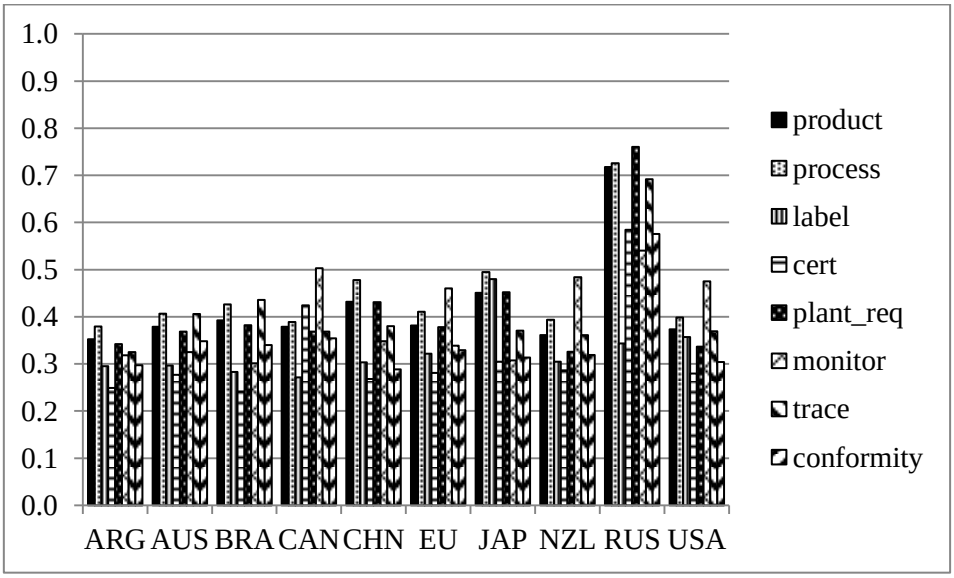
Figure 2: Indices of regulatory heterogeneity (HIT) for different types of requirements for animal products, average value per importing country (presented on the x-axis).



Note: India is not included due to missing information for requirements, except MRLs.

Source: calculation using NTM-Impact database.

Figure 3: Indices of regulatory heterogeneity (HIT) for different types of requirements for plant products, average vale per importing country (presented on the x-axis).



Note: India is not included due to missing information for requirements, except MRLs.

Source: calculation using NTM-Impact database.

5. Concluding remarks

This paper presents a first preliminary analysis of an index of regulatory heterogeneity in trade, the HIT index, applying the new data collected within the EU project "NTM impact". The final analysis will be more detailed so as to shed light on the question about which requirements differ between pairs of trade partner countries, and how much they differ. Such analysis provides useful insights for policy-makers when deciding on convergence, harmonisation or equivalence of the requirements of trade partner countries or when solving market access issues due to regulatory heterogeneity.

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