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STUDY OF AVERAGE EFFECTS OF NON-TARIFF MEASURES ON TRADE IMPORTS

by

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Abstract

Newly collected data in UNCTAD's Trade Analysis and Information System (TRAINS) database on non-tariff measures (NTMs) offers the possibility to assess its impact on trade. The approach chosen is using a frequency count, which is the number of NTM on a single product. This novel method can be relevant if one can assume that NTM do have a cost for exporters, even if that cost is unknown. The key concept is the average cost of any NTM. This analysis checks whether more measures imposed on a single product, will increase difficulty for exporters to comply with all requisites and still being able to export competitively. European imports of agri-food products (at 4 digit level) is analysed, and data suggests that higher frequency of SPS measures may be significant to influence European imports from all countries, and it impacts LDC in special, particularly those in Africa. Exports could be reduced by around 3 per cent for all countries, and almost 5 per cent for LDC countries for each additional SPS requirement in the importing country. Countries in Asia do not seem to be affected, but this is probably because of trade patterns, since European Union is not a major market for agri-food exports coming from those countries. Other middle income countries are affected in a lesser way. This fact gives strength to the idea that the higher income in a country, the more resources are available to the companies operating in their territory to overcome obstacles posed by NTM in partner markets and continue exporting. Even in the evidence that NTM may negatively affect trade, negotiation for reduction, harmonization or elimination is not automatic or even desirable. Some policy implications are discussed based on the conclusions.

JEL Classification: F13 F14 O24 Q17

Keywords: Non-tariff measures, sanitary and phytosanitary measures, market access, agriculture and food products, European Union, Least Developed Countries, impact on trade

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A. INTRODUCTION

The effect that NTM may have on trade is at best difficult to measure, especially when assessing multiple NTM on various sectors. The method may depend on the data available. This study uses NTM official measures collected through the Transparency in Trade (TNT) initiative.[1] It consists of a comprehensive set of regulations that are in place, though this study concentrates on SPS measures. Measures such as sanitary requirements may be elusive for quantification because it may be hard to evaluate quantitatively the effect of a hygiene certification, a fumigation requirement or the accessibility of traceability information. This is not only because there is no numeric quantity in the regulations, but also because individual technical measures (TBT) and sanitary and phytosanitary measures (SPS) can be very different in nature, and so in the costs they carry. The "measures" to be analysed can be collected in a database but always be essentially of legal nature with no direct measurement or quantification of impact or effect associated with it.

The problem is crucial because market access becomes more complex than a few decades ago, and goes clearly beyond tariffs. NTM may enhance exports of a country when it complies with the requirements, as it has gained de facto market access to the country imposing these measures. This can promote the competitiveness of the exporting country and foster its exports. Some middle-income countries have used SPS measures as a lifeline and saw compliance to SPS measures as a strategy to compete against other countries with lower cost of production (Neeliah, Neeliah and Goburdhun, 2013). At the same time, it can reduce exports of those not being able to pay the higher costs of compliance. This study questions whether less developed countries could face further difficulties because of its conditions compared to other more developed.

This exercise concentrates on SPS measures for agri-food products. These products are sensible to many countries, and definitely are likely to be highly regulated for different reasons. The import market studied is the European Union, and it analyses the responsiveness of various regions to restrictions in a major market as this one.

The method chosen in this study is to use the frequency count of NTM on products as a measure of restrictiveness. This could be assumed as "adding up" the average cost of complying with measures that exporters face across countries and companies. The assumption is that the more measures imposed on a single product, the more difficulty for exporters to comply with all requisites and still being able to export competitively. This method can be relevant as an approximation of the average cost for exporters when the cost on NTM is unknown. The key concept is the average cost of any NTM, and not the cost of any single measure. As any average, the estimated calculated cost in terms of impact on trade is representative of all measures, but not of any one in particular.

Using this approach, any NTM picked randomly would "yield" the average cost impact. When a large number of measures of a country are analysed, then the assessment will be more accurate. The "frequency" measure is simply "adding up" the unknown average cost of individual measures to analyse the cost in the margin. The exercise is set to show if the imports of the agri-food products affected with more SPS measures are imported less, compared to others, in which case SPS would have a restrictive effect on trade. Special attention is given to LDC countries to see if this condition affects in a special way the level of exports of these products when confronted to SPS measures. In other words, that their effects are not independent.

[1] The African Development Bank (AfDB), the International Trade Centre (ITC), the United Nations Conference on Trade and Development (UNCTAD), and the World Bank are forming a partnership called Transparency in Trade (TNT) (http://www.tntdata.org/). Within this initiative, UNCTAD will lead in coordinating the collection of NTMs data.

This average cost on NTM is estimated across companies for a single country. The assumption is that each country has a level of development that provides a certain level of service to all companies located in it. The average cost (or availability) of certification and verification bodies as well as export services can be higher in developing countries, especially in LDCs. Institutional capacity can, then, affect negatively less developed countries, and all companies located in it.

The results suggest the SPS measures are relevant for exports of agri-food products to Europe. Higher frequency of measures decreases exports of around 3 per cent worldwide, and for LDC countries in Africa, the reduction can reach to 5 per cent for each additional SPS measure on agri-food products imposed by the European Union. The interaction of both conditions (being an African LDC and facing more SPS measures) suggests the impact is disproportionate for them. The two features are not independent, and this affects this group of countries in their ability to export in a different way. On the other hand, Asian LDC seem not to be affected by import regulation of these products. The control group is all High Income countries. In general terms, these results are in line with other studies that suggest then NTM have a negative effect on trade (Carrère and de Melo, 2009 and Ferrantino, 2009).

Likewise, the analysis using presence/absence of those measures is also significant, and quite large. The usefulness of analysing the trade effect through categorical "dummy" variables for presence/absence of SPS measures is limited because it would assume not only that all measures are the same in terms of effect, but also that facing one or many should have the same impact on trade. This is a very broad an imprecise assessment. Still, this set of equations using confirms the conclusions driven by the frequency count analysis in the sense that the effect could be considerable and that African LDC could suffer more from it. Also, the fact that LDC countries in Africa have the lowest value for coverage ratio of SPS measures compared to other regions, confirms the idea that these LDC countries in Africa tend to export less of those highly regulated products.

Nonetheless, more important than the exact amount of calculated effect, is the corroboration of an economic effect, which is also stable across different specifications.

The control variables, for their part, are successful in isolating the effects of market size, country or economy size, tariffs, distance, and exporting tradition of countries. They all have the expected signs. The Lead time to Exports, which captures facilitation difficulties in the exporting countries, is not always significant. And when it is, it suggests every extra day may decrease exports by 1 per cent. This is how exports could be reduced because of lengthy processes in the exporting country.

This study fits into a growing literature on NTM impact assessment with a new method and using newly collected data from official sources. Generally, literature points out that NTM may have a cost to exporters even if the motivation to set the measure is to pursue legitimate policy objectives, such as correct market failures, or shifting profits home by exploiting market power (WTO, 2012). In fact, measures for issues such as safety and quality of food may be put in place due to changes in demand, consumer awareness and new eating behaviours. It does not need to be a protectionist measure to affect trade negatively. Many times, NTM have a legitimate purpose, and so they could reduce negative externalities, for example in the case of environmental threat or food safety. NTMs may also facilitate trade when they reduce asymmetries in information between consumers and producers, for example about the quality or safety of the product. The effort of complying with NTMS could also help countries to upgrade capacities, (or mitigating institutional deficiencies for monitoring and enforcing regulations, in words of van Tongeren, Begin, Marette, 2009) in which case the ultimate development impact is positive for the exporting country. In some cases compliance strategy of exporters can be reactive or proactive, such as construction of new food testing facility, implementation of farm

registration schemes for better traceability along the production chain, or providing training on good Agricultural Practices (Neeliah, Neeliah and Goburdhun, 2013).

However, higher and more stringent requirements make it more expensive for exporters to comply. Developing countries have limitations to overcome food safety standards due to poor access to compliance resources, including scientific and technical expertise and institutions, limited information and finance (Jongwanich, 2009 and Henson and Loader, 2001). This idea could imply that richer countries would be favoured as exporting partners and middle-income countries would find it easier to comply and upgrade capacities, making the gap larger for those who could not. Higher requirements imply higher value for products. The question whether the losers and winners of the new import rules will is pre-determined, for example for being in richer or poorer countries, is not always studied. This study offers some evidence in this regard. Low-income countries face more restrictive market access because their exports concentrate towards agricultural products, where the aggregate of trade restrictions are estimated to be the highest (Carrère and de Melo, 2009). This study analyses whether there is a separate impact on least developed countries, apart from export composition. It raises the question whether NTM have a different impact depending on the development level of the exporter, irrespective of the export basket, or even the tradition of exporting a particular product.

This analysis does not assume the trade measures have protectionist intent or are unjustified. It is worth mentioning that it is not the legitimacy of measures which is at stake, but any (desired, or not desired) economic effects it may bring. Measuring the effect of NTMs is relevant both for adapting policies for exporting countries and for negotiating purposes with those imposing measures on imports, besides assessing the impact and considering ways to neutralize it, for example through technical assistance and capacity building.

The next section presents general figures for trade in agri-food products, such as exports from LDC and imports into Europe, by regions; and also incidence of SPS measures SPS on agri-food products in European Union, such as Frequency Index and Coverage ratio. Section C describes the data used, the construction of variables and explains the method used. Section D presents results, and section E concludes with also some very general policy recommendations. In the annex, there are all complete tables with results, and list of countries in LDC groups in Asia and Africa.

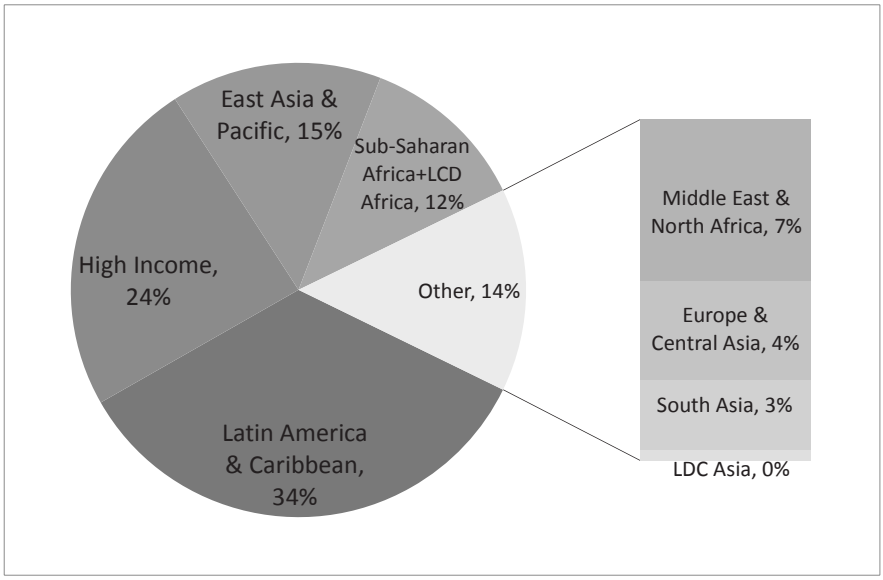
B. AGRI-FOOD IMPORTS IN EUROPEAN UNION AND NTM APPLIED TO THEM

TRADE

Figure 1 presents the regional origin of agri-food products imported into the European Union. The largest supplier is Latin America, followed by High Income countries in Europe or America, such as United States, Canada, Norway, Switzerland, New Zealand, or Australia. In East Asia and Pacific there are important suppliers, such as China, Indonesia, Thailand, Viet Nam, Malaysia, and others. Sub-Saharan Africa and LDCs in Africa account for 11 per cent of the imports of agri-food products into the European Union. This share is not negligible.

The results point to particular conclusions for African LDCs. It is important to note that European Union represents more than 30 per cent of exports to these countries, as it is shown in Figure 2. On the other hand, it only represents 3 per cent to Asian LDC, since exports are oriented mainly to Asia, especially to South Asia.

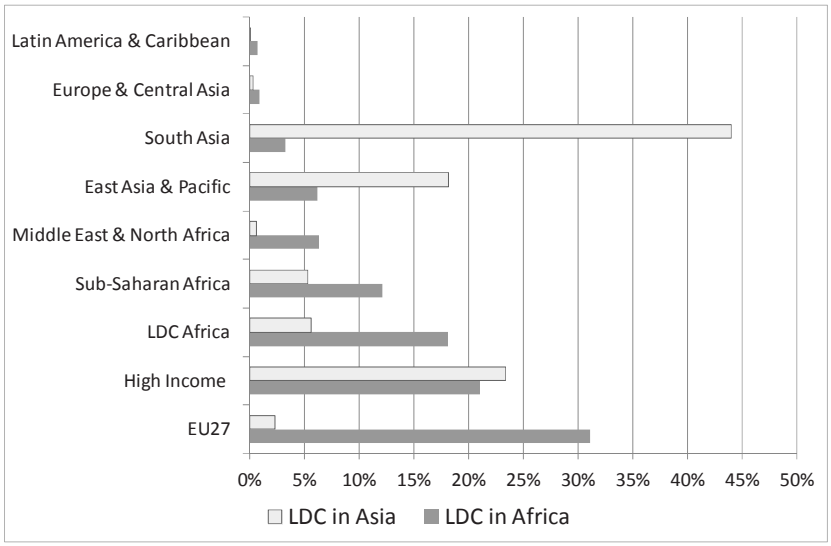
Figure 1
Imports of agri-food products into EU (percentage share by region)



Source: WITS COMTRADE.

Note: Average yearly exports for 2008 to 2010.

Figure 2
Exports of agri-food from LDC in Africa and Asia (percentage share by region)



Source: WITS COMTRADE.

Note: Average yearly exports for 2008 to 2010.

INCIDENCE OF SPS MEASURES

A simple way to grasp the relevance of NTM measures is to calculate two incidence measures: frequency index and coverage ratio (UNCTAD, 2002). The frequency index accounts only for the presence or absence of an NTM, and summarizes the percentage of products to which one or more NTMs are applied. The coverage ratio is the percentage of trade subject to NTMs for the importing country and provides a measure of the importance of NTMs on overall imports.[2]

The Table and Figures below show that these products are highly regulated. Most of agri-food products and trade is covered by at least one SPS measure. Both incidence measures reach almost 100 per cent coverage. This information is in line with expectations, but it is not useful *per se* to infer the restrictiveness of the regulations. Moreover, if imports were already reduced by the measures imposed, then the coverage ratio will be downward biased (UNCTAD, 2002).

Table 1
Incidence measures of SPS on agri-food products in European Union

	Frequency index (per cent)	*Coverage ratio (per cent)*
High Income	92.9	98.1
Europe & Central Asia	92.7	97.6
Latin America & Caribbean	92.9	96.5
East Asia & Pacific	92.9	98.0
South Asia	92.8	92.4
Middle East & North Africa	92.9	96.3
Sub-Saharan Africa	92.9	98.9
LDC Africa	93.3	84.3
LDC Asia	94.1	95.5
World	92.9	96.9

Source: TRAINS/WITS UNCTAD NTM database.

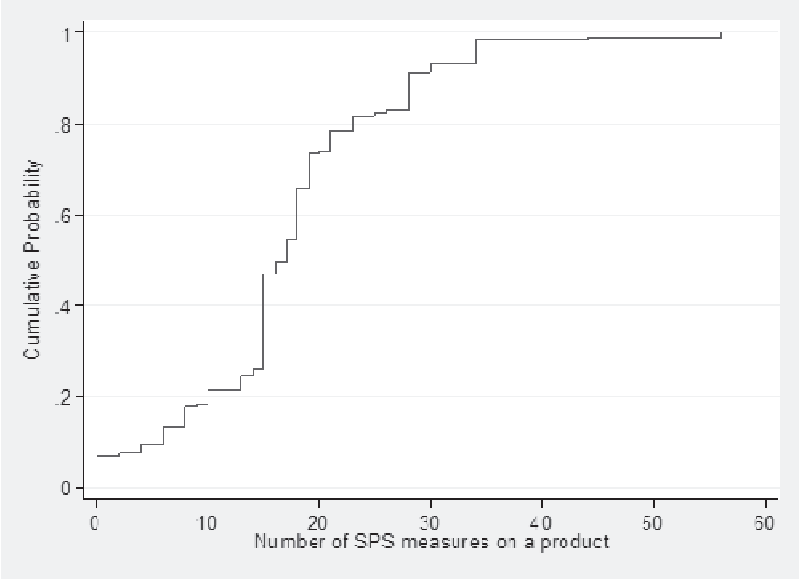
LDC countries in Africa have a lower value for coverage ratio than the world imports into the EU, and the lowest value of all regions. Being the regulations the same across countries, and considering it is calculated only on the products that are imported into EU, it suggests that these LDC countries in Africa concentrate more on non-regulated products when they export to EU.

The figure 3 shows the cumulative distribution of the number of SPS measures that apply to each product. The ones with highest number have almost 60 distinct measures applying to it.

Agri-food products have a high concentration of SPS measures. On average, there are 14 SPS measures on each product, while there are only 6 TBT measures on each product, on average. SPS measures affect only 261 products, 90 per cent of which are agri-food products. TBT measures affect more than a thousand different products, but are distributed across the board.

[2] Here, only agri-food products are shown, more information is provided in UNCTAD (2012), "Non-Tariff Measures to Trade: Economic and Policy Issues for Developing Countries"

Figure 3
Frequency of SPS on agri-food products at 4 digits HS imposed by European Union



Source: TRAINS/WITS UNCTAD NTM database.

C. DATA AND METHODOLOGY

Previous studies suggest there may be a negative impact on trade, but usually data used is a proxy for NTM. One is the incidence of detention at the United States frontier, on border inspection when shipments are rejected. For example, Jongwanich (2009) measures SPS as the incidence of detention at the United States frontier, i.e. detained shipments. Other studies rely on one type of measure. e.g. Maximum Residue Limit (MRL) of certain chemical. In the case of Ferro, Wilson and Otsuki (2013), they use MRL data and construct a restrictiveness index using data for 66 products and 1500 pesticides for 61 importing countries. Gravity models may use a change in one measure to assess its impact (Otsuki et. al. (2001). Others use in depth surveys where exporters in any country are asked to specify the significance of the problems experienced.

The data chosen in this study is an inventory-based approach that uses Official data on trade control regulations. The source of data is the UNCTAD's TRAINS database, which as from 2009, collects measures directly from official legal sources in each country. It records measures which have been published as official legal requirements according to the new classification (developed from 2007 to 2009). For the case of the European Union, it consists of processed and classified data which originally is collected by European Export Help Desk[3] . All the measures are mandatory regulations published in the Official Journal of the EU.

The data does not indicate how important any restrictions or limitations are. It just lists measures that control trade, associated with the corresponding affected products. Measuring the restrictiveness of the NTM is a complex task, involving assigning a value to the impact they may cause on trade. Normally, either prices or quantities traded are altered when NTM are in place. There alternative ways of calculating this, to then drawing conclusions on the restrictiveness of NTM applied. Several studies record possible methodologies to quantify the effect of NTM. The impact studied can be on trade or on welfare. This would also depend on what information is available (Ferrantino, 2006, and Beghin and Bureau, 2001).

[3] http://exporthelp.europa.eu/thdapp/index_en.html

This study choses to assess the effect on trade volume. One way of doing it is using the frequency count. This is the number of NTM on a single product. The assumption is that the more measures imposed on a single product, the more difficulty for exporters to comply with all requisites and still being able to export competitively. This method can be relevant as an approximation of the average cost for exporters when the cost on NTM is unknown. The key concept is the average cost of any NTM, and not the cost of any single measure. While the average cost is also unknown, it can be assessed. As any average, the estimated calculated cost in terms of impact on trade is representative of all measures, but not of any one in particular.

In reality, the cost to the exporter may be different not only for each NTM, but also for each exporting country or region. Each country has a level of development that provides a certain level of service to all companies located in it. The average cost (or availability) of certification and verification bodies as well as export services can be higher in developing countries, especially in LDCs. Institutional capacity can, then, affect negatively less developed countries, and all companies located in it. Furthermore, the cost can be different for two distinct companies within the same country when they have or have not enough resources to invest (or have already invested) to comply with requirements and adapt its product or production process. This can be associated with the competitiveness of the company. Closely related to this is that companies may also differ in production technologies, technical capacities or differences in product specifications, which may also affect the cost of compliance across companies (Ferrantino, 2009). Moreover, there could be a close relationship and/or interdependence between the average cost associated to the country of origin, i.e. availability (or not) of infrastructure, export services, testing and certification capacity in exporting countries, etc. and those costs associated to the companies operating in them, which are directly related to their competitiveness. A joint assessment is more appropriate to for and empirical analysis oriented to negotiation and policy needs.

While theoretically NTM could have a differing cost to different companies located in any country or region depending on their competitiveness, what is relevant for this study is that the average cost across companies can be assessed. Using this approach, any NTM picked randomly would "yield" the average cost impact. When a large number of measures of a country are analysed, then the assessment will be more accurate. The "frequency" measure is simply "adding up" the unknown average cost of individual measures to analyse the cost in the margin.

The equation studied is the following:

$$\ln m_{EU\,k,j} = c + \beta_1\, frequencySPS_{k} + \beta_2\, dumLDC + \beta_3\, dumLDC{*}frequencySPS_{k,j} + \beta i \text{ Other control variables} + u_{k,j}$$

where the dependent variable, $m_{EU,}$ is the European import value. It is the average annual imports considering data from COMTRADE from 2008 to 2010. The average across three years is used to avoid any short term volatility in trade. It is bilateral and by product, at HS 4 digits. It is used in log.

The frequency variable is *frequencySPS,* and is the count of SPS measures as described above. The frequency count is calculated taking into account how many different regulations are applied to a 4-digit product, as stated in any single regulation, i.e. a single legal document issued officially by the government. Each regulation or legal document must be read to distinguish all measures within its text, and then all are to be registered separately.[4] Thus, it does not matter, how many 8-digit products [5] are in any 4-digit group, but only how many differentiated regulations

[4] In the case of the EU, the regulations are consolidated documents grouping a few laws, decrees, or directives, etc. that relate to the same subject and group of products. This is determined by availability of data from the Help Desk.

[5] Original NTM data for EU is at 8-digit level

are applied to it. The result is a maximum of around 60 measures applied to a single product.[6] Measures on Organic products are dropped because they are not affecting but organic-labelled products, and this is a condition on products that is considered voluntary.

A dummy variable for identifying effects on LDC is introduced through *dumLDC.* There is also an interaction term of the LDC dummy variable and frequency of SPS measures, which is *dumLDC*frequencySPS*. This term would capture any specific effect that additional SPS measures would have in the value of exports for LDC countries, apart from the general effect on all countries.

The control variables are the following: (a) World market size, which is the value of world imports for product i, in log. It accounts for differences in value of imports related to the fact that some products normally have higher traded value (due to price or volume) than others, irrespective of the importer. The variable (b) is the Lead Time to export, as appears in the World Bank survey Doing Business. It is the average number of days of delay to export from each of the countries. When there is no data available for a country, the regional average (available from the same source) is assigned to this country. It reflects whether exports could be lower/higher due to internal conditions of the exporting country, normally related to export facilitation. Some countries have lengthier processes to export, and this could affect the export value. The tariffs data is used in variable (c). It is calculated using tariff data from WITS, and using the AVE calculations from the same source.[7] The (d) Distance variable accounts for the fact that some countries may trade less with Europe just because they are geographically distant. Some other countries may export more to Europe because they are either big countries, accounted for in (e) GDP, used in log, or because they are big exporters, as reflected in (f) Exports to other markets, also in log. This last variable describes exports from country j of product i to the World, except for European Union. It accounts also for any particular condition in a country (e.g. endowments, traditional production) that makes it an important exporter of a particular product, regardless of importing conditions in Europe.

The exercise is set to show if the imports of the agri-food products affected with more SPS measures are imported less, compared to others, in which case SPS would have a restrictive effect on trade. When proved statistically significant, the interaction term (of frequency of SPS measures and LDC dummy) would show if the condition of being an LDC affects in a special way the level of exports of these products when confronted to SPS measures. In other words, that their effects are not independent.

Only agri-food products are used. More specifically, only those in chapters 1 to 24 are considered in this group.

D. RESULTS

The results suggest the SPS measures are relevant for exports of agri-food products to Europe. The dummy variable for presence/absence of those measures is significant, and quite large. Moreover, results also suggest the higher frequency of measures decreases exports, especially for LDC countries in Africa. Most of the control variables are significant, and they have the expected signs.

[6] It could happen that there are two regulations applying two measures that fall in the same NTM code, e.g. two regulations for labelling. Since they are originated in two different sources of official legislation, and having different content, they are both counted.

[7] Variable is calculated as ln(1+tariff in decimal). Bilateral data, simple average, and AVE values are used. AHS are used, when available, PRF rates are the second information used, when available, then MFN when the others are missing.

Several specifications have been tested. The first set uses the dummy variable to analyse the presence/absence of SPS measures, and main results are shown in table 2. The second set looks at the frequency effect of SPS measures. Key information result is shown in table 3. The same method is tested in equations of group 1 and 2. First, the SPS variable is tested in parallel with an LDC dummy variable to isolate any specific feature of these countries. In a second stage, an interaction term between SPS measures and LDC is introduced to signal any specific influence of SPS measures in those countries. For example, the equation 12 tests globally all LDC, while equation 13 and 14 test African and Asian LDC separately. The last equation, identified as 15, also distinguishes these two groups but considers them at the same time.

Table 2
Summary of regression results using presence/absence of SPS measures

	Eq.3	*Eq.4*	*Eq.5*	*Eq.6*
(g) SPS dummy	-0.575*	-0.57*	-0.645**	-0.577*
(h) SPS dummy*LDC	-0.572			
(i) SPS dum*LDC Africa		-0.888*		-0.917**
(j) SPS dum*LDC Asia			0.149	0.069
R-sq overall	0.3761	0.3771	0.3788	0.3795

Nbr of observations: 10249

legend: * p<.1; ** p<.05; *** p<.01

All equations in the second set suggest the higher frequency of measures seems to decrease exports around 3 per cent worldwide, on average. The coefficient is highly significant in all specifications, and it has a similar value in all of them. This suggests countries are affected in their exports when there are a large number of Non-Tariff Measures, in particular for SPS measures on agri-food products. Each additional measures imposed on a single product would make its imports decrease in about 3 per cent, for any country.

The drawback is that it is only an average worldwide. Considering the diversity of countries and regions, this information may not be very useful for determining any conclusions that could lead to policy implications. One way of overcoming this difficulty is analysing what is considered the most vulnerable group: the Least Developed Countries (LDC), and results prove that the impact is also relevant.

Results from the specification using LDC as a single group in the equation 12 suggest that there is a mild negative effect for LDC countries as a group. There should be an additional effect of around 1 per cent for those countries for facing SPS measures, apart from the average effect across countries. Still, if the LDC group is split in regions, a specific more acute effect emerges for African countries. Equations 13 and 15 show that an additional 2 per cent decrease in exports could be added to the 2.8 per cent average effect across countries. These results suggest that LDC in Africa, in particular, find extra difficulty in exporting; they are relatively more affected than the rest whenever the number of SPS measures is increasing. The total effect rises to almost 5 per cent of decreased exports for any product for each extra SPS measure imposed by the European Union (which is the only importing market analysed).

For the specific group of LDC in Asia the conclusions are different. The condition of being in that country group negatively affects exports to Europe and in a stronger way that for those in Africa, but for reasons that do not relate to NTM. In fact, the interaction term (variable (q) in table 3), is not significantly different from zero. LDC in Asia may suffer from the worldwide average effect of 3 per cent, but there is no additional or special effect for them as it was found for African LDC.

Table 3
Summary of regression results using frequency of SPS measures

	Eq.12	*Eq.13*	*Eq.14*	*Eq.15*
(k) LDC dummy	0.181			
(l) LDC Africa		0.768***		0.677***
(m) LDC Asia			-1.24***	-1.13***
(n) Frequency of SPS	-.0288***	-.0286***	-0.031***	-.0288***
(o) FreqSPS*LDC	-.0146*			
(p) Freq SPS*LDC Africa		-.0224**		-.0224**
(q) Freq SPS*LDC Asia			0.0085	0.0058
R-sq overall	0.3800	0.3811	0.3827	0.3834

Nbr of observations: 10249

legend: * p<.1; ** p<.05; *** p<.01

Additionally, the SPS and TBT measures were tested together to see if changes in trade could be also driven by the TBT measures in place, besides any that of SPS. Results show that this is not the case: for agri-food products what is decisive is the frequency of SPS measures, but not the TBT. This is probably because only 10 per cent of TBT measures are applied to these products, while more than 90 per cent of SPS fall onto agri-food products, and SPS measure heavily outnumber TBT measures.[8]

The first set of equations, using the presence/absence of SPS measures, also suggests that SPS have some impact on European imports of agri-food products, as shown in table 1. Using this type of specification would suggest that having one or more SPS regulations on any product makes a big difference for imports. The estimated impact in percentage change of Europe imports, using calculations suggested by Kennedy (1981)[9] can be found in the appendix. The estimated percentage impact calculated for this coefficient in this set of equations is around 46-50 per cent decrease in EU imports when there are SPS measures. Again, the impact is greater in the case of African LDC, and more sizeable than for the rest of countries. This effect is not evident when all LDC countries are grouped together, but only when considering separately African and Asian LDC.

The presence of SPS measures appears to be very important, but there is a limitation. Since this specification used only dummy variables, the total effect considering all variables concerned in the case of an African LDC facing SPS measures, are (g)+(l)+(i) , which totals around 75 per cent positive impact value, because there is a positive effect of being an African LDC captured in variable (l) which is positive and significant in all cases. It is not related to SPS measures, not to market size or distance, or any other of the control variables. It still holds true that SPS measures seem to have a sizeable impact in exports from these countries.

Still, the usefulness of analysing the trade effect through categorical "dummy" variables is limited because it would assume not only that all measures are the same in terms of effect, but also that facing one or many should have the same impact on trade. This is a very broad an imprecise assessment, since only presence/absence is considered for one or many measures. Probably, the estimations are more accurate if considering the frequency, rather than the presence/absence of one or more measures. So conclusions are based on the second set of

[8] There are 3357 observations for SPS measures on agri-food products, while there are 673 only TBT measures on the same group of products.

[9] The calculations are done using the program proposed by Scott Merryman, version 1.0.0 9 October 2005. The value "p = exp(b}-1" is not known. Kennedy (1981) pointed out that this transformation results in a biased estimator for p, and suggested "p = 100*(exp{b_hat - .5*V(b_hat)} - 1)".

equations. The first set just confirms that effect could be considerable and that African LDC could suffer more from it.

The control variables, for their part, are successful in isolating the effects of market size, country or economy size, tariffs, distance, and exporting tradition of countries. All these are significant. The Lead time to Exports, which captures facilitation difficulties in the exporting countries, is not always significant. And when it is (equations 6 and 15), it suggests it may decrease exports by 1 per cent. This is how exports could be reduced because of lengthy processes in the exporting country.

Tariffs and distance seem to restrict trade strongly, while the others have a positive effect, as expected. The tradition of exportation into Europe seems to be of influence.

This variable is country and product specific and so takes into account any condition favouring exports of a particular product from a particular country, e.g. traditional exports of commodities.

Table 4
Key regression results. Equations for regions

Variables	*Eq.Regions*
(r3) Freq SPS*Region3. Europe & Central Asia	-.0229*
(r4) Freq SPS*Region4. Latin America & Caribbean	-.0262***
(r5) Freq SPS*Region5. East Asia & Pacific	-0.00608
(r6) Freq SPS*Region6. South Asia	-0.0083
(r7) Freq SPS*Region7. Middle East & North Africa	-.0337***
(r8) Freq SPS*Region8. Sub-Saharan Africa	-.0438***
(r9) Freq SPS*Region9. LDC Africa	-.0414***
(r10) Freq SPS*Region10. LDC Asia	-0.013
(r11) Freq SPS*Region11. Other	0.00213
constant	6.28***

legend: * p<.1; ** p<.05; *** p<.01

It is also possible to add other regions to the analysis to check whether LDCs in Africa are particularly affected as the single group. Table 4 shows the results for an equation including the above mentioned control variables, plus Region categorical variables and their interaction with SPS frequency count. Results suggest that LDC in Africa and countries in Sub-Saharan Africa are the ones who suffer most when SPS measures summate. Their exports are reduced above 4 per cent for each additional NTM in agri-food products, while other regions, such as Latin America, Middle East and North Africa would see their exports reduced in about 2.6 per cent and 3.3 per cent, respectively. Europe & Central Asian countries are less affected; the coefficient is smaller and the confidence level is lower. The impact could be around 2 per cent. There is no significant effect for countries in Asia. The High Income countries are the control group.

E. CONCLUSIONS

This study shows one approach to use recently available data on NTM to assess the impact on trade. Though it is generally assumed that NTM restrict trade, the existence of a measure should not be taken as protectionist policy in all cases. First, because according to WTO agreement on SPS, a country is free to set measure to control sanitary risks when it can show regulation is based on scientific arguments to protect itself from sanitary risks and it could even be the first-best policy to address legitimate public policy objective. Second, because this measure could also be comparable in restrictiveness to similar measures applied by other countries; and third, because there is nothing in the NTM database that can give an estimation of the cost to the exporter. The database simply lists trade control measures used by that country and determined by the law. This analysis does not assume the trade measures have protectionist intent or are unjustified; it tries to assess broadly intended or unintended trade effects.

This study contributes to the discussion on restrictiveness, necessity and appropriateness of NTM on those products, especially in developed countries. It can help raise awareness on different impacts of NTM to exporters in different regions, and especially on Least Developed Countries (LDC). Though NTM are generally unilateral and applied to imports from all countries alike, exporters in different origins may have differentiated capacity to comply with regulations, and this can be more clearly seen in LDCs.

This analysis provides a preliminary look into any possible impact on trade. It compares one measurement of restrictiveness which is the number of NTM applied to a product, to import trade flows for that product, coming from different countries. This method assumes that measures have different costs, and adding up the number of measures to compare across products would give a preliminary estimation of the average cost of each measure. As any average, it is representative of the whole group, but cannot be taken as an estimate for any of the individual measures. The cost carried by an NTM is not known, because it is different for each type of measure, but it may also vary for each exporting country, and probably for each exporting company too. Nevertheless, the average cost for a measure faced by any country can be assessed and it becomes a key concept to rely on this method.

The data studied concentrates on one type of measures, SPS, and only on certain products, agriculture and food products. These products are sensible to many countries, and definitely are likely to be highly regulated for different reasons. The only importing market analysed is European Union.

The results suggest the SPS measures are be relevant for exports of agri-food products to Europe. The dummy variable for presence/absence of those measures is significant, and quite large. Still, this categorical analysis does not offer much insight and its usefulness is limited. The results using the frequency count suggest that when a product is highly regulated (more distinct measures are imposed on it), imports of this product would be reduced, especially for LDC countries in Africa. Higher number of measures on a single product seems to decrease exports around 3 per cent worldwide, on average. The impact for African LDC is stronger, and their exports could be reduced by almost 5 per cent for each additional SPS measure on agri-food products imposed by the European Union. The interaction of both conditions (being an African LDC and facing more SPS measures) suggests the impact is disproportionate for them, affecting them more in their ability to export. This result together with the fact that LDC countries in Africa have a lower value for coverage ratio than the world imports into the EU, and the lowest value of all regions, confirms the idea that these LDC countries in Africa tend to export less of those highly regulated products.

The analysis including other regions, besides LDC, supports the idea that the effect is not even across countries or regions. High income countries and those in Asia, including LDC in Asia, do not seem to be affected. Probably, this relates to the fact that exports from Asia to Europe do

not concentrate on agri-food, or because their exports of these products go mainly to other regions. It also gives strength to the idea that High Income countries, or at least many of the exporting companies in these countries, may have the resources to overcome obstacles posed by NTM in partner markets and continue exporting.

The results suggest that NTM affect poorer countries disproportionally. LDCs in Africa, but also those in Sub-Saharan Africa are relatively more affected than others, such as Latin America or Middle East or North Africa, who would see their exports reduced in about 3 per cent for each additional SPS measure on agri-food products. Europe and Central Asian developing countries could face a negative impact of around 2 per cent, but the coefficient in this case is significant only at 90 per cent confidence.

Even in the evidence that NTM may negatively affect trade, it does not mean that measures should be eliminated. Negotiation for reduction, harmonization or mutual recognition of these measures is not automatic either. One way is to work towards harmonization with an international standard, or with other major importers. If importing countries consider the measures in place to be legitimate and required, and, given the nature of measures, it is not possible to negotiate any special and differential treatment; it could be envisaged to compensate the effect by technical assistance or capacity building. Conformity assessment and testing and certification capacity in exporting countries is normally a fertile area for achieving this objective.

Lastly, the assessed percentage of decrease is not likely to affect all companies in a region (country) alike. It is reasonable to think that it could come from a few companies not being able to continue exporting, and probably being excluded from business. This feature could be more damaging for the economy and labour market of a country than an even decrease in all companies active in the export sector. This is also an area that national policies could address, so as to provide resources and facilities to assist vulnerable companies to be competitive. But the effect at the company level is not examined in this study.

This analysis provides a preliminary look on average impact of NTM measures, but it does not distinguish between costs associated to the country of origin, i.e. availability (or not) of infrastructure, export services, testing and certification capacity in exporting countries, etc. and those costs associated to the companies operating in them. These are directly related to their competitiveness. Still, there are reasons to believe these two are not independent, and a joint assessment is useful for empirical analysis oriented to negotiation and policy needs.

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ANNEX 1

Table A1
Regression results. Equations 1 to 6

	Eq.1	*Eq.2*	*Eq.3*	*Eq.4*	*Eq.5*	*Eq.6*
(a) World market size	.134***	.155***	.155***	.152***	.16***	.158***
(b) DayDelay	-0.00196	-0.00211	-0.00156	-0.0104	-0.00825	-.0144*
(c) Tariffs	-1.09***	-1.09***	-1.1***	-1.05***	-1.22***	-1.18***
(d) Distance	-.621***	-.622***	-.619***	-.621***	-.596***	-.597***
(e) GDP	.183***	.183***	.179***	.198***	.172***	.183***
(f) Exports to other markets	.548***	.548***	.546***	.551***	.545***	.547***
(g) SPS dummy		-.633**	-.575*	-.57*	-.645**	-.577*
(h) SPS dummy*LDC			-0.572			
(i) SPS dum*LDC Africa				-.888*		-.917**
(j) SPS dum*LDC Asia					0.149	0.0694
(k) LDC dummy			0.462			
(l) LDC Africa				1.22***		1.15**
(m) LDC Asia					-1.22*	-1.09
(n) Frequency of SPS						
(o) Freq SPS*LDC						
(p) Freq SPS*LDC Africa						
(q) Freq SPS*LDC Asia						
constant	2.58***	2.88***	2.86***	2.66***	2.8***	2.62***

legend: * p<.1; ** p<.05; *** p<.01

Table A2
Regression results. Equations 7 to 15

	Eq.7	*Eq.8*	*Eq.9*	*Eq.10*	*Eq.11*	*Eq.12*	*Eq.13*	*Eq.14*	*Eq.15*
(a) World market size	0.171***	0.172***	0.168***	0.176***	0.174***	.171***	.168***	.176***	.173***
(b) DayDelay	-0.00214	-0.000952	-0.00926	-0.00826	-0.0132*	-0.00112	-0.00951	-0.00826	-.0135*
(c) Tariffs	-1.09***	-1.11***	-1.06***	-1.22***	-1.19***	-1.12***	-1.07***	-1.22***	-1.2***
(d) Distance	-0.621***	-0.619***	-0.622***	-.595***	-0.597***	-.618***	-.621***	-.596***	-.597***
(e) GDP	0.183***	0.179***	0.198***	0.171***	0.183***	.179***	.198***	.171***	.183***
(f) Exports to other markets	0.548***	0.547***	0.551***	0.545***	0.547***	.546***	.551***	.545***	.547***
(k) LDC dummy		-0.0851				0.181			
(l) LDC Africa			0.36***		0.269***		0.768***		0.677***
(m) LDC Asia				-1.08***	-1.02***			-1.24***	-1.13***
(n) Frequency of SPS	-0.0307***	-0.0307***	-0.0308***	-0.0307***	-0.0307***	-0.0288***	-0.0286***	-0.031***	-0.0288***
(o) FreqSPS*LDC						-0.0146*			
(p) Freq SPS*LDC Africa							-.0224**		-0.0224**
(q) Freq SPS*LDC Asia								0.009	0.006
constant	2.61***	2.64***	2.44***	2.51***	2.4***	2.6***	2.41***	2.52***	2.37***

legend: * p<.1; ** p<.05; *** p<.01

Table A3
Unbiased estimated percentage change in dependent variable

Impact on EU imports. Percentage change										
	Eq.3	*Eq.4*	*Eq.5*	*Eq.6*	*Eq.9*	*Eq.10*	*Eq.11*	*Eq.13*	*Eq.14*	*Eq.15*
(g) SPS dummy	-46.4%	-46.2%	-50.1%	-46.6%						
(k) LDC dummy										
(l) LDC Africa		204.8%		186.1%	42.7%		30.2%	111.2%		92.7%
(m) LDC Asia			-76.9%			-66.4%	-64.4%		-72.5%	-69.4%
(i) SPS dum*LDC Africa		-62.9%		-63.9%						

Kennedy's (1981) approximation method for semilogarithmic equations.

Note: only those that are significantly different from zero are shown here.

Table A4
Regression results. Equations for regions

Variables	*Eq.Regions*
(a) World market size	0.161***
(b) DayDelay	-.0251***
(c) Tariffs	-0.493
(d) Distance(sq)	-1.19***
(e) GDP	0.231***
(f) Exports to other markets	0.559***
(n) Frequency of SPS	-0.0109
Region 3 dum. Europe & Central Asia	-0.495*
Region 4 dum. Latin America & Caribbean	1.6***
Region 5 dum. East Asia & Pacific	0.665***
Region 6 dum. South Asia	0.764**
Region 7 dum. Middle East & North Africa	0.432*
Region 8 dum. Sub-Saharan Africa	1.95***
Region 9 dum. LDC Africa	1.71***
Region 10 dum. LDC Asia	-0.0541
Region 11 dum. Other	0.209
(r3) Freq SPS*Region3. Europe & Central Asia	-0.0229*
(r4) Freq SPS*Region4. Latin America & Caribbean	-0.0262***
(r5) Freq SPS*Region5. East Asia & Pacific	-0.00608
(r6) Freq SPS*Region6. South Asia	-0.0083
(r7) Freq SPS*Region7. Middle East & North Africa	-0.0337***
(r8) Freq SPS*Region8. Sub-Saharan Africa	-0.0438***
(r9) Freq SPS*Region9. LDC Africa	-0.0414***
(r10) Freq SPS*Region10. LDC Asia	-0.013
(r11) Freq SPS*Region11. Other	0.00213
constant	6.28***

legend: * p<.1; ** p<.05; *** p<.01

ANNEX 2

Table B1
Average days of delay to export, by region

Region	*Lead Time to export*
High Income	2
East Asia & Pacific	3.583333
Europe & Central Asia	2.75
Latin America & Caribbean	3.93
Middle East & North Africa	2.749
South Asia	1.884286
Sub-Saharan Africa	8.132728
LDC Americas	8.5435
LDC Africa	8.5435
LDC Asia	8.5435

Source: World Bank, Doing Business survey.

Table B2
LDC countries

LDC countries		
in Africa (1)	*in Africa (2)*	*in Asia*
Angola	Liberia	Afghanistan
Benin	Madagascar	Bangladesh
Burkina Faso	Malawi	Bhutan
Burundi	Mali	Cambodia
Cape Verde	Mauritania	Lao People's Democratic Republic
Central African Republic	Mozambique	Myanmar
Chad	Niger	Nepal
Comoros	Rwanda	Yemen
Democratic Republic of the Congo	Sao Tome and Principe	
Djibouti	Senegal	
Equatorial Guinea	Sierra Leone	
Eritrea	Somalia	
Ethiopia	Sudan	
Gambia	Togo	
Guinea	Uganda	
Guinea-Bissau	United Republic of Tanzania	
Lesotho	Zambia	

Source: The Least Developed Countries Report 2011, UNCTAD.

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