



**TRADING WITH CONDITIONS:
THE EFFECT OF SANITARY AND
PHYTOSANITARY MEASURES ON LOWER INCOME
COUNTRIES' AGRICULTURAL EXPORTS**

POLICY ISSUES IN INTERNATIONAL TRADE AND COMMODITIES
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Abstract

Agriculture plays a fundamental role in the development prospects of many developing countries, especially those at the lower end of the development process for which export earnings are largely related to the export performance of their agricultural sector. Although the last few decades have seen a progressive trade liberalization, market access for agricultural products is increasingly determined by a wide array of regulatory measures. The increase in the use of such measures has been largely driven by non-trade policy objectives such as consumers' demand for quality and safety of products and to the needs of agri-food businesses to streamline food production chains. Still, regulatory measures have a critical role in determining market access conditions as compliance with them is often a sine-qua-non condition for exporting to developed countries markets. From a trade perspective one of the most important aspects of such regulatory measures is their potential distortionary effect as their cost of compliance is often asymmetrical across countries. Using the UNCTAD's TRAINS database on non-tariff measures, this paper utilizes an econometric model to investigate the effect of the European Union's sanitary and phytosanitary (SPS) measures across 21 broad categories of agricultural goods. The findings indicate that SPS measures result in relatively higher burdens for lower income countries but that membership in deep trade agreements seems to reduce the difficulties related to compliance with SPS measures. Overall, the additional trade distortionary effect of the European Union SPS measures is quantified in a reduction of lower income countries' agricultural exports of about 3 billion \$US (equivalent to about 14 percent of the agricultural trade from lower income countries to the European Union). These results are consistent with the hypothesis that while many middle and high income countries have the internal capacity to comply with SPS measures, lower income countries do not. In broader terms, these results may be interpreted as an indication that technical assistance is helpful for lower income countries to meet compliance costs related to SPS measures. Further progress with well-targeted technical assistance projects, both at the bilateral and multilateral levels, could generate considerable gains for lower income countries.

Keywords: Non-Tariff Measures, "Agricultural Trade", Trade Policy

JEL Classification: F1

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1. INTRODUCTION

Agriculture plays a fundamental role in the development prospects of many developing countries, especially those at the lower end of the development process and which export earnings are largely related to the export performance of their agricultural sector. Although the last few decades have seen a progressive trade liberalization, market access for agricultural products is increasingly determined by a wide array of regulatory measures. These regulatory instruments are generally referred to as sanitary and phytosanitary (SPS) measures and include many diverse conditions such as import licenses, inspection requirements, testing and certification requirements, labeling and packaging requirements, and quarantines. The increase in the use of such measures has largely been driven by non-trade policy objectives such as the increase in consumers' demand for the quality and safety of products and the needs of agri-food businesses to streamline food production chains. Still, SPS measures have a critical role in determining market access conditions as compliance with them is necessary for entering developed countries markets.¹

From a trade perspective one of the most important aspects of SPS measures is their potential distortionary effect. SPS measures are generally applied in a nondiscriminatory manner as they usually target products regardless of their origin. However, regulatory and procedural requirements are of particular relevance for poorer countries' exports for two main reasons. First, regulatory measures fall disproportionately in sectors on which poor countries are dependent (i.e. agriculture). Second, compliance with SPS measures is asymmetrical because it requires technical know-how, production facilities, and an infrastructural base that, while usually available in developed and emerging markets, is often lacking in many lower income countries (Athukorala and Jayasuriya, 2003).

The distortionary and trade-restrictive effects of SPS measures are among the most important reasons why SPS measures are increasingly addressed in trade agreements. At the multilateral level SPS measures are governed by the broad guidelines set in the World Trade Organization (WTO) Agreement on the Application of Sanitary and Phytosanitary Measures (the SPS Agreement). The fundamental tenet of the SPS Agreement is the principle of non-discrimination for which SPS measures should be applied in order to limit unnecessary distortions in international trade.² The restrictive effects of SPS measures are increasingly addressed in regional and bilateral trade agreements. The inclusion of provisions on SPS measures together with those on technical barriers to trade (TBT) is motivated by a desire to remove barriers to deeper economic integration through mutual recognition or the harmonization of each party's regulatory system and by facilitating compliance through the means of technical assistance programs and other trade facilitation mechanisms. Still, the actual effectiveness of trade agreements with regard to addressing the effects of SPS measures is debatable. This effectiveness greatly depends on the implementation of a cooperative work program aimed at reducing the discrepancies among different regulatory systems and on the actual realization of technical assistance programs aimed at reducing compliance costs.

The literature on the effects of SPS on international trade has shown that SPS measures often have both restrictive and trade diverting effects. The rationale is that the presence of regulatory measures imposes country and sector specific compliance costs that alter export competitiveness. These diverse costs ultimately reflect in the structure of international trade flows. Among the various studies on the topic, Disdier *et al* (2008) find distortionary effects resulting from SPS measures applied by OECD members on their agricultural and food exports. Using a gravity model framework, Disdier *et al* findings indicate that SPS measures significantly reduce developing countries' exports to OECD countries, while not affecting trade between OECD members. Athukorala and Jayasuriya (2003) also look at the export responses to regulatory measures in countries with different levels of. Their study

¹ UNCTAD (2012).

² The WTO SPS Agreement stipulates that SPS measures should be based on international guidelines and common risk assessment techniques and encourages standards based on participation and consensus. However, the Agreement permits Members to introduce or maintain measures which result in a higher level of protection than would be achieved by measures based on the relevant international standards, guidelines or recommendations, if there is a scientific justification.

finds that many developing countries face considerable problems in meeting even basic food hygienic requirements. However, they also find that the level of compliance increases for more developed partners. The study by Essaji (2008), which uses the US data on agricultural, mining and manufacturing imports to examine the impact of regulatory measures on trade patterns, also suggests that foreign regulations significantly impinge on developing countries' export capacities by providing incentives to firms with less advanced production processes to specialize away from sectors with regulatory burdens. This in turn affects developing country export patterns and the probability to export to highly regulated markets. Distortionary effects of SPS measures are also found in sector specific studies. For example, Tran *et al* (2011) find similar results in a case study on the impact of imposing stricter drug residue standards on crustacean imports to Canada, the European Union, Japan, and the United States. These authors show how stricter standards result in uneven responses by countries with different levels of development. Maskus *et al* (2004), using firm-level data generated from 16 developing countries, show that the exporters from developing countries encounter significant additional costs while adapting their production processes to comply with foreign regulatory measures. Maskus *et al* argue that these costs stem from developing countries' lack of administrative, technical and scientific capacities to comply with foreign standards. Further, they argue that even if the relative impact of compliance costs is small on average, the supply response by enterprises in developing countries' is often more sensitive and thus such firms might tend to avoid higher-cost markets while favoring markets and products with a lower regulatory burden. Similarly, Chen *et al* (2006), using firm level data on export performance of 17 developing countries, find that regulatory measures do affect export decisions. Particularly, these authors find that testing and inspection procedures by importers reduce exports by 9 per cent and 3 per cent, respectively, and that foreign standards overall impede exporters' market entry by reducing the likelihood of exporting in different markets. Furthermore, Chen *et al* demonstrate that the difference in standards across foreign countries impedes the economy of scale for producers and thus has a negative impact on decisions about whether to enter export markets.

The present paper contributes to the discussion above by investigating and quantifying the effect of SPS measures in a highly regulated market, the European Union (EU), on lower income countries' exports. As the EU is by far the largest importer of agricultural products worldwide, its regulations have large repercussions for developing countries' exports. The empirical analysis utilizes econometric methods and relies on the UNCTAD's TRAINS non-tariff measures (NTMs) database. The data covers EU imports across 21 broad categories of agricultural goods. The main finding of the paper is that the EU's SPS measures have distortionary effects against lower income countries.

The remainder of the paper is organized as follows. Section 2 describes the EU regulatory framework on agricultural products. Section 3 presents the estimating framework to assess the impact of the EU's SPS measures on lower income countries and discusses the results. Section 4 concludes.

2. EUROPEAN UNION REGULATORY FRAMEWORK

The stated objective of the EU regulatory framework with respect to agricultural imports is to minimize related risks and to guarantee a high level of safety for food products marketed within the EU. For this purpose the EU relies on a regulatory regime that comprises a complex and comprehensive set of SPS measures. The overarching regulatory framework laying down the EU's agricultural SPS measures resides in the General Principles of Food Law (EC) № 178/2002 which was adopted in January 2002 by the European Parliament and the Council. The EU regulations define principles and obligations covering various stages of food production and distribution. These principles are harmonized among the EU member states and apply both to food products produced within the EU and those imported from third countries.³

³ Foreign foodstuffs may also be sold in the EU market under the conditions that the pertinent foreign food safety requirements are recognized by the EU to be at least equivalent to its own. To facilitate this, the EU legislation also

The EU regulatory framework is generally more comprehensive and stringent than frameworks implemented in many other countries, especially in those where health-related priorities are different and where consumers' advocacy is less established (Henson, 2006). The widespread use of SPS measures by the EU derives from the adoption of the precautionary principle (i.e. the EU takes an active stance on managing uncertainty and risk rather than limiting itself to implementing regulatory policy only when harm is proved) and from the fact that the EU regulatory framework takes into account diverse pre-existing national frameworks (Wiener and Rogers, 2002). In practice, even though the EU food law is based on international standards, the EU regulatory framework often adopts more specific and stringent regulations, when international standards "would be an ineffective or inappropriate means for the fulfillment of the legitimate objectives of food law or where there is a scientific justification, or where they would result in a different level of protection from the one determined as appropriate in the Community"⁴.

The comprehensiveness of the EU regulatory framework, as well as its higher stringency vis-à-vis frameworks implemented by trading partners, act as an important market access barrier as compliance with such standards requires production processes and quality controls that are not easily available on a cost effective basis in many developing countries. Indeed, the disproportionate effect of the EU regulations related to agricultural products on the exports of developing countries is recognized within the EU regulatory framework. In this regard, EU Regulation № 882/2004 acknowledges the special needs of developing countries, in particular of the least developed countries, and furthermore a need for technical assistance to help developing countries to comply with the EU regulations. Still, the EU legislation with respect to the preferential treatment of developing countries in the field of food safety is relatively limited and the above-mentioned regulation is an example of a rather finite package of provisions devoted to this issue.⁵ In practice the EU regulations regarding developing countries' needs to facilitate compliance with SPS measures are often vague, not binding and without firm commitments or precise mechanisms to facilitate regulatory convergence.

Issues related to developing countries' compliance with the EU SPS measures are more precisely addressed in bilateral preferential trade agreements (PTA). Such agreements usually incorporate specific clauses on SPS measures with the purpose of either harmonization or mutual recognition of standards between the PTA members as well as technical assistance programs, which essentially are aimed to build the capacity of the EU PTA's partners to apply the EU regulations. For instance, the EU-Morocco agreement specifically calls for wider use of the EU technical rules and regulations for agricultural products and certification procedures by the Moroccan exporters.⁶ Similarly, the EU-Mexico agreement calls for the harmonization of health, plant-health and environmental standards between the parties.⁷ In the EU-CARIFORUM agreement, the EU pledges to "assist CARIFORUM States in establishing harmonized intraregional sanitary and phytosanitary measures also with a view to facilitating the recognition of equivalence of such measures with those existing in the European Community Party"⁸ as well as to "assist CARIFORUM States in ensuring compliance with SPS measures of the European Community Party".⁹ The EU-Chile PTA assumes "technical assistance

provides for the establishment of bilateral agreements between the EU and third countries that may set specific requirements for compliance between the parties to such agreements. Art 11 of Regulation (EC) № 178/2002

⁴ Art 5.3 of Regulation (EC) № 178/2002

⁵ For example, the Regulations (EC) № 852/2004, № 853/2004 and № 854/2004 (which together with Regulation 882/2004 make up the so-called "hygiene package") make no reference to developing countries. On the contrary, Regulation 852/2004 in Article 10 provides that third country food business operators exporting to the European Community shall comply with the Community's substantive hygiene requirements (from Bromberg, M. (2009)).

⁶ Article 40.1 of the Euro-Mediterranean Agreement establishing an association between European Communities and the Kingdom of Morocco.

⁷ See Article 21.2 (a) of Economic Partnership, Political Coordination and Cooperation Agreement between the European Community and the United Mexican States

⁸ See Article 53 (c) of Economic Partnership Agreement between the CARIFORUM States and the European Communities.

⁹ See Article 53 (d) of Economic Partnership Agreement between the CARIFORUM States and the European Communities.

for strengthening of sanitary and phytosanitary control systems, with a view to supporting as far as possible the promotion of equivalence and mutual recognition agreements". This agreement also calls for implementing "specific projects aimed at supporting sanitary, phytosanitary, environment and food quality measures, taking into account legislation in force for both Parties, in compliance with WTO rules and other competent international organizations".¹⁰ The EU-Egypt agreement aims at "upgrading the level of Egyptian conformity assessment bodies, with a view to the establishment, in due time, of mutual recognition agreements in the area of conformity assessment".¹¹ The EU-South Africa Trade and Development Cooperation Agreement is another illustration of the EU's commitment to "facilitate technical assistance for Southern African capacity-building initiatives in the field of accreditation, metrology, and standardization"¹², as well as to "developing practical links between the South African and European standardization, accreditation, and certification organizations"¹³. Overall, the provisions and technical assistance projects that are present in the EU PTAs surely add an incentive to cooperate in streamlining the regulatory policies on the application of SPS measures between the PTA members. Still, the effectiveness of technical assistance in addressing SPS related issues is debatable as it depends on how such assistance is allocated (Wiig and Kolstad, 2005).

3. EMPIRICS

The aim of this paper is to identify any distortionary effects that SPS measures may have on lower income countries.¹⁴ The empirical approach consists of investigating whether products that are subject to a large number of regulatory measures are also products for which trade flows tend to be relatively smaller for lower income countries. The rationale is that since regulations result in additional and exporter-specific costs to trade (due to different compliance capacity), one would expect that the trade of products subject to regulation would be biased against exporters for which cost of compliance is larger (i.e. lower income countries).

The initial step in analyzing the effects of regulatory measures on trade is to construct an index of regulatory intensity. For this purpose we use data from the UNCTAD's TRAINS¹⁵ database on NTMs on a subset of SPS measures applied by the EU. In particular, we use measures that fall under tolerance limits, hygienic requirements, production requirements and conformity assessments. All these measures comprise about 17 different types of SPS measures.¹⁶ UNCTAD raw data is synthesized into an index of regulatory intensity by taking the number of SPS measures applied to each HS 6 digit line. Then, to construct the broader aggregates (at the HS 2 digit) we use trade-weighted means. For example, a regulatory intensity index of 5 implies that there are about five different SPS measures that are applied on average to imports of that particular goods category. Such an index has the advantage of taking into account both the number of different SPS measures and the frequency of their use across the various goods in each product group. The empirical analysis covers the EU imports across 21 broad categories of agricultural goods and is based on data for the year 2010.

¹⁰ See Article 24.2 (a) and (g) of Agreement establishing an association between the European Communities and Chile.

¹¹ See Article 47 (b) of Euro-Mediterranean Agreement establishing an association between the European Communities and the Arab Republic of Egypt.

¹² See Article 47(d) of the Agreement on Trade, Development and Cooperation between the European Communities and the Republic of South Africa.

¹³ See Article 47 (e) of the Agreement on Trade, Development and Cooperation between the European Communities and the Republic of South Africa.

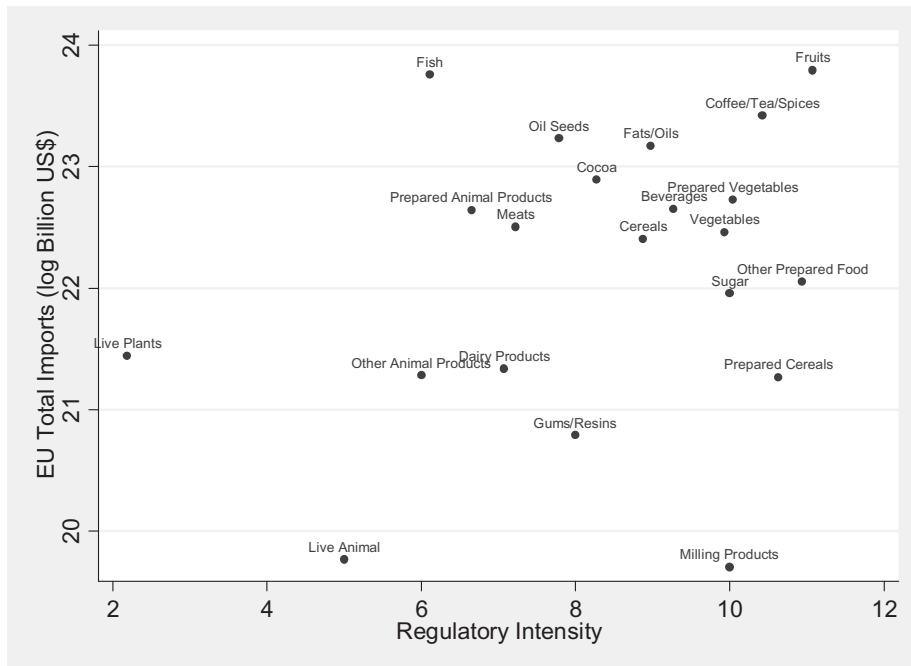
¹⁴ Lower income countries are these with a GDP per capita of less than 4,085 \$US.

¹⁵ TRAINS (Trade Analysis and Information System), available at: <http://www.unctad.info/en/Trade-Analysis-Branch/Key-Areas/TRAINSWITS/>

¹⁶ More specifically we use the NTM three digit codes that fall under A2, A4, A5, A6, and A8 of the UNCTAD classification of NTMs.

One important issue to consider is that the intensity of the regulatory framework is specific to the typology of each product as regulatory measures are applied to products depending on their very nature and related risk. For example, agricultural products ready to consume such as fruits and processed foodstuffs are generally subject to a larger number of regulatory measures than raw food that needs to be cooked or processed. Indeed, regulatory intensity varies greatly across product groups ranging from an average of just two measures (live plants) to more than ten different measures applied (fruits and prepared food). As shown in Figure 1, regulatory intensity also varies in relation to import levels. In general, there is a larger number of regulations on products that are more widely imported (and consumed) so as to better safeguard consumers from health and safety risks.

Figure 1
Regulatory intensity and total imports



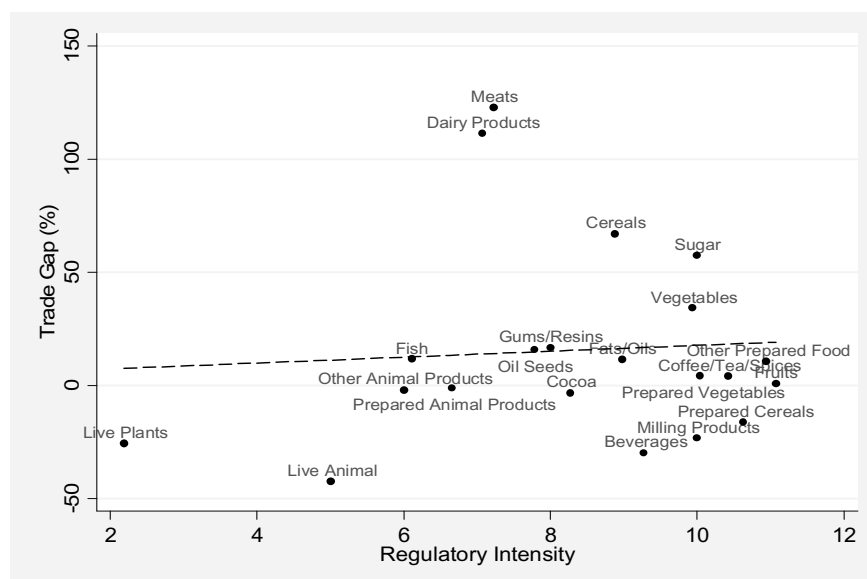
The above discussion is reflected in our identification strategy. In practice, the effect of regulatory intensity on trade flows cannot be isolated by relying exclusively on the variance across products, as such strategy would both capture product specific differences as well as be biased due to endogeneity issues. Instead, our identification is based on a cross country variance but taking into account product specific regulatory differences. More in detail, we examine whether SPS measures pose an additional burden for lower income countries by testing whether trade gaps (defined as the difference between potential and observed exports at the product level) are correlated with the countries' level of development. The rationale is as follows: if trade costs associated with SPS measures are more burdensome for lower income countries, then such costs should translate into relatively larger trade gaps for lower income countries in products for which regulatory intensity is higher. Conversely, trade gaps should be more similar across countries at different levels of development when regulatory intensity is lower. At the limit, trade should be undistorted when regulatory intensity equals zero.

We test whether EU import bias against lower income countries depends on regulatory intensity by proceeding in two steps. First, we obtain a measure of the trade gap for each bilateral relationship and product group (HS2-digit), and second we check whether the magnitude of the gap can be explained by regulatory intensity. The reason for proceeding in two steps is driven by the lack of comparable cross country and reliable time series SPS data. In practice, while the first step takes advantage of the rich cross country gravity dataset, the second step is constrained by a much more limited dataset on SPS measures.

To form predictions about the gap between potential and observed trade we use the canonical gravity model of bilateral trade by using a Poisson estimation which is robust to the presence of zero trade flows.¹⁷ We estimate the model for each of the 21 product groups in a cross section comprising about 150 countries. The results of these regressions are similar to those of the relevant literature. Gravity variables are generally significant and with the correct sign the model explains about 80 or more percent of the variation.¹⁸ The gravity model provides us with estimates of potential trade which we then confront with the observed trade so as to calculate the trade gap for each exporter in each of the 21 product groups.¹⁹ We address scale-related issues by calculating the percentage deviation of predicted levels versus observed levels of trade. In practice, a positive trade gap implies that the observed level of exports is lower than its potential level as measured by the gravity model, while a negative trade gap indicates the opposite. We calculate aggregate trade gaps in respect to the EU imports for each trading partner by summing up the gaps of all EU members across each product group. Average trade gaps for 21 HS2-digit categories along with the regulatory intensity of the SPS measures are illustrated in Figure 2. As one would expect, trade gaps are on average positive, and more so for categories of products that are more highly regulated. Still, what matters for our analysis is not a simple relationship between the trade gap and regulatory intensity, but whether the trade gap is relatively larger for lower income countries (as compared to the other EU trading partners) when regulatory intensity is higher. We investigate this in the second step of the econometric analysis.

Figure 2.

Regulatory intensity and trade gap



¹⁷ Santos Silva, J. M. C. & Tenreyro, S. (2006).

¹⁸ In more formal terms for each product group we estimate the model: $X_{jk} = \exp[\alpha + \beta D_{jk} + \gamma \ln M_{jk} + \omega_j + \psi_k] \phi_{jk}$ where j denotes importers and k denotes exporters and where α is a proportionality constant, D_{jk} is the $1 \times k$ row vector of explanatory variables with corresponding parameter vector β , which represents the different dimensions of transactional distance: geographic distance, contiguity, language, and colonial links. The term M_{jk} includes terms controlling for the presence of unobserved relative trade impediments that a country has with all its trading partners (Anderson & Van Wincoop, (2003)) as in Baier & Bergstrand, (2009) and Baier, Bergstrand and Mariutto, (2010). Finally, ω_j, ψ_k are sets of fixed effects controlling for importer and exporter specific characteristics and $\phi_{jk} \equiv \exp(u_{jk})$ is an error term. In this equation D_{jk} and u_{jk} represent respectively observed and unobserved bilateral trade cost determinants.

¹⁹ A limitation of this approach is that cross section gravity models can be misspecified as such models do not fully control for bilateral effects. In this regard, any systematic deviation of observed trade from predicted trade may be due to omitted variables. Still, the two step approach remains valid as the second step examines whether any systematic variation can be explained by trade policy variables.

The dataset for the second step is composed by pooling together trade gaps from all exporting countries and for all product groups. The econometric estimation follows simple ordinary least squares while the specification consists of explaining bilateral trade gaps controlling for tariffs and the presence of a deep trade agreement.²⁰ In this setup, the issues related to product specific regulatory intensity discussed above are controlled for by employing product fixed effects. To investigate whether the SPS result in a relatively larger burden for lower income countries the variable of interest is the interaction among 3 terms: regulatory intensity, a dummy variable for the lower income countries, and the presence of a deep trade agreement.²¹ The results from the second step regression are presented in Table 1.

Table 1
Regression results on overall regulatory intensity

Dependent Variable: Trade Gap (percentage)					
	(1)	(2)	(3)	(4)	(5)
Lower Income	-1.079 (0.711)	-1.157 (0.752)	-1.313* (0.782)	-1.247 (0.891)	0.464 (0.920)
Lower Income * Reg. Intensity	0.076* (0.042)	0.071* (0.044)	0.085* (0.046)	0.085* (0.046)	-0.022 (0.050)
Tariff (log)		3.648 (3.596)	3.784 (3.606)	3.742 (3.584)	3.811 (3.586)
No Deep Agreement		0.867** (0.219)	1.669** (0.697)	1.683** (0.706)	2.092** (0.830)
No Deep Agreement * Reg. Intensity			-0.048 (0.040)	-0.048 (0.040)	-0.073 (0.048)
Lower Income * No Deep Agreement				-0.081 (0.542)	-2.153 (1.505)
No Deep Agreement * Lower Income * Reg. Intensity					0.124* (0.074)
R-Squared	0.026	0.032	0.033	0.034	0.034
Observations	1848	1848	1848	1848	1848

Note: Robust standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01
All specifications include sector fixed effects.

²⁰ By "deep" agreements we mean the agreements that go beyond tariff liberalization to tackle regulatory and behind the border issues.

²¹ The core specification is

$$trade_gap_{ki}^{EU} = \alpha + \beta_1 \ln(1+t_{ik}) + \beta_2 L_k + \beta_3 ND_k + \beta_4 (ND_k \cdot RI_i) + \beta_5 (L_k \cdot RI_i) + \beta_6 (ND_k \cdot L_k) + \beta_7 (ND_k \cdot RI_i \cdot L_k) + \omega_i + \phi_{ik}$$

where i denotes product groups and k exporters, ND is the absence of a deep trade agreement with the EU, t is the bilateral applied tariff, L is a dummy for lower income countries which controls for common factors across all lower income countries, and RI is regulatory intensity. Finally, ω_i denotes product group fixed effects and ϕ_{ki} is an error term. In such a setup, β_7 is the coefficient of interest which captures the effect of the regulatory intensity for lower income countries not being part of a deep trade agreement with the EU. A positive sign on β_7 implies that the higher the regulatory intensity the larger is the trade gap for lower income countries that have not signed deep trade agreements with the EU.

In describing the results we proceed in steps. We start by simply testing whether the trade gap is different for lower income countries and whether this gap increases with regulatory intensity. The results of specification (1) indicate that an increase of one point of regulatory intensity increases the trade gap of lower income countries by about 7.6 percentage points. Specification (2) adds the tariffs and deep trade agreements as control variables. While tariffs are not significant, the magnitude of the trade gap depends on whether the exporter is part of a deep agreement with the EU. Most importantly, the introduction of these two terms does not significantly affect the result on the interaction term. Specifications (3) and (4) further add interaction terms between various variables. In this case the results also do not change. Finally, specification (5) adds the triple interaction term so as to investigate whether there are differences in trade gaps between lower income countries depending on their membership on deep trade agreements with the EU. These last results suggest that the impact of regulatory intensity is limited to lower income countries that are not members of deep trade agreements with the EU. All along, the results seem to indicate two key dynamics with regard to the significance of regulatory measures. First, regulatory measures result in relatively higher burdens for lower income countries. Second, while participation in a deep trade agreement seems to facilitate lower income countries in overcoming the costs related to SPS measures, deep trade agreements have little effect to reduce SPS's cost of compliance for middle and higher income countries. This last result is consistent with the hypothesis that while more developed countries have the internal capacity to comply with SPS measures, lower income countries do not. In this regard, the results suggest that the technical assistance programs present in deep trade agreements facilitate the capability of lower income countries to cope with SPS measures and therefore to export to regulated markets.²²

Table 2

Regression results on regulatory intensity based on conformity assessment

Dependent Variable: Trade Gap (percentage)

	(1)	(2)	(3)	(4)	(5)
Lower Income	-1.317*	-1.523*	-1.677*	-1.631*	-0.0047
	(0.735)	(0.769)	(0.790)	(0.874)	(0.932)
Lower Income * Reg. Intensity	0.434*	0.446*	0.492*	0.493*	0.006382
	(0.207)	(0.216)	(0.222)	(0.222)	(0.223)
Tariff (log)		3.550	3.728	3.698	3.785
		(3.594)	(3.600)	(3.581)	(3.582)
No Deep Agreement		0.895***	1.664**	1.675**	2.077**
		(0.221)	(0.719)	(0.732)	(0.860)
No Deep Agreement * Reg. Intensity			-0.231	-0.231	-0.352
			(0.197)	(0.197)	(0.237)
Lower Income * No Deep Agreement				-0.057	-2.048
				(0.533)	(1.324)
No Deep Agreement * Lower Income * Reg. Intensity					0.594*
					(0.347)
R-Squared	0.026	0.032	0.033	0.034	0.034
Observations	1848	1848	1848	1848	1848

Note: Robust standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01. All specifications include sector fixed effects.

²² Although this last result would require further analysis as there are only four lower income countries that have a deep trade agreement with the EU.

It is noteworthy that the results presented above are related to an index of regulatory intensity that takes into account a large number of SPS measures. Many, but not all, of these SPS measures require proof of compliance or conformity assessments in the form of certificates or tests. In Table 2 we present the results of whether measures requiring conformity assessment matter most, or, in other words, have most trade-impeding effect. We do this by recalculating the index of regulatory intensity taking into account only conformity assessment measures and re-estimating the five specifications of Table 1. The overall results confirm those of Table 1 and suggest a larger distortionary effect of regulatory measures requiring conformity assessment.²³

As a final caveat it is important to keep in mind that the results are constrained by the SPS data availability and are based on cross sectional data, which may not completely control for specific bilateral factors that may in turn affect the magnitude of trade gaps. Still, the identification strategy controls for possible endogeneity of trade to regulatory intensity as it relies on within-product variations. Additionally, it is important to note that our results are not exhaustive with respect to the overall effects that SPS measures may have on international trade. Since the identification relies on product fixed effects it does not capture any likely underlining effect common to both lower income and non-lower income exporters.

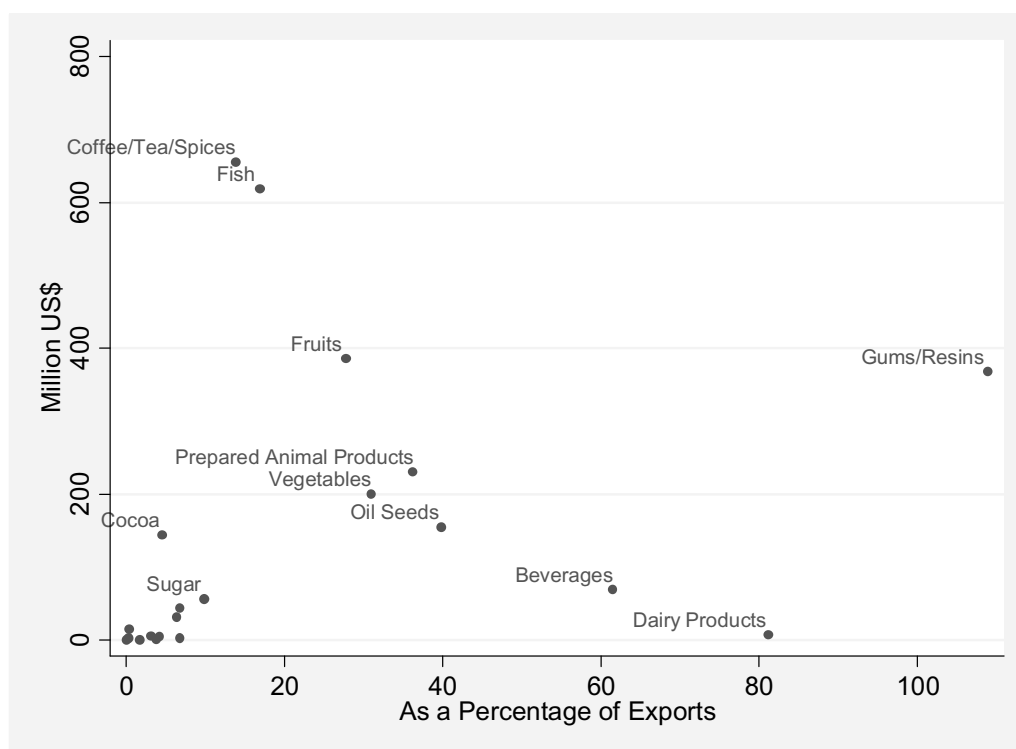
Now we turn to roughly quantify the distortionary effect of EU SPS measures for lower income countries across various product groups. To do so we use the results of specification (5) of Table 1 and apply these to different regulatory intensity across product groups.²⁴ As discussed above these figures are to be interpreted not as the total effects of SPS measures but as the additional effects that SPS measures have on lower income countries vis-à-vis other countries. The results are presented in Figure 3. The distortionary effects of SPS measures for exports from lower income countries to the EU are largely concentrated in a limited number of product groups namely coffee/tea/spices, fish, fruits, gums/resins vegetables, and prepared animal products. For each of those product groups the effect of SPS measures are quantified in a loss of exports of more than 200 million \$US. In percentage terms over the existing level of exports these numbers vary from less than 20 percent of coffee/tea/spices and fish to more than 100 percent in the case of gums/resins. Considering all agricultural products, the additional trade distortionary effect of the European Union SPS measures is quantified in a reduction of lower income countries' agricultural exports of about 3 billion \$US, representing about 14 percent of the total agricultural exports of these countries to the EU.

²³ Note that we cannot differentiate between the burden brought by conformity assessment itself vis-à-vis that of underlining regulatory measures. Instead, these results are to be interpreted in the sense that SPS measures for which there is a related conformity assessment matter the most.

²⁴ We retrieve the effect of regulatory intensity on the value of exports of lower income countries to the EU by calculating: $Trade(\beta_7 \cdot RI - 1)$, and capping this value to the trade gap (in value) as estimated from the gravity setup.

Figure 3

Effects of SPS measures on low income countries exports to the EU



4. CONCLUDING REMARKS

The focus of trade policy debates and international cooperation is increasingly sound in the context of non-tariff measures, related regulatory policies, and trade facilitation especially with respect to lower income countries. In the present analysis we investigated how SPS measures affect the export capacity of lower income countries while trading with the EU.

Our results indicate two key dynamics. First, EU SPS measures result in relatively higher burdens for low income countries. Overall, we quantify the distortionary effect of the EU SPS measures to reduce lower income countries agricultural exports by about 3 billion \$US, representing about 14 percent of agricultural trade from lower income countries to the EU. Second, while participation in a deep trade agreement seems to facilitate lower income countries in overcoming the costs related to SPS measures, such agreements have little effect in reducing the SPS's cost of compliance for middle and high income countries. This last result is consistent with the hypothesis that while more developed countries have internal capacity to comply with SPS measures, lower income countries do not.

In broader terms, the results of this paper support two main arguments. First, that the proliferation and increased stringency of SPS measures can form a basis for the competitive repositioning of international trade favoring the exporters capable to efficiently achieve SPS compliance at the expense of exporters originating in countries where the costs of compliance are higher (Henson and Jaffee, 2008). Second, lower income countries need well targeted technical assistance to overcome the cost of compliance related to SPS measures (Hoekman, 2002; Athukorala and Jayasuriya, 2003). Further progress with well-targeted technical assistance programmes both on bilateral and multilateral levels could generate considerable gains for lower income countries.

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