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# Protecting Health or Protecting Imports? Evidence from EU Non-Tariff Barriers

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## Abstract

Non-tariff measures such as food safety standards are used to achieve the non-trade objective of protecting consumers' health and safety. However, they can also be used as a trade protection tool to drive a price wedge between domestic and foreign producers. This study investigates the protectionist intent of EU food safety standards using a sample of EU food imported from African countries with a specific focus on tomatoes and citrus fruits. We formalize what protectionism is by comparing EU standards to the internationally scientific referenced benchmarks regulated jointly by both the Food and Agricultural Organization and the World Health Organization. Our results show that the EU tomato sector is less dependent on imports and is overprotected by more stringent standards relative to the international benchmarks. Conversely, we find that the EU orange and lime and lemon sectors are heavily import dependent and are under-protected relative to the international standards. These results largely support the hypothesis that heavily import dependent sectors are less protected.

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**Keywords:** Trade Protectionism, Non-tariff barriers, Food Safety Standards, Food exports

**JEL Classifications:** F13 F14 L15 P16 Q17 Q18

## 1 INTRODUCTION

Trade protectionism involving the deliberate use of government regulations to limit the importation of goods and services from third countries has been a popular facet of international trade. Prior to the General Agreement on Tariffs and Trade (GATT) and its subsequent revisions, extensions, and rounds, protectionism has been attained with the use of overly high tariffs on exported goods. However, as a result of the GATT<sup>1</sup> agreement, this kind of protectionism has lost its ground following a decrease in the use of tariffs and the consequent rise of non-tariff measures (NTMs) by many countries who shift towards using them as trade barriers (Baldwin, 1970). NTMs take many different forms ranging from traditional barriers, such as quotas and subsidies, to more sophisticated and complex ones, including voluntary sanitary and phyto-sanitary barriers, mandatory technical regulations, and minimum entry price controls. However, protectionist intent is not usually glaring in NTMs as it often is with tariffs since they are frequently less transparent than tariffs and are, at times, linked to non-trade policy objectives<sup>2</sup> such as consumer protection. Consequently, protectionist intent is more difficult to detect. Such non-trade objectives include the legitimate concern for the welfare of the citizenry, in which case the government is mandated to protect consumers' health and the environment by ascertaining that the NTMs guarantying a certain health and safety concern is observed.

However, such NTMs could also be used as a potential barrier to protect domestic producers and drive out foreign producers by using stringent trade protectionism as a tool to drive a wedge between domestic and foreign producers (Baldwin, 1970, 2000). This is the case with many food products in which the government seeks to achieve a non-trade objective of maximizing consumers' health and safety, but at the same time sets much more stringent food safety standards than would be required by international benchmarks. Indeed, the proliferation and continuous use of some food safety standards as protectionist tools has been found to inhibit the expansion of exports in global markets for many developing countries, particularly in Africa (Otsuki et al., 2001; Shepherd and Wilson, 2013). Consequently, this may jeopardize the developmental progress of the continent since deep trade integration is widely viewed as the most promising avenue to achieving economic growth (Nicita and Rollo, 2015).

The protectionist use of NTMs and their implication for exporting countries is not yet completely understood. Studies investigating if the use of NTMs has protectionist intent are rare; this can be largely attributed to the difficulty of differentiating their non-trade policy objectives from their trade policy objectives and a lack of a globally accepted benchmark for doing this (Xiong and Beghin, 2014). Our study therefore contributes to the literature by ascertaining the protectionist intent of NTMs with a specific focus on sanitary and physio-sanitary standards. We posit that standards are a good case study given the fact that they are primarily enacted due to a legitimate concern for consumers' health and safety (the non-trade objective). However, they can also be used as a protectionist tool by importing countries that set overly restrictive standards so as to attain a certain level of protectionism (the trade objective). This provides a basis for determining whether or not the chosen level of standards

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<sup>1</sup> GATT agreements and the subsequent post-war GATT rounds (such as the Uruguay and Tokyo rounds) and the need to substantially reduce the pervasive protectionism of the 1930's and expand world trade resulted into increased success in the reduction of visible tariff. Rivera-Batiz and Danyang (1992).

<sup>2</sup>Such non-trade objective includes achieving certain minimum health and safety level.

is indeed protective. Moreover, out of all NTMs, our interest in standards stems from the fact that a significant share of traded food products are subject to standards regulated by many importing countries and thus provide an important NTM to be studied.

While the World Trade Organization (WTO) agreements on sanitary and phyto-sanitary measures (SPS) and technical barriers to trade (TBT) recommend that international standards should be used, the agreements also recognize that countries could resort to the usage of domestic standards provided they have scientific justification. This clause has been extensively exploited to the advantage of many developed standard-setting countries to the extent that some standards have generated a number of disputes, due to the accusation that they are being used as disguised protectionism. For instance, there have been a significant number of disputes among several OECD countries and a number of these have been brought to the WTO after its dispute settling procedure was established in 1995 (Dee and Ferrantino, 2005).

Given that countries have a free hand to make standards that deviate from the international norm, one may pronounce domestic standards that exceed the international socially optimal benchmark with a non-trade objective as being overly stringent, suboptimal, perhaps protectionist in nature, and therefore more trade distorting (Fisher and Serra, 2000; Grandal and Shy, 2001; Marette and Beghin, 2010). Likewise, domestic standards that are lower than the international socially optimal benchmark can be said to be less trade distorting or perhaps trade enhancing, but also suboptimal and non-protectionist. However, empirical investigations of trade effects of such ‘suboptimal standards’ are rare due to the difficulty of distinguishing standards with legitimate intent from those with protectionist intent (Li and Beghin, 2014). Thus, this study fills this research gap by estimating the protectionism extent of EU standards relative to a globally acceptable benchmark and how this affects the potential of African food exporters to establish trade relations with the European Union (EU). The closest measure in this sense is that of Li and Beghin (2014), albeit still with significant differences. Firstly, the focus of their study was on the United States rather than the EU. Secondly, their study utilized a cross-section of minimum residual limits (MRLs) of pesticides and veterinary drug standards to panels of trade flows. As a result, this study misses an important part of heterogeneity in standards. We use the newly available time series from the EU database of MRLs to estimate the impact on African exports. Our study is an improvement on previous literature in a number of ways as we are able to control for unobserved heterogeneity with the use of panel data. Furthermore, to our knowledge, this represents the first study of its kind on African exports.

We investigate the protectionist intent of EU food safety standards using a sample of EU food imports from African countries with a specific focus on tomatoes and citrus fruits. These products provide a good case study to analyse standard protectionism with an explicit focus on African countries due to a number of reasons. First, the EU is the largest importer of these products. As a consequence, this may spur interest groups to lobby the EU food standard setting process so as to protect domestic consumers and their economies of scale, being a marginal producer of tropical fruits. Second, the EU remains the top destination for many African countries; top exporters of these products tend to originate from African countries due to the favourable climatic conditions which give them a comparative advantage in the production of these products. This has therefore necessitated our focus on African exporters. Third, these

products are an easy target for protectionist non-tariff barriers relating to standards concerns due to their perishable nature and suitability for direct consumption.

This study is motivated by recent literature on firm heterogeneity which reveals that the growth of developing countries' trade was predominantly due to the expansion of trade along the extensive margin rather than due to growth in the volume of trade (Reis and Farole, 2012; Nicita and Roll, 2015). In spite of this assertion, we argue that the ability of developing countries to initiate or penetrate new markets might be ultimately constrained by the stringent market conditions of importing countries. Thus, the analysis of the impact of the aforementioned EU market conditions in the food sector on Africa's extensive margin is crucial to understanding the process of entries and exits in the export markets and identifying which factor may be the biggest constraint to Africa's export competitiveness. For instance, studies that look at the impact of EU market conditions in the food sector on Africa's exports have predominantly focused on the intensive margin (Otsuki, et al., 2001; Grebrehewit et al., 2007). However, the implications of EU food regulations have received less attention when it comes to market access at the extensive margin of trade. Having a better understanding of the effects of this EU market access conditions in the food sector and their effect on potential exporters is important from a policy perspective.

The rest of the study is organized as follows: Section 2 briefly reviews the literature and also presents a simple model of trade protectionism. In section 3, we describe the data and develop a protectionist index of standards. Section 4 provides the empirical analysis. Section 5 discusses the results and the final section concludes.

## **2.0 LITERATURE REVIEW**

The literature on standards and international trade flows has primarily focused on examining the effect of minimum quality standards and compatibility standards on trade flows (Grandal and Shy, 2001; Otsuki et al., 2001; Disdier et al, 2008; Ferro et al., 2015; Fontagne et al., 2015; etc). However, recent contributions have examined how standards can be used as a tool of regulatory protectionism. While the literature on the protectionist use of food safety standards is scarce, there are a few theoretical works available in contrast to the very limited empirical literature. On the theoretical side, early studies in this area have qualified protectionism to occur when the welfare maximizing standards of the domestic country are higher than those of the social planner, and vice versa for anti-protectionism. They demonstrated that domestic policy makers set a number of standards in order to maximize both producer and consumer welfare along with the welfare of some interest groups. These domestic standards are then compared to a globally acceptable international standard that a social planner would have implemented, seeking only to maximize social welfare inclusive of foreign profits (Fisher and Serra, 2000; Marette and Beghin, 2010).

The major conclusion that emerges from these theoretical literature publications is that standards are being used as tools of disguised protectionism to protect domestic producers from competition (Anderson et al., 2004; Fischer and Serra, 2000; Sturm, 2006; Sheldon, 2012). Nevertheless, extensive theoretical underpinning of some other authors has pointed to the fact

that standards are not necessarily protectionist, and might at times be anti-protectionist (Maertens and Swinnen, 2007; Marette and Beghin, 2010; Swinnen and Vandemoortele, 2011; Tian, 2003). However, the empirical validation of these theoretical predictions are rare, a gap which this study attempts to fill. The divergent nature of these theoretical assertions indicates the need for standards to be empirically analyzed product by product before ultimately categorizing them as protectionist tools – an indication that empirical analyses are of paramount importance.

## 2.1 The Political Economy of Government Standards

Theoretical studies on this issue usually rely on the famous protection for sales model that was first developed by Grossman and Helpman (1994) to analyse the political economy of trade protection. This political economy model allows for interest groups to influence a government's decisions and is essential to understanding the process of standard setting. Thus, to explain standard protectionism, we also rely on a simple model of protection for sales to compare government public standards with international standards.

### 2.1.1 The Protection for Sales Model

We draw from the Grossman and Helpman (1994) model of trade to provide a political economy explanation for standard protectionism by the government. In the protection for sales model (summarized here for expository purposes), we assume a two-country world with agricultural trade interactions between a small food exporting country (foreign) and a large food importing country (home). We assume that the former is a price taker and also standards taker as they have limited resources to initiate the setting of standards. However, the latter is a standard setter and imposes its standards on the small country's food exports; this same set of standards is also applied on domestic producers. Following Grossman and Helpman (1994), we restrict the set of policy instruments available to the government to standards only. By setting the standards, we assume that government care about protecting consumers' health and safety, and so the government's main objective is to maximize social welfare.

Although by setting standards governments aim to maximize social welfare, this objective is also being influenced by lobbyists (both producers and consumers) who seek to influence government policies. Producer lobbyists look to achieve a desired level of protection for domestic producers against international competition and consumer lobbyists aim to influence government policy to receive higher quality or safety. As such, it is assumed that the government cares about social welfare and wants to maximize social welfare but nevertheless also cares about political contributions from these interest groups and consequently seeks to maximize their welfare. Since government values both the weighted sum of the total level of political contributions from the interest group and also the social well-being of the people, the total government objective function is given as the summation of social welfare and contributions from each of these lobbyist groups. The government objective function with political economy concerns for the domestic interest groups is given below.

$$G(s) = a_1 W^G(s) + \sum_{p \in L} a_2 C_p(s) \quad a_1, a_2 \geq 0 \quad (1)$$

Here,  $a_1$  is the strength of the political effectiveness of the interest group(s) on a specific food product  $p$  which they seek to lobby the government about;  $L$  is the set of the politically organized sectors,  $S$  is the standard,  $a_2$  is the weight the government attaches to general welfare  $W^G$ .  $C_p(s)$  is the political contribution by the organized food sector  $p$ . It is assumed that there is truthfulness in the contribution such that the government is given higher contributions if the standards stimulate higher producers' surpluses, and vice versa. Maximizing the government welfare function, the first order condition with respect to the standard gives the politically optimal standards ( $s'$ ):

$$a_1 \frac{\partial W^G(s')}{\partial s} + \sum_{p \in L} a_2 \frac{\partial C_p(s')}{\partial s} = 0 \quad (2)$$

The politically optimal condition in equation (2) is posited to depend on the political effectiveness of the lobby groups and the associated relative benefits of the standards for the groups, the producers' compliance costs, and consumers' preferences. According to Swinnen and Vandemoortele, (2012), these factors might increase or decrease the optimal standards as expositied below. Firstly, *ceteris paribus*, a higher effectiveness leads to a higher standard if the lobby group stands to gain from the imposition of a higher standard, and *vice versa*. Secondly, higher compliance costs for domestic producers lead to lobbying for lower standards as producers have incentives to give less lobby contributions to the government. Higher compliance costs also imply larger prices which result in a lower consumer surplus and increases lobbying for a lower standard. Higher compliance costs for foreign producers relative to domestic producers may motivate producers to give more lobby contributions to the government so as to achieve economies of scale and increased competition. Thirdly, a shift in the consumers' preferences for quality and safety can also lead to an implementation of a higher standard by the government, and vice versa, assuming that the consumers are well-organized.

Alongside the government, we assume a social planner exists whose objective is solely to maximize global social welfare. This, for instance, can be the case with international organizations such as the Food and Agriculture Organization (FAO) and the World Health Organization (WHO) who jointly make standards with the sole aim of maximizing international social welfare and whose agenda is void of any protective motive. Likewise, the socially optimal standards are obtained by the first order condition that maximizes social welfare.

$$a_1 \frac{\partial W(s^*)}{\partial s} = 0 \quad \text{subject to } s^* \geq 0 \quad (3)$$

Equation (3) thus gives a socially optimal standard( $s^*$ ), which is the globally acceptable benchmark. Similar to the analysis of tariff in the traditional trade model, the politically chosen trade policy is also compared to the socially optimal trade policy in order to clarify what protectionism is (Swinnen and Vandemoortele, 2011). The comparison is made on the basis of equations (2) and (3). Here, the chosen government standard is said to be suboptimal when the politically optimal standard is different from the socially optimal standards set by the social planner in the international context. The divergence between these two standards is said to



depend on a number of factors including the political effectiveness of the lobby groups, producers' implementation costs, and consumers' preference (Swinnen and Vandemoortele, 2011; 2012).

Interest groups may lobby either in favour of or against standards, subsequently increasing or decreasing the politically optimal standard. In the EU, this is the case for organized retailers who seek to influence the standard setting process. In recent times, (NGOs) such as 'Friends of the Earth Europe', Greenpeace, Compassion in World Farming, Ecoropa, and Green League have taken an interest in standard setting and implementation and, more generally, in the politics of food; their influence is especially pervasive in the area of anti-genetically modified organism and pro-organic food campaigns. Thus, on the one hand, lobby groups can lobby for the increase in stringency and proliferation of standards, thereby making the politically optimal standards rise above the socially optimal standards that would be implemented by a social planner - the case of over-standardization. On the other hand, producers can also lobby for negative protection and the reduction of standards such that the politically optimal standards might fall below the socially optimal standards – a case of under-standardization. In other words, two suboptimal cases may occur when the socially optimal is less than or greater than the politically optimal standards, which describes over- and under- standardization respectively.

On the one hand, interest groups (producers) might lobby for over-standardization if their cost of complying with the standards is relatively low, and they want to enjoy economies of scale and increase the foreign producers' cost of complying with standards, thereby giving them diseconomies of scale. A higher effectiveness of consumer's interest groups might also result in over-standardization if they value the quality of the product. On the other hand, domestic producers might lobby for under-standardization or a reduction in standardization if the standards are too costly to comply with for them. In addition, for net importers and heavily depend on foreign exported goods for production inputs, their relative preference to the producer lobbyist groups to lobby the government for a higher standard might be weaker, depending on the consumers' preference for safety and quality.

The protection for sales model thus yields three straightforward implications and testable predictions. (1) The politically optimal standards might coincide with the socially optimal standards when all lobby groups can attain their maximum surplus income at the social optimum. In this case, optimality implies that exporters would not be hurt when politically optimal standards are equal to socially optimal standards, even if the latter are trade enhancing or trade inhibiting. (2) Under-standardization: for cases in which the politically optimal standards are higher than the socially optimal set, both domestic and foreign producers benefit from this under-standardization. The negative impacts of standards on trade are reduced such that the level of protection will be directly related to the value of exports. Thus, although under-standardization is suboptimal, it is not protectionist from this point of view. (3) Over-standardization: for cases in which the politically optimal standards are higher than the socially optimal set. The higher the level of over-standardization, the harder it becomes for exporters particularly those from "small countries" to comply with the importing country's standards. Thus, in the case of a small country, over-standardization will distort trade and give rise to a

higher surplus income for domestic producers while foreign producers lose out. As a result, for protected industries (if the sector or good is protected), then the level of protection will be inversely related to the export value.

### 3 Data and Descriptive Statistics

In this section, we provide a protectionism index of EU standards alongside some descriptive statistics of EU pesticide standards *vis à vis* those set by the Codex Alimentarius Commission. In addition, we provide an insight into the structure of EU production and trade for each of the three products considered in this study with a view to understanding the need to protect or not protect the sector.

#### 3.3.1 Measuring Protectionism – a Protectionism Index of Standards

In this paper, our measure of standards is based on quantifiable pesticide standards regulated by the importing countries; the standards are represented in the form of a maximum residual level (MRL) of pesticides that is scientifically permitted for consumption. To avoid using standards as a protectionist tool, the WTO obliged its members to employ internationally scientific based standards, such as the Codex<sup>3</sup> Alimentarius Commission (hereafter Codex) standards, wherever possible. We define protectionism as the fraction of a country's standards that are more stringent than the standards internationally recognized by the WTO. Following Li and Beghin (2014), using MRLs of pesticides standards, we formalize what protectionism is by developing an index of protectionism which we define as the differences in the stringency of a country's standards to internationally acceptable science based standards. Thus, our measure of protectionism is constructed by measuring the differences in EU standards against an international benchmark. One may pronounce standards that exceed the internationally accepted set as being overly stringent, 'excessive standards', and protectionist in nature and therefore more trade distorting.

We employ Codex standards as the 'socially optimal' scientifically based benchmark. We developed a simple criterion for protectionism: EU pesticide standards that exceed those set by Codex are taken to be protectionist, while those that are laxer than those set by Codex are defined to be anti-protectionist. Our product level protectionism index for pesticide standards is given as:

$$P_{ijkt} = \frac{1}{n} \left( \sum_{k=1}^n \exp \left( \frac{Codex_{MRL_{kt}} - EU_{MRL_{kt}}}{Codex_{MRL_{kt}}} \right) \right) \quad (4)$$

Here,  $P_{ijkt}$  measures the extent of protectionism of pesticide standards aggregated over pesticide  $k$ , imposed on country  $j$  exports at time  $t$ ;  $EU_{MRL_{kt}}$  denotes the maximum residual limits of EU pesticide standards at time  $t$ ;  $Codex_{MRL_{kt}}$  is the maximum residual limit of the international scientific reference pesticide standard at time  $t$ . The upper part of the index,

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<sup>3</sup>The Codex Alimentarius Commission (CAC) is a joint Food and Agriculture Organization and World Health Organization commission. Codex is established to develop internationally standards using scientific knowledge, with the aim of protecting consumers' health and the environment as well as avoiding unnecessary obstacle to trade.

$Codex_{MRL_{ikt}} - EU_{MRL_{ikt}}$ , measures the protectionism of the standard; it was thereafter scaled by Codex standards so as to make the index invariant to differences in pesticide limits between the EU and Codex.

Equation (4) results in an index that is lower and upper bounded by zero and  $e \approx 2.718$ , respectively, with the index normalized at one when both EU and Codex standards are the same. The lower the EU MRL standards (and the higher the stringency) are relative to the international Codex standards, the higher the index. The higher the EU standards (and the lower the stringency) are relative to the international Codex standards, the lower the index. In other words, the index is normalized at one when both EU and Codex standards are the same, describing the equilibrium condition; an index above one indicates more stringent EU standards relative to those of Codex and describes protectionism; finally, an index below one indicates lower stringency of EU standards relative to those of Codex – anti-protectionism. Thus, the higher the index is, the higher its stringency, and the harder it becomes for exporters to comply with EU standards relative to Codex standards; this consequently implies lower exports and vice versa. As a result, the coefficient on the protectionism index is expected to be negative if the EU pesticide standards are protectionist relative to those of Codex, and vice versa.

There are some issues that were encountered when working with both the EU and Codex pesticide standards. The foremost issue is that of unestablished pesticide standards. Appendix III of EU Directive 396/2005 stipulates that a default MRL of 0.01 should be applied to products for which no pesticide standards are established. So, we substitute this default MRL value for non-established pesticide standards in the EU. Codex also has some rare cases where certain pesticides who were not initially given an MRL value were later assigned one in later years. As a result, we are faced with the problem of missing MRLs; this is exacerbated by the fact that Codex does not use a default MRL value. In order to solve this issue, we posit that African countries exporting to the EU still have to face EU default standards even when the EU uses standards set by Codex. We therefore substitute these missing values with default EU values. Fortunately, such cases are rare and we concur that they will not significantly distort our results.

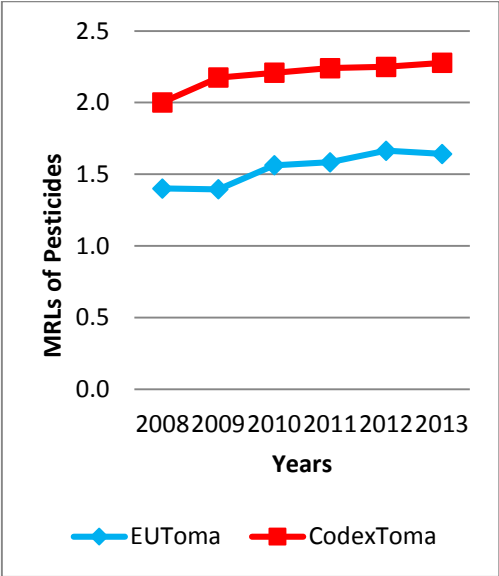
A second issue is that Codex has only established rules on a subset of standards that are regulated by the EU. For example, in 2013 it established about 72 pesticide standards on tomatoes which is in stark contrast to the EU which established around 462 standards in the same period. To solve this issue when calculating the protectionism index, we were forced to consider only pesticide standards that are regulated by both the EU and Codex. This is done to allow us to produce a consistent list of pesticides regulated by both bodies and allow for ease of comparison of their MRLs. We keep this caveat in mind when interpreting our results.

### **3.2 Overview of EU and FAO/WHO Pesticide Safety Standards**

Standards on pesticides are specified in terms of maximum residual limits (MRL) and the intensity and stringency of the standard is provided by the maximum residual limit of the pesticide on or in food. The stringency of pesticide standards is measured in parts per million (indexed as mg/kg). The higher the MRL, the lower the stringency of the pesticide standard, and a decrease in the MRL signals an increase in its stringency level. The EU coverage of

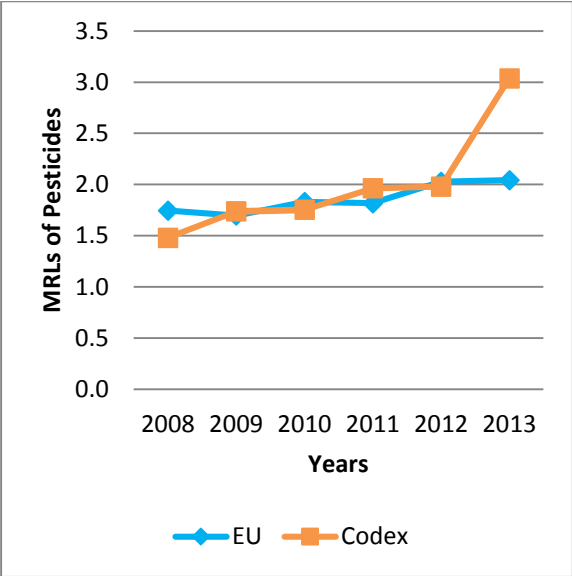
regulated pesticides is high in contrast to Codex who only establish rules on a subset of standards regulated by the EU. So, for ease of comparison, we limited ourselves to only consider the pesticide standards that are regulated by both the EU and Codex. Figures 1, 2, and 3 display the average stringency levels of the subsets of pesticides regulated by the EU and Codex between 2008 and 2013 based on the index formulated in equation (4).

**Figure 1: Tomatoes MRLs**



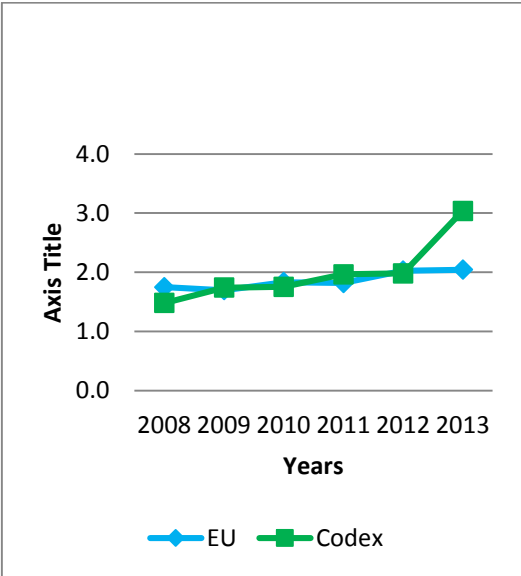
**Source: Europa and Codex Databases**

**Figure: Oranges MRLs**



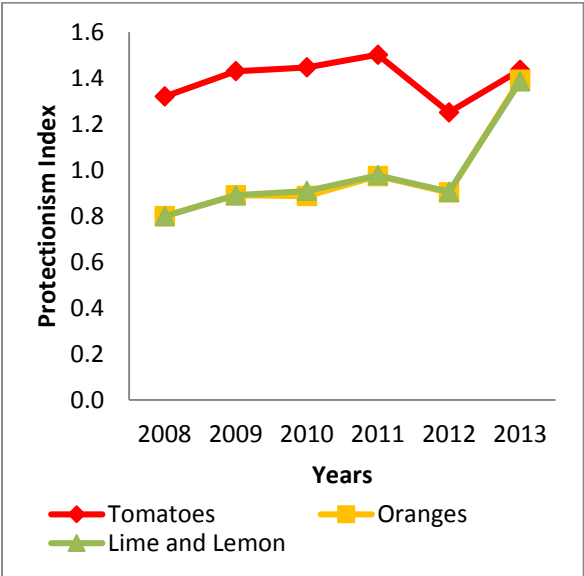
**Source: Europa and Codex**

**Figure 3: Lime and Lemon MRLs**



**Source: Europa and Codex Databases**

**Figure 4: Trend in Protectionism Index**



**Source: Author's Computation**

In the case of tomatoes, Figure 1 shows that the regulated MRL of EU standards is consistently below those of Codex for all years, indicating that the EU set lower (stricter) pesticide standards on tomatoes relative to the international benchmark set by Codex. This is an indication of over-standardization and protective standards relative to the international standards. However, in the case of oranges, and limes and lemons, as shown in Figures 2 and 3, the EU standards are only more stringent than those of Codex in 2011 and 2013. There is a significant presence of under-standardization as the stringency is below that of Codex in the other years. In other words, there are indications of protectionism in 2011 and 2013 and anti-protectionism in other years. Thus, the overall impact is an empirical one.

Finally, in Figure 4, we depict the protectionism index as formulated in equation (1). As noted earlier, the index is bounded between 0 and 0.278 with an index above one indicating more stringent EU standards relative to those of Codex; an index below one indicates lower stringency of EU standards relative to those of Codex. Clearly, for both oranges, and limes and lemons, the index always lies below one with the exception of 2013, indicating evidence of anti-protectionism for all years apart from 2013. However, in the case of tomatoes, the index lies above the one for all years which might be an indication of protectionism. Whether or not these assertions are true will be empirically ascertained in the next sections.

### **3.3 Structure of EU Production and Trade in the Selected Products.**

The EU is an important importer of fresh fruits and vegetables. It is a net exporter, recording a constant trade deficit in fresh and processed fruits and vegetables since 1999 with the deficit increasing from a value of 8.7 billion euros in 1999 to 11.9 billion in 2011 (EC, 2014). However, trade balance is revealed to be worsening in the fruit sector while it is more or less constant and, at times, slightly improving in the vegetable and processed fruit sectors. This deficit is due to the growth of imports which are uncompensated by EU exports due to the fact that the EU is a marginal producer of tropical fruits and vegetables.

Tables 1 and 2 show the trend in the production and trade of the products focused on in this study. With regard to citrus, there is a high reliance on imports due to the fact that citrus fruit production in the EU is restricted by unfavourable climatic conditions. However, the vast volume of citrus fruit production originates in Spain, amounting to around 59.8% (EC, 2014). In terms of composition, citrus, particularly oranges constitute a top import product for the EU with the top exporters being South Africa, Egypt, and Morocco. South Africa is one of the major suppliers of oranges to the EU, supplying the EU market from June until October when the harvest starts in the Northern Hemisphere (Gain, 2015). However, in 2014, there was an 11.5% decrease in imports from South Africa since May 27, 2014. This followed the European Commission's (EC) increased control measures on South Africa's citrus imports due to the perceived health risks relating to black spot diseases by the European EC. This resulted in decreased orange imports from South Africa. On the side of production, Table 2 shows that between 2008 and 2013, a yearly average of around 6629.8 thousand tonnes of oranges were produced, with Spain, Italy, and Greece accounting for about 96% of the total production with a share of 46.7, 36.4% and 13.2% respectively (Table 1). During this period, 4% of production was exported to third countries amounting to around 933 million euros; meanwhile the total import cumulated to a value of about 3007.1 million euro.

**Table 1: Structure of Production of the Selected EU Products, averaged 2008 to 2013**

	Oranges		Limes and Lemons		Tomatoes	
	Tonnes ('000)	Share in EU (%)	Tonnes ('000)	Share in EU (%)	Tonnes ('000)	Share in EU (%)
Belgium	0.0	0.0	0.0	0.0	231.0	1.5
Bulgaria	0.0	0.0	0.0	0.0	111.3	0.7
Czech Republic	0.0	0.0	0.0	0.0	11.5	0.1
Denmark	0.0	0.0	0.0	0.0	9.0	0.1
Germany	0.0	0.0	0.0	0.0	68.7	0.5
Estonia	0.0	0.0	0.0	0.0	1.2	0.0
Ireland	0.0	0.0	0.0	0.0	3.1	0.0
Greece	878.4	13.2	48.3	3.9	1275.0	8.5
Spain	3098.2	46.7	712.2	57.0	4099.5	27.3
France	3.3	0.1	2.8	0.2	651.2	4.3
Croatia	0.3	0.0	0.0	0.0	20.7	0.1
Italy	2410.6	36.4	458.7	36.7	5800.7	38.6
Cyprus	35.9	0.5	12.9	1.0	18.1	0.1
Latvia	0.0	0.0	0.0	0.0	3.6	0.0
Lithuania	0.0	0.0	0.0	0.0	9.0	0.1
Luxembourg	0.0	0.0	0.0	0.0	0.1	0.0
Hungary	0.0	0.0	0.0	0.0	156.8	1.0
Malta	1.2	0.0	0.5	0.0	13.2	0.1
Netherlands	0.0	0.0	0.0	0.0	795.0	5.3
Austria	0.0	0.0	0.0	0.0	47.3	0.3
Poland	0.0	0.0	0.0	0.0	500.9	3.3
Portugal	201.8	3.0	12.9	1.0	638.1	4.2
Romania	0.0	0.0	0.0	0.0	495.7	3.3
Slovenia	0.0	0.0	0.0	0.0	4.3	0.0
Slovakia	0.0	0.0	0.0	0.0	18.3	0.1
Finland	0.0	0.0	0.0	0.0	39.2	0.3
Sweden	0.0	0.0	0.0	0.0	7.5	0.0
United Kingdom	0.0	0.0	0.0	0.0	0.0	0.0
EU 28	6629.8	100.0	1248.4	100.0	15030.0	100.0

**Source: Eurostat**

Similar trends also occur for limes and lemons. Between 2008 and 2013, yearly production of limes and lemons totalled an average of 1248.4 thousand tonnes (Table 2) with 96% of total production concentrated in Spain (57%), Italy (36.7%) and Greece (3.9%). 5.7% of the total production of limes and lemons were exported to extra EU countries, representing a yearly value of 59.7 million Euros. Meanwhile, imports were relatively higher at a yearly average value of 380.3 million Euros, amounting to an average yearly trade deficit of 320.6 million Euros. The scenarios for both limes and lemons, and oranges two products depict the EU as a net importer with a significant trade deficit in each product as the EU relies extensively on imports to satisfy domestic demand. Thus, our hypothesis is that the sector might be less protected. In other words, the EU's heavy dependence on third countries for domestic consumption might undermine the relative influence of lobbyists on the government, and or prompt the government to lower its standards and allow more imports.

**Table 2: Structure of Trade with Extra EU countries, 2008 to 2013**

	Oranges		Limes & Lemons		Tomatoes	
	Sum	Average	Sum	Average	Sum	Average
Production ('000 tons)	39778.7	6629.8	7490.2	1248.4	90179.8	15,030
Volume Exported ('000 tons)	1590.1	256.0	426.1	71.0	1364.1	227.3
% of Production Exported	4.0	4.0	5.69	5.69	1.5	1.5
Imports (Value million EUR)	3007.1	501.2	2282.1	380.3	2247.3	374.5
Exports (Value million EUR)	933.0	155.5	358.4	59.7	1668.3	278.0
Trade Balance (Value million EUR)	2074.1	345.7	1923.7	320.6	579	96.5

**Source: Eurostat**

The case of tomatoes is somewhat different. It remains the EU's top imported vegetable, constituting the highest share of its fresh vegetables imports, amounting to around one fifth of its vegetable imports (EC, 2014). The EU exports of fresh vegetables is also dominated by tomatoes, however, this is not enough to achieve a trade balance. According to the Eurostat data, major exporters to the EU are Morocco and Egypt, with Morocco supplying about 80% of EU imports of the product. Unlike citrus products which are mainly tropical fruits, tomatoes are cultivated *en masse* by some Southern EU countries due to the favorable weather conditions. This is complemented by production from all season greenhouses in countries such as Belgium and the Netherlands, reducing an overreliance on imports in contrast to what that seen in the cases of oranges, and limes and lemons. The total production between 2008 and 2013 amounts to 90179 thousand tones with major producers accounting for 91% of production; major producing countries include Italy (38.6%), Spain (27.3), Greece (8.5%), France (4.3%), the Netherlands (5.3%), Portugal (4.2%), and Romania (3.3%). Tomato production is more than twice as large as both orange production, and lime and lemon production with only 1.5% of it being exported and the rest being consumed domestically. The huge domestic production of tomatoes relative to the other citrus products reduces the need for excessive imports and might explain why the sectors' total trade deficit between 2008 and 2013 of 579 million Euros is far below the deficits for oranges and limes and lemons of 2074 and 1923 million Euros, respectively.

Thus, unlike citrus, the EU is not overdependent on imports to satisfy tomato consumption; as a result, they may yield more to lobbyists who seeks to influence the EC to set stringent standards so as to increase exporters' implementation costs and therefore erode their market competitiveness. However, in the case of food safety standards, it is not clear if stringent MRLs set by the EU since 2008 are influenced by lobbyists due to the difficulty of differentiating standards' trade and non-trade objectives. Thus, a testable hypothesis in this study is that protectionism decreases or vanishes altogether with overdependence on imports and vice versa. In other words, for products where the EU heavily (lightly) depends on foreign exported goods for its domestic consumption, under-standardization (over-standardization) can result as the relative influence of lobbyist groups may be weaker (stronger). Thus, we hypothesized that the two selected citrus fruit sectors are under protected due to the heavy import dependence; the

tomato sector is hypothesized to be over-protected due to relatively less reliance on imports.

#### 4 EMPIRICAL ANALYSIS

To investigate the protectionist intent of EU food safety standards, we employ the gravity model of trade which predicts that bilateral export between two countries is explained by exporters' and importers' economic masses; which are a proxy for their income and geographical distance between the country-pairs as well as some trade factors that increase or inhibit trade (Pöyhönen, 1962; Anderson, 1979; Anderson and Wincoop, 2003).

##### 4.1 Model Specification

Our empirical strategy is to measure the extent of using standards as a protectionist tool on the probability to export to the EU. The theoretical model for our analysis is based on firm heterogeneity behavior; this shows that due to the heterogeneous behavior of firms, a small fraction of firms finds it profitable to export while others choose not to as they are less productive (Melitz, 2003; Helpman et al., 2008). Thus, this makes the trade matrix contain both positive and zero trade flows. The intuition is that EU market conditions on food might affect the probability of African countries exporting to the EU, with productive firms exporting and non-productive firms choosing not to export. Our empirical strategy is therefore to measure the effect of EU food regulations on Africa's probability to export. Our model is similar to that of Nicita and Rollo (2015) which analyzed the impact of tariffs on the extensive margin of trade for sub-Saharan exports. Similarly, we employ a probabilistic model to explore the implications of the EU entry price system and food safety standards on the probability of exporting. Moreover, our bilateral export data contain many zeros, thus allowing us to exploit the presence of zero trade flows along the extensive margin. A probit model is specified in log-linear form as follows:

$$\rho_{ijt} = P(T_{ijt} = 1 | x_{ijt}) = \Phi(\alpha_0 + \alpha_1 \ln Y_{it} + \alpha_2 \ln Y_{jt} + \alpha_3 \text{Initial\_Status}_{ijt} + \alpha_4 PM_{ijt} + \alpha_5 \ln Dist_{ij} + \alpha_6 Lamg_{ij} + \alpha_7 RTA_{ijt} + \varepsilon_{ijt}) \quad (5)$$

Equation (5) is a probabilistic model which determines the binary decision of whether to trade or not. The subscripts  $i, j, t$  denote exporter, importer and time respectively, while  $\ln$  is the logarithm. The dependent variable  $\rho_{ij}$  is the probability that country  $i$  exports to country  $j$ , conditional on the observed variables;  $T_{ijt}$  is a binary variable which is equal to one if country  $i$  exports to country  $j$  ( $T_{ijt} = 1$ ) and zero when it does not ( $T_{ijt} = 0$ ), where  $Y_{it}$  and  $Y_{jt}$  are the exporting and importing countries' nominal GDP respectively, measured in US dollars and obtained from the World Bank's World Development Indicators (WDI).  $PM_{ijt}$  describes the average MRLs capturing the extent of protectionism of EU standards relative to Codex standards; this information was obtained from the Europa and Codex Alimentarius Commission websites which estimate separately for tomato, lime and lemon, and orange exports at the 6 digit Harmonized System (HS) level.  $Dist_{ij}$  is the geographical distance between countries  $i$  and  $j$ , obtained from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII)



database. Lang, Col, and RTA are dummy variables that take the value of one when the exporting and importing countries share a common language, have colonial ties, or belong to similar trade agreement arrangements, respectively, they take a value of zero otherwise;  $\varepsilon_{ijt}$  is the idiosyncratic error term which is assumed to be well-behaved. Similar to Nicita and Rollo (2015), we include a proxy of initial export status of the product (*initial\_status*) which is a dummy given the value of one when the export product was successfully exported in the initial period of 2008 (the start of the harmonization of EU food regulations), and zero otherwise. The intuition is that products already exported in the year 2008 have a high probability of being exported in subsequent years. The list of countries included in the analysis is provided in the appendix.

To obtain consistent estimates, we also control for multilateral trade resistance terms, theoretically modelled by Anderson and van Wincoop (2003), using the Baier and Bergstrand<sup>4</sup> (2010) first order Taylor series approximation of bilateral trade costs using simple averages. For each trade cost variable, the first order Taylor series is expanded and all the newly demeaned bilateral trade cost variables are transformed using the following approximation:

$$(x_{ijt})_{P_i P_j} = x_{ijt} - \frac{1}{N} \sum_{j=1}^N x_{ijt} - \frac{1}{2} \frac{1}{N^2} \sum_{i=1}^N \sum_{j=1}^N x_{ijt} \quad (6)$$

Where  $P_i P_j$  is the MRT,  $x_{P_i P_j}$  is the contribution of  $x$  to  $P_i P_j$ ,  $N$  is the number of bilateral observations on exports, and  $x$  stands for any of the variables associated with coefficients  $\alpha_3$  to  $\alpha_7$  in equation (5). The first term on the right hand side is the simple average of gross trade costs facing exporter  $i$  across all importers  $j$ . The second term on the right hand side denotes the simple average of all trade costs faced by importer  $j$  across all exporters.

#### 4.5 RESULTS AND DISCUSSION

Table 3 presents the marginal effects of the probability of exporting to the EU. For all products, each gravity variable has the expected sign with the exception of language which is not statistically significant for tomato exports. Sharing the same language and membership in regional trade agreements with the EU increases Africa's exports at the extensive margin; while physical distance – a proxy of trade costs - inhibits export potential. In addition, for all products, our results point out that the decision whether or not to export to the EU largely depends on if the product was already exported in the initial period (*initial\_status*). In other words, products already exported in 2008 have a high probability of being exported in subsequent years, whether or not the standard is overprotective.

Our variable of interest – which measures the protectionism of pesticide standards, is differently signed across products indicating that the decision to protect a product can be product specific. In the case of tomato exports, the coefficient on protectionism index is negative and statistically significant; this points to the evidence that EU pesticide standards on tomatoes are actually

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<sup>4</sup>Their approach also produces estimates similar to the Anderson and van Wincoop (2003) structurally iterated least squares method.

protectionist as they are more stringent than the international benchmark stipulated by Codex. In essence, the negative coefficient reinforces the fact that they have demand inhibiting effects on potential African exporters, preventing them from establishing trade relationships with the EU and from taking advantage of the preferential access the EU is usually granted to Africa's exports. Thus, the EU might have set very stringent and low pesticide residue limits on tomatoes due to lobbying from consumer groups in a bid to safeguard consumers who do not want to buy organic varieties.

**Table 3: Protectionist Extent of EU Standards Relative to International Benchmarks**

VARIABLES	(1) Tomatoes	(2) Limes and Lemons	(3) Oranges
Exporter GDP	0.179*	0.282**	0.112
Importer GDP	0.101	0.110	0.091
Protectionism Measure	0.270**	0.660***	0.621***
Initial_Status	0.131	0.203	0.128
Distance	-1.720***	0.750***	0.464**
Language	0.545	0.188	0.181
RTA	1.004***	0.514**	0.556***
Constant	0.247	0.252	0.185
AIC	-3.881**	-2.980**	-3.219***
BIC	1.593	1.395	0.908
Observations	2.207***	2.354***	3.689***
	0.717	0.804	0.632
	6.434***	0.966	1.509**
	2.351	1.208	0.593
	-14.525***	-27.756***	-21.369***
	4.010	5.669	4.438
	585.955	551.224	668.921
	631.584	597.388	713.529
	1176	1248	1050

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1 clustered robust standard errors in parentheses, clustered by importer, exporter and year

While the tomato sector is relatively less import dependent and is revealed to be over-protected, the case for oranges and limes and lemons is somewhat different. The coefficients on the protectionism index are positive and significant, denoting that EU standards do not have protectionist intent. These EU standards have a demand enhancing effect; they are capable of stimulating new trade relations with the potential to enhance trade for new and potential African exporters targeting EU markets. Given the set of Codex standards considered in this study, the corresponding EU standards seem to be less stringent relative to those regulated by Codex. Thus, for these two products, EU pesticide regulations represent legitimate concerns for consumers' health and safety and do not necessarily imply protectionism against imports. Similar results were reported by Xiong and Beghin, (2014) for US standards. One important explanation for this result was provided by Marette and Beghin (2010) who posited that such anti-protectionism behavior might occur if producers and exporters from exporting countries are more cost efficient in complying with standards than domestic producers. However, in the case of African countries, this explanation is less tenable as many of them cannot meet selected standards set by the EU due to a lack of financial, technical and qualified labor (Henson and

Wilson, 2005). A much more reasonable explanation for this result is that domestic policymakers in the EU may choose a relatively lower standard than an international social planner; this could serve to explain in part the observed results. For instance, compared to tomatoes, the EU are heavily dependent on third countries' citrus fruits for domestic consumption and processing. Due to the large numbers of imports and heavy dependence on foreign exported citrus for domestic juice production, the relative influence of lobbyists might be weaker on the government such that the government might be prompted to lower standards to allow more imports.

Thus, our results support the hypothesis that protectionism decreases or altogether vanishes with overdependence on imports and vice versa. In other words, unlike tomatoes, the EU does not have comparative advantage in the production of citrus due to unfavorable weather conditions; instead they depend heavily on imports to satisfy the domestic consumption of these fruits and thus, might be less yielding to lobbyists who seek to influence the EC to set stringent standards. This might even give rise to under-standardization in order to allow more imports.

As a further step, we investigate the assertions that many developed countries resorted to using protectionist NTMs both during and after the financial crisis (Bown, 2011; Datt et al., 2011; OECD, 2010). Thus, to ascertain if this is true in the case of standards, we have split our dataset into the crisis period (2008 to 2009) and the post-crisis period (2010 to 2013). Table 4 presents the estimates from both the financial and post-financial crisis periods. For the financial period, our estimated results as reported in the first three columns of Table 4 refute the claim that standards on tomatoes and two selected citrus fruits were used as protectionist tools during the financial crisis. Indeed, the positive coefficients on the protectionism index indicate that more of these export products have been allowed access into the EU market during the financial crisis. This result supports that of the WTO report of 2009 which finds that none of its Member states have retreated into the widespread use of trade protectionism or trade restrictions; furthermore, there was no evidence of any significant occurrences of trade retaliation (WTO, 2009) during the global financial crisis. However, during the period of the post-financial crisis, the last three columns of Table 4 show the estimates of the protectionism measure to be negatively signed, inferring that food safety standards were more protective in the post financial period.

**Table 4: Extent of Protectionism during and after the 2008/2009 Financial Crisis.**

	Crisis Period			Post Crisis Period		
	Tomatoes	Limes and Lemons	Oranges	Tomatoes	Limes and Lemons	Oranges
	(1)	(2)	(3)	(5)	(6)	(7)
Exporter GDP	0.051 (0.294)	0.508* (0.268)	-0.028 (0.137)	0.118 (0.101)	0.269** (0.117)	0.076 (0.097)
Importer GDP	-0.067 (0.248)	1.179*** (0.455)	0.680*** (0.256)	0.298** (0.141)	0.786*** (0.268)	0.668*** (0.150)
Protectionism Measure	4.165 (2.769)	11.153*** (3.395)	4.636* (2.480)	-1.741*** (0.533)	0.563*** (0.218)	0.173 (0.196)
Initial_Status	4.769***	3.981***	2.996***	0.443	-0.237	-0.103

	(1.463)	(0.361)	(0.647)	(0.289)	(0.352)	(0.254)
Distance	-7.726	-4.856**	-3.886**	-4.352**	-4.749*	-3.490***
	(4.954)	(2.021)	(1.658)	(1.720)	(2.737)	(0.935)
Language	7.103	2.931*	4.683***	2.024***	2.925***	3.851***
	(4.625)	(1.599)	(1.286)	(0.708)	(1.105)	(0.721)
RTA	0.104	-0.053	-0.011	-4.277	3.277*	4.507
	(0.640)	(1.601)	(0.575)	(3.892)	(1.934)	(6.451)
Constant	-5.694	-47.358***	-19.974**	-13.354***	-31.530***	-21.724***
	(5.764)	(11.127)	(8.052)	(4.000)	(7.852)	(4.992)
AIC	157.364	160.647	208.740	472.893	424.425	504.660
BIC	193.105	196.924	243.462	514.873	466.939	545.620
Observations	392	416	350	784	832	700

Clustered robust standard errors are in brackets and \* p<0.10; \*\* p<0.05; \*\*\* p<0.01

#### 4.5 Robustness Checks

In this section, we test the robustness of our results to alternative estimation technique. We have previously employed a probabilistic model to investigate the extent of protection on Africa's binary export decision of whether to trade with the EU or not. However, while it is true that the decision not to export (and the consequential occurrence of zeros in export flows to the EU) by many of these exporting countries might be in part attributable to over-protective standards, it may also be due to the statistical recording format. For instance, we have used the United Nations Commodity Trade (UN COMTRADE) statistical database of the United Nations Conference on Trade and Development (UNCTAD); some literature has reported that UNCTAD record export values that are below a certain threshold as zeros (Linder and De Groot, 2006). If some of the zeros in our data are due to the statistical record format, this implies that some of the export data has been censored<sup>5</sup>. Thus, as a robustness check, we employ the Tobit model which is well suited to deal with such situations. The results using the Tobit model are presented in Table 4.5 below. Remarkably, even if some of the zeros in the data are as a result of statistical zeros and not because of the inability to meet the standards (true zeros), the basic conclusions based on the results that were obtained in Table 4.3 remain the same, indicating that our previous results are robust to the presence of statistical zeros.

**Table 5: Robustness to Different Estimation Techniques – using Tobit Model**

	(1) Tomatoes	(2) Limes and Lemons	(3) Oranges
Importer GDP	0.130* (0.076)	0.167*** (0.064)	0.080 (0.049)
Importer GDP	0.217* (0.113)	0.412*** (0.140)	0.345*** (0.075)
Protectionism Measure	-1.080*** (0.351)	0.410*** (0.126)	0.245** (0.107)
Initial_Status	0.544*** (0.127)	0.289** (0.125)	0.249*** (0.092)
Distance	-2.619* (0.851)	-1.835 (0.851)	-1.748*** (0.851)

<sup>5</sup>This implies that some of the actual trade flow observations were not included in the trade matrix or have been recorded as zeros as they fell below a minimum predetermined threshold. Any trade flow value that is less than a certain predetermined threshold is recorded as zero, while other observations that are equal to or greater than the threshold are recorded as their actual value.

	(1.374)	(1.184)	(0.664)
Language	1.375***	1.427***	1.875***
	(0.457)	(0.516)	(0.239)
RTA	5.732***	0.590	0.560
	(1.720)	(1.812)	(1.345)
Constant	-10.970***	-17.087***	-12.275***
	(3.455)	(3.553)	(2.416)
AIC	855.295	816.519	1050.102
BIC	905.994	867.812	1099.668
Observations	1176	1248	1050

Clustered robust standard errors are in brackets and \* p<0.10; \*\* p<0.05; \*\*\* p<0.

## 5 CONCLUSION

This study provided some of the first empirical evidence on the extent of protectionist intent of EU standards relative to Codex standards which serve as the international benchmark recommended by the WHO and FAO. Using a sample of African countries, EU tomato standards are found to exhibit protectionist tendencies as they are more stringent than their Codex counterpart. However, in the case of oranges, and limes and lemons, these fruits exhibit anti-protectionist tendencies on firms' decisions to export; this points to the indication that EU pesticide regulations may be aimed solely at addressing legitimate concerns for human health and safety and do not necessarily address protectionist concerns. Our results show that tomatoes represent a relatively less import dependent sector which is over-protected; meanwhile oranges and limes and lemons represent a heavily import dependent sector which is under-protected. Thus, our results support the hypothesis that protectionism vanishes with overdependence on imports and vice versa. The implication of our findings highlights the fact that importing countries' standards are not always protectionist and can at times be anti-protectionist relative to internationally acceptable standards. In other words, standards are not necessarily always problematic or protectionist as widely portrayed in the literature. The protectionist intent of a standard is product specific, indicating that the decision is either based on a will to protect health or is sector specific.

Despite the fact that the EU sets one of the strictest collection of standards in the world and international standards like Codex have been posited as those that maximize global social welfare, EU standards are not always the more stringent of the two nor is it always the case that they are trade inhibiting. Thus, a caveat is worth mentioning: although we found international standards to at times have a weaker trade enhancing effect than domestic standards, this is not to say that countries should refrain from the usage of globally acceptable standards as recommended by the WTO. Clearly more research is needed in this direction with extensions to other product lines and importing countries.

Conclusively, from a policy point of view, an important policy implication of our findings is that overly protective standards can have huge trade inhibiting effects on developing countries. Although many African countries are in RTAs with the EU, standards make market access penetration conditional, as most of the existing RTAs are negotiated on the basis of reduced tariffs and not on the transfer of technical or financial resources to increase conformity to standards. Thus, increased capacity building and transfer of technology would be a welcome

policy if the numerous RTAs that the EU has with Africa are to help in achieving the continent's developmental goals. Consequently, even if standards are used as a protectionist tool, the effect might be dampened for these countries.

## REFERENCES

- Anderson, J. (1979). A theoretical foundation for the gravity equation. *The American Economic Review*, 69(1), 106-116.
- Anderson, J., and Van Wincoop, E. (2003). Gravity with gravitas: A solution to the border puzzle. *American Economic Review*, 93(1), 170 - 192.
- Anderson, K., Damania, R., and Jackson, L. (2004). Trade, standards, and the political economy of genetically modified food (No. 3395). World Bank Policy Research Working Paper.
- Baier, S. L., and Bergstrand, J. H. (2010). *Approximating general equilibrium impacts of trade liberalizations using the gravity equation*. In P. A. G. van Bergeijk and S. Barkman (Eds.), *The gravity model in international trade. advances and applications* (1st ed., pp. 88-134). Cambridge: Cambridge University Press.
- Baldwin, R. (1970). *Nontariff distortions of international trade*. Washington, DC: Brookings Institution.
- Baldwin, R. (2000). *Regulatory protectionism, developing nations and a two-tier world trading system*. (S. Collins and D. Rodrik, Eds.) Brookings Trade Forum. Washington, DC: Brookings Institution.
- Bown, C. P. (2011). *The great recession and import protection: the role of temporary trade barriers*. London: Centre for Economic Policy Research and the World Bank.
- Datt, M., Hoekman, B., and Malouche, M. (2011). Taking stock of trade protectionism since 2008. *Economic Premise*, 72, 1-9
- Dee, P. S., and Ferrantino, M. J. (2005). Quantitative methods for assessing the effects of non-tariff measures and trade facilitation (Vol. 54). APEC Secretariat.
- Disdier, A.-C., Fontagné, L., and Mimouni, M. (2008). The impact of regulations on agricultural trade: Evidence from the SPS and TBT agreements. *American Journal of Agricultural Economics*, 90(2), 336-350.
- Ferro, E., Otsuki, T., and Wilson, J. S. (2015). The effect of product standards on agricultural exports. *Food Policy*, 50, 68-79.
- Fischer, R., and Serra, P. (2000). Standards and protection. *Journal of International Economics*, 52(2), 377-400.
- Fontagné, L., Orefice, G., Piermartini, R., and Rocha, N. (2015). Product standards and margins of trade: Firm-level evidence. *Journal of International Economics*, 97(1), 29-44.
- Gandal, N., and Shy, O. (2001). Standardization policy and international trade. *Journal of International Economics*, 53(2), 363-383.
- Gebrehiwet, Y., Ngqangweni, S., and Kirsten, J. F. (2007). Quantifying the trade effect of sanitary and phytosanitary regulations of OECD Countries on South African food exports. *Agrekon*, 46(1), 1-17.
- Grossman, G. M., and Helpman, E. (1994). Protection for sale. *American Economic Review*, 84(4), 833-850.
- Helpman, E., Melitz, M., and Rubinstein, Y. (2008). Estimating trade flows: trading partners and trading volumes. *Quarterly Journal of Economics*, 123(2), 441-487.

- Henson, S., and Wilson, J. S. (2005). *The WTO and technical barriers to trade*. Edward Elgar Publishing.
- Li, Y., and Beghin, J. C. (2014). Protectionism indices for non-tariff measures: An application to maximum residue levels. *Food Policy*, 45, 57-68.
- Linders, G.-J. M., and De Groot, H. L. F. (2006). Estimation of the gravity equation in the presence of zero flows. *Mimeo*, 1-26.
- Maertens, M., and Swinnen, J. (2007). Standards as barriers and catalysts for trade, growth, and poverty reduction. *Journal of International Agricultural Trade and Development*, 4(1), 47-61.
- Marette, S., and Beghin, J. (2010). Are standards always protectionist? *Review of International Economics*, 18(1), 179-192.
- Melitz, M. J. (2003). The impact of trade on intra-industry reallocation and aggregate industry productivity: A comment. *Econometrica*, 71(6), 1695-1725.
- Nicita, A., and Rollo, V. (2015). Market access conditions and sub-Saharan Africa's exports diversification. *World Development*, 68, 254-263.
- Otsuki, T., Wilson, J. S., and Sewadeh, M. (2001). Saving two in a billion: quantifying the trade effect of European food safety standards on African exports. *Food Policy*, 26(5), 495-514.
- Pöyhönen, P. (1963). A Tentative Model for the Volume of Trade between Countries. *Weltwirtschaftliches Archiv*, 90, 93-100.
- Reis, J. G., and Farole, T. (2012). Trade competitiveness diagnostic toolkit. The World Bank (Vol. 1). World Bank Publications. Washington, DC: World Bank. Retrieved from <https://openknowledge.worldbank.org/handle/10986/2248>, [Accessed September, 2015].
- Sheldon, I. M. (2013). North-South trade and standards: What can general equilibrium analysis tell us? *World Trade Review* 11(3), 376-89.
- Shepherd, B., and Wilson, N. L. W. (2013). Product standards and developing country agricultural exports: The case of the European Union. *Food Policy*, 42, 1-10.
- Sturm, D. M. (2006). Product standards, trade disputes, and protectionism. *Canadian Journal of Economics*, 39(2), 564-581.
- Swinnen, J. F. M., and Vandemoortele, T. (2011). Trade and the political economy of food standards. *Journal of Agricultural Economics*, 62(2), 259-280.
- (2012). Trade and the political economy of standards. *World Trade Review*, 11(3), 390-400.
- Tian, H. (2003). Eco-labelling scheme, environmental protection, and protectionism. *Canadian Journal of Economics/Revue Canadienne d'Économie*, 36(3), 608-633.
- WTO. (2009). Overview of developments in the international trading environment. Annual report by the Director-General - Trade Policy Review Body. (Geneva).
- Xiong, B., and Beghin, J. (2014). Disentangling demand-enhancing and trade-cost effects of maximum residue regulations. *Economic Inquiry*, 52(3), 1190-1203.

## Appendix

**Table A4.1: List of Countries in the Tomato Dataset**

<b>Country Groups</b>	<b>Members</b>
Importers (EU)	Belgium, France, Germany, Luxembourg, Netherlands, Portugal, Spain
Exporters (Africa)	Algeria, Angola, Cape Verde, Comoros, Democratic Republic of Congo, Côte d'Ivoire, Egypt Arab Republic, Equatorial Guinea, Gabon, The Gambia, Ghana, Guinea-Bissau, Kenya, Liberia, Mauritania, Morocco, Nigeria, Sao Tome and Principe, Senegal, Sierra Leone, South Africa, Togo.

**Table A4.2: List of Countries in the Lime and Lemon Dataset**

<b>Country Groups</b>	<b>Members</b>
Importers (EU)	France, Italy, Luxembourg, Netherlands, Poland, Portugal, Spain
Exporters (Africa)	Algeria, Angola, Benin, Cape Verde, Congo Republic, Côte d'Ivoire, Djibouti, Equatorial Guinea, Gabon, Ghana, Liberia, Madagascar, Mauritania, Morocco, Nigeria, Sao Tome and Principe, Senegal, Sierra Leone, South Africa

**Table A4.3: List of Countries in the Oranges Dataset**

<b>Country Groups</b>	<b>Members</b>
Importers (EU)	Belgium, France, Italy, Malta, Netherlands, Portugal, Spain
Exporters (Africa)	Algeria, Angola, Benin, Cape Verde, Chad, Democratic Republic of Congo, Congo Republic, Côte d'Ivoire, Egypt Arab Republic, Equatorial Guinea, Gabon, The Gambia, Ghana, Guinea-Bissau, Liberia, Madagascar, Mali, Mauritania, Morocco, Nigeria, Sao Tome and Principe, Senegal, Sierra Leone, South Africa, Togo.