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Abstract

Changes in tastes and preferences in importing countries as well as the need to keep the environment safe, especially in developed markets, has contributed to a rising trend in the demand for sanitary and phytosanitary measures for quality products. However, the stringency and the preponderance of these measures have effects on trade, particularly for the developing and least developed countries in Africa. The effects often influence the attainment of the development aspirations of these Africa countries, especially employment, poverty reduction and sustainable growth. To this end, this study investigates the export effects of the EU standards for Africa. It uses the two-step Helpman et al. (2008) extensive and intensive trade margins model for two high-value foods and two traditional products. The EU standard requirements for each product are called the 'hurdle to pass' before the product can gain access to the EU market. In all, 52 African countries are considered in an empirical analysis covering the period 1995 to 2012. The study finds that product standards for fish and cocoa are trade-enhancing at the extensive margins, but this is not the case at the intensive margins. However, the standards are trade-inhibiting at both the extensive and intensive margins of exports for vegetables, while the standards are trade-restrictive at the extensive margins and trade-enhancing at the intensive margins for coffee. Thus, the findings suggest that the impacts of standards on exports are commodity-specific due to the significant differences in the costs of compliance, the size of the exporting firms or countries, access to development assistance and the commodity-specific interests of countries. The study recommends development partnerships and alliance policies on the part of Africa, with the development of institutions that can improve the level of standard-compliance in all African exporting markets.

Keywords

Technical Regulations, Food Exports, Africa, EU, Gravity Model

JEL Classification: C33, C87, F13, F42

1.0 Introduction

The gradual and continuous collapsing of tariffs in global trade due to bilateral, regional and multilateral trade negotiations and agreements has brought to the fore the importance and relevance of the use of non-tariff measures (NTMs) in regulating international trade (Fugazza, 2013; Moise and Le Bris, 2013; UNCTAD, 2012, WTO, 2012). NTMs are non-price trade policy measures that are used to regulate trade, the use of which has been increasing over the years. In fact, Gourdon and Nicita (2013) present a frequency index in terms of broad types of NTMs which shows that among these NTMs, technical measures are the most often used. Technical barriers to trade (TBT) such as technical regulations and standards (Sanitary and Phytosanitary measures (SPS)) stand out among other NTMs because of their importance in protecting human and animal lives as well as the safety of the environment. Moreover, they have the ability to be used for trade protectionism and/or the enhancement of the flow of trade in quality products that meet the changing tastes and preferences of consumers. To many least developed countries (LDC) and developing countries, technical barriers to trade, especially standard requirements[1] (SPS) are trade-restrictive because they add to the series of costs faced by their exporters, particularly in developed markets. These NTMs can almost double the trade barrier effects imposed by tariffs for some products (Moise and Le Bris, 2013).

Furthermore, Fugazza (2013) posits that the increasing use of TBTs and Sanitary and Phytosanitary measures poses concern for developing country exports, particularly TBTs, which are mostly used. An average of about 30% of products and trade are confronted with TBTs, and 15% with SPS, especially in trade with developed countries (Fugazza, 2013). This has implications for developing countries' export earnings and incomes. In turn, it affects their quest for sustainable development through reducing poverty, unemployment and reliance on smallholder producers in the trajectory of development. This quest for sustainable development, among other factors, is the reason for Africa's continuous global integration, especially through trade relations. Kaplinsky (2008) identifies trade among other channels[2] through which countries can integrate into the global market and African countries are exploring this channel. However, the gains from trade as advocated by orthodox trade theories have not been fully realized due to the quality of the exports, the export base, their stage of development and the protectionist nature of TBTs.

Many African governments and some scholars (see Cheminitz, Grethe and Kleinwechter, 2007; Otski, Wilson and Sewadeh, 2001) opine that the standards being used are trade restrictive. However, there are some studies, such as Henson and Humphrey (2008) and Maertens and Swinnen (2009), that have concluded that due to increasing demand for quality products these technical regulations will enable producers/exporters to engage in product upgrading, which will enhance the market access of their products. Although in the short run the producers/exporters might incur some compliance costs, in the long run these costs will stabilize and thereby enhance their exports to overseas markets. In reality, there are many standard requirements before a product can access any given market. Most of the studies in this area often use a single standard requirement. For instance, Liu and Yue (2011) use the Hazard Analysis Critical Control Point (HACCP) to investigate the EU orange trade; Otsuki, Wilson and Sewadesh (2001) quantify the impact of EU aflatoxins on African exports of cereals, dried fruits and nuts; Jun Yang and Findlay (2008) investigate the effects of the maximum residue limit (MRL) standards on China's exports of vegetables (Chlorpyrifos MRL) and aquatic products (Oxytetracycline MRL); Wei, Huang and Yang (2012) evaluate the effects of MRL of pesticides on China's tea exports; and Xiong and Beghin (2011) study the tightening of the EU maximum residue limit on aflatoxins on Africa's exports of groundnuts in 2002. The present study, however, departs from previous studies by considering all the applicable standard requirements for the products

[1] i.e. public standards, which are mandatory, unlike private standards, which are voluntary.

[2] Other channels are investment, migration, finance, global governance and environment.

selected. Another contribution to the literature is its coverage of four products: high-value and traditional cash crops, which are rarely combined in empirical analysis. Moreover, uses of the mostly unexplored Perinom standard data in the two-stage Helpma, et al. (2008) model are scarce in the literature, especially that employing African trade data.

The product safety requirements for the selected export products are called 'hurdles to pass' (HTP) prior to their accessing the EU market. Although for every product certain standard requirements might be dominant[3], all the requirements must be complied with before accessing the market. To this end, this study addresses the following questions. Do the EU standard requirements enhance Africa's exports? What are the standards required for agricultural exports to the EU? Are there border rejections in this market for Africa's agriculture food exports? These research questions lead to the objective of the study, which is to investigate the impact of EU standard requirements on Africa's exports.

1.1 Motivation

A perusal of the literature on standards shows that different indicators have been used to measure standards. Most often, studies in this area use aflatoxin (a measure of mycotoxin in food products) to measure standards (see Otsuki et al., 2001; Wilson and Otsuki, 2003, Xiong and Beghin, 2011). In addition, there are studies that use maximum residual limits (MRLs) for chlorpyrifos and oxytetracycline in vegetables and aquatic products, such as Yua Yang and Findlay (2008); ones that use MLRs in pesticides, such as Wei et al. (2012) and Ferro et al. (2013). Furthermore, the impact of MRLs in antibiotics is evaluated by Wilson et al. (2003), while a few studies have only used hazard analysis critical control points (HACCP) as an indicator to measure standards (see Liu and Yue, 2011). The commonality of all these studies with one measure of standards is that their conclusions are based on the fact that the measures of standards that they use are the ones that impact on the market access of the selected export products[4]. However, none of the studies clearly show that more standards than the standard indicator that they use apply to the export item that they consider. For instance, Otsuki et al (2001),Wilson and Otsuki (2003) and Xiong and Beghin (2011) use aflatoxin as a measure of standards for vegetables, fruit, groundnuts, etc, but in reality there are more than eight product standards relevant to these products.

Furthermore, using MRLs in pesticides as a measure of standards, Ferro et al. (2013) and Wei et al. (2012) investigate the impact of these standards on agricultural food products and conclude that the standard requirements in the importing countries inhibit exports to developed markets. However, evidence available from the World Trade Organisation's (WTO) NTMs database, Perinom, the Food and Agriculture Organisation (FAO) and the EU Rapid Alert System for Food and Feeds (RASFF) standards statistics show that there are more standards than the MRLs in pesticides used by these studies which equally have great impact on the market access of the export products. Most often, the explanation these studies give is that the indicators they use are the most relevant product standards applied to the chosen export items (see Fugazza, 2013; Cipollina and Salvatici, 2008; Shephaerd and Wilson, 2013; and Czubala et al., 2007). In contrast, the United Nations Industrial Development Organisation (UNIDO) (2010) and RASFF (2013) show that all the standards applied are equally relevant and important and require compliance, because non-compliance will lead to border rejection of the products.

Therefore, it can be seen that using one or two measures of standards from all the applicable product standards will lead to selection bias, while the conclusions drawn may be unreliable and biased, which will not be efficient in showing the impact of the standards applied on the selected

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[3] For instance, aflatoxin in groundnuts, cereal and other products.

[4] That is, their inferences on market access for the selected products were based on the chosen standards, i.e. aflatoxin, pesticides, etc.

product(s). At best, what ought to be done by these studies is to make their inferences and deductions specific to the impact of the chosen product standards on the selected products and not on the market access of the products, since other standards applied to the product are not considered[5]. Generalization of the impact of one product standard on the market access of a product may be misleading and might not give useful information[6]. For instance, in the theory of demand and supply, it is generally acknowledged that price is not the only determinant of demand and supply, so any conclusion that the demand or supply is only affected by price changes will be inappropriate. Even in the case where other determinants of demand and supply are held constant for simplicity, there will be limited applicability of the conclusions. In line with this, previous studies that have based their conclusions on the basis of this premise (using one product standard) might be liable to the generalizations of their findings on market access of the product(s) being misleading and biased[7]. One of the reasons often given for using a single measure of standards is the fact that standards data are not easy to obtain, and when obtained they are not well organized, and moreover it is very challenging to obtain the time series. However, the present study documents the trend and accumulates the time series for the applied product standards in the EU for certain agricultural food products, using Perinom datasets. All the applicable standards for each of the selected agriculture food exports to the EU as they are reported by the sources are used.

Furthermore, to the best of my knowledge most of the few studies in this area on Africa usually focus on high-value products, particularly in horticulture, with few or virtually no studies on traditional cash crops like cocoa and coffee. This study fills this gap. Thus, it investigates the effects of SPS on the ease and volume of food exports. Analysis of the number of incidences of border rejections of these exports originating from Africa is rarely performed and has not been seen in any empirical study. This differentiates the present study from previous ones that were more concerned with the application of models to trade data than the contextual issues surrounding them.

2.0 Research Background

The quality of export products determines whether market access will be allowed or not, according to whether the products are in conformity with the directives and regulations of the importing authorities. The EU has directives and regulations on standards for every product line at all levels of product classification, such that any non-compliance means border refusal. In this section, the incidences and number of border rejections are examined as well as the reasons for the rejections. The final part of the section presents an analysis of the trends in the relationship between exports of the selected products, the standards and income growth.

2.1 EU Standard Requirements as Hurdles to Pass for the Selected Products

An evaluation of the 'hurdles to pass' (HTP) in the EU market for all product lines, and in particular foods and feeds, indicates that more than one hurdle (standard requirement) needs to be passed or is in place for a product to access the EU market. In this study, I examine the HTP for four selected products. Table 1 presents the different HTPs for these products, which are the prerequisites for access to the EU market. Fish and fishery products have 10 HTPs that are always examined before these products can access the market, so that every standard requirement is as important as every other.

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5 Also, an explicit assumption ought to be made that other applied standards were held constant.

6 Fallacy of hasty generalization.

7 Their conclusions would more realistically be that the selected product standards have certain effects on the products, but do not necessarily indicate that the product(s) might be accepted or rejected at the border. For instance, compliance with the aflatoxin requirement does not necessarily mean market access, because other standards applied to the products must be satisfied and complied with before border access.

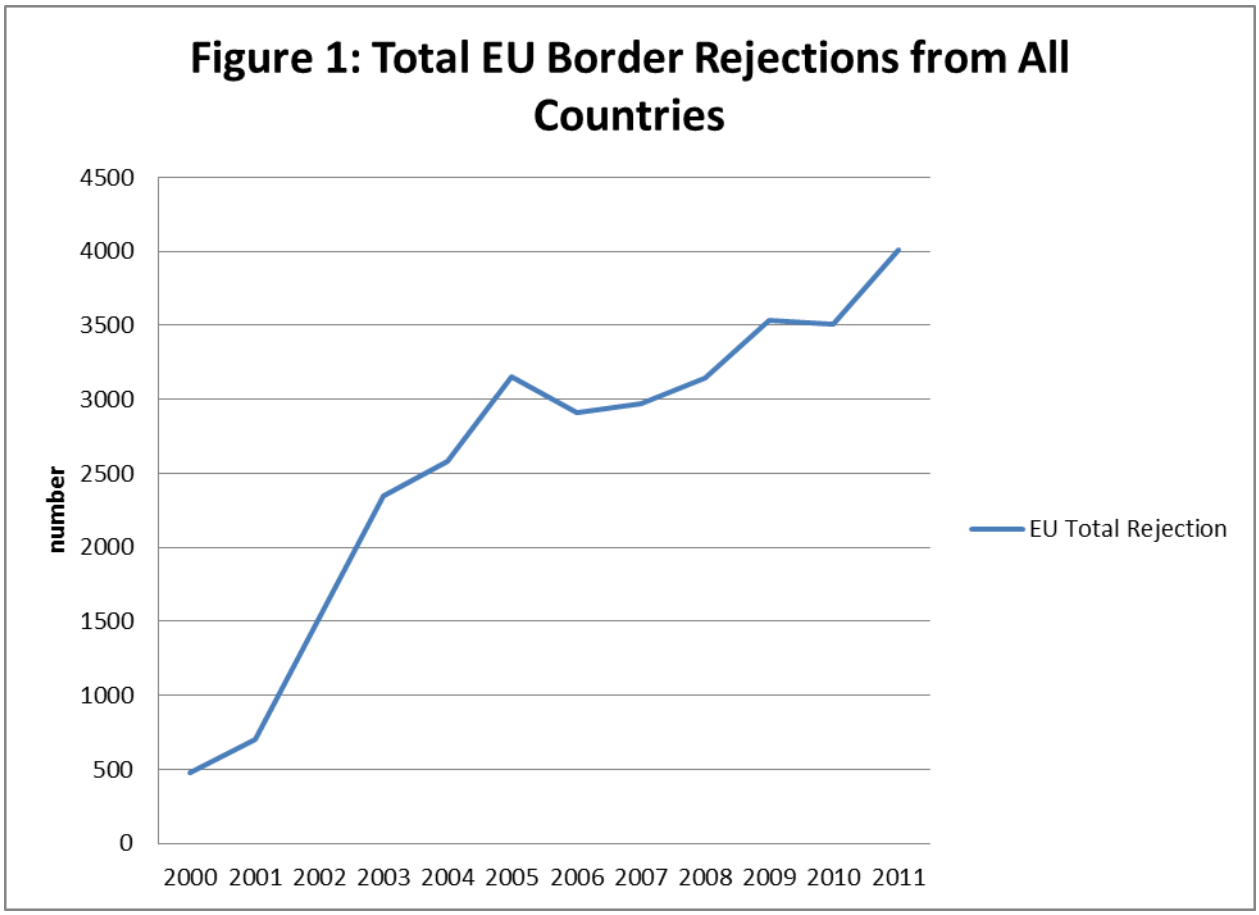
Fruits and vegetables have 11 HTPs that must be complied with. Mycotoxins, microbiological contaminations, foreign bodies, radiation and 'not determined/other' are the HTPs required for nuts and seed exports. The HTP requirements for herbs and spices are foreign bodies, pesticide residues, unauthorized food additives, microbiological contaminants and mycotoxins. It should be noted that these HTPs are for the period from 2002 to 2012. There can be changes to the HTP requirements at any point in time.

Table 1: The EU Standard Requirements for Some Selected Products

Standard	Fish & Fishery	Fruit & Vegetables	Nuts & Seeds	Herbs & Spices
Mycotoxins		X	X	X
Microbiological contaminants	X	X	X	X
Veterinary drug residues	X			
Heavy metals	X	X		
Unauthorized food additives		X		X
Product composition	X	X		
Pesticides residues		X		X
Migration				
Industrial contaminants	X			
GMO/Novel food		X		
Foreign bodies		X	X	X
Biotoxins / Contaminants	X			
Radiation	X	X	X	
Organoleptic	X			
Bad or insufficient control	X			
Parasitic infestation		X		
Labelling				
Packaging				
Other Chemical contamination				
Allergens				
Feed additive				
Not determined / other	X	X	X	

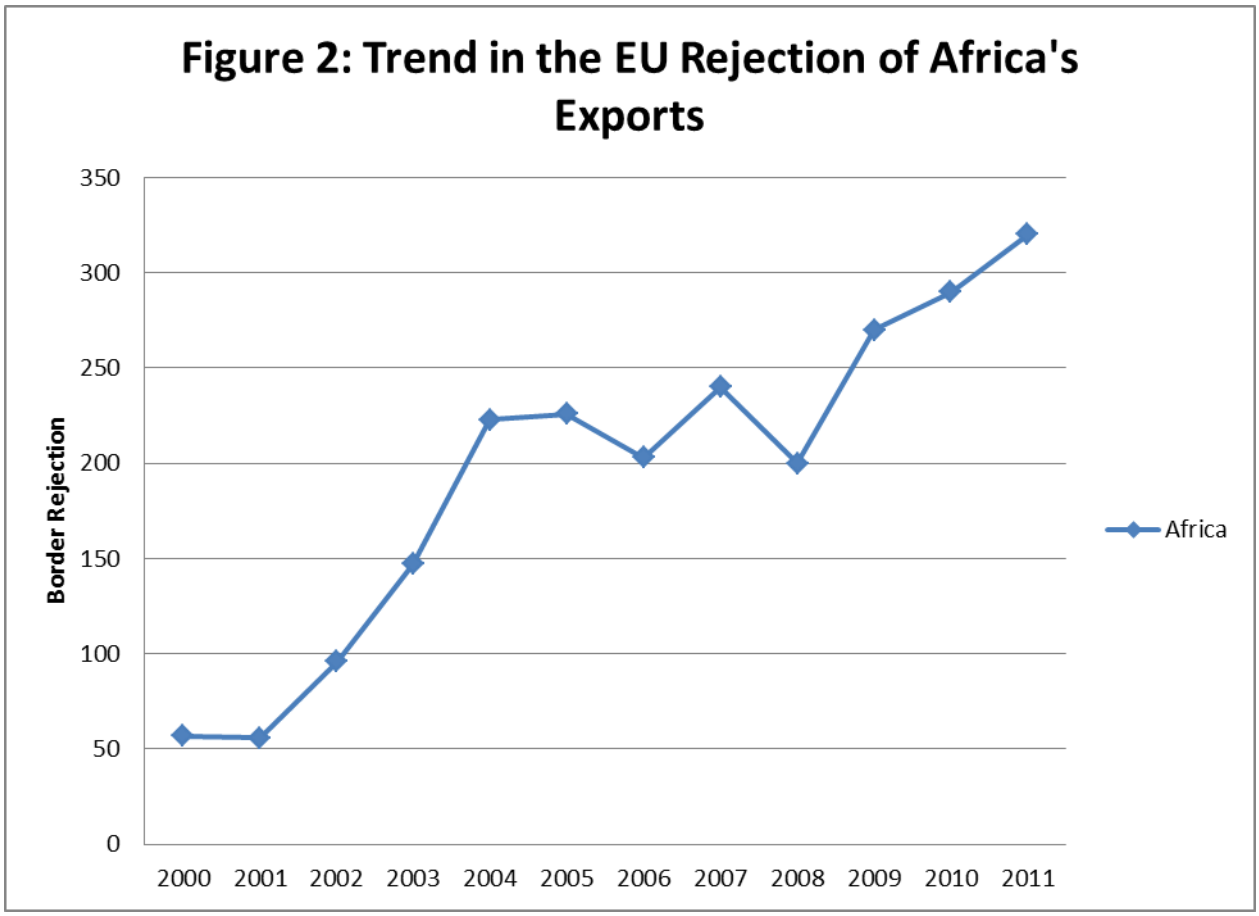
Source: Author's Compilation from the Rapid Alert System for Foods and Feeds (RASFF).

These standards applied to product lines must be adhered to; otherwise market access will be denied. In fact, the EU has denied access to its market to many volumes of exports, mainly due to non-compliance. Border refusal of exports cuts across all countries and is not limited to any specific country or region. The number of border rejections in the EU has been increasing over the years. This may be a result of new standards that are being introduced due to advances in science and technology, or may be necessitated by changes in taste, fashion and preferences for the health of humans, animals and plants, as well as for environmental reasons. Figure 1 shows the trend in EU border rejections for the period 2000-2011. The total number of EU refusals of imports in 2000 was 477, which two years later increased by almost 220% to 1524, before rising to 3152 in 2005. There was a slight decline of 8% in 2006, and then rises to 3505 and 4011 in 2010 and 2011 respectively. It can be seen that import refusals in this market increased more than tenfold over the period. The implication of this is that the amount of trade recorded by the EU during this period would have been more than the actual trade statistics if these exports were of the required standards. However, border rejections can also mean prevention of communicable infections in humans, animals and plants.



Source: Compilation from RASFF

Figure 2A shows a decomposition of the EU total border rejections, isolating rejections from Africa. There was an upward trend during the period under review. In 2000 Africa had only 57 cases of border refusal of its exports to the EU, but the number of products rejected due to standards non-compliance more than tripled by 2003. This rising trend continued and reached 226 in 2005 before declining to 203 in 2006, but later increased to 240 in 2007. A drop of 17% was witnessed in 2008 at the beginning of the global economic crisis, although this could be attributed to a reduction of exports to this market. However, by 2009, the number of refused exports had risen to 270, and later reached 320 in 2011. Obviously, these numbers of border rejections would be more meaningful if the total number of export consignments were known, but going by the continent's poor export base and the intensity of exports, it can safely be said that these rejections will have significantly impacted on the exporters' economies, and especially on poor producers.



Source: Compilation from RASFF

2.1.1 EU Import Rejections of Foods and Feeds, and Reasons

The access of a commodity to any import market will depend largely on its fulfilment of the conditions required for market access. Here, I examine the EU standards that are applicable to foods and feeds, especially those that are relevant to African countries. Table 2 presents the numbers of EU border rejections of food and feeds products. In 2002, the number of fish and fishery product exports that were prevented from gaining access to the EU market was 396, which later dropped to 380 in 2006 and further declined to 166 in 2012. Nuts and seed products recorded 244 rejected exports in 2002, which later increased to 707 in 2006 before declining to 468, 424 and 272 in 2010, 2011 and 2012 respectively. Fruits and vegetables had 110 border rejections in 2002, which later rose to 258 in 2006 before declining to 244 in 2010 but later increased to 360 and 479 in 2011 and 2012 respectively. Herbs and spices had 26 instances of refusal in 2002, before declining to 116 and 83 in 2011 and 2012 respectively. In 2002, only 2 consignments of food contact materials were denied access, but by 2006 the number had increased to 109, before dropping to 88 in 2010, and later increasing to 125 and 127 in 2011 and 2012 respectively. In relative terms, cocoa and cocoa preparations and coffee and tea had low numbers of border rejections, with 15 in 2002, rising to 26 in 2006, before declining to 9 in 2010. However, in 2011 and 2012 the numbers increased to 16 and 52 respectively. In absolute terms, the total number of EU border rejections for all foods and feeds products in 2002 was 1049, which later increased to 2197 in 2006 and later rose to 2566, 2845 and 2621 in 2010, 2011 and 2012 respectively. A closer examination of the products that were rejected in this market shows that nuts and seeds, fish and fishery products, fruit and vegetables, and herbs and spices were the main categories denied access to the EU countries.

Table 2: EU Rejections of Foods and Feeds Products

Product	**2002**	**2006**	**2010**	**2011**	**2012**
Nuts and seeds	244	707	468	424	272
Fish and fishery products	396	380	183	217	166
Fruit and vegetables	110	258	244	360	479
Herbs and spices	26	129	153	116	83
Food contact materials	2	109	88	125	127
Cereal and bakery products	3	140	52	64	69
Poultry meat and poultry meat products	112	7	15	14	53
Meat and meat products	37	28	52	50	40
Confectionery	2	34	13	32	37
Feed for food-producing animals	1	12		2	0
Animal nutrition	21	39	0		2
Cocoa and cocoa preparations, coffee and tea	15	26	9	16	52
Total	**1049**	**2197**	**2566**	**2845**	**2621**

Source: Author's Compilation from RASFF and United Nations Industrial Development Organisation (UNIDO)

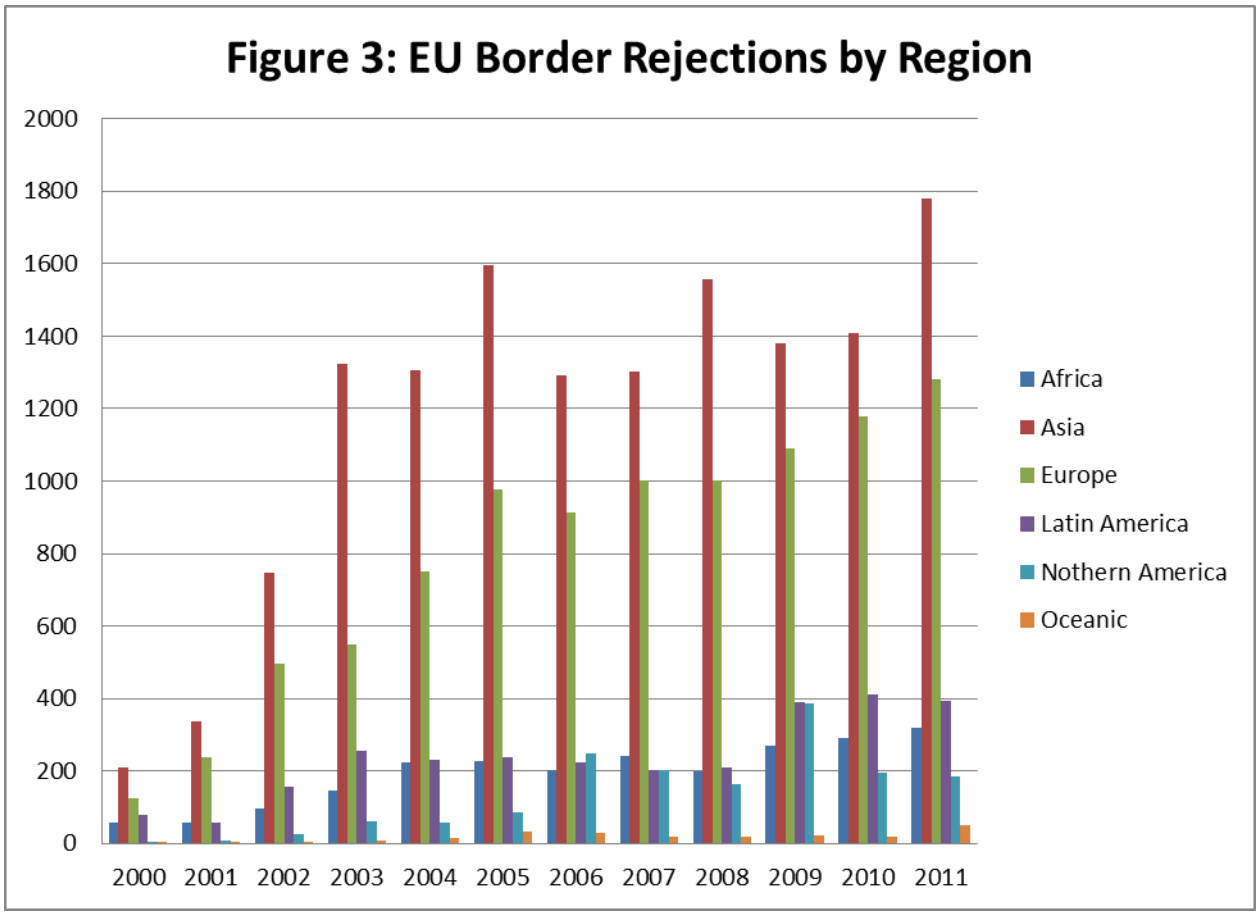
Table 3 shows the reasons for the border rejection of products in the period from 2002 to 2012. The statistics from the RASFF suggest that presence of mycotoxins, especially aflatoxin, in these products was the main reason for many of the refusals at the EU borders. The total number of border rejections due to mycotoxin presence was 6768, which is about 38% of all the reasons for rejection. Other major hazards that affected access to this market were heavy metals in these products, for which 1198 rejections (about 7% of the total) were recorded. Residues of veterinary medicinal products had 1173 rejections, which is about 7%, followed closely by pesticide residues with 1154 (6% of total rejections) and pathogenic micro-organism with 1140 (6%). 1028 products were rejected due to chemical contamination, while food additives and flavouring accounted for 708 and poor or insufficient controls for 709. These were the main reasons for border refusals in the EU market, but this is not to say that other hazards were negligible or could be set aside because all the standard requirements must be complied with. Nevertheless, mycotoxins in the period under review tended to be the most common hazard affecting the market access of food and feed products.

Table 3: EU Reasons for Rejection of Food & Feed Products by Hazard Category

Reason/Hazard	2002	2006	2011	2012	Total[a]	% of EU Total[b]
Adulterated / Fraud	1	1	67	74	216	1.20
Allergens	10		1	3	131	0.73
Biocontaminants		11	5	9	129	0.72
Biotoxin (others)		4			27	0.15
Chemical Contamination (other)	380	5		1	1028	5.70
Composition		24	86	60	459	2.55
Feed Addition			1	33	52	0.29
Food Additive and Flavouring		112	56	59	708	3.93
Foreign Bodies	3	30	119	61	536	2.97
GMO/Novel Food		9	17	52	340	1.89
Heavy Metals		114	107	108	1198	6.65
Industrial Contaminants		14	8	9	155	0.86
Labelling absent/incomplete/incorrect	9	8	16	17	182	1.01
Migration		13	63	51	321	1.78
Mycotoxins		722	514	425	6768	37.55
Non-pathogenic micro-organism			76	50	175	0.97
Not determined/Other	7	45	34	1	406	2.25
Organoleptic	0	24	87	53	422	2.34
Packaging defective/incorrect	4	12	16	18	168	0.93
Parasitic infestation	18	4	59	13	285	1.58
Pathogenic micro-organism		40	114	159	1140	6.32
Pesticide residues	129	15	219	320	1154	6.40
Poor or insufficient controls		18	177	144	709	3.93
Radiation	3	11	12	16	124	0.69
Residue of veterinary medicinal products	356	50	46	18	1173	6.51
TSEs			1		18	0.10
EU Total	**920**	**1286**	**1901**	**1754**	**18024**	**100.00**

Source: Author's Compilation and Calculations from RASFF.

An evaluation of EU border rejection at the regional level can be seen in Figure 3, where foods and feeds from Asia had the highest number of border rejections, totalling 11,473 from 2000 to 2011. This was followed by European products, with the total number of refusals for the same period being 9600. Border refusals from Asia were about 41% of the total EU rejections; from Europe 34%; and from Latin America 10%, with the number of refusals being 2843. The total number of rejections of foods and feeds from Africa was 2328, which is 8% of the total. This trend analysis indicates that the EU also denied access to products originating from Europe due to non-compliance with the standard requirements in the destination countries.



Source: Compilation from RASFF

Statistics for the ten most affected countries in Africa are shown in Table 4. Morocco had the highest number of export rejections in 2002, with 17 of its food and feed exports refused access. This was followed by 16 rejections from Namibia; 13 from South Africa; 9 from Egypt; and 7 from Cote d'lvoire. Ghana, Egypt and Nigeria had the highest numbers of refusals of exports in 2006 with 44, 30 and 29 respectively. Morocco recorded 23 rejections, and Tunisia and South Africa 7 each. In 2012, all these countries recorded double-digit border rejections except Cote d'lvoire, and Morocco and Egypt had the highest number of rejections with 61 and 55 respectively. Thus, during the period from 2002 to 2012 a total of 432 (17% of the total African rejections) food and feed exports were refused entry from Morocco, followed by Egypt with 405 (16%), Ghana with 13%, and Nigeria with 241 (about 10%).

Table 4: EU Rejections of Food and Feeds for the Ten Most Affected African Countries

Country	2002	2006	2011	2012	Total	% Share[8]
Tunisia	5	7	25	15	160	6.45
Morocco	17	23	71	61	432	17.41
Egypt	9	30	55	55	405	16.32
Nigeria	1	29	13	13	241	9.71
South Africa	13	7	26	26	170	6.85
Mauritania	1		13	10	54	2.18
Senegal	4	6	31	47	185	7.46
Ghana	1	44	22	14	317	12.78
Namibia	16	3	1	12	83	3.35
Cote d' lvoire	7	11	3	4	64	2.58
Other Countries	24	39	36	53	370	14.91
Total	98	199	296	310	2481	100.00

Source: Author's Compilation and Calculations from RASFF

A disaggregation of the reasons for the border rejection of African products is presented in Table 5 for some selected countries in the period from 2002 to 2008. A total of 101 exports of foods and feeds from Ghana were denied access due to the presence of product composition. For the same reason, 23 commodity exports were rejected from Egypt, 18 from Nigeria, only one from Morocco, and none from Tunisia. Mycotoxins in food and feed exports led to 130 export rejections from Egypt, 91 from Ghana, 90 from Nigeria, while 5 and 1 were recorded for Morocco and Tunisia respectively. Microbiological contaminants accounted for 44 border rejections for Morocco, 31 and 30 for Tunisia and Egypt respectively; and 30 for each of Nigeria and Ghana. Basically, product composition, mycotoxins, microbiological contaminants, unauthorized food additives and the presence of heavy metals were the main reasons for rejecting foods and feeds from Africa.

[8] This is the percentage share for each country of the total number of border rejections from Africa during the period under consideration.

Table 5: EU Reasons for Rejections of Food and Feed Products, 2002-2008

Reason	Ghana	Egypt	Nigeria	Morocco	Tunisia	Total
Mycotoxins	91	130	90	5	1	5335
Mocrobbiological contaminants	13	30	13	44	31	1740
Veterinary drug residues	0	2	0	0	0	1327
Heavy metals	5	1	10	15	8	1124
Unauthorized food additives	11	8	16	17	24	1009
Product composition	101	23	18	1	0	985
Pesticide residues	0	41	1	30	1	651
Migration	0	1	0	1	0	390
Industrial contaminants	8	1	1	4	2	292
GMO/Novel Food	0	0	0	0	0	280
Foreign bodies	5	11	7	1	16	251
Biotoxins/Contaminants	0	0	0	14	1	215
Radiation	0	0	1	0	0	169
Organoleptic	6	1	2	4	4	160
Bad or insufficient control	6	2	2	5	6	159
Parasitic infestation	0	0	1	1	2	105
Labelling	4	3	1	2	4	98
Packaging	4	0	0	2	1	67
Other chemical contamination	0	0	0	1	0	42
Allergens	0	0	0	0	0	37
Feed additives	0	0	0	0	0	19
Not determined/Others	8	5	2	0	6	403
Total	264	259	164	147	107	14858

Source: Author's Compilation and Calculations from RASFF

2.2 Descriptive Analysis of Africa's Food Exports

The following figures present the trends in the flow of exports originating from Africa to various destinations in the EU as well as the corresponding standards for each of the selected products. Imports of fish from Africa to this market increased overall in the period considered: from $3.2 million dollars in 1995 to $4.5 million in 2000, and later to $7 million in 2010 and $11 million in 2012 (Table 6). However, the cumulative HTPs (standards)[9] for this product rose from 18 standard requirements in 1995 to 27 in 2000. These later increased to 49 different hurdles for Africa's fish exports to pass before gaining access in 2012. This increasing trend in HTPs affected the volume of fish exported. Figure 4 shows that Africa has been witnessing an increase in income, and the average growth rate is 11% over the last three years, but this has not translated into an improvement in fish output for export, because compliance with the technical requirements is still a challenge to exporters.

[9] Including additional standards and minus withdrawn standards.

Table 6: Africa's Exports of Selected Food Products ($ Million)

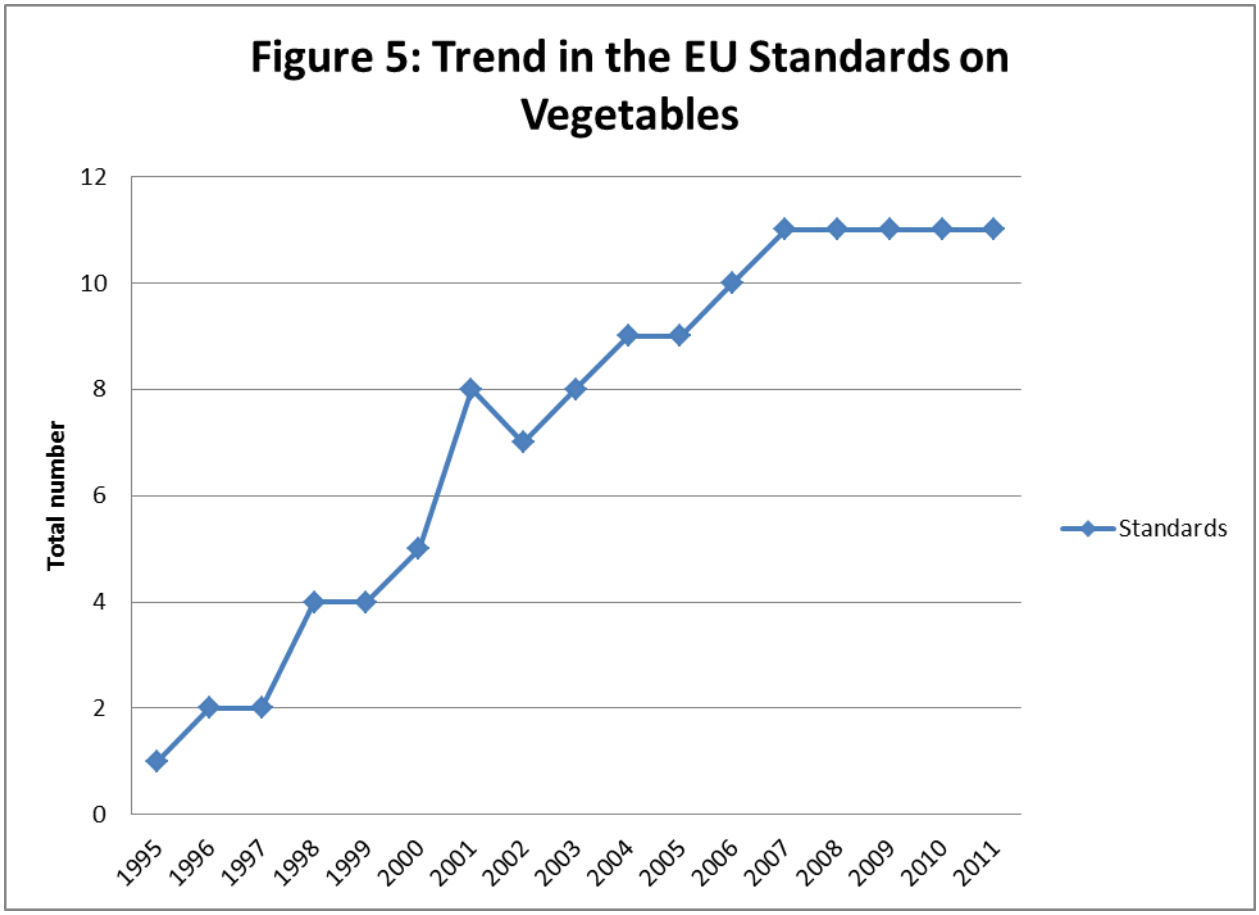
Year	Cocoa	Coffee	Vegetables	Fish	Total Food
1995	1413.53	2002.97	26.67	3.21	10509.34
2000	1033.72	758.83	11.62	4.49	9160.48
2005	2146.73	700.71	19.25	11.97	14668.41
2006	2121.46	711.42	21.83	13.19	15446.45
2007	2637.62	881.52	29.58	12.21	18307.34
2008	3321.99	1025.21	29.26	9.81	20228.37
2009	3321.99	1025.21	29.26	9.81	19102.28
2010	4121.62	1073.82	35.75	6.97	19903.40
2011	4760.41	1566.59	53.98	8.54	22691.06
2012	3711.60	1266.81	41.18	11.05	20291.54

Sourced: UNCTAD Statistics

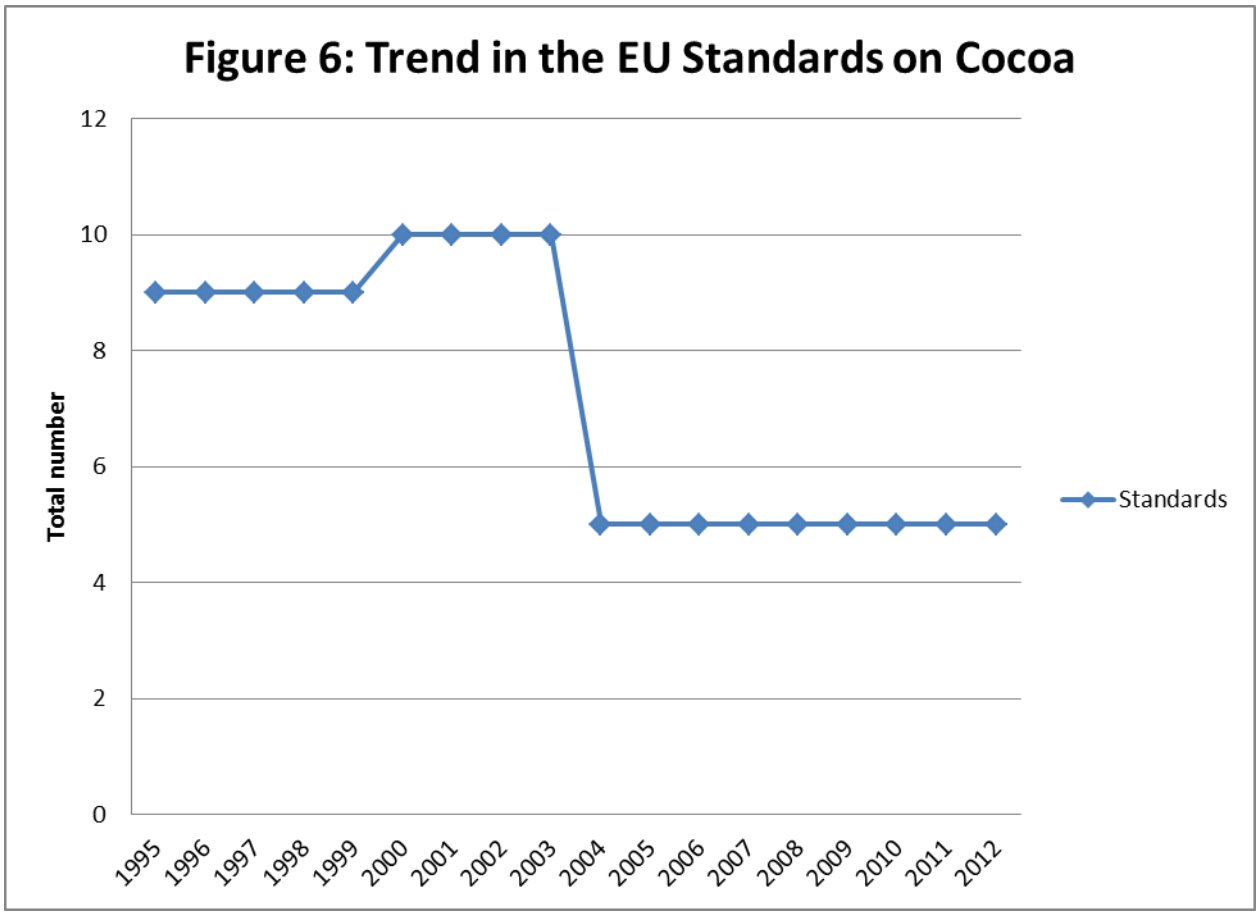
Source: Computed

Africa's vegetable exports to the EU market dropped from $26 million in 1995 to about $12 million in 2000. This was a result of an increase from one to five HTPs in the same period. The volume of vegetable exports managed to rise to $19 million in 2005 before reaching $36 million and $41 million in 2010 and 2012 respectively. The increase recorded for this export was due to stability in the number of HTPs between 2007 and 2012 (Figure 5). Although one might be tempted to say that income growth in Africa relatively boosted exports of this commodity, the volume of exports was not really

commensurate with the economic growth. This implies that more needs to be done to enhance vegetable exports through adequate standards compliance.



Source: Computed

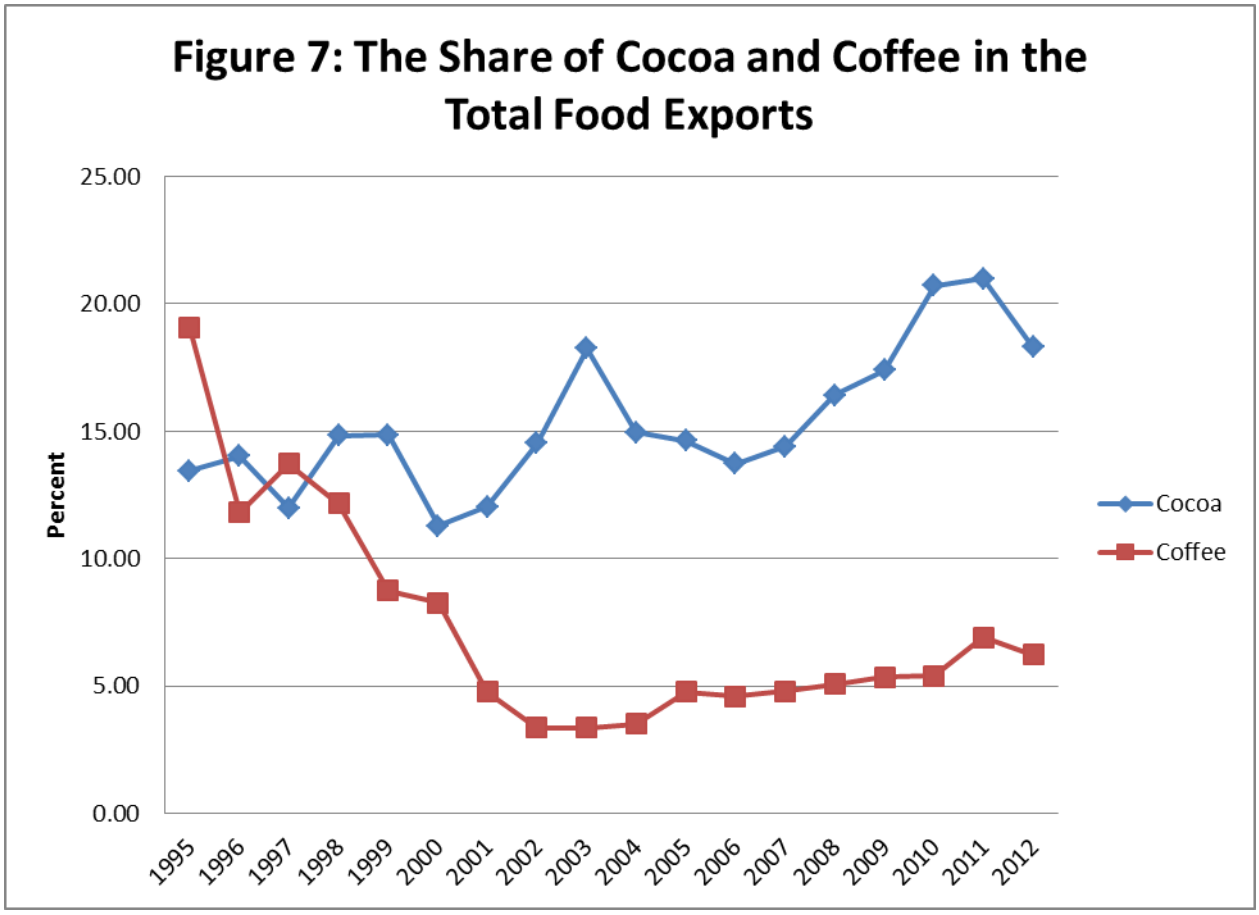


Source: Computed

The number of standards for cocoa has gradually declined over the years, so that there has been stability in these requirements since 2004, with 5 HTPs, after dropping from 9 in 1995. However, Africa's exports of cocoa did not respond appropriately and oscillated from $1.4 billion in 1995 to $1 billion in 2000. They later rose to $2.1 billion and $4.2 billion in 2005 and 2010 respectively, and afterwards fell to $3.7 billion in 2012 (Table 6). The decreases experienced in the last few years were a result of increases in border rejections (see page 9) and strict implementation of the regulations for cocoa in the EU. According to a report by Divine Jr. (2013) the reason for the rising trend in the stringency of the technical regulations was exporters rushing for attractive world market prices for the commodity, which made them neglect the quality requirements in their search for quantity. Moreover, recurring black pod disease epidemics, marauding, and heavy rains wrecked the quality of the products. In addition, ageing of the commodity and the producers as well as the facilities for processing it are other challenges facing exporters. The international Cocoa Organization (ICCO) has been making efforts to assist producers in complying with standards. However, the governments of the major exporting countries have not use the growth experienced in their economies to boost cocoa standard compliance and technologically assist domestic producers to pass these standard hurdles.

Similarly, coffee exports follow the same trend as cocoa, with oscillating figures, as can be seen from Figure 7. They dropped from $2 billion in 1995 down to about $759 million in 2000 and declined to $700 million in 2005. An upward trend of $1 billion was recorded in 2010, and they later rose to about $1.3 billion in 2012. In spite of the relative stability and consistency in the standards for coffee, the exporting countries did not make use of the opportunity through improvement in investment and allocations for the agricultural sector to boost production for export. There are very few technical requirements for coffee in this market, but efforts must be made by governments to assist producers in passing these hurdles through adequate upgrading of the production and processing of the commodity.

In terms of the shares of the selected commodities in Africa's total food exports to the EU, Figure 7 shows that cocoa had the highest share among these products. In 1995, the share of cocoa exports in all Africa's food exports to the EU was 13%, which later declined to 11% in 2000 before rising to about 15% in 2005. It reached about 21% in 2010 and later declined to 18% in 2012. The coffee share was 19% in 1995 and later dropped by more than 50% in 2000, with a further drop to 5% in 2010, before slightly increasing to 6% in 2010. Vegetable and fish exports represent less than 1% of Africa's total food exports during the years under consideration. This is representative of the fact that Africa has not been doing well in exporting high-value food commodities to the EU market, especially of these two products.



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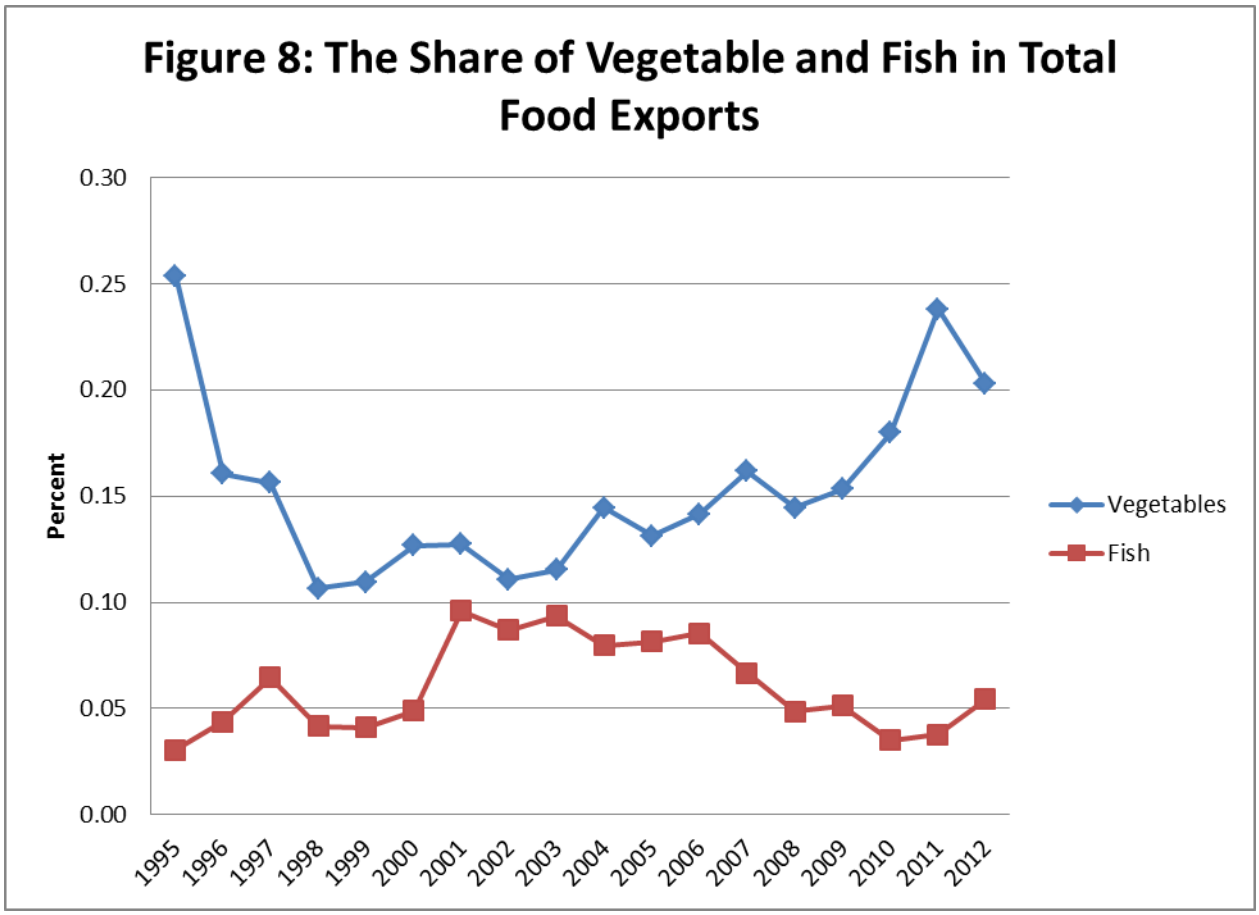

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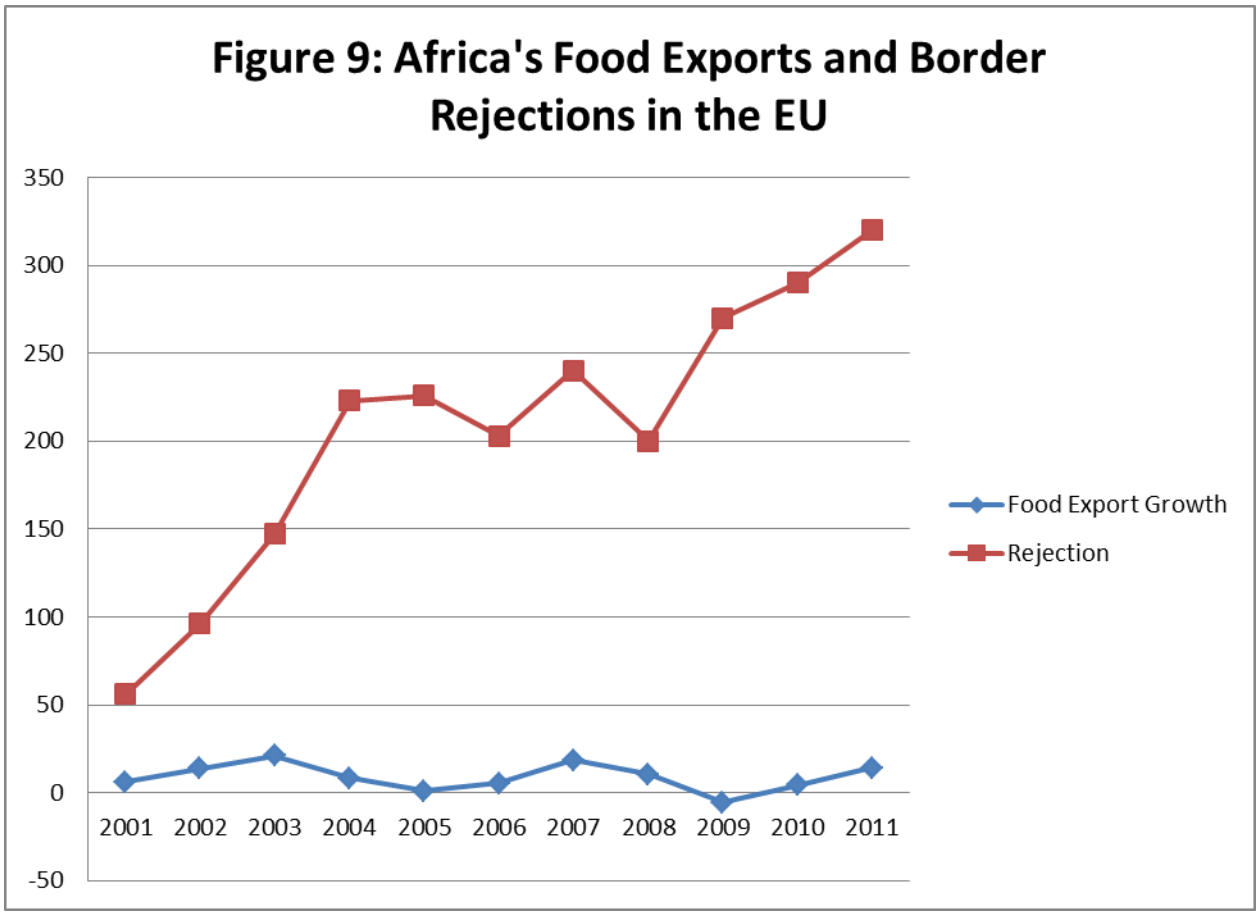
An examination of the trend in border rejections due to food export growth indicates that although border rejections often increase with a growth in exports this is not always the case. For instance, total food exports grew by 6% in 2001 with 56 border rejections. Exports later grew by 21% in 2003 with 147 corresponding border refusals, which later increased to 223 and 226 in 2004 and 2005 despite a reduction in the growth rate of food exports to 8% and 1% respectively. However, when food exports increased to 5% in 2006, border rejections dropped to 203 before increasing to 240 when food exports grew to about 19% in 2007. A similar trend was also witnessed in 2009, when the number of border refusals increased from 200 to 270 with a growth rate of 10% compared to the previous year, when the growth rate of exports had been negative (-6%). In 2010, a positive growth in food exports was recorded (4%) with a corresponding rise in border rejections to 290, before increasing to 320 in 2011 due to a rise in the growth of exports by 14%. Interestingly, the same trend was seen with the products selected[10]. Thus, although, it may be expected that the number of border rejections should increase with a growth in exports, the evidence in this study has shown that this might not always be the case.

[10] Not presented in this study.



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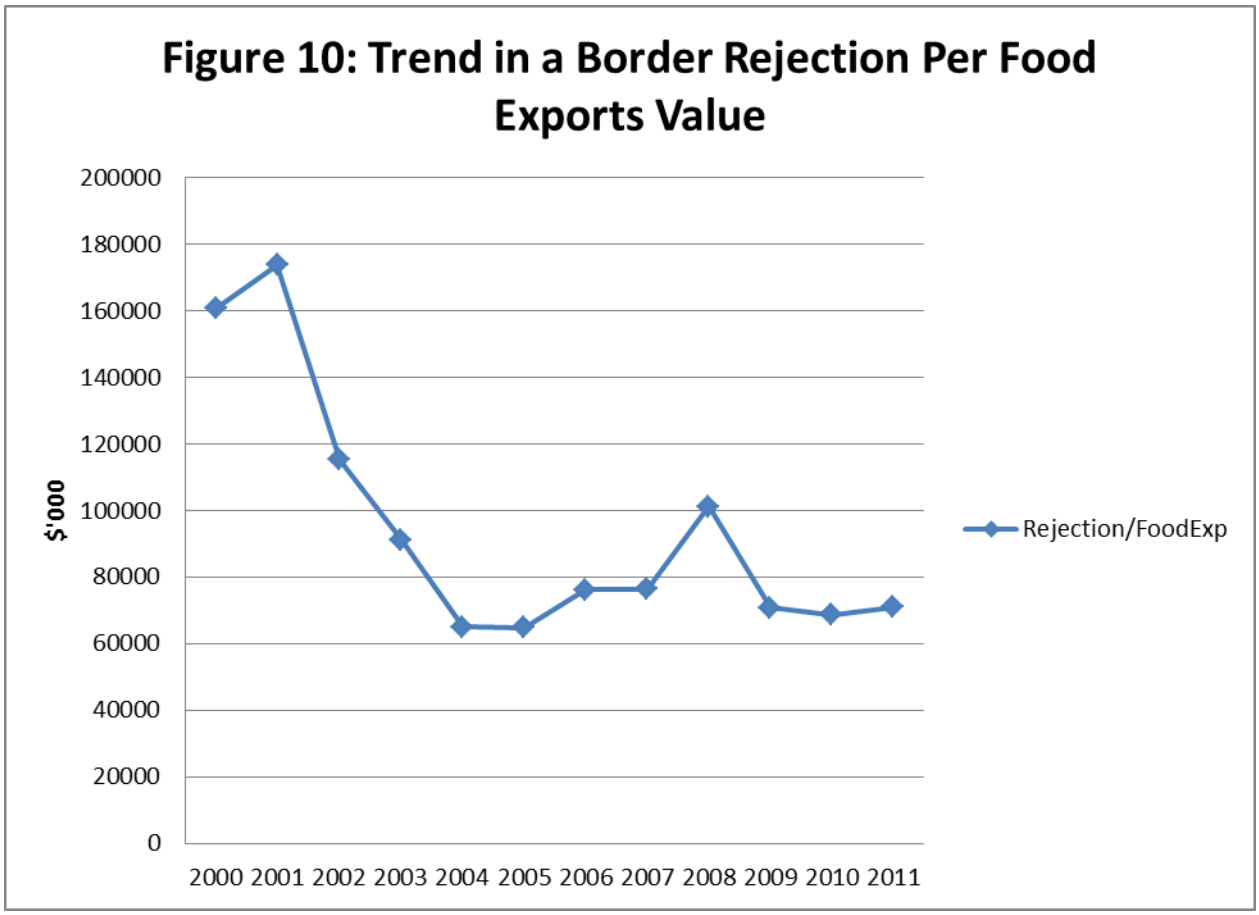
In order to quantify the value of border rejections of African products, Figure 10 presents the trend in the value of border rejections for all food exports from Africa. It should be noted that the downward trend in the curve does not mean a reduction in border refusals according to the value of food exports but the opposite. That is, the value of food export refusals increases as it moves down the curve. For instance, in 2000, for every $160 million worth of food exports from Africa there was a border rejection. This improved in 2001 because for every $174 million approx. of food exports only one border denial was recorded, and the figure later dropped to about $65 million in 2005[11]. A border rejection was witnessed for every $69 million of food exports from Africa in 2010, while the situation was slightly better in 2011 with a rejection for every $71 million worth of food exports.

[11] This means that if the 2005 value had been the same as that for 2001, then about 3 border rejections would have been witnessed.



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3.0 Review of the Literature

Available evidence has shown that tariffs are reducing and their impact is gradually becoming marginal due to bilateral, regional and multilateral trade agreements (WTO, 2012; UNCTAD, 2013; Asci et al, 2013; Kareem, 2010). However, the non-tariff measures in global trade have become prominent trade policy and cannot be overlooked in any trade relations (UNCTAD, 2013; Fugazza, 2013; Haveman and Thursby, 2000; Fugazza and Maur, 2006; Fontagne et al, 2010; Staiger, 2011; Kareem, 2012). Non-tariff measures are measures ranging from safeguard measures such as anti-dumping, countervailing to rule of origin, procurement, subsidies, voluntary export restrictions and quotas to technical barriers to standards and technical regulations, conformity assessment, certification, etc (see UNCTAD, 2013). Among these non-tariff measures, the issue of technical measures has become an important feature in the regulation of global trade (see Fugazza, 2013; UNCATD, 2013). The importance of these technical standards to Africa's exports has been emphasized and investigated by Otsuki et al. (2001), Okello and Roy (2007), and Maertens and Swinnen (2007).

In spite of the importance of SPS to Africa's quest for sustainable development through employment generation, poverty reduction and growth, few studies have been conducted to actually determine the extent to which standards have influenced the market access of commodities. This paucity of empirical studies, which is acknowledged by Shepherd and Wilson (2010), has inhibited research and evidence-based policy formulation by African governments. This had made it difficult to solve the problem of inadequate conformity and inaccessibility of African exports to the markets of its trading partners. Three strands of the literature relate to the trade impact of standards. First, there are studies which conclude that standards are trade inhibiting; second, some studies find standards to be

trade enhancing; and finally some studies argue that standards could be trade inhibiting (in the short run) and enhancing (in the long run). Studies, among others, conducted by Cheminitz, Grethe and Kleinwechter (2007), Wilson and Abiola (2003), Czubala, Shepherd and Wilson (2007), and Otski, Wilson and Sewadeh (2001) show that Africa's exports to developed markets are restricted due to its inability to meet the standards set by these markets. For instance, Mutume (2006) opines that standards that implicitly are aimed at raising African countries' standards to the levels of developed countries result in extra layers of regulatory barriers in developed countries which have shut out cheap exports from Africa.

However, there are studies such as Jaffee and Henson (2005), Henson and Jaffee (2009), Henson and Humphrey (2008), and Maertens and Swinnen (2009) which argue that standards could serve as an impetus for long-run export growth in the agriculture and food sector. They are of the view that standards could act as a bridge between producers in Africa and consumer preferences in developed markets. They could serve as catalysts to improve, upgrade and modernize the food supply system in the continent and this would enhance their competitive capacity. Put differently, McCullough, Pingali and Stamoulis (2008), Swinnen (2007) and Henson (2006) are of the opinion that the trade impact of standards could be both restrictive and enhancing depending on the degree of adjustment of institutions regulating trade. They argue that the rise in standards, both private and public, has led to a sudden change in the organization of exports, and for food exports in particular. This has effects on the distribution of welfare, not only across countries but also along supply chains and among rural dwellers (World Bank, 2005).

A further evaluation of the standards literature indicates that the majority of Africa studies have been conducted on horticulture, of which Kenya has a comparative advantage (see Wilson and Abiola, 2003; Jafee, 2005). Wilson and Abiola (2003) review the impact of standards on the horticultural industry in Kenya and find that the major challenges, apart from changing consumer preferences, are an inability to meet the MRLs in the exporting markets and pest risk analysis. However, the cost of compliance varies with the type of intervention and the crop grown. A case study on Kenya by Carey (2008) on the standards of good agricultural practice in horticulture with the use of government voluntary standards (Kenya GAP)[12] discovers that the creation of Kenya GAP and its benchmarking to global good agricultural practice (GLOBALGAP) has had several positive impacts on the Kenya horticultural sector. This has created jobs, exposed farmers to international standard requirements and also increased the quality as well as the volume of the Kenyan horticultural sector's exports. Jaffee (2005) studies Kenya's fresh vegetable trade in the context of emerging food safety and other standards in Europe together with the challenges and opportunities presented. He examines the challenges of changing regulatory and market requirements and the coping strategy that Kenya horticultural exporters have adopted. He finds that exporters and growers have already accepted that standard compliance is a must, that it is currently required by major importers and will be required by other countries in the future. Therefore, they have improved their product quality in line with these requirements.

A case study by Minten et al. (2006) of a large contract-farming scheme with smallholder producers in Madagascar's vegetable export sub-sector that involves on-farm assessment and extension services indicates that they have to ensure conformity with standards in all their export produce. To buttress this point, Maertens and Swinnen (2009) discuss the outcome of a shift from a procurement strategy that was 95% based on contracting with smallholders to a 50% reliance on vertically integrated production on estate farms in the vegetable exporting sector in Senegal due to a rise in standards. Research has also been conducted on other areas of agricultural exports in Africa. The ISEAL Alliance (2008) in conjunction with the Trade Standards Practitioners Network (TSPN) in Tunisia examines the effects of organic standards on farmers. They discover that the expansion of

[12] These are product standards that are not mandatory by law to exporters, but compliance with which might be required before market access.

Tunisia's organic agricultural sector has significantly improved its commercial and trade performance. Henson and Mitullah (2004) investigate the effects of EU food safety standards requirements on Kenya Nile Perch exports. The imposition of these food safety requirements stimulated Kenya exporters to strive to meet these standards so that their exports could gain access to the market. However, the country's domestic food safety regulations remain weak and obsolete. Due to increased market access restrictions, especially in 1997-2000, efforts were made to upgrade facilities for processing export Nile Perch, which led to a high cost of compliance, while domestic legislation and control mechanisms were enhanced. They conclude that the Kenyan case is one where the risk of loss of market access could lead to a concerted effort to comply with standard requirements. This illustrates the importance of responding to emerging food safety requirements in a proactive and effective manner.

In another study, Rio et al. (2009) evaluate the extent to which investment in standard compliance by private, government and donor agencies has contributed to improving market access to exporters of horticulture in Uganda. The study evaluates the size of the industry and the contributions of these stakeholders towards smallholders compliant with horticultural standard requirements in developed markets. It finds that the size of the industry is small, which affects its profitability and competitiveness, thereby adversely affecting rural income, employment and poverty. The conclusion is that the challenge of compliance is just one of several challenges faced by the horticulture industry in Uganda and that government and donor agencies should look beyond the compliance challenge in the industry to other issues such as management, applied research, technology transfer and access to finance.

Thus, the findings of these studies are influenced by the type of standards that they cover (see Henson, 2006; Henson and Northen, 1998; Henson and Reardon, 2005; Asfaw, Mithoefer and Waibel, 2008; Anders and Caswell, 2009; Disdier, Fontagne and Mimoun, 2008, etc.) and whether they are harmonized or not (Shepherd and Wilson, 2010; Czubala, Shepherd and Wilson, 2007; Chen and Matoo, 2008; Portugel-Perez, Reyes and Wilson, 2009). A meeting point in all these empirical studies relating to the effects of standards on the economies of Africa is that the measures have adverse effects on the continent's exports in the initial stage but the subsequent impact depends on the level of transformation that must take place in the quality of agricultural output.

It is pertinent to note that many of the empirical studies in this area were conducted for countries and regions other than Africa (see Vancauteren and de Frahan, 2004; Chemnitz, Grethe and Kleinwechter, 2007; Schlueter, Wieck and Heckelei, 2009; Crivelli and Groschl, 2012; Munasib and Roy, 2011; Beghin, Disdier, Marette and Tongeren, 2012 etc.). The majority of these studies measure the effects of public standards on developing economies, including some African countries (Beghin, Disdier, Marette and Tongeren, 2012; Manasib and Roy, 2011; Crivelli and Groschl, 2012; Swan, 2010; Maskus and Wilson, 2000 etc.). While little empirical literature exists on private standards (see Henson, 2006; Henson and Humphreys, 2009; Martinez, Fearne, Caswell and Henson, 2007;), recent developments in global trade and standard requirements give relevance to private standards, the evolution of which has been traced by Henson and Humphrey (2009). Among the studies that have worked on public standards, some, such as Vancauteren and de Frahan (2004), Shepherd and Wilson (2010), Swann (2010), Shepherd (2008), Shepherd and Wilson (2013) and Ferro et al. (2013), have used harmonized standards while only a few use non-harmonized product standards (see Maskus and Wilson, 2000).

Furthermore, in relative terms, the literature in this area for other countries and regions is somewhat impressive, although it is still scant given the importance and emergence of NTBs as major market access barriers to countries, especially the developing ones. A WTO (2012) report traces the genesis of the use of NTBs to the period of the General Agreement on Tariffs and Trade (GATT). However, it is only in recent years that the frequency and number of incidences of NTB use have become pronounced, probably due to the continuous decrease in tariffs and the recent global economic crisis, which has affected most developed economies. A diagnostic analysis of the literature on

standards shows that many of the studies were conducted in order to determine the impact of standards on developing economies, including some countries in Africa (see Chemnitz, Grethe and Kleinwechter, 2007; Shepherd and Wilson, 2010; Henson and Humphrey, 2009; Rio and Jafee, 2008; Beghin, Disdier, Marette and Yengern, 2011; Crivelli and Groschi, 2012; Schlueter, Wiek and Heckelei, 2009; Martinez and Roole, 2004; Henson and Jaffee, 2006; and Henson, 2006; etc.). Many of the studies conclude that standards are trade-impeding and the reasons for this, in part, are relatively poor development of science and technology, institutions, management and the absorptive capacity of producers.

According to Jaffee and Henson (2004), the developing countries perceive standards as barriers to exports, either because they lack the technical and administrative capacities needed for compliance or due to the fact that the standards can be applied in a protectionist manner. Martinez and Poole (2004) argue that for developing countries to sustain an international demand for their exports they will need to develop strategic, procedural and structural initiatives which will solidify the confidence and trust of importing countries in the safety and quality of their exports. In a similar vein, Chemitz, Grethe and Kleinwechter (2007) develop an analytical framework that structures the problem of whether, how and the extent to which small producers in developing countries are at the receiving end of the rise in the prevalence of food standards. They argue that small and medium producers can hardly comply with the standards required without support from the actors downstream, while literate and wealthy farmers can easily integrate.

In identifying the legal measures in the European Community's food safety regime that really hinder developing countries' exports of food products, Brobery (2009) proposes three specific measures that could serve as solutions to these problems. These are: an improvement in the harmonization of food safety measures in the developed markets; the European Commission regularly examining the consequences of any new proposed food safety measures for developing countries; and lastly the EU strengthening its provision of development assistance to enable developing countries to comply with its food safety standards. However, Jaffee and Henson (2004) examine the changing standards environment and its effects on developing countries' existing and potential exports of high-value agriculture and food products. The partial evidence they obtain shows that the picture for developing countries as a whole is not necessarily problematic and certainly is less pessimistic than the mainstream 'standards-as-barriers' perspective. This outcome is complemented by Henson and Humphrey (2009a), who infer that the diversity of food safety standards, in their institutional form, scope and prevalence across value chains, belies attempts to draw general conclusions. Although they concur that standards do present challenges for developing countries, especially regarding the role of governmental institutions in the regulation of food safety at the national and international levels, they argue that many of the debates on food safety standards are fuelled by misunderstanding of the reason for the evolution of such standards. In another study, Henson and Jaffee (2008) argue that standards ought to be seen as "catalysts" in the context of food safety in international trade rather than as "barriers" as is the prevalent view in the standards literature. Despite this assertion, the study does not deny the adverse effects that public and private standards may have on agriculture and food exports from developing countries. Rather, they emphasize the need for a strategic orientation when considering the trade effects of food safety standards. The study presents some limited evidence in terms of scope and scale, and stresses the need for further research.

4.0 Empirical Strategy

Many of the studies in the literature that look at the issue of bilateral and multilateral trade relations use gravity models to determine and evaluate the issues raised and to test their various hypotheses. The major reason for the use of these models is that they take care of the political, spatial and temporal factors in trade relations (see Head and Mayer, 2013). The simplest form of trade gravity model assumes that the volume of trade between any two trading partners is an increasing function of their national incomes and populations, and a decreasing function of the distance between them.

The theoretical underpinning of the gravity model is relevant to almost every trade model with full specialization, as shown by Evenett and Keller (2003). The theoretical framework for this study's model is derived from new trade theory, which makes provision for economics of scale and an imperfect market. Bergstrand (1990) provides a description of the link between a gravity equation and bilateral trade patterns in a monopolistic competition framework within new trade theory. Anderson (1979), Bergstrand (1990) and Helpman and Krugman (1985) derive gravity equations from trade models based on product differentiation and increasing returns to scale. The model is also extensively used by Shepherd and Wilson (2010), Czubala, Shepherd and Wilson (2009), Portugal-Perez, Reyes and Wilson (2009), and Shepherd (2007) to determine the impact of non-tariff barriers on exports.

Recently, studies such as Shepherd (2012), UNCTAD-WTO (2011), Baldwin and Taglioni (2007, 2011), Westerlund and Wilhelmsson (2006), Helpma, et al. (2008), Santos Silva and Tenreyro (2009), and Martinez-Zarzoso (2013) have shed light on the appropriate specification, including variables and types of data, to be used in gravity model estimations. Although Anderson and Wincoop (2003) give a sound theoretical micro-foundation for the use of gravity models, their study uses cross-sectional data, which is not the type of data used in the present study. Mayer and Zignago (2006) use panel data covering both developed and developing counties with the imports, GDPs and prices in relative terms. However, Baldwin and Taglioni (2006) show the importance of using the nominal values of these variables for unidirectional trade and GDP at an aggregated trade level. Haveman and Thursby (2000) specify a gravity model for unidirectional trade with nominal values of imports and GDP at a disaggregated product level. In addition, the study uses cross-sectional data for two years – 1994 and 1998 – and includes trade policy variables; A critical review of all these studies and current ones has recently been carried out by Head and Mayer (2013), covering current knowledge of gravity modelling and establishing sound estimation and interpretation techniques of gravity equations for bilateral trade. They argue against a reliance on one particular method for modelling gravity equations and instead advocate a workhorse, toolkit and cookbook approach.

Thus, to investigate the food export effects of SPS in trade relations between Africa and the EU, I adapt the two-stage Helpman, Melitz and Rubinstein (2008, hereafter called HMR) model. It was Heckman (1979) who first developed a gravity model that corrected for sample selection bias and specification error for non-random zero trade. However, a new dimension was brought to the Heckman model with the contribution of HMR (2008), which argued that there will be estimation bias whenever only positive trade flows are considered in trade relations without considering countries that do not trade. This is due to the fact that vital information in the data must have been lost. HMR also found that there was symmetry in the standard gravity model specifications, which was inconsistent with the data and therefore biased the resulting estimation. The HMR model corrects these biases by developing a theory with positive and zero trade flows among trading countries. HMR also derive estimation procedures that make use of information available in the dataset on trading and non-trading countries. Building on Anderson and van Wincoop's (2003) gravity model, HMR develops an estimable trade effect of trade barriers at the extensive and intensive margins of trade in line with Melitz's (2003) model. The HMR model shows the heterogeneity of firms in the industry, while arguing that any model of firm-level export effects of trade barriers not considering the heterogeneity of firms and zero trade would be liable to a selection bias, and it is the inclusion of firm-level heterogeneity in the correction of the sample selection which distinguishes the HMR model from the Heckman model. Hence, the importance of the model in determining the extensive and intensive margins of trade has been emphasized in recent studies (see Ferro et al., 2013; Munasib and Roy, 2013; Crivelli and Groschl, 2012; and Helpman et al., 2008). This study therefore makes use of mostly unexploited standards data from the Perinom database. Specifically, the study tests the null hypothesis that the EU SPS are trade-impeding to Africa's agricultural food exports. To test this hypothesis, a Helpman et al. (2008) gravity model is specified as follows:

$$T_{ijt} = \beta_1 + \gamma_{it} + \rho_{jt} + C_{ij}\vartheta + \pi E_{ijt} + \alpha STD_{t-1ijt} + \varepsilon_{ijt} \quad (1)$$

$$V_{ijt} = \beta_2 + \gamma_{it} + \rho_{jt} + \pi STD_{t-1ijt} + C_{ij}\vartheta + \varphi\sigma_{ij} + \tau_{ij} + \varepsilon_{ijt}, \quad (2)$$

where T_{ijt} is a binary variable that equals 1 if the exports from country i to country j at time t are non-zero; otherwise it is 0 and V_{ijt} is the corresponding value. The intercepts are $\beta_1$and β_2; the importer and exporter time fixed effects are γ_{it} and ρ_{jt}, respectively; C_{ij} is a vector of pair-varying control variables including, among others, distance, language, colonial affiliation and regional trade agreements (RTA). E_{ijt} is the exclusion variable, which does not enter the second-stage regression; τ_{ij} is the unobserved firm heterogeneity – the number of firms exporting from country *i* to *j*, which can possibly be zero, and σ_{ij} is the inverse Mills ratio from the first stage regression. The standards in the equation are STD_{t-1ijt}; , which are the EU harmonized standards. The dates of implementation of the following trade agreements and partnerships that Africa and the Africa, Carribean and Pacific countries (ACP) had with the EU are used: the Lome conventions, the Cotonou agreements, the Every but Arm(EBA) and Generalised System of Preference (GSP) Note that not all African countries are in the EBA, but many of them fall within the Lome, and by extension the Cotonou, agreements. At the end of the Cotonou agreements, when some countries were foot-dragging on the Economic Partnership Agreement (EPA), they were asked to go back to the GSP or EBA.

The regression equation in the first step of this model is a probit regression while the second step is a non-linear regression for the volume or value of trade flows. The second step takes into consideration the selection into trade flows as characterized in the first step with the inclusion of the inverse Mills ratio as one of the explanatory variables. The inverse Mills ratio is the ratio of the probability density function (PDF) and the cumulative density function (CDF) of the normal distribution. This is evaluated at the predicted outcomes divided by the standard error of the probit estimation. The exclusion variable in the first step is one that is highly correlated with a country's propensity to export and not significantly correlated with the volume of exports. Previous studies have used different exclusion variables; in fact Helpman et al. (2008) used common religion in their pioneering study estimating the extensive and intensive margins of trade in a heterogeneous firm model. This study uses common language as the exclusion variable which does not go into the second-step estimation.

Estimation of a gravity model with the flow of trade is often confronted with double biases, in line with Helpman et al. (2008). First, there is the standard sample selection problem in the intensive margins regression, where the sample of non-zero exports is non-random. However, the inclusion of the inverse Mills ratio in the Heckman model as an explanatory variable in the second step is used to correct bias in the coefficients in the second stage. The second bias is the omitted variable bias due to firm heterogeneity in the extensive margin of trade as identified by Helpman et al. (2008). The trade fixed costs and the productivity distribution of firms determine the number of exporting firms. In line with this, it is firms that have productivity beyond a certain threshold that end up exporting. Thus, in this study standards are fixed costs of exporting and therefore affect the extensive margin of trade.

4.1 The Data

The data for this study come from the following sources: the Perinom database provides the product standards data; import refusals are sourced from the RASFF and UNIDO standards compliance database; other trade data are sourced from the World Integrated Trade Solution (WITS) database. The control variables, such as gross domestic products (GDPs), are from the World Development Indicators (WDI). The study covers the period from 1995 to 2012 for 52 exporting African countries in all the estimations. The importing countries are the EU countries and they are all considered in the study. Inclusion of EU countries in the dataset is based on their year of accession to the organisation. For instance, for 1995 15 countries are included, and the number later increases to 25 in 2004 and 27 from 2007 to 2012.

The technical regulations regarding SPS were not in usable form when obtained, as they were written as directives, rules and regulations. These rules and regulations have been coded according to the number of occurrences. Cumulative standards data are used and any withdrawals are deducted and

new regulations added[13]. The following simple formula for the calculation of cumulative standards is used:

$$Z_{t-1}\beta + \rho_t - \omega_t, \quad (3)$$

where β are the initial standard requirements in the first year of the study periods, Z_{t-1} is the previous cumulative number of standards, ρ_t stands for the number of additional standards at time t, and the number of standards withdrawn at time t is represented by ω_t. The formula is applicable from the second year onwards.

The study selects four commodities; two of them are high value and the other two are traditional cash crops. The high-value commodities selected are fish and vegetables, while cocoa and coffee are the traditional cash crops. They are obtained from WITS at the HS-4 digit level. The economic size variables are the GDPs (as employed in any standard gravity model and amplified by Baldwin and Taglioni, 2007) of the importing and exporting countries obtained from the WDI.

5.0 Findings

The results of the two-step HMR model are presented in this section. The extensive margin of trade results are shown in the first part and the intensive margin of trade ones are provided in the second. The robust cluster errors that often arise in this type of model are corrected in the first-step estimation. Multilateral trade resistance variables are included in the estimation of the intensive margins of exports but are not reported in the table due to the large size of the cross-sections. However, they are not estimated for the extensive margins due to incidental parameter problems (see Neyman and Scott, 1948).

5.1 Extensive Margin of Exports: Fish

Table 7 presents the results for the selected agricultural commodities, i.e. fish, vegetables, coffee and cocoa for the extensive margin of exports estimations. The economic mass of the trading partners (exporters and importers' GDPs) propels the probability of exporting African fish to the EU. There is an increased probability of exporting fish by new exporters and by those that have exported in the past but are no longer exporting (disappearing exporters) and would want to export in the future, as well as by those that are currently exporting with a probability of expanding their exports for every instance of economic growth witnessed. Economic growth in the exporting countries enhances the possibility of new firm entries into fish exports. A one percent increase in GDP raises the probability of new exporters, disappearing exporters and existing exporters exporting fish to the EU by 0.29%. Similarly, expenditure on Africa's fish, measured by the GDPs of the importing countries, shows that this commodity is a normal good such that an additional one-percent increase in expenditure on this commodity will enhance the probability of exporting by 0.65%. The EU standards on fish do not hinder the extensive margins of fish exports. This means that the standards are not restrictive in that they prevent exports of fish at the extensive margin and this is statistically significant. This implies that many of the exporters at this margin of trade often considered the standard requirements for market access beforehand and ensured adequate compliance prior to entering the market. This result is in conformity with Maertens and Swinnen (2007), Mangelsdolf et al. (2012), Xiong and Beghin (2011), Lui and Yue (2011), Reyes (2011), Jaffe and Henson (2004), Henson and Humphrey (2009) and Henson and Jaffee (2008). Moreover, some importers assisted many of their exporters and potential exporters technologically in complying with the technical regulations, which is in line with the hypotheses and findings of Okello and Roy (2007). The trade costs by distance proxy does not

[13] That is, if in 1995 there were 2 regulations for a product and in 1996 another 2 were added, then they are added together to give the total number of regulations for the product as 4. If in the following year, 1997, no additions to the regulations are made but one is withdrawn, then for that year the total number of regulations for the product will be 3, and so on.

inhibit exports of fish at this margin of trade, although they are statistically insignificant, while the regional trade agreements do not significantly propel trade. However, common language and price are significant factors at the extensive margin of exports. An inverse relationship exists between price and the extensive margin of fish exports, while language is directly related.

Table 7: Extensive Margin of Trade

Variable	Fish	Vegetables	Coffee	Cocoa
Exporter GDP	0.2940***	0.4590***	0.0031	-0.3311***
	(0.0494)	(0.0399)	(0.0091)	(0.0231)
Importer GDP	0.6524***	0.0053	0.0125	-0.0497***
	(0.0547)	(0.0289)	(0.0220)	(0.0253)
EU Standard	0.1463***	-0.0730	-0.2116***	7.6110***
	(0.0328)	(0.0610)	(0.0457)	(0.8559)
Distance	0.0018	-0.0350	0.3770***	-1.3704***
	(0.2298)	(0.0778)	(0.0876)	(0.0635)
RTA	0.1060	-0.3949***	-0.2865***	-0.7895***
	(0.2048)	(0.1458)	(0.1041)	(0.0635)
Price	-0.0124***	-0.0171***	-0.0465***	-0.4210***
	(0.0030)	(0.0051)	(0.0030)	(0.0344)
Language	0.5341***	0.1839	0.0526	0.0939
	(0.2084)	(0.1709)	(0.1157)	(0.0937)
Constant	-22.8174***	-8.0966***	2.3154***	46.1462***
	(3.0708)	(1.6202)	(1.1231)	(2.5778)
Wald Chi-sq	291.81 (0.0000)	205.36	384.92	463.06
		(0.0000)	(0.0000)	(0.0000)
Observation	7650	8922	10922	6324

Source: Estimations.

Note: All variables are in log form except the dummy variables. The equations are estimated without the multilateral trade resistance variables due to the incidental parameter problem. *, ** and *** denote significance levels at 10%, 5% and 1% respectively.

Vegetables

Africa's GDP impacted positively and significantly on the extensive margin of vegetable exports to the EU, such that for every one-percent rise in GDP there is a 0.45% improvement in the propensity for vegetable exports. Given the fact that vegetables are a high-value commodity, many African countries often promote and encourage export of the commodity through improving investment-friendly domestic policies. Vegetables are an economically insignificant normal good in the EU. There is a virtually negligible marginal propensity to consume this commodity at additional levels of consumer income. This means that tastes and preferences in this market do not really encourage the propensity to export. Thus, the trade intensity effect of EU expenditure on vegetables is indistinguishable from zero. This is similar to Ganslandt and Markusen's (2001) result, although they find a significant propensity to consume. The result also shows that EU SPS on vegetables have insignificant adverse effects on the extensive margin of exports. This could be due to the nature of the commodity, which is perishable. The fact that the commodity needs to be exported the same day that it is harvested will affect prospective exporters that do not have the science and technology to preserve the quality of the commodity. Similar findings are reported by Chen, et al. (2006), Chevassus-Lozza, et al. (2008), and Disdier and Marette (2010). Trade costs do not hinder the flow of this trade and they are economically and statistically insignificant. This implies that trade costs are not important factors

that determine the extent of this export, but improvements in trade facilitations will enhance exports. Trade agreements within these trade relations do not significantly contribute to the extensive margin of export of the commodity, while common language seems to significantly encourage this export at the extensive margin.

Thus, the results for vegetables show that the GDP of the exporters, the SPS required, regional trade agreements and the price level are the relevant and determining factors of vegetable exports to the EU at the extensive margins.

Coffee

The coffee results suggest that the economic mass of the trading partners does not significantly contribute to improvement in coffee exports at the extensive margin. However, the EU standards have a significant negative impact on coffee extensive margins such that for every additional standard requirement exports at this extensive margin decline by about 0.21%. This confirms the findings of Chevassus-Lozza et al. (2008) and Disdier and Marette (2010). Distance does not significantly inhibit the extensive margin for coffee, while the same cannot be said for regional trade agreements because agreements significantly do not impact positively at the extensive margin. The results further indicate that higher prices significantly affect exports at this margin of trade. This means that high costs of compliance often lead to higher prices, which in turn adversely affects exports. Common language is a factor that enhances trade in this commodity, although it is not significant. In summary, at the extensive margin of exports standards, trade costs, regional trade agreements and prices are the relevant determining factors for this commodity. They constitute significant factors to be considered by potential, disappearing and existing countries in Africa exporting coffee to the EU market.

Cocoa

Standards for cocoa are economically significant to the flow of this export. The estimation shows that cocoa standards have a significant direct relationship with cocoa exports, so that prospective exporters are not discouraged even in the presence of standard requirements. An evaluation of the EU directives on cocoa standards indicates that there has been relative stability and consistency in the directives, which gives exporters at this margin of trade leverage in exporting. Income in exporting countries does not significantly propel exports of this commodity. This could be a result of government neglect and the organic production requirements in this market, which Africa is struggling to comply with. This has strongly affected Africa's exports of cocoa to the EU despite the income growth experienced, which could have been used to improve exports. However, according to Agritrade (2012), Africa has redirected its exports of this commodity to Asia because of the stringent market access requirements in the EU. Thus, Africa's cocoa has become an inferior commodity and its consumption has significantly declined due to change in tastes in favour of organically compliant commodities. Trade costs as measured by distance significantly inhibit the flow of trade at the extensive margin. Similarly, regional trade agreements between the trading partners do not significantly contribute to improvements in exports of cocoa. Common language is not significant in the trade relations, although it has the expected degree of association, while the commodity price has significantly adverse effects on demand.

The main determinants of the extensive margin of cocoa exports are the marginal propensity of income in the exporting and importing countries, standards, trade costs, price and regional trade agreements. In general, for all the commodities selected for the extensive margin of exports except for coffee the economic mass of the trading partners is important. Standards are statistically significant for all the commodities except for vegetables and must not be neglected when considering exports to this market. The EU standards on fish and cocoa enhance exports at the extensive margin. Thus, the impact of standards at this margin of exports is commodity specific and so generalization of their impact in the analysis of a single commodity will be misleading.

5.2 Intensive Margins of Exports: Fish

The results for the intensive margin of exports are presented in Table 8, from which it can be seen that Africa's income growth has not translated into increased exports of fish. This implies that the promotion of fish exports, despite the growth being experienced by Africa, has not been encouraging. As more income accrues there is a neglect of expanding exports of fish, which implies that the commodity is not targeted for promotion. Xiong and Beghin (2011) conclude that the trade potential of African exporters is more constrained by domestic supply issues than by limited market access. The EU's absorptive capacity for this commodity is relatively encouraging, which indicates that there is demand for this commodity. In other words, expenditure on African fish in this market would be very encouraging if only supply of the commodity could be expanded and improved upon. This is due to SPS compliance, with the quality of the commodity meeting consumers' tastes. To this end, the EU standards at the intensive margin of fish exports are not significant, although they have a negative sign, indicating that compliance at the extensive margin has helped trade at the intensive margin. This non-significant impact of standards is due to the support and assistance rendered by EU importers (particularly GLOBALGAP) and UNIDO in complying with the standards. This is in line with the conclusions of Asfaw, et al. (2007), Mangelsdolf et al. (2012), Xiong and Beghin (2011), Lui and Yue (2011), and Reyes (2011).

The trade costs associated with exports of fish significantly affect the flow of trade, which might be due to bottlenecks in trade facilitation. Regional trade agreements do not contribute meaningfully to exports of the commodity, while price is not a significant economically inhibiting factor. The significant value of the inverse Mills ratio shows that the selection bias in the model has been adequately corrected for. Thus, at the intensive margin of Africa's fish exports to the EU, the economic mass variables, trade costs and price are the main important determinants of the volume of exports.

Vegetables

This is the other high-value commodity considered in this study. Income in African countries significantly enhances exports of vegetables to the EU, and the relationship in fact is more than one-to-one. This implies that there is high volume of vegetable exports to the EU for every one-percent increase in income level. However, the absorptive capacity for this commodity in the importing countries is insignificant and indistinguishable from zero. Put differently, the propensity in the EU to consume vegetables from Africa is inadequate at the intensive margin. This could be associated with the standards compliance level affecting the intensity of exports. The standard requirements need to be adhered to before market access can be assured, and the results show that the product standards have adverse effects on the intensity of exports. Wilson and Otsuki (2004), Ganslandt and Markusen (2001), and Anders and Caswell (2009) obtain similar results. Distance, although not significant, is negatively related to this intensive margin of exports. Price has an inverse association with intensity of exports and it is also an important factor determining the flow of vegetable exports. The inverse Mills ratio indicates that the selection bias in the estimation has been rectified and the results are robust.

A further examination of the results shows that the GDPs of the exporting countries are important for vegetable exports at the intensive margin. Apart from this, product standards, price and regional trade agreements are relevant factors determining the intensity of Africa's vegetable exports to the EU market.

Table 8: Intensive Margin of Trade

Variable	Fish	Vegetables	Coffee	Cocoa
Exporter GDP	-0.9832*** (0.1678)	2.1454*** (0.2553)	0.6346*** (0.1224)	-0.4378** (0.2164)
Importer GDP	0.4703*** (0.2148)	0.0018 (0.0220)	0.0807 (0.0601)	0.0492 (0.2748)
EU Standards	-2.8467 (2.0021)	-0.3356*** (0.1088)	2.7105*** (0.4151)	-12.1616*** (3.8684)
Distance	-2.0975*** (0.2653)	-0.0350 (0.1016)	1.1005 (0.7416)	0.1669 (0.6882)
RTA	-0.0487 (0.1640)	13.7949*** (4.8108)	-18.2043*** (4.7258)	4.2514*** (1.6541)
Price	0.0171*** (0.0047)	-0.0744*** (0.0125)	-0.2751*** (0.0874)	0.1426 (0.2095)
Inverse Mills	0.8708*** (0.1878)	-28.1910*** (1.0053)	3.3143*** (0.0273)	0.3727*** (0.0816)
Constant	14.4764*** (4.2196)	-17.2420*** (6.0493)	-0.2625 (5.3257)	-28.8076*** (8.4192)
Adjusted R-squared	0.6291	0.5767	0.6487	0.9493
Observations	2848	5574	6479	1394

Note: All variables are in log form except the dummy variables. The equations are estimated with the multilateral trade resistance variables. *, ** and *** denote significance levels at 10%, 5% and 1% respectively.

Coffee

The exporters' GDP directly impacts on the export of coffee to the EU. That is, there is a significant positive degree of responsiveness between exporters' income and exports of the commodity. The degree of responsiveness of coffee exports to changes in income is inelastic. Similarly, the degree of responsiveness of exports to changes in expenditure in the importing countries is inelastic. The absorptive capacity in the importing countries is very low and statistically insignificant. It can also be seen that although Africa's coffee is a 'normal good' in the EU countries it is not significant. Since coffee is a 'normal good' in the EU, efforts must be made to improve the quality of Africa's coffee exports to this market. The standards imposed on the commodity significantly enhance the flow of exports due to the compliance that is witnessed at the extensive margin. This gives leverage at the intensive margin, since a certain level of compliance must have been attained. This indicates that SPS are not problematic to coffee exports; compliance with the standards must have been taken into consideration prior to exporting. This is in line with the findings of Xing and Beghin (2011). Trade costs do not discourage coffee exports at this intensive margin. There might be some improvement in the bottlenecks associated with trade flows. Price has a significant inverse relationship with coffee exports, while regional trade agreements do not significantly contribute to improving exports of coffee to the EU market. The results also indicate that the selection bias in the model has been significantly corrected. Thus, the major determinants of Africa's exports of coffee to the EU market are the level of income in the exporting country, standards, regional trade agreements and the price level.

Cocoa

EU cocoa standards have negatively impacted the flow of exports. The estimation shows that cocoa standards have a statistically significant inverse relationship with Africa's exports, so that any additional technical regulation will lead to more than a 12% decrease in cocoa exports. Although the EU regulations on cocoa had been relative stable and consistent, the prevailing standards are very difficult to comply with for exporters from Africa at this margin of exports, and this is coupled with the supply challenges confronting producers of the commodity (see page 17). Income growth in the exporting countries has not significantly enhanced exports of the commodity, which is due to neglect of the promotion of cocoa by successive governments in African countries. Demand in the importing countries is insignificant due to changes in tastes and preference for organic products, with inadequate science and technology in Africa affecting compliance, leaving Africa struggling to comply. The intensive margin of exports is strongly affected by these preferences. This might be one of the reasons for the redirection of Africa's cocoa exports to Asia, as noted earlier. Thus, demand for Africa's cocoa has become insignificant and expenditure on it has significantly declined due to changes in tastes in favour of organically compliant products. Trade costs as measured by distance do not hinder the flow of trade, although they are not significant. Regional trade agreements are trade promoting and contribute positively to the demand for cocoa.

The major determinants of the intensity of cocoa exports are income of the exporting countries, standards, and regional trade agreements. Hence, the results for all the selected commodities except for fish at the intensive margin of exports show that the product standard requirements are important factors determining market access to the EU countries. Moreover, Africa's economic size, price levels, and regional trade agreements are the essential propelling factors for these exports. Favourable consumer preferences and tastes are found for fish exports, while trade costs are obstacles to the flow of trade in this commodity to the EU.

6.0 Conclusion

The issue of technical regulations on global trade among non-tariff barriers is vital to most countries, especially developing ones and African countries in particular, where compliance is seen as the necessary condition for accessing importing markets. The EU directives and regulations on standards often impact directly on potential and existing exporters. The regulations can also influence consumers' tastes and preferences in the importing countries. This suggests that standards affect the propensity and/or volume of exports in both directions. Stricter SPS will enhance trade only if the costs of compliance are less than the expenditure/demand gain; otherwise they become trade restrictive. The empirical uncertainty of the effects of the EU technical regulations/standards on exports, particularly agricultural products, originating from Africa, demands pragmatic investigation of the export effects of these regulations. Interestingly, despite the importance of this issue to Africa's growth and development, few empirical studies exist. To this end, this study has investigated the export effects of EU SPS in the agricultural food sub-sector. To investigate the impact of standards on Africa's agricultural exports, an evaluation of the trends in African exports of certain selected food products to the EU has been performed. Four food products were selected: two high-value ones – fish and vegetables; and two traditional commodities – cocoa and coffee. There is an upward trend in the demand for the high value commodities in this market while the same cannot be said for the traditional products. Neglect of the promotion and expansion of exports of these commodities has been noticed despite the continent's economic growth.

Furthermore, the standards requirements in the EU market, which I have called the 'hurdle to pass' prior to accessing this market, have been evaluated. The analysis indicates that there are many applicable standards for every product, although at any point in time a particular standard requirement might dominate the reasons for border rejection. The HTP for food products of relevance to Africa have been analyzed for certain countries. The reasons for rejections of exports from Africa at the EU

borders and the hazards that affect these products have been presented. It has been discovered that the hazards are commodity-specific because of differentials in compliance costs and the size of the exporters. The number of export rejections faced by Africa in relation to other continents exporting to the EU market shows that it suffers fewer rejections than Asia and Europe. The border rejections witnessed by the ten countries in Africa most affected have been highlighted and it has been found that overall Morocco, Egypt, Ghana and Nigeria, in that order, are the most affected countries

An empirical review of previous studies has suggested three strands of conclusions in the literature. The first strand argues that standards are trade inhibiting; another that they are trade enhancing; and the third is of the view that they could be either trade enhancing or inhibiting depending on the compliance level, the stage of development of the exporting countries and the choice of standards used in the empirical analysis. This study gives support to the view that the impact of standards on trade is commodity-specific and generalization of conclusions on market access from the analysis of one commodity is not appropriate. Moreover, when not all the applicable standards for products of interest are used in empirical estimations it is inappropriate to make inferences about the market access effects of one selected standard. To this end, the empirical analysis in this study has used all the applicable standards for each of the high-valued and traditional commodities – fish, vegetable, cocoa and coffee – in a HMR model. At the extensive margin of exports, standards are trade enhancing for fish and cocoa, but inhibiting for vegetables and coffee. Africa's income growth has not boosted exports of these commodities despite the potential and favourable tastes and preferences in the importing countries. This gives support to the known fact that Africa has an inadequate export supply and export base, which is due to some supply constraints. Regional trade agreements have not contributed to trade in the products studied except for fish. At the intensive margin, standard requirements do not constitute restrictions to coffee exports, but they hinder the flow of fish, vegetables and coffee. The volumes of exports of fish and cocoa are not encouraging, despite Africa's increasing income, while vegetable and coffee exports are enhanced. Demand for fish encourages exports.

Thus, this study has found that SPS in fish and cocoa are trade enhancing at the extensive margin, but not at the intensive margin. This implies that the propensity to export is enhanced and potential producers learn from market information on the required standards in the market, which enables compliance. The market information is usually obtained from institutional and technological support from governments and development partners. However, standards are trade inhibiting at both the extensive and intensive margins of exports for vegetables, which indicates that the compliance level is inadequate and makes access to the EU market difficult. The technological and logistical requirements for vegetable trade might also contribute to this inadequate compliance, while tastes and preferences in the EU, especially for organic products, which Africa is struggling to comply with, are another hindrance.

Therefore, this study concludes that the impact of standards on trade is commodity-specific because of the significant differences in the application of SPS, the costs of compliance across commodity lines, the size of firms or countries[14], access to development assistance and countries' specific commodity promotion interests. That is, the interest of each exporting country in promoting certain commodities will impact on SPS compliance of other commodities. Furthermore, the level of compliance at the extensive margin often influences the volume of exports. Hence, Africa must invest more on standards compliance in order to ensure improved access not only to the EU market, but to all its export markets. Africa should put in place development partnerships and alliance policies with institutions around the globe to provide technological, institutional and human capacity development support and assistance to the agricultural sector, particularly to commercial and smallholder farmers. In addition, the continent must design and adequately implement inclusive policies that will improve domestic institutions and regulation capacities, as well as putting into consideration the needs of producers and exporters in order to stimulate quality outputs for exports.

[14] See Helpman et al. (2008)

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