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Standards and Food Exports in a South - North Trade: Evidence from the 'Hurdles to Pass' for High-Value Products

Olayinka Idowu Kareem[1]
Jean Monnet Fellow
Global Economics – GGP
Robert Schuman Centre for Advanced Studies
European University Institute
Florence, Italy.

And

Trade and Development Policy Research Network
Ibadan, Nigeria.

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Abstract
The continuous reduction in tariffs due to trade negotiations and agreements among trading partners have brought into fore the importance of the use of non-tariff measures (NTMs) in regulating the flow of trade. The incidences of NTMs have been increasing in the past decades. Technical barriers to trade (TBT) such as technical regulations and standards stand out among other NTMs because of its importance, in terms of product quality assessment and human, animal and environmental safety requirements. Also, its ability to be used for trade protectionism and enhancement of trade flows through quality products that meet the changing taste and preferences of consumers. To many developing and least developed countries, technical regulations, especially standards are trade restrictive such that it added to the series of costs faced by their exporters, particularly in the developed markets, which in fact can almost double the trade barriers effects imposed by tariffs for some products. This has implication for developing countries' export earnings, income and in turns their quest for sustainable development through reduction in poverty, unemployment and smallholder producers' inclusiveness in the trajectory of development. In reality, there are many standard requirements before a product could access any market. Most of the studies in this area often used single standard requirement, however, this study departs from these previous studies by considering all the applicable standards for the selected products, which is called the 'hurdles to pass' (HTP) prior to accessing the EU market. To this end, this study investigates the impact of EU standard requirements on Africa's food exports.

A two – stage Heckman gravity model specification was adopted using mostly unexploited standards data from the Perinom database. Two high value commodities were selected, fish and vegetable, at HS-4 digit level. The findings show that at the extensive margins of export, standards are trade enhancing in fish, while inhibiting the volume of export vegetable. Similar results were obtained at the intensive margins of exports where standard requirements did not constitute restriction to fish export; however, they hindered the flow of vegetable. Thus, this study finds that product standards in fish are trade inhibiting at the extensive margin but trade enhancing at the intensive margins of exports, however, standards at the extensive margins of vegetable export are trade enhancing, while trade inhibiting at the intensive margins. Therefore, I conclude that the impact of standards on trade is product-specific. Hence, Africa must ensure adequate standards compliance not only in the EU market, but in all its markets in order to reduce the cost of border rejections at both the extensive and intensive margins. Thus, as matter of importance, African countries' agricultural policy agenda must include partnership with international institutions in order to support and assist in improving technology for standards compliance.

1. Introduction

The continuous decline of tariffs in trade relations due to the bilateral, regional and multilateral trade negotiations and agreements have brought into recognition the relevance and the preponderance of the use of non-tariff measure (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, in which its use has been

increasing over time. In fact, in terms of the broad type of NTMs, Gourdon and Nicita (2013) present a frequency index, which shows that among these NTMs, technical measures are often the most use. The technical barriers to trade (TBT) such as technical regulations and standards (Sanitary and Phytosanitary measures (SPS)) stand out among other NTMs because of its importance, in terms of the quality of human, animal and environmental safety requirements. Also, in its ability to be used for trade protectionism and/or the enhancement of the flow of trade through quality products that meet the changing taste and preferences of consumers. To many least developed countries (LDC) and developing countries, technical barriers to trade, especially standard requirements[2] (SPS) are trade restrictive such that it's added to the series of costs faced by their exporters, particularly in the developed markets. These NTMs can almost double the trade barriers effects imposed by tariffs for some products (Moise and Le Bris, 2013).

Further, Fugazza (2013) posits that the increasing incidences of TBT and Sanitary and Phytosanitary measures pose concern for developing countries' exports, particularly the TBT that is mostly used. An average of about 30% of products and trade are confronted with TBT, while that of SPS is 15% of trade in countries, especially the developed ones (Fugazza, 2013). This has implication for developing countries' export earnings, income and in turns their quest for sustainable development through reduction in poverty, unemployment and smallholder producers' inclusively 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) has identified trade among other channels[3] with which countries could integrate into the global market. Trade channel of global integration has been explore by African countries, however, the gains from trade as advocated by orthodox trade theories has not been fully realized due to the quality of the exports, export base and their development stages as well as the protectionism nature of TBT. Many African government and some scholars (see Cheminitz, Grethe and Kleinwechter, 2007; Otski, Wilson and Sewadeh, 2001) opine that standards are trade restrictive as being used, however, there are some studies such as Henson and Humphrey (2008), Maertens and Swinnen (2009) that have concluded that these technical regulations due to increasing

2 The type of standards is public standards, which is mandatory and different from the private standards.

3 Other channels are investment, migration, finance, global governance and environment.

demand for quality products, change in taste and preferences of consumers in importing countries, especially in developed markets, would enable producers/exporters to engage in product upgrading that will enhance market access of the products. Although, in the short run, the producers/exporters might incur some compliance costs, but in the long run, these costs will stabilize and thereby enhance their exports to these markets. In reality, there are many standard requirements before a product could access any given market. Most of the studies in this area often used single standard requirement, for instance Liu and Yue (2011) used the Hazard Analysis Critical Control Point (HACCP) on EU orange trade, Otsuki, Wilson and Sewadesh (2001) quantified the impact of EU aflatoxins on African exports of cereals, dried fruits and nuts, Jun Yang and Findlay (2008) investigates 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) used MRL of pesticides on China's tea export, Xiong and Beghin (2011) used the tightening of the EU maximum residue limit (MRL) on aflatoxins in 2002 on Africa's export of groundnut, etc. However, this study departs from these previous studies by considering all the applicable standard requirements for the selected products. Another contribution to the literature is the coverage of the study that included four products, high value and traditional cash crops, which are rarely combined in empirical analysis. Also, the use of mostly unexplored Perinom standards data in the two-stage Heckman model, are very scare in the literature, especially those with African trade data. The product safety requirements for the selected exported products are called in this study 'hurdles to pass' (HTP) for such products prior to accessing the EU market. Although, in every product, certain standard requirement might be dominant[4] among these requirements, but all the requirements must be complied with before accessing the market. To this end, this study inquires the following; do the EU standard requirements enhance Africa's exports? What are the standards required for agriculture exports in the EU? Is there any border rejection or refusal in this market for Africa's agriculture exports? Thus, from these research questions, this study draws its objective, which is to investigate the impact of EU standard requirements on Africa's exports.

1.1 The Motivation

A perusal of the literature on standards shows that there are different indicators that have been used to measure standards. Most often studies in this area use aflatoxin (a measure of

4 For instance, aflatoxin in groundnut, cereal and other products.

mycotoxin in food products) to measure standards (see Otsuki et al., 2001; Wilson and Otsuki, 2003, Xiong and Beghin, 2011), also we have studies that have used maximum residual limits (MRLs) in chlorpyrifos and oxytetracycline in vegetables and aquatic products such as Yua Yang and Findlay (2008) , those that used MLRs in pesticides such as Wei et al. (2012), Ferro et al. (2013), MRLs in antibiotics (Wilson et al. 2003) while some have used only the hazard analysis critical control points (HACCP) as indicator to measure standards (see Liu and Yue, 2011). The convergence of all these studies that have used one measure of standards is that their conclusions are based on the fact that those measures of standards that they have used were the ones that impacted on the market access of the selected export products[5]. However, none of these studies have clearly shown that for each export item that they have considered, had more than the standards indicator (s) they have used. For instance Otsuki et al (2001),Wilson and Otsuki (2003), Xiong and Beghin (2011) used aflatoxin as a measure of standards on vegetable, fruit, groundnut, etc, but in reality, there are more than eight applied product standards to these products.

Further, using MRLs in pesticides as a measure of standards, Ferro et al. (2013) and Wei et al. (2012) investigate the impact of this standards measure on agricultural food products and concluded that the standards requirements in the importing countries inhibit export of these products to the developed markets, but available evidences from World Trade Organisation (WTO), Perinom, Food and Agriculture Organisation (FAO) and EU Rapid Alert System for Food and Feeds (RASFF) standards statistics show that there are more applied standards than the MRLs in pesticides as 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 indicator (s) have they used are the most relevant product standards applied to such export items (see Fugazza, 2013, Cipollina and Salvatici, 2008; Shephaerd and Wilson, 2013; Czubala et al., 2007), however, UNIDO (2010) and RASFF (2013) show that all the applied standards are equally relevant and important that require compliance, of which non-compliance will lead to border rejection of the products.

To this end, it could 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 would

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

be unreliable and bias that will not be efficient in showing the impact of applied standards on such selected product (s). At best, what ought to be done by these studies is to make their inferences and deductions with respect to the impact of the chosen product standards on the selected products and not on the market access of the products since other applied standards to the product are not considered[6]. The generalization of the impact of one product standard on market access of such product would be misleading and will not give us efficient information[7]. 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 shall only be affected by price changes will be inappropriate. Even in the case where simplicity assumption is made by holding other determinants of demand and supply constant, there will be limited applicability of the concluding assertions. 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 generalization of findings, which conclusions on market access of the product (s) might be misleading and biased[8]. Although, one of the reasons often adduced for using a single measure of applied standards is due to the fact that standards data are not easy to obtain, and when obtained, they are not well organized from the sources and more so, getting the time series is very challenging. However, this study has documented the trend and accumulated the time series of the applied product standards in the EU for some agricultural products. Perinom datasets were explored to document this time series of standards data. I have used all the applicable standards to each of the selected agriculture food exports to the EU as were reported by these sources.

Further, most of the few studies in this area on Africa usually focus on horticulture high valued products, with little consideration for aquaculture. To this end, this study finds this as a gap that needs to be filled, which inform this empirical investigation in order to determine the effects of HTP on the propensity and volume of exports. The presentation and analysis of

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

7 Fallacy of hasten generalization.

8 Their conclusions ought to be that the selected product standards has certain effects on the products, but does not necessarily indicate that the product (s) might be refused or rejected at the border. For instance, compliance with the aflatoxin requirement does not necessarily mean market access, because other applied standards to the products must be satisfied and comply with before border access.

the incidences and number of border rejections of these exports originating from Africa are rarely done and has not been seen in any empirical study, which also differentiate this study from the previous one who are much concern about the application of the model to trade data than the contextual issues surrounding the study. Thus, the coverage of this study makes use of high value horticulture and aquaculture products with their corresponding standards data from Perinom database, which provides different dimension to the issue under consideration.

2. Export Structure and Performance

In terms of the structure of Africa's exports, although, it has been widely said that Africa exports little commodities to the global markets and this is the reason that they have not been having their fair share in global trade, however, the few products that Africa exports, how are they been fairing? And which markets are they being demanded? All these shall be answered in table 1.

Table 1 shows the export structure of Africa by partner and product group. In the category of all products exported in Africa, in 1995, over US$103 billion worth of products were exported to the rest of the world, out of this amount US$70.3 billion went to the developed countries, which is 68% of the total exports of all products. Developing countries got US$24 billion, which is about 24% of the exports. From the share of the developed countries, EU got the highest of about 35%, followed US, Japan and then Canada. Also, in 1995, Africa exported 10.4% of the share of developing countries in the all products category to Africa, though this is less to the share of all Asia excluding Japan that is 10.8%, while America got 2.3%. By 2005, the share of developed countries from the all products category has dropped to 66.7%, which further reduced in 2009 to 59.3% while that of developing countries rose to about 31% and later rise to 40% in 2009. Out of the proportion of the developed countries, EU maintained it lead though the share fell to 40.5% and later declined to 35.5% in 2010, while US recorded about 19% followed by Japan 3% and Canada about 2%. By 2009, US share has declined to about 17%, while Canada and Japan had 1.9% a piece. Asia got the highest in the developing countries share with 17% followed by Africa 10% and America 3%. Africa's exports going to Asia increased in 2009 to 24%, while that Africa rise to over 12% and America got 3.1%. The implication of this is that Africa has been trading more with the EU than any other countries in the world, though; their share has been falling over time.

Another thing to deduce from the table is that Africa has started focusing on South-South trade, despite the tariff structure in the bloc (South-South) that is relative high.

This same trend continued in the all food items category. Though, the share of developed countries has been depleting over the years, they still have the lion share of Africa's export of all food item. The developed countries recorded about 73% of all food items exported by Africa in 1995, while developing countries got over 23%. By 2005, about 62% of the total all food items exported went to developed countries, a drop of 11% to the 1995 share, while the proportion of these items exported to developing countries increased to about 34%, of which 20.5% of it went to Africa, which is more than the share of Asia that is 12.7%. However, in 2009, the developed countries share had dropped to 54%, while that of developing was 42% of which Africa got over 22%. This means that intra-Africa trade in the category of all food items has been improving over time and that most of the countries in Africa have now started to open up their economies to their fellow African exporters. Also, developing countries have been allowing the export of all food items to their markets. This is contrary to EU, which could be seen from their share of all food items of Africa that is declining, however, the US and marginally Canada have opened their economies to the export of Africa's all food items to their economies, which could be seen from their share of Africa's all food items category (see table 1).

In the category of Agricultural raw materials, most of these products were exported to developed countries in 1995 all through 2000, but by 2005 to 2009, the developing imported more of Africa's Agricultural raw materials. Precisely, in 1995, about 60% went to developed countries, but by 2005, it has fallen to 48%, of which 47% went to EU in 1995 and 37% in 2005. The share of the US fell marginal from 3.9% to 3.1% in 1995 to 2005, respectively. Japan imported more of Africa's agricultural raw materials than US as they recorded 6.4% in 1995 and fell to 6% in 2005. By 2009, developed countries share in Africa's Agricultural raw materials declined to 46% of which the EU had 38%. However, developing countries recorded an increased in their import of African agricultural raw material. It got 50% in 2005 from 39% in 1995, which later increased to over 53%. Out of this Asia got the highest with a rise from about 25% in 1995 to 35% in 2005 and later 41% in 2009, while Africa recorded 14% in 2005 from about 13% in 1995 before declining to about 10% in 2009. The implication of this is that Japan opened her markets to Africa's agricultural raw materials than

US and Canada, while Asia has been liberalizing her markets to Africa's agricultural raw materials.

The share of developed countries in the Ores and Metals category has been increasing over the years. This might be due to the importance of Ores and Metals to their industrial sector and the development of their various economies. For instance, developed countries imported about 66% in 1995 and by 2005 it has risen to about 68% before dropping to 55% in 2009, of this EU got 41.5% in 1995 and fell to 29% and 22% in 2005 and 2009, respectively. The US share rose from 7.7% in 1995 to about 13% in 2005 before declining to 6% in 2009, while Japan got 10.6% and about 15% as well as 7% in 1995, 2005 and 2009, respectively. From the share of developing countries of 32.5% in 1995, Asia got 23.5%, while that of Africa is 7.7%. However, by 2005, the developing countries share dropped to about 26%, of which Africa has 7% while Asia got about 18%. In 2009, the share of developing countries rose to 44%with Africa recording about 10% of it. The implication of this is that developing countries have been restricting the imports of Ores and Metals to their economies, except for recent years. While developed countries such as the US and Japan have relatively opened up their borders to Africa's exports of this category of products.

Table 1: Africa's Export Structure by Partner and Product Group (Millions of Dollars)

Destination / Origin	Year	World	Total Developed Countries	EU	Canada	US	Japan	Total Developing Countries	Africa	America	Total Asia
All product ($Million)	1995	103430	70315	46400	1009	15363	3347	24317	10775	2367	11166
	2000	148712	95300	61540	1800	25778	2462	40828	14588	4709	20939
	2005	271001	180714	109652	5143	50275	8285	83407	27972	9004	46070
	2009	372273	220878	132068	7221	62046	6910	147299	45864	11639	90061
All Products (%)	1995	100.0	68.0	44.9	1.0	14.9	3.2	23.5	10.4	2.3	10.8
	2000	100.0	64.1	41.4	1.2	17.3	1.7	27.5	9.8	3.2	14.1
	2005	100.0	66.7	40.5	1.9	18.6	3.1	30.8	10.3	3.3	17.0
	2009	100.0	59.3	35.5	1.9	16.7	1.9	39.7	12.3	3.1	24.2
All Food Items (SITC 0+1+22+4)	1995	100.0	72.6	58.6	0.6	3.5	6.5	23.4	14.3	0.5	8.6
	2000	100.0	60.8	47.3	0.7	4.5	5.6	34.3	20.3	0.7	13.2
	2005	100.0	61.6	49.6	0.8	5.4	3.5	33.7	20.5	0.4	12.7
	2009	100.0	54.2	43.7	0.8	5.6	1.9	42.7	22.4	1.9	18.3

Agricultural Raw Materials (SITC 2-22-27-28)	1995	100.0	59.6	47.3	0.2	3.9	6.4	39.4	12.9	1.5	24.9
	2000	100.0	54.6	42.9	0.2	3.3	5.4	44.6	15.2	1.6	27.8
	2005	100.0	48.3	37.0	0.1	3.1	6.1	50.2	14.4	0.6	35.2
	2009	100.0	46.3	38.3	0.2	3.1	3.1	53.2	9.9	2.3	40.8
Ores and Metals (SITC 27+28+68)	1995	100.0	65.8	41.5	1.7	7.7	10.6	32.5	7.7	1.3	23.5
	2000	100.0	66.5	42.4	1.2	8.7	9.0	31.0	8.1	3.3	19.6
	2005	100.0	67.5	29.1	0.8	12.6	14.7	25.8	7.1	1.0	17.6
	2009	100.0	54.7	21.6	3.2	6.2	7.1	44.0	9.9	0.6	33.6
Fuels (SITC 3)	1995	100.0	78.3	46.0	1.6	27.1	1.0	18.0	5.3	3.5	9.2
	2000	100.0	70.1	40.2	1.6	26.7	0.4	27.4	5.3	4.7	16.7
	2005	100.0	68.6	37.1	2.7	26.3	1.4	29.5	5.8	4.7	18.9
	2009	100.0	63.5	35.1	2.3	23.8	0.9	36.0	6.6	4.3	24.8
Manufactured Goods (SITC 5 to 8 less 68)	1995	100.0	64.1	48.3	0.6	7.1	2.4	34.1	20.1	2.4	11.6
	2000	100.0	65.8	50.0	0.5	8.8	1.7	28.1	16.9	1.7	9.5
	2005	100.0	66.6	50.8	0.6	7.7	3.3	32.0	18.1	2.1	11.7
	2009	100.0	53.3	40.7	0.8	8.6	1.3	45.7	26.4	1.8	17.3

Source: Author's Compilation from UNCTAD Handbook of Statistics (Several Years)

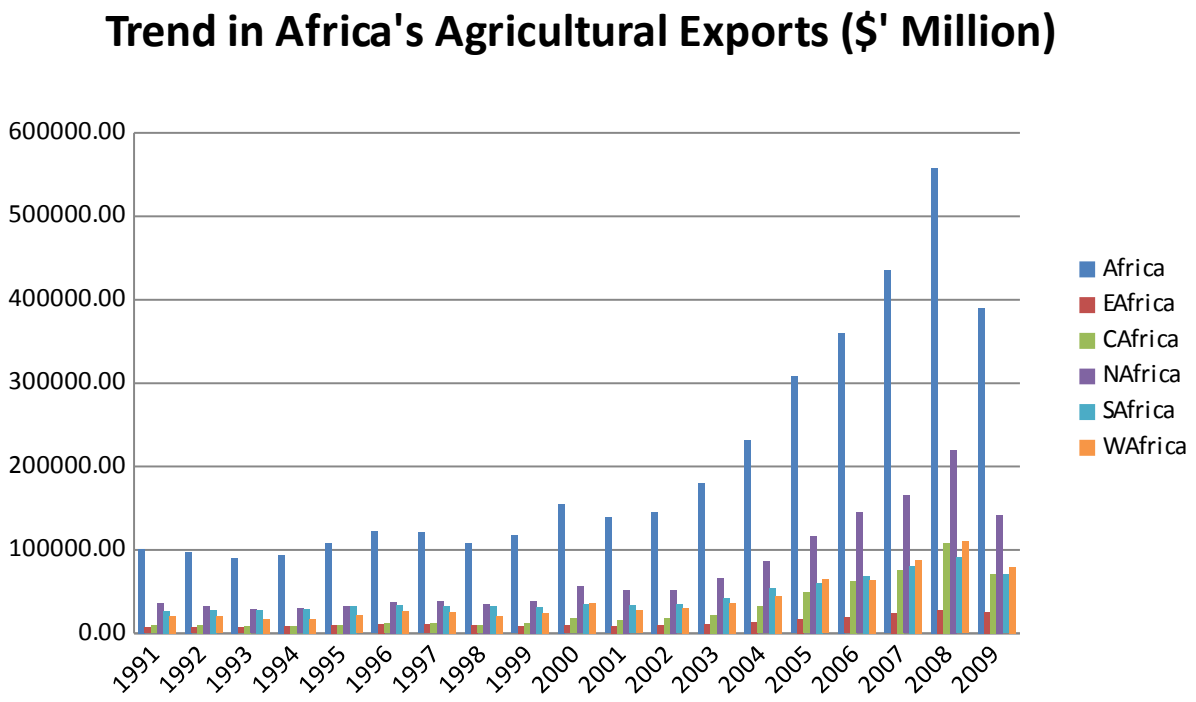
In the category of fuels (SITC3), developing countries have improved their importation of the products, especially Asia; they have reduced the trade restriction that will not allow the access of these products to their markets. For instance, of the share of developing countries in 1995 that is 18%, Asia took more than half, while by 2005; they got more than half, which is more than the double of the share in 1995. Same trend was recorded in 2009 for developing countries. The share of the developed countries decreased from 78% in 1995 to about 69% in 2005 and further decreased to 64% in 2009. Out of this the EU accounted for the largest share out of developed countries share with 46% in 1995 and later fell to 37% and 35% in 2005 and 2009, while US recorded 27%, 26% and 24% in 1995, 2005 and 2009, respectively.

Africa's manufactured goods exports were allowed access to the developed countries; this is due to the low level of tariffs imposed in manufactured goods by the developed countries. The developed countries got 64% in 1995 and later rose to about 67% in 2005 before declining to about 53% in 2009. The EU recorded the highest share with 48%, 51% and 41% in 1995, 2005 and 2009, respectively. The share of US and Japan also increase from 7% to 8%, then 9% and 2% to 3% then 1%, respectively, in the period under review. Surprisingly, African countries have been closing their borders to manufactured goods emanating from the continent e.g. the share of Africa reduced from 20% to 18% in 1995 and 2005, respectively. And by 2009, it increased to over 26% due to regional integration arrangements within the continent. However, relatively Asian countries have allowed Africa's manufactured goods access to their market than African countries themselves.

2.1 Agricultural Sector's Performance

Agricultural sector has been and will always be an important sector to African economies. This is because the sector has been the major employer of labour and earner of foreign exchange to many of the countries. Prior to three decade or more, most African economies are agrarian such that most of the foreign exchange earnings in most countries in Africa are from the sector. However, due to the discovery of natural resources in commercial quantities in many of the countries, the sector was neglected and its performance has been dwindling.

Figure 1

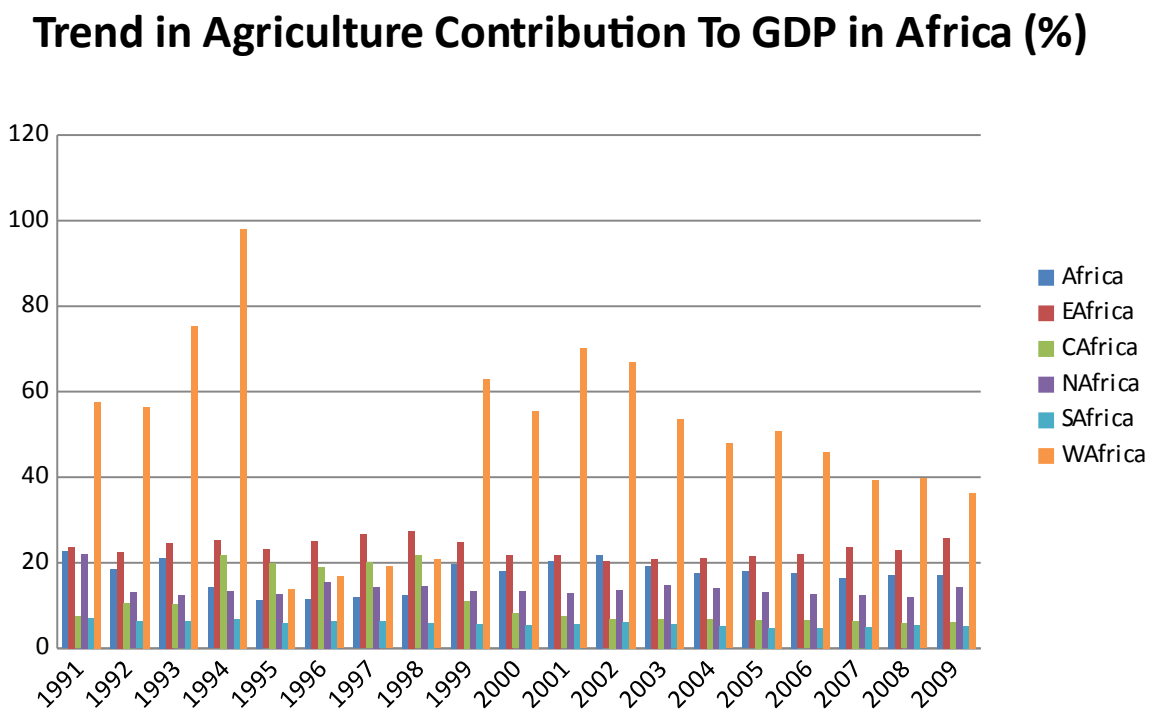


Source: FAO Statistics Database

This could be seen in terms of its exports and contributions to the GDP in Africa. Figuret 1 shows that in 1991, Africa exported $100.9 billion worth of agricultural products to the world and this later reduced to $93 billion n 1994. This reduction was as a result of inadequate supports and infrastructure that would encourage agriculture production for export. By 2000, Africa's agricultural exports had risen to $154.9 billion, which further increased to $307.9 billion in 2005. These increments were due to efforts by various Africa governments to encourage and promote agriculture production for export, especially in their quest for diversification of their economies and expansion of export base. This further yielded positively as the value of export increased to $558 billion in 2008, however, due to the global economic meltdown, which affected the demand of Africa's agricultural export, the total amount of agricultural exports declined to about $390 billion in 2009. Disaggregating Africa's exports by sub-regional groupings, North Africa had the

highest agricultural exports all through the period under consideration, while it was followed by Southern Africa except for 2007 to 2009 where West Africa recorded more agricultural exports. Examining the contribution of agriculture to the gross domestic products (GDP) in Africa, it could be said that this contribution has not been encouraging and interesting, in spite of the importance of agriculture to African economies. For instance, in 1991, this contribution was about 23% and by 1995, it has declined to 11% (reduced by over 50%). This actually complemented the reduction in the agricultural exports experienced in the same period. However, the little encouragement agriculture sector got from African governments in the subsequent years yielded positively and it increased its contribution to the GDP in 2000 to 18%, before further increasing to about 22% in 2002. By 2009, the contribution of agriculture to Africa's GDP dropped to 17% (see Figure 2) as a result of inadequate investment promotion in the agricultural sector.

Figure 2



Source: UNCTAD and FAO Statistics Databases

2.2 The Hurdles to Pass in the EU for Selected Products

A perusal of 'hurdles to pass' (HTP) in the EU market for all product lines, especially foods and feeds indicates that more than one hurdle (standard requirement) needs to be passed or is place on a product before accessing the EU market[9]. Four different products are selected at HS-2 digit level in order to examine their HTP. The choice of the products was informed by the availability of the standards at the Rapid Alert System for Food and Feed (RASFF). Table 2 presents different HTP for these products as prerequisite for market access to the EU market. Fish and fishery products have 10 HTP that are always examined before these products could access the market. Fruits and vegetables have 11 HTP that must be complied with otherwise market access will be denied. Mycotoxins, microbiological contaminations, foreign bodies, radiation and not determined/other are HTP required for nuts and seeds 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 HTP that are used in this study are those standards imposed for the period from 2002 to 2012. Afterwards, there might be withdrawal and/or additional to the HTP requirements.

Table 2: The EU Standard Requirements for Some Selected Products

Standard	Fish & Fishery	Fruit & vegetable	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			

9 This is based on Rapid Alert System for Foods and Feeds (RASFF) statistics.

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 Rapid Alert System for Foods and Feeds (RASFF).

2.3 EU Import Refusals/Rejections of Foods and Feeds

The access of a commodity to any import market will depend largely on its fulfilment of the conditions required for market access. The EU has product standard requirements (i.e. HTP) for all product lines. In this section, I have examined the EU standards that are applicable to foods and feeds, especially those that are relevant to African countries. Table 3 presents the EU border rejection of foods and feeds products, in terms of the volume of exports that were prevented from accessing the EU market. 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. Fruits and vegetables had 110 border rejections in 2002 and the volume of border rejection of the products rise in 2006 to 258 before declining to 244 in 2010 and later increased to 360 and 479 in 2011 and 2012, respectively. In absolute terms, the EU total border rejections for all 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 fish and fishery products, and fruits and vegetables were mostly denied access many of the EU countries.

Table 3: EU Rejection 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 and 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 preparation, 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)

An evaluation of the EU border rejection at the regional level could be seen in table 4 where Asia foods and feeds had the highest border rejection in this market totalling 11473 from 2000 to 2011 that was followed by the European products with the total volume of refusal for the same period being 9600. While Asia border refusal was about 41% of total EU rejection, Europe got 34%, Latin America recorded 10%, with the number of refusal being 2843. Africa's total foods and feeds rejection was 2328, which is 8% of the total border rejection in the EU. This trend analysis indicates that the EU also has been denying products originating from Europe due to non-compliance to the standards requirements in the destination countries.

Table 4: EU Product Rejection by Region of Origin

Region	2000	2005	2011	Total	% of EU Total
Africa	57	226	320	2328	8.29
Asia	123	978	1780	11473	40.84
Europe	123	978	1280	9600	34.17
Latin America	78	237	395	2843	10.12
Northern America	6	86	185	1629	5.80
Oceanic	3	31	51	222	0.79
EU Total Rejection	390	2536	4011	28095	100.00

Source: Author's Compilation and Calculations from RASFF

Statistics of 10 most affected countries in Africa is shown in table 5, in terms of border refusals in this market. Morocco had the highest export rejection in 2002 with 17 of its foods and feeds refused access, followed by 16 rejections from Namibia, South Africa had 13, Egypt recorded 9 while Cote d'lvoire had 7. Ghana, Egypt and Nigeria had the highest refusals of exports in 2006 with 44, 30 and 29, respectively. Morocco recorded 23 rejections while both Tunisia and South Africa got 7 exports denied access. By 2012, all the countries recorded double digit border rejections except Cote d'lvoire, while Morocco and Egypt got the rejections of 61 and 55, respectively. Thus, during the period from 2002 to 2012, a total of 432 foods and feeds (17% of total Africa rejection) exports were refused entry from Morocco, followed by Egypt with 405 (16%), Ghana had 13% of total rejection and Nigeria recorded 241, which was about 10% of the Africa's export rejections.

Table 5: EU Rejection of Food and Feeds by Ten Most Affected African Countries, 2002-2012

Country	2002	2006	2011	2012	Total	% Share of Total
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
Nambia	16	3	1	12	83	3.35
Cote d' lvoire	7	11	3	4	64	2.58
Total	98	199	296	310	2481	100.00

Source: Author's Compilation and Calculations from RASFF

In terms of the border rejection of the selected products level, it could been seen from table 6 that for fish and fishery products' border rejection from 2002 to 2008, a total of 77 Morocco's exports of these products were rejected, which is about 3% of total EU rejections. The number of rejection for Tunisia was 58; Senegal had 46, while Namibia got 27. Ghana had the highest

border rejection for the products among African countries with 97, which is about 4% of EU total border rejection for these products.

Table 6: EU Rejection of Fish and Fishery Products by Selected African Countries

Country	2002	2006	2007	2008	Total	% Share
Morocco	13	11	14	6	77	2.87
Tunisia	3	4	10	23	58	2.16
Senegal	4	6	11	7	46	1.72
Namibia	6	3	7	4	27	1.01
Angola	1	2	6	0	18	0.67
Cote d' lvoire	1	3	6	2	15	0.56
Ghana	15	6	6	7	97	3.62
Total	396	380	344	288	2680	100.00

Source: Author's Compilation and Calculations from RASFF

Table 7 presents the EU rejection of fruits and vegetables for selected African countries where it could be seen that 33 exports from Egypt were rejected, 23 from Tunisia, 20 Nigeria's export rejections while Ghana, Morocco, and Kenya had 17, 16 and 10, respectively.

Table 7: EU Rejection of Fruits and Vegetables Products by Selected African Countries

Country	2002	2006	2007	2008	Total	% Share
Egypt	2002	3	12	8	33	2.06
Tunisia	3	3	6	8	23	1.43
Nigeria	0	4	4	1	20	1.25
Ghana	3	0	6	4	17	1.06
Morocco	0	3	4	1	16	1.00
Kenya	1	5	2	1	10	0.62
Total	0	256	308	351	1604	100.00

Source: Author's Compilation and Calculations from RASFF

2.4 Reasons for EU Rejections of Foods and Feeds

In terms of the reasons for the border rejection of products in the period from 2002 to 2012 as shown in table 5, statistics from the rapid alert system for foods and feeds (RASFF) in table 8 suggest that mycotoxins, especially aflatoxin presence in these products were the main reasons for many of the refusal at the EU borders with the total number of 6768 exported products

rejected, which is about 38% of all the reasons/hazards of rejections. Other major hazards that affected access to this market were the heavy metals in these products, in which 1198 rejections (about 7% of the total hazards) were recorded for these hazards. The residue of veterinary medicinal products hazards had 1173 rejections, which is about 7%, followed closely by pesticide residues with 1154 (6% of total rejection) and that pathogenic micro-organism was 1140, which was also 6%. Products rejected due to chemical contamination were 1028, while the food additives and flavouring as well as poor or insufficient controls had 708 and 709, respectively. Therefore, the aforementioned hazards were the main reasons for border refusals in the EU market. This is not to say that other hazards were negligible or could be set aside because all standard requirements must comply with, but those mentioned were often found in exported foods and feeds, in which their compliance level has not been adequate for market access. Thus, mycotoxins as at the period under review tend to be the most hazards affecting market access of the products.

Table 8: EU Reasons for Rejection of Food & Feed Products by Hazard Category

Reason/Hazard	2002	2006	2011	2012	Total	% of EU Total
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
Total	920	1286	1901	1754	18024	100.00

Source: Author's Compilation and Calculations from RASFF

A disaggregation of the reasons for the border rejection of at the Africa products level was presented in table 9 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 23 exported goods were rejected from Egypt, Nigeria had 18; Morocco only got 1 while none of Tunisia exports were rejected as of this hazard. Mycotoxins in foods and feeds exports led to 130 exported products rejected from Egypt, 91 from Ghana, Nigeria got 90, while 5 and 1 were recorded for Morocco and Tunisia, respectively. Microbiological contaminants accounted for 44 border rejection for Morocco, while it was 31 and 30 for Tunisia and Egypt, respectively; and Nigeria as well as Ghana got 30 apiece. Basically, product composition, mycotoxins, microbiological contaminants, unauthorized food additive and presence of heavy metals were the main reasons for rejecting foods and feeds from continent.

Table 9: EU Reason for Rejections of Food and Feed Products, 2002-2008

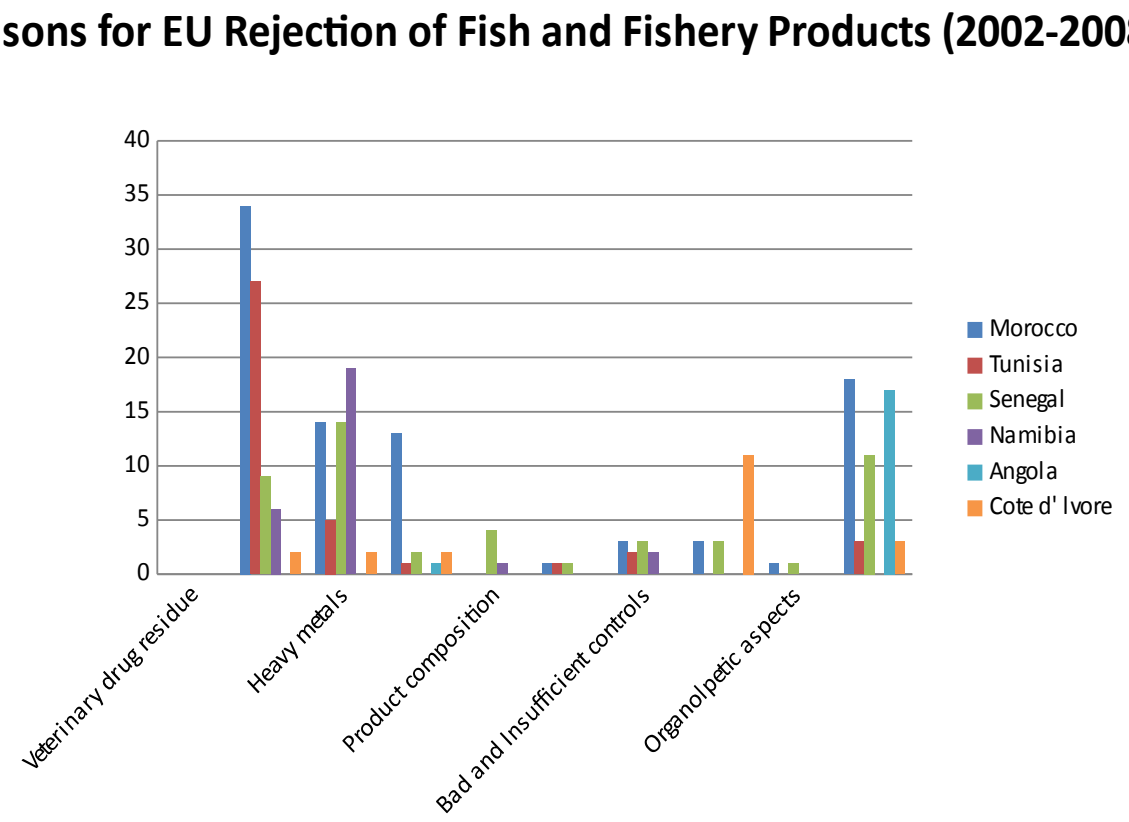
Reason	Ghana	Egypt	Nigeria	Morocco	Tunisia	Total
Mycotoxins	91	130	90	5	1	5335
Microbiological Contaminants	13	30	13	44	31	1740
Veterinary Drug Residues	0	2	0	0	0	1327
Heavy Metals	5	1	10	15	8	1124
Unauthorized food Additives	11	8	16	17	24	1009
Product Composition	101	23	18	1	0	985
Pesticide Residues	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

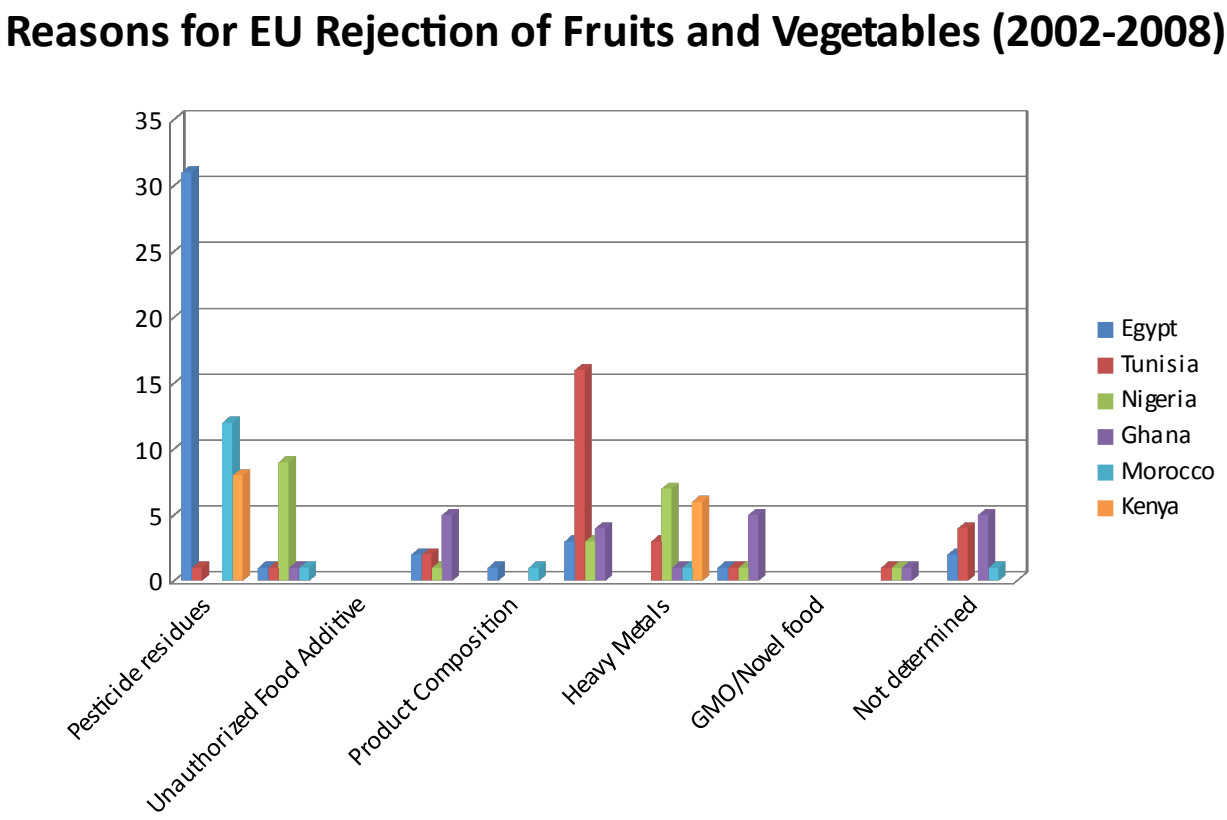
Further, figure 3 shows the reasons for the refusal of fish and fishery products for the selected African countries. None of the countries selected was affected by the veterinary drug residue; however, the major hazards to fish and fishery products are the microbiological contaminants for Morocco, Tunisia and Senegal. Heavy metals were also found to have contributed to border rejection of these products where Namibia, Morocco and Tunisia were mostly affected. Biotoxins accounted for major Morocco's fish and fishery products' rejection. Not determined/other hazards contributed to rejection of these exports in Morocco, Senegal and Angola.

Figure 3: EU Reasons For Rejections of Fish and Fishery Products, 2002-2008



The hazards that accounted for these rejections of fruits and vegetable were pesticide residues and foreign bodies for Egypt fruits and vegetables, Tunisia products were often affected by mycotoxins, microbiological contaminants, foreign bodies, heavy metals, organoleptic aspect and hazard not determined/other. Foreign bodies, heavy metals, organoleptic aspect and hazards not determined/other mostly affected Nigeria's fruits and vegetables.

Figure 4: EU Reasons for Rejection of Fruits and Vegetables Products



3. The Review of the Literature

A diagnostic analysis of literature on standards show that many of the studies were conducted in order to determine its impact on developing economies including some countries from Africa (see Chemnitz, Grethe and Kleinwechter, 2007; Shepherd and Wilson, 2010; Brobery, 2009; Henson and Humphrey, 2009b; Diaz Rio and Jaffee, 2008; Beghin, Disdier, Marette and Yengern, 2011; Crivelli and Groschi, 2012; Schlueter, Wiedk and Heckelei, 2009; Martinez and Poole, 2004; Henson and Jaffee, 2006; Henson, 2006; etc.). Many of the studies concluded that standards are trade impeding and the reasons for this in part are due to relative poor development

of science and technology, institutions, management, absorptive capacitive of producers, etc, in these countries that prevent them from conforming to the standards in their trading partners markets, particularly the developed markets.

Put differently, available evidences have shown that tariffs are reducing and its impact is gradually becoming marginal, although still significant due to bilateral, regional and multilateral trade agreements (WTO, 2012;UNCTAD, 2013; Asci et al, 2013; Kareem, 2010). Recent studies have shown the importance of non – tariff measures in global trade (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 such as anti-dumping, countervailing to rule of origin, procurement, subsidies, voluntary export restriction, quotas and technical barriers to trade such as standards and technical regulations, conformity assessment, certification, etc (see UNCTAD, 2013). Out of all these non – tariff measures, the issue of technical measures has become an importance feature in the regulation of global trade (see Fugazza, 2013; UNCATD, 2013). The importance of these technical regulations to Africa's exports has been emphasized and investigated by Otsuki et al. (2001), Okello and Roy (2007), Maertens and Swinnen (2009).

In spite the importance of the issue of product standards to Africa and its quest for sustainable development through employment generation, poverty reduction and growth, only scanty studies were conducted to actually determine the extent to which this technical barrier to trade (TBT) has influenced market access of products originating from Africa. The paucity of empirical studies which was acknowledged by Shepherd and Wilson (2010), hasinhibitedresearch and evidence-based policy formulation by Africa governments in order to solve the problem of inadequate conformity and thereby inaccessibility of African exports to the markets of its trading partners. Studies conducted by Cheminitz, Grethe and Kleinwechter (2007), Wilson and Abiola (2003), Czubala, Shepherd and Wilson (2009), Otski, Wilson and Sewadeh (2001) etcetera, show that Africa's exports were restricted to the developed markets due to its inability to meet the standards set by these markets. For instance, Dean (2008) concluded that the Food Safety Law of the EU effectively restricted East Africa's livestock exports to their market. Mutume (2006) opined that the implicit standards that is aimed at raising African countries standards to the

developed countries' levels resulted in extra layers of developed countries regulatory barriers, which has shut out cheap exports from Africa.

However, there are studies such as Ignacio (2008), Jaffee and Henson (2005), Henson and Jaffee (2009), Henson and Humphrey (2008), Maertens and Swinnen (2009), etc., which opined that standards could serve as impetus for long run export growth in the agricultural and food sector. They are of the view that standard could act as a bridge between producers in Africa and consumer preferences in developed markets, which can serve as catalyst for improving, upgrading and modernizing food supply system in the continent that would enhance their competitive capacity. Put differently, McCullough, Pingali and Stamoulis (2008), Swinnen (2007), Henson (2006) opined that the trade impact of standards could be both restrictive and enhancing depending on the degree of adjustment of institutions regulating trade. it was argued that the rise in standards, both private and public, has led to sudden change in the organization of exports, especially food exports and thereby have effects on distribution of welfare not only across countries but also along supply chains and among rural dwellers (World Bank, 2005).

Further, an evaluation of African standards literature indicates that majority of the studies were conducted on horticultural products, which country of coverage usually focus on Kenya and other East African countries (see Wilson and Abiola, 2003; Jafee, 2005).Wilson and Abiola (2003) reviewed the impact of standards on horticultural industry in Kenya and found that the major challenges apart from the changing consumer preferences are the inability to meet the maximum residual levels (MRLs) in the exporting markets and pest risk analysis. However, the cost of compliance varies with the type of intervention and crop grown. Jaffee (2005) studies Kenya's fresh vegetable trade in the context of emerging food safety and other standards in Europe in the light of its challenges and opportunities. He examined the challenges of changing regulatory and market requirementsand the coping strategy that Kenya horticultural exporters have adopted and found that exporters and growers have already presumed that standard compliance is a must, which is currently required by major importers and shall be demanded by other countries in the future. So, they have improved their products quality in line with these requirements.

A case study by Minten, Randrianarisen and Swinnen (2006) of a large contract-farming scheme with smallholder producers in Madagascar's vegetable export sub-sector with contract that involve on-farm assessment and extension services indicate that they have to assure conformity with standards in all their export produce. To buttress this point, Maertens and Swinnen (2009) gave an outcome of a shift from procurement strategy that was 95% based on contracting with small holders to a reliance on 50% on vertical integrated production on estate farm in vegetable exporting sector in Senegal due to rise in standard. Aside the above studies, research were conducted on other areas of agricultural exports in Africa. ISEAL Alliance (2008) in conjunction with Trade Standards Practitioners Network (TSPN) in Tunisia examines the effects of organic standard on farmers. They discovered that the expansion of Tunisia's organic agricultural sector has significantly improved the commercial and trade performance. Henson and Mitullah (2004) investigate the effects of EU's food safety standards requirements on Kenya Nile Perch exports. The imposition of these food safety requirements gingered Kenya exporters to strive in order 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 restriction especially in 1997-2000, efforts were made to upgrade facilities for processing export Nile Perch, which led to high cost of compliance while domestic legislation and control mechanism were enhance. They conclude that the Kenyan case is a case where loss of market access could propel concerted effort in complying to standard requirement and thus, illustrate the importance of responding to emerging food safety requirements in a proactive and effective manner.

In another study by Rio, Jaffee, Henson and Mugisha (2009) to evaluate the extent to which investment instandard compliant by private, government and donor agencies have contributed to improve market access by exporters of horticulture in Uganda. Efforts were made in the study to evaluate the size of the industry and the contributions of these stakeholders towards smallholders compliant with horticultural standard requirements in developed markets. They found that the size of the industry is small, which affect profitability and competitiveness, thereby adversely affecting rural income, employment and poverty. The conclusion is that the challenge of compliance is just part 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 were influenced by the type of standards that were covered (see Henson, 2006; Henson and Northen, 1998; Henson and Reardon, 2005; Asfaw, Mithoefer and Waibel, 2007; Anders and Caswell, 2009; Disdier, Fontagne and Mimoun, 2008; Moenius, 2007; etc.), whether harmonized or non-harmonized (Shepherd and Wilson, 2010; Czubala, Shepherd and Wilson, 2009; Chgen and Matoo, 2008; Portugal-Perez, Reyes and Wilson, 2009).However, the convergence ofmost of these empirical studies investigating the effects of standards on the economies of Africa is the fact that the measures would have its adverse effects on the continent's exports at the initial stage but in the long run, this could change depending on extent of standards compliance attained through structural transformation and technology advancement in these countries.

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

According to Jaffee and Henson (2004), the developing countries perceived these 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) opined that for the developing countries to sustain an international demand for their exports; will depend on the strategic, procedural and structural initiatives, which will solidify the confidence and trust of importing countries on the safety and quality of their export.In similar vein, Chemitz, Grethe and Kleinwechter (2007) developed ananalytical framework that structure the problem of whether, how and the extent to which small producers in developing countries are at the receiving end due to the rise in the prevalence of food standards. They argue that small and medium producers hardly comply with the required standards without support from the downstream actors, while literate and wealthy farmers can easily integrate.

Identifying the legal measures of the European Community's food safety regime that really hindered developing countries' export of food products, Brobery (2009) proposed three specific measures that could serve as solutions to these problems, they are; the improvement in the harmonization of food safety measures in the developed markets, the European Commission should often examine the consequence of any new proposed food safety measures on developing countries and lastly, should strengthen its provision of development assistance to enable the developing countries to comply with the 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 got 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 was complemented by Henson and Humphrey (2009a) when they infer that the diversity food safety standards, in their institutional form, scope and prevalence across value chains, belies attempts to draw general conclusion. Although, they concur that standards do present challenges for developing countries, especially on the role of governmental institutions in the regulation of food safety at the national and international levels, but opined that many of the debates on food safety standards were fuelled by misunderstanding of the reason for the evolution of such standards.In another study carried out by Henson and Jaffee (2008), they argued that standards ought to be seen as "catalysts" in the context of food safety in international

trade rather than as "barriers" as dominated in the standard literature. However, the study did not deny the adverse effects that public and private standards may have on agriculture and food exports from developing countries, but rather emphasize the need for a strategic orientation when considering the trade effects of food safety standards. The study presented limited evidence in terms of scope and scale and stressed the need for further research.

4. **The Data**

The data sources for this shall come from the following sources: Perinom shall be used to source for the EU harmonised product standards data. The import refusal used in the descriptive analysis was sourced from the Rapid Alert for Foods and Feeds (RASFF) and UNIDO's trade standards compliance database, while the export data shall come from the World Integrated Trade Solution (WITS) database. The economic size of the trading partners, i.e. the gross domestic product (GDP) shall be sourced from the World Development Indicators (WDI). This study shall cover the period from 1995 to 2012 for 49 African countries as exporters across all the estimations. These periods cover the year of the establishment of World Trade Organisation (WTO) when tariffs declined were pronounced among trading partners while the incidences of NTBs are on the increase[10]. The EU is used as bloc that is, as a custom union. The use of the EU members is based on the year of accession. For instance, in 1995 it was EU-15, while it was increased to EU-25 from 2004, which later rose to EU-27 from 2007. That is, they are use in piece meal in the analysis

The technical regulation vis a vis, product standards were not in usable form when obtained, as they were in written form of rules and regulations. I coded these rules and regulations in their number of occurrence. Cumulative harmonised standards data were used with the deduction of any withdrawal and addition of new regulations[11] (see next section for the calculation). This study selected two of high value products. The high value products are fish and vegetables. The products are selected because they are in relative high demand in the EU and the continent has

10 The WTO report 2012 confirms this.

11That is, in 1995 if there are 2 regulations for a product and in 1996, another 2 is added, then I added them together to give total regulations for the product as 4. And if by the following year, which is 1997 no addition to the regulation but a withdrawal of a regulation previously in existence, then for the year the total regulation for the product is 3,and so on.

high production and comparative advantage at the HS-6 level of the products. Data for these products were obtained from WITS at the HS-64 level. The economic mass variables are the nominal GDPs of the importing and exporting countries that are obtained from the WDI.

5. The Empirical Strategy

Many of the studies in the literature that looked at the issue of bilateral and multilateral trade relations used gravity models in the determination and evaluation of the issues raised and in testing their various hypotheses. Major reasons that were adduced in the use of this model are the fact that it takes care of the political, spatial and temporal factors in the 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.

There is no more doubt about the gravity model's theoretical framework, which could be found to occur in almost every trade model especially that of the increasing returns, which are important causes of perfect product specialization and gravity equation as shown by Evenett and Keller (2003). The theoretical framework for this study model is derived from the new trade theory, which made provision for economics of scale and imperfect market. Bergstrand (1990) provides a description of the link between gravity equation and bilateral trade patterns in a monopolistic competition framework of the new trade theory. Anderson (1979), Bergstrand (1990) and Helpman and Krugman (1985) have derived gravity equations from trade models based on product differentiation and increasing returns to scale. This model was also extensively used by Shepherd and Wilson (2010), Czubala, Shepherd and Wilson (2009), Portugal-Perez, Reyes and Wilson (2009), and Shepherd (2007) in the determination of the impact of non-tariff barriers on exports.

This study investigates the agricultural export effects of product standards in the trade relations between Africa and the EU. A two – stage Heckman gravity model specification shall be adopted. Heckman model has the ability of dealing effectively with the zero trade observations and enables to differentiate the impact of bilateral trade barriers at the extensive and intensive margins of trade (Cipollina et al. 2010). The importance of the model in determining the

extensive and intensive margins of trade have been emphasized in recent studies (see Munasib and Roy, 2013; Crivelli and Groschl, 2012; Helpman et al., 2008). I would make use of mostly standards data that are not often use in the previous studies and these data are from the Perinom database. Specifically, this study shall test the null hypothesis that the EU standards are trade impeding to Africa's agricultural exports. Thus, to test this hypothesis, a modified Munasib and Roy (2013) Heckman gravity model shall be adopted.

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

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

Where T_{ijt} is a binary variable that equals 1 if the export from country i to j at time t is nonzero, otherwise it is 0, and V_{ijt} is the export value from country i to j at time t. The intercept are β_1 and β_2 ; the multilateral trade resistance terms are not fully used because the importer is the EU as a bloc[12], so I used exporters and time fixed effects, which are γ_{it} and ρ_{jt} , respectively; C_{ij} is a vector of pair – varying control variables such as distance, language, colonial affiliation, preferential/regional trade agreements (RTA)[13] and the EU consumption or demand of same domestically produced products. E_{ijt} is the exclusion variable that does not enter the second – stage regression, this study used the common language and σ_{ij} is the inverse mills ratio from the first stage regression. I have used the date of the implementation (the day that they came to force) of the following trade agreements and

12 Since the EU is used as a bloc, there would not be change in the dummy variable over time if importers fixed effects are applied, so it was dropped.

13 These are the preferential trade agreements between Africa and the EU.

partnerships that Africa and ACP had with the EU: Lome conventions, Cotonou agreements, EBA and GSP. Note that not all African countries are in EBA, but many of them fall within the Lome and by extension Cotonou agreements. At the end of the Cotonou agreements, when some countries were foot-dragging on the EPA, they were asked to go back to the GSP or EBA. Also, the use of the consumption of domestically produced commodities (fish and vegetable) is to show whether the EU consumption of its domestically produced commodities would affect import of same products. This is seldom use in the standards literature, which is another contribution to the literature. Since the actual data for each of the EU country consumption of these products is not available, I have proxy the sum of each EU country import from the rest of the EU members as the domestic consumption of these products in the EU. For instance, it is the summation of each country import of fish from other EU member. That is:

$\sum \sum_{ij}^{27} X_{kijt}$, where i = j = EU countries, while k is the product. X_{kij} is country i import of k from country j at time t.

The EU harmonised cumulative standards data were used with the deduction of any withdrawal and addition of new regulations[14]. I have the following simple formulae for the calculation of the cumulative standards:

$$Z_{t-1} + \rho_t - \omega_t \qquad \text{---- (3)}$$

Where Z_{t-1} is the previous cumulative number of standards, ρ_t stands for the number of additional standards in time t, while the number of standards withdrawn in time t is represented by ω_t . The formula is applicable from the second year. It is important to note that only the exporters and time fixed effects were used because of the use of EU as a bloc, more so, product fixed effects were not included due to the fact that the estimations were product specific and not product panel data.

14 That is, in 1995 if there are 2 regulations for a product and in 1996, another 2 is added, then I added them together to give total regulations for the product as 4. And if by the following year, which is 1997 no addition to the regulation but a withdrawal of a regulation previously in existence, then for the year the total regulation for the product is 3,and so on.

The regression equation in the first – step of this model is known as the probit regression while the second step is the linear regression for the volume or value of trade flows. The second step took 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, which is evaluated at the predicted outcomes divided by the standard error of the probit estimation. The exclusion variable in the first step is the one that is highly correlated with a country's propensity to export and not significantly correlated with the volume of export. Previous studies have used different exclusion variables; in fact Helpman et al (2008) used common religion in their pioneering study of estimating the extensive and intensive margins of trade in a heterogeneous firm model. This study uses common language as the exclusion variable that does not into the second-step estimation.

The estimation of gravity model with the flow of trade is often confronted with double biases in line Helpman et al. (2008). First, there is the standard sample selection problem at the intensive margins regression where the sample of nonzero exports is non-random. However, the inclusion of the inverse mills ratio in the Heckman model as an explanatory variable in the second step has been used to correct the biasness in the coefficients in the second stage. The second bias is the omitted variable bias due to firms' heterogeneity in the extensive margins 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 the firm that has its productivity beyond a certain threshold that end up exporting. Thus, in this study, standards are fixed costs of exporting and thereby affect the extensive margins of trade

In this study, tariffs, although, part of the trade policies used in the EU, however, they are not included in the analysis: first, because this study actually look or focus specifically on products standards, which are non-tariff barriers and second, studies have found that tariffs are declining and the trade impact of tariffs in Africa is indistinguishable from zero given that the continent enjoyed preferential trade tariffs in this market (see Czubala et al., 2009; Kareem, 2010; Fugazza, 2013).

Further, there are different methods that have been used in the product standards literature to measure standards. Brenton et al.(2001), Chen and Matoo (2004) and Baller (2007) have used dummy variables for standards, such that the dummies capture whether directives were given by the EU[15] on their selected products or not for the years considered. Some studies such as Fontagne et al. (2005) and Disdier et al. (2007) used the TBT standards notification at the WTO, which was usually found to be inaccurate as acknowledged by Czubala et al. (2009), given that countries notifications are often inadequate. Czubala et al. (2009), Shepherd and Wilson (2010) and Shepherd and Wilson (2013) used the frequency method and further aggregated the data to differentiate across its sub-sector, while adding any amendment to the existing standards. In the case of withdrawal, they assume the standard is still in force for the entire year. The method of the bridge to cross was used by Munasib and Roy (2013). They used the difference between the standards in the exporting and importing countries as the bridge to cross, which indicate the remaining standard requirements that will be faced by exporters in the importing countries after complying the with their domestic standards. However, I found this method not too appropriate in this trade relation between developing countries, especially Africa, and developed countries because most African countries do not have official standards requirements and where they are available, implementations or applications are very inadequate due to the drive for exports. The standard restrictiveness method was used by Ferro et al. (2013), Li and Beghin (2013); they used the stringency of MRLs for pesticides and few veterinary drugs in agricultural and food trade. However, this study used cumulative or aggregated standards for the selected food products as in the case of Czubala et al. (2009) because it considers all the amendments and/or withdrawals to the standards during the period under consideration. Contrary to Czubala et al. (2009) that applied these standards to textiles products, this study focuses on selected food products in a Heckman (2008) model and also goes beyond their data point of 1995 – 2003 by extending the data point to include recent information at the Perinorm database - 1995 to 2012.

6. **The Findings**

The results of two-step Heckman model are present in this section. All the extensive margins of trade results are shown in the first part, while the other part shows the intensive margins of trade

15 EU committee for standardization (CEN)

results. The estimated results have corrected for the robust cluster errors that often arise in this type of model. The exporter and time fixed effects were included in the estimation but not reported due to the large size of the cross-sections. I have estimated the extensive model using the probit regression since the dependent variable in the model is binary. This estimation corrects the robust cluster errors and distils the inverse mills ratio from the first-step regression, which was used in the second-step regression (intensive margins estimation) as an explanatory in order to know whether any selection bias has been corrected or mitigated. The second-step equation was estimated with the generalised least square method in order to mitigate the problem of heterogeneity associated with panel regression.

Extensive Margin of Export: Fish

Table 15 presents the results of the selected agricultural products, vis a vis, fish, vegetable and coffee, in the extensive margins of export estimation. The economic mass of the exporting countries (exporters' GDPs) propel the probability of exporting African fish to the EU. There is increased probability of exporting fish by new exporters, 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 those that are currently exporting with the probability of expanding their exports. It could be seen that economic growth in the exporting countries enhances the possibility of new country entry into exporting of fish such that a percentage increase in GDP would raise the probability of new exporters, disappearing exporters and existing exporters' fish export to the EU by 0.25%. However, the expenditure on Africa's fish, measured by the GDPs of importing countries, shows that this commodity is inferior good such that there will be potential reduction in demand of the product as more firms get into exporting. The EU standards on fish hinder export at the extensive margins, which means that the standards were restrictive to the fact that they will prevent export of fish at the extensive margin and this is statistically significant. This implies that compliance to the standard requirements often increase the fixed costs substantially such that it discourage potential new firms from exporting. The trade costs proxy by distance serve as barriers to export of fish at this margin of trade, although, it is statistically insignificant, while the regional trade agreements is significant in propelling trade. However, common language and domestic demand of locally produced fish are not significant factors to consider at the extensive margins of export.

Inverse relationship exists between language and extensive margins of fish export, while the demand of locally produced fish is directly related to it, but insignificant.

Table 10: Extensive Margin of Trade

Variable	Fish	Vegetable
Exporter GDP	0.2526*	0.2620***
	(0.1436)	(0.1092)
Importer GDP	-1.3528	-0.1072
	(0.9927)	(0.2144)
EU Standard	-0.8606*	0.2922**
	(0.4983)	(0.1358)
Distance	-0.2190	-0.0164
	(0.6497)	(0.5514)
RTA	1.5513**	-0.6543
	(0.7977)	(0.8009)
Domestic Substitute	01436	-0.2086
	(0.8145)	(0.3156)
Language	-0.1671	-0.2455
	(0.5603)	(0.5936)
Constant	15.2451	0.9639
	(2.2531)	(4.7165)
Wald Chi^2	48.91	14.01
	(0.0000)	(0.0814)
Observation	808	684
Rho	0.6911	0.6204

Note: All variables are in log form except the dummy variables. The equations were estimated with the country and time dummies. *, ** and *** denote significant level at 10%, 5% and 1%, respectively.

Vegetable

Africa's GDPs significantly impacted positively on the extensive margins of vegetable export to the EU such that for every percentage rise in growth there will be 0.26% improvement in margin of extensiveness of vegetable export. Given the fact that vegetable is a high value commodity, many African countries, especially those in the East and West Africa, often promote and encourage export of the commodity through improve and investment friendly domestic policies. Vegetable is an inferior good in the EU given the inverse relationship between this margin of export and income. This means that taste in this market discourages propensity to export such that few countries are encouraged to enter the market, those exporters that have abandoned the market are also not motivated to export while existing exporters are further de-stimulated, although it is insignificant. The result also shows that the EU standards on vegetable have statistically significant positive effects on the extensive margin of export. This could be due to some supports and assistance from Africa developing partners including the EU that provide market information and technical capacity to Africa. The magnitude of the effects of the trade costs is negligible and statistically insignificant, which implies that trade costs are not important factors that determine the extensiveness of this export. Trade agreements within these trade relations did not contribute to the extensive margin of export of the commodity, while common language and the EU domestically produced substitute are insignificantly at this extensive margins of exports. This means that the domestically produced vegetable does not significantly affect export of the product at the extensive margin. Thus, result for vegetable shows that the GDPs of the exporters, as well as the standards are the relevant factors that determine vegetable exports at this extensive margin of export.

Intensive Margins of Exports: Fish

The results of the intensive margins of exports are presented in table 16, where it could be seen that there are indirect relationships between the Africa income and the volume of export of fish. This indicates that income in Africa did not propel the volume export of fish to the EU such that for every percentage rise in growth or output there will be corresponding neglect of fish export by 0.54%, despite the demand in this market. Further, the absorptive capacity of this commodity in the EU is very high, which depicts the fact that there is demand for this commodity if the commodity could gain access to the market. In other words, expenditures on Africa fish in this market are very encouraging if only supply and the quality of the commodity could be improved

upon. This could be due to the adequate compliance to the EU standards, which positively affected supply to this market. To this end, the EU standards encourage the flow of this commodity. The trade costs associated with the flow of export of this commodity are problematic to the trading partners, which probably might be due to nature of the product and the need to fast track its shipments as well as other transaction costs associated with the shipment. Regional trade agreements significantly did not contribute to the flow of export of this commodity, while the consumption of domestic fish in the EU has significant inverse relationship with its import of fish from Africa. Indicating that as more of domestically produced fish are consume there will be lower import of African fish. The results show that there is no selection bias in the model going by the coefficient of the inverse mills ratio, hence, indicating that I have correctly specified the selection equation.

Vegetable

This is another high value commodity considered in this study a part from fish. Incomes or outputs in African countries did not enhanced export of vegetable to the EU. This implies that there is low motivation to export vegetable to the EU for every percentage increase in the income level. Contrarily, there is absorptive capacity in the importing countries for this commodity and it is statistically significant. In other words, expenditures (favourable taste for the commodity) on the vegetable in the importing countries did encourage export at the intensive margins for Africa, which might be due to the favourable taste for the products. The standard requirements need to be comply with before market access could be assured in which from the result the product standards have adverse effects on the intensity of export. Wilson and Otsuki (2004),Ganslandt and Markusen (2001), and Anders and Caswell (2009) got similar result. Distance, though not significant but negatively related to this intensive margin of export. Domestically produced vegetable significantly does not affect import of Africa's vegetable, which means any rise in the consumption of domestically produced vegetable does not affect import of the product from Africa. 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 exporters are important to vegetable export at this intensive margin. Aside this, product standards, regional trade

agreements between the trading partners and the consumption of domestically produced vegetable are relevant factors determining the intensiveness of Africa's vegetable export to this market.

Table 11: Intensive Margin of Trade

Variable	Fish	Vegetable
Exporter GDP	-0.5432*** (0.1585)	-0.6306* (0.3733)
Importer GDP	10.1384*** (2.1280)	0.3155* (0.1943)
EU Standard	3.3206*** (1.3287)	-1.7056*** (0.4715)
Distance	-0.0805 (0.3734)	-0.1266 (0.3556)
RTA	-2.3007** (1.2066)	3.9301*** (1.1443)
Domestic Substitute	-5.2563*** (1.6683)	1.3024** (0.5873)
Inverse Mills	-2.5267*** (0.7937)	-8.3359*** (2.0637)
Constant	-95.1323*** (21.4778)	9.3388*** (2.9146)
Wald Chi^2	71.31 (0.0000)	122.45 (0.0000)
Observation	274	296

Note: All variables are in log form except the dummy variables. The equations were estimated with the country and time fixed effects. *, ** and *** denote significant level at 10%, 5% and 1%, respectively. The estimations show that there is no heterogeneity and endogeneity.

7. Conclusion

This study investigates the export effects of EU product standards in the agricultural sector of the African economy. The issue of standards among the non-tariff barriers is very vital to Africa, and it compliance has been the necessary condition in accessing this market. An empirical review of previous studies suggest three strands of conclusions in the literature; first strand argues that standards are trade inhibiting, while the other opined that they are trade enhancing, however, the last strand are of the view that it could either be trade enhancing or inhibiting depending on the compliance level, stage of development in exporting countries and the choice of standards used

in the empirical analysis. This study gives supports to the fact that the impact of standards on trade is product-specific and the generalization of conclusion on market access from analysis of a product is not appropriate. Besides, when all the applicable standards to products of interest are not use in the empirical estimations, it will be inappropriate to make inference (s) on the market access from such selected standard. To this end, the empirical analysis in this study used all the applicable standards to the two high valued commodities in a Heckman model. At the extensive margins of export, standards are trade enhancing in vegetable, while inhibiting the propensity to export fish. The incomes of exporting countries have not substantially boost export of these products despite the potentials, taste and preferences favouring these products in the importing countries. This gave supports to the known fact that Africa has inadequate export, which is due to some constraints. Regional trade agreements have not contributed meaningfully to trade in these products except for fish. Similar results were obtained at the intensive margins of exports. Standard requirements did not constitute restriction to fish export; however, they hindered the flow of vegetable. The income of the exporting countries have not contributed to increment in the volume of export and did not really stimulate the flow of these commodities, while the regional trade agreements have not really contribute to trade. The consumption of domestically produced substitute products is major determinant of import of the selected products.

Thus, this study finds that product standards in vegetable are trade enhancing at the extensive and inhibiting at intensive margins of exports, implying that new producers of the product were able to comply with the standards, which could be due to the institutional and technological supports from the governments and development partners, but subsequently after accessing the market, the standards of the product could not be sustain. Fish standards are trade restrictive at the extensive margins but trade enhancing at the intensive margins. This Implies that the HTP hinder prospective and disappearing exporters from either thinking of exporting or going back to exporting in this market. Therefore, this study concludes that the impact of standards on trade is product-specific, while the inability to effectively overcome all HTP in this market can be costly for Africa, in terms of the border rejections, and the income thereof. This will have consequences on exporters' income and thereby, negatively affect employment and the level of poverty in these countries. Hence, Africa must ensure adequate standards compliance not only in the EU market,

but in all its markets in order to reduce the cost of border rejections at both the extensive and intensive margins.

As a matter of importance, African countries' agricultural policy agenda must include partnership and alliances with national, regional and international institutions in order to support and assist in improving technology, institutions and human capacity for standards compliance, particularly among the commercial and smallholder farmers. Enabling institutional, regulatory and domestic policies that will stimulate quality outputs for export must be design and adequately implemented. Thus, this study proposes well structured export technical regulatory policy for all African countries, and where it is mildly available or exist, it should be improved upon. This will reduce the existing technical regulatory gap, which constituted the HTP, between the trading partners and has the tendencies of boosting Africa's exports, especially at the extensive margin.

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