AGRODEP Working Paper 0009

December 2014

Product Standards and Africa's Agricultural Exports

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About the Author

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Acknowledgement

I wish to thank IFPRI through the African Growth and Development Policy (AGRODEP) Modeling Consortium for the innovative research grant. Also, I appreciate the constructive comments, suggestions and contributions of Prof. Luca Salvatici. This research has benefitted from the supports of Prof. Antoine Bouet, Betina Dimaranan, Kathryn Pace Kincheloe, and Fousseini Traore.

Table of Contents

Abstract

The preponderance and stringency of product standards have implications for global trade, especially for developing countries. Despite the importance of this issue to Africa, only a few empirical studies exist in the area. It is on this basis that this study draws its objective, which is to investigate the impact of EU standards on Africa's exports in relation to the Comprehensive Africa Agricultural Development Programme. A two-step Heckman model is adopted using mostly unexploited standards data from Perinorm. Two high-value commodities were selected, fish and vegetable, as well as a traditional cash crop, coffee, at HS-6 digit level. The findings show that at the extensive margins of export, standards are trade-inhibiting in fish and coffee, while enhancing the export of the vegetable. At the intensive margin, standards are trade-inhibiting in vegetable and coffee exports while trade-enhancing in fish export.

Résumé

La prépondérance et l'exigence des normes de produits ont des implications pour le commerce mondial, en particulier pour les pays en développement. Malgré l'importance de cette question pour l'Afrique, il n y a que peu d'études empiriques dans ce domaine. C'est sur cette base que cette étude que repose l'objectif de cette étude, à savoir étudier l'impact des normes de l'UE sur les exportations de l'Afrique dans le cadre Programme Détaillé de Développement de l'Agriculture Africaine (PDDAA). Une méthode de Heckman à deux étapes est adoptée en utilisant les données de normalisation quasiment inexploitées de Perinorm. Deux produits à forte valeur ont été sélectionnés, le poisson et les légumes ainsi qu'une culture de rente traditionnelle, le café, au niveau HS-6. Les résultats montrent qu'à la marge extensive des exportations, les normes restreignent le commerce du poisson et du café, tout en améliorant l'exportation de légumes. À la marge intensive, les normes freinent le commerce de légumes et les exportations de café tout en améliorant les exportations de poisson.

1. Introduction

The developmental aspiration of developing countries, especially African countries, to achieve sustainable growth and poverty reduction is linked in part to their interaction and integration to the rest of the world. Integration into global market by the poorer countries offers the opportunity and potential for rapid growth and reduction in poverty (Martinez and Poole, 2004). It is widely recognised that trade serves as a veritable channel through which countries can interact or relate economically. Global trade has been acknowledged by many theorists, especially the orthodox ones, to be beneficial and that countries could gain from their participation. These theorists based their propositions on the premise that there will be trade flows among/between participating countries. In reality, however, this is often not the case, as there are various trade barriers to some key exports, especially those for which developing countries and Africa in particular have a comparative advantage. As a result of these trade policies, Africa has found it difficult to take full advantage of the opportunities embedded in global trade. The gradual and continuous collapse of tariffs in global trade due to the bilateral, regional, and multilateral trade negotiations and agreements have brought into fore the relevance and the preponderance of the use of non-tariff measure (NTMs) in regulating international trade (Fugazza, 2013; WTO, 2012). Kareem (2010) finds that the non-tariff barriers constitute the most significant trade barriers or restrictions that Africa's exports face in the markets of their trade partners.

To this end, African countries believe that the technical barriers to trade (TBT), standards in particular, are trade restrictive such that they add to the series of costs faced by their exporters. These types of NTMs can almost double the trade barriers effects imposed by tariffs for some products (Moise and Le Bris, 2013). Also, Gourdon and Nicita (2013) present a frequency index which shows that among the NTMs, the technical measures are often used most. TBTs such as technical regulations and standards (Sanitary and Phytosanitary measures, or SPS) stand out among other NTMs due to their importance to human and animal health as well as the protection and safety of the environment. The TBT could also be used for trade protectionism and/or means of enhancing trade flow.

To mitigate this problem, the African Union (AU) New Partnership for African Development (NEPAD initiated the Comprehensive Africa Agriculture Development Programme (CAADP) to strengthen and enhance Africa's agricultural production through sustainable interventions by African governments in order to accelerate and promote agricultural production for export. In order to do this, the CAADP has put in place a policy that ensures that each member countries allocate 10 percent of national budget to agriculture investment/sector so as to attain 6 percent average annual growth rate of the economy.

This CAADP policy on agricultural investment is yielding dividends: there has been relative increase in Africa's agricultural products exports (CAADP Pillar 2 Document). However, the major hindrances to market access for Africa's agricultural exports are the trade policies in the continent's trading partners' markets. Specifically, the issue of tariffs and non-tariff barriers is germane to the market access of Africa's exports. Out of these trade policies, studies have shown that the magnitude of the impact of

tariffs is very minimal due to the fact that most of exports of Africa origin are been granted preferential tariff rate. The main restriction to Africa's exports access to developed and developing countries' markets are the non-tariff barriers, specifically the product standards (Kareem, 2010; Czubala et al. 2009). Most of Africa's exports do not meet the standards set by these countries for any product coming to their markets. This is because Africa does not have the technical wherewithal in terms of advanced technology and sciences to produce products that will meet international product standard requirements. The imposition of these market access conditions on agricultural exports, especially those that African countries have comparative advantage in, has hindered the extent to which the sector contribute to overall income growth in the rural areas and stimulate growth in other sectors of the economy through the expansion of goods and services demanded from these sectors. Also, it has restricted the degree to which earnings on agricultural exports could be used to reduce poverty, hunger, and overall malnutrition levels in the continent. To this end, efforts made by African governments through CAADP to mitigate these market access barriers are not yielding expected results due to the fact that the already defined and detailed set of project activities in the programme did not allowed for a decentralised and bottom-up implementation. Also, its guidelines have not all been adopted yet, while the peer monitoring and learning among African countries have been minimally utilised. This is because CAADP is sometimes seen as a parallel to the national policy processes. Furthermore, CAADP procedures for implementation are still very rudimentary and weak, with inadequate capacities in many ways. As such, CAADP is seen as being far from fulfilling the expectation that is embedded in it, which is to become the centre of all "green" policy areas for agriculture-based industrial policy and food security.

It is noteworthy that most studies modelling the actual distortions to trade due to trade barriers have focused on the impact of tariff barriers on trade flows between developing and developed countries, i.e. south–north trade, with capital and consumer products flowing in one direction and primary products in the other (see Mayer and Zignago, 2005). In contrast, there are very few studies that have examined the effects of non-tariff barriers on trade flows among these trade partners. Additionally, there are scant specific studies determining the impact of product standards on exports of relative importance to African countries despite the importance of this issue (Czubala et al. 2009). Moreover, I have not seen consideration for the impact of the domestically produced commodities that were imported-- that is, the EU consumption of or demand for their domestically produced products-- in any empirical literature in this area. This study intends to close these gaps by determining the effects of products standards in the European Union's market on Africa's exports in the light of the CAADP agenda.

This study is motivated by the following research questions: do product standards matter in trade, especially trade between Africa and the European Union (EU)? Can the CAADP mitigate these problems, and if so to what extent? From these research questions, this study draws its objective, which is to investigate the impact of EU standard requirements on Africa's exports. This study departs from previous studies (Otsuki et al. 2001; Jun Yang and Findlay, 2008; Xiong and Beghin, 2011), which used

only one standard requirement, by considering all the applicable standard requirements for the selected products. These 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. While for every product certain standard requirement might be dominant[1] among these requirements, but all the requirements must be complied with before accessing the market.

In order to investigate the impact of standards on Africa's exports, I have organised the proceeding sections of this paper as follows: the second section presents the context within which the study is situated; section three reviews the literature; the fourth section deals with the empirical strategy adopted; the research findings are discussed in section five; the importance of the findings to CAADP is discussed in the sixth section; and the last section presents the conclusions drawn from the study.

2. The Background

This section deals with the context within which the study is situated in terms of evaluation of some macroeconomic indicators that could have direct or indirect influence on agricultural production for export. The study also examines trade policies among Africa's major trade partners, with a view to ascertain the extent to which these policies have been beneficial or detrimental to the access of the continent's access to their markets.

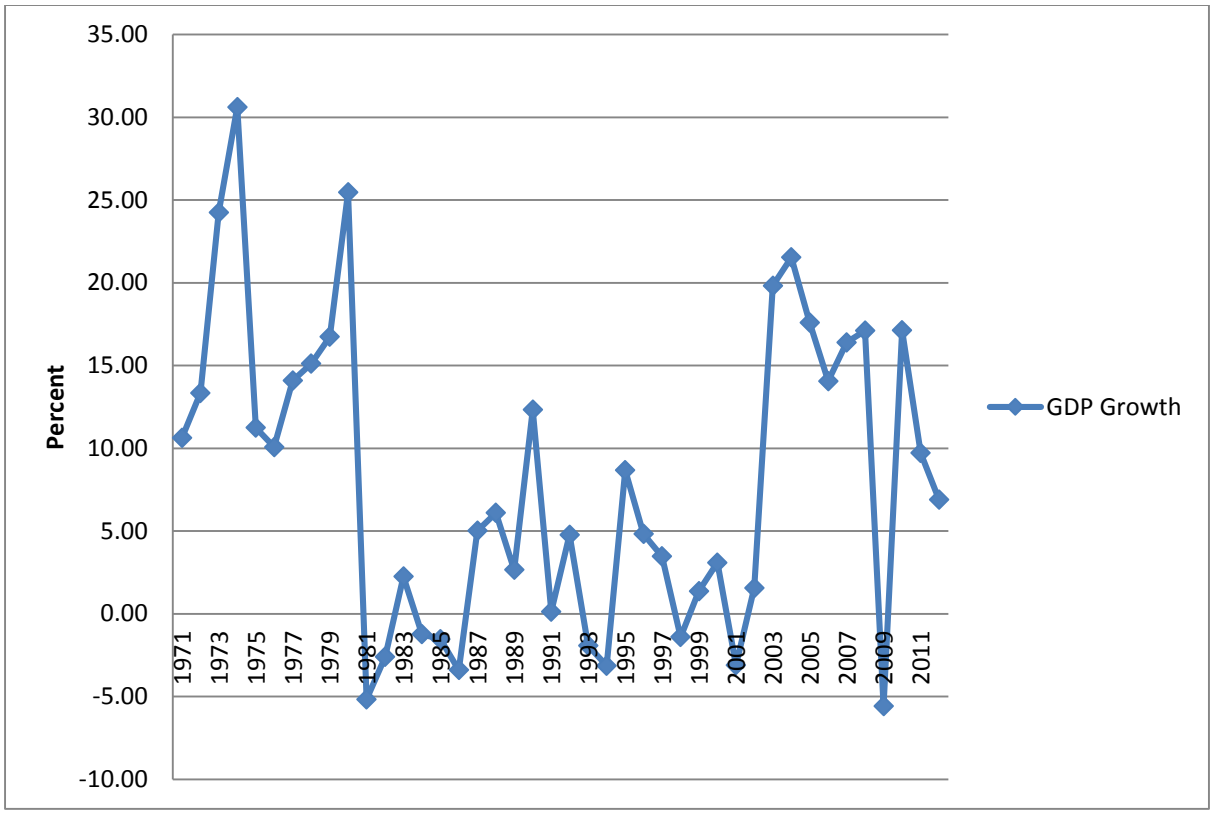
2.1 Macroeconomic Performance

In terms of Africa's gross domestic products (GDP) growth rate, Chart 1 shows that there has been oscillation to the point that the continent did not experience a decade of continuous increased growth rate of the GDP from the 1970s to 2010. In fact, the continent has not recorded continuous positive GDP growth rate more than ten years. For instance, in 1971 the continent's GDP grew by about 11 percent and got to its peak in 1974 with about a 31 percent growth rate due to the oil boom during the period. By 1976, however, the growth rate had reduced to about 10 percent, which later rose to more than double in 1980 with the growth rate of over 25 percent. The positive double digit growth rate recorded for Africa's GDP was due to the boom in the continent's natural resource exports, especially that of oil. During the oil boom in the international market, most oil exporting countries in the continent recorded high increases in their GDPs, particularly Nigeria, Gabon and Libya. This boom was also complemented by stability in most African countries' economic and political environments. By 1981, however, when austerity had set in in most of these countries due to the fall in the international price of their natural resource exports, the GDP growth rate was negative. For instance, in 1981 the negative growth rate of the GDP was more than five percent, which later dropped to one percent in 1984 and rose to about three percent in 1986. These negative GDP growth rates were also due to mismanagement, misappropriation, and maladministration of public funds by the governments in Africa. This actually

1For instance, aflatoxin in groundnuts, cereal, and other products.

led to series of measures to mitigate these economic crises, especially high import bills recorded by most countries during the period. The eventual consequence of this was the demand for loans from the International Monetary Fund (IMF) by most countries in Africa with the conditionality of adoption of the Structural Adjustment Programme (SAP) complimented by domestic austerity measures. With these measures, the continent recorded a positive GDP growth rate of 5 percent in 1987 and reached about 12 percent in 1990. There were oscillations of the GDP growth rates in 1990s due to political crises in some countries, specifically in Somalia, Liberia, Sierra Leone, Cote d'Ivoire, DRC, Nigeria, etc.

Figure 1. Africa's Growth Domestic Product Growth Trend

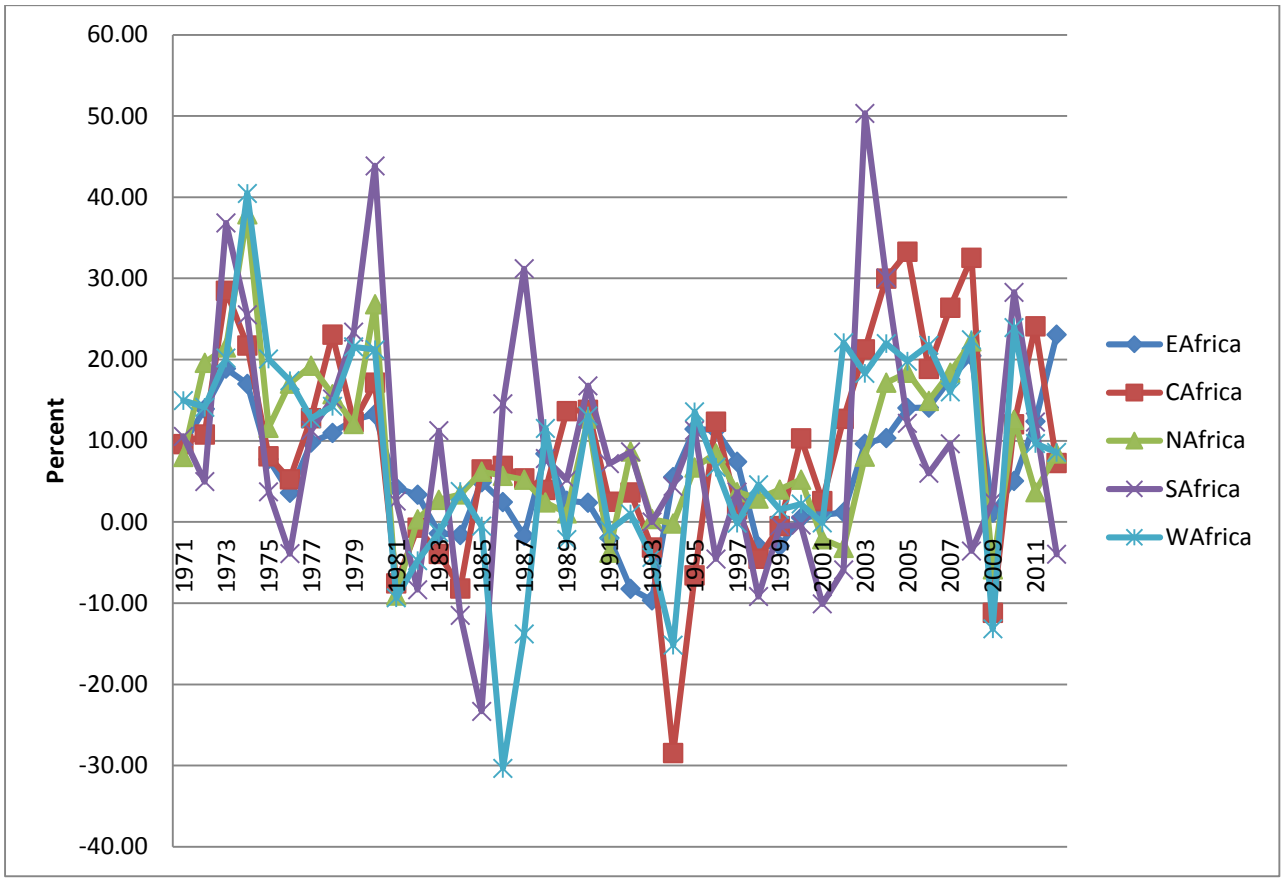


Source: UNCTAD Statistics Database

By the early 2000s, when some of these crises had been resolved, the continent recorded a marginal positive GDP growth rate of over one percent in 2002, which rose to over 21 percent in 2004 and dropped to about 17 percent in 2008. The stability in the political environments on the continent was complemented with very high international price of crude oil for oil exporting African countries like Nigeria, Angola, Gabon, Libya, etc. The global economic crisis in late 2008 affected the continent, and by 2009 its GDP growth rate has dropped to a negative value of over 5 percent. African economies quickly recovered from the global economic meltdown with relative expansion in their export base, which led to an increase in the GDP with a growth of over 16 percent in 2010 before declining to 7 percent in 2012.

Similar GDP growth rate trends were recorded for eventually all the sub-regional groupings in Africa. For example, in the 1970s all of these sub-regions recorded positive GDP growth rate; but only West Africa had double digit growth rate throughout the period, while Southern Africa had negative GDP growth rates in 1976. Central Africa and Southern Africa sub-regions did not record any negative GDP growth rate in the late 1980s. From 2003 to the year before the global economic meltdown, all the sub-regional groupings except Southern Africa had positive GDP growth rates; in fact, West Africa had double-digit all through this period. Despite the global economic meltdown in late 2008 and 2009, only East Africa and Southern Africa recorded marginal positive GDP growth rate of 1.2% and about 2.8%, respectively (see Figure 2).

Figure 2. Africa's Gross Domestic Product Growth Trends by Sub-Region

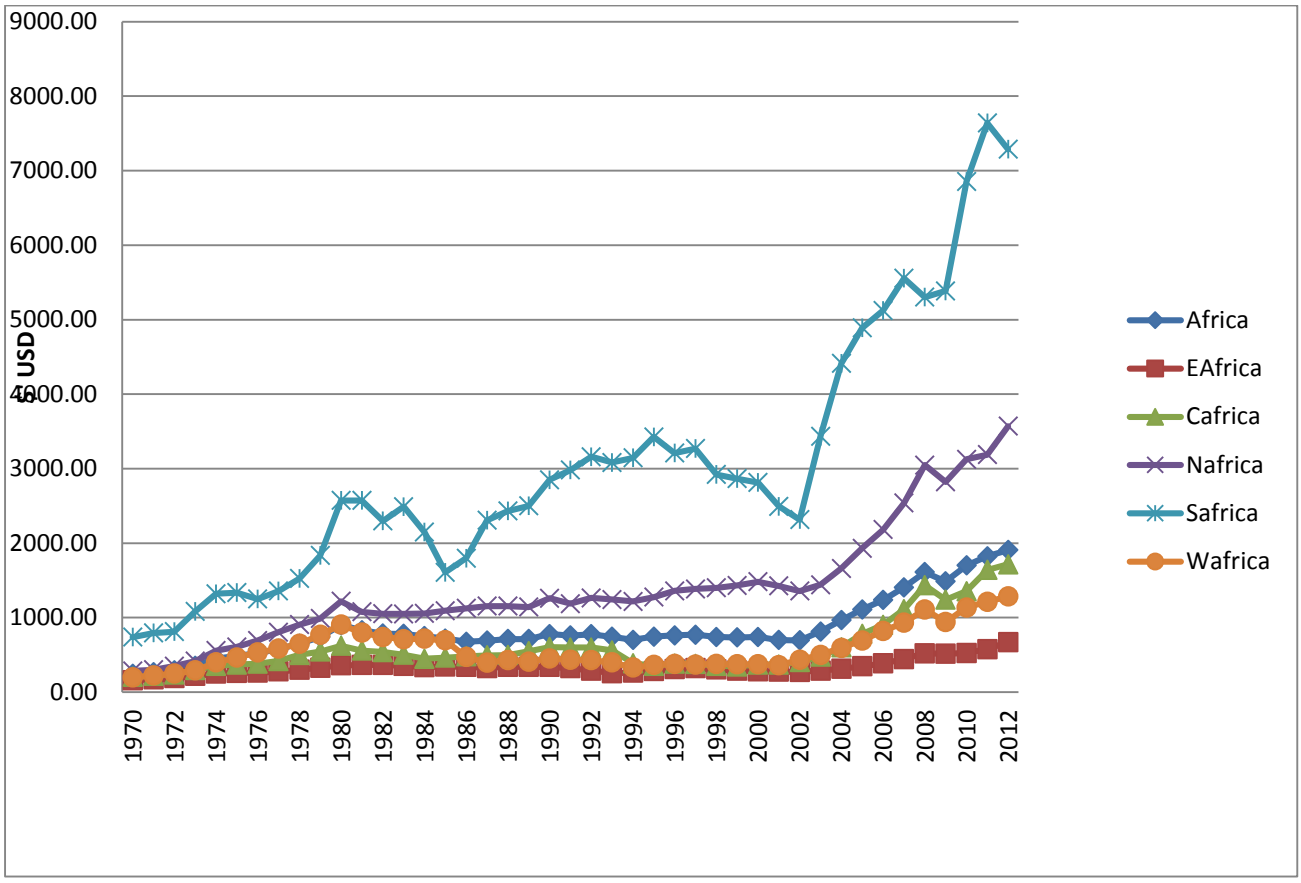


Source: UNCTAD Statistics Database

In terms of Africa's GDP per capita income, there was more than a decade of consistent increase in this macroeconomic indicator from 1970 to 1980. This complemented the booming economic growth recorded during this period. For instance, in 1970 the continent recorded $241 (USD) as its per capita income, and this rose to about $448 in 1974 before reaching the period's peak of over $903 in 1980. Disaggregating these figures, Southern Africa continuously maintained the highest per capita income in Africa, followed by North Africa, with Central and West Africa jockeying for the third position. By 1981, Africa recorded a fall in its GDP per capita to $829. This drop in GDP per capita was recorded in

all of the sub-regions except East Africa. The drop in the GDP per capita continued up till 1986 with $674, before rising to $685 in 1987 and $736 by 2000. There was a drop in the following year (2001) to $695, but it rose to $805 in 2003 and more than doubled in 2012 to $1,907. As indicated earlier, Southern Africa had the highest GDP per capita in Africa, with $7,288 in 2012, followed by North Africa with $3,571, West Africa with $1,285, and Central Africa and East Africa with $1,715 and $672, respectively (see Figure 3).

Figure 3. Africa's Per Capital Income



Source: UNCTAD Statistics Database

2.2 Export Structure and Performance

It has been widely said that Africa exports little commodities to the global markets and that this is the reason that they have not been having their fair share in global trade. Of the few products that Africa exports, though, how have they been fairing, and in which markets are they in demand?

Table 1 shows the export structure of Africa by partner and product group. In 1995, Africa exported over USD $103 billion worth of products; out of this amount, $70.3 billion went to the developed countries (68 percent of the total exports), while developing countries got $24 billion (about 24 percent of the exports). Among developed countries, the EU received the highest percentage (about 35 percent), followed the US, Japan, and then Canada In terms of Africa's exports to developing countries, in 1995

intra-African export was 10.4 percent in the all products category, though this is less to the share of Asia excluding Japan which is 10.8 percent, while America got 2.3 percent. By 2005, Africa's exports to developed countries in the all products category dropped to 66.7 percent, which further reduced in 2009 to 59.3 percent, while that of developing countries rose to about 31 percent and later to 40 percent in 2009. Among developed countries, the EU maintained its lead, though the share fell to 40.5 percent and later declined to 35.5 percent in 2010; while US recorded about 19 percent followed by Japan at 3 percent and Canada at about 2 percent. By 2009, US share declined to about 17 percent, while Canada and Japan had 1.9 percent apiece. Asia received the highest share among developing countries with 17 percent, followed by Africa 10 with 10 percent and South America with 3 percent. Africa's exports going to Asia increased in 2009 to 24 percent, while intra-African export was over 12 percent and export to South America 3.1 percent. 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 South-South bloc being relatively high.

This same trend continued in the all food items category. Though the share of developed countries has been decreasing over the years, they still have the lion share of Africa's export of all food items. The developed countries received about 73 percent of all food items exported by Africa in 1995, while developing countries got over 23 percent. By 2005, about 62 percent of the total all food items exported went to developed countries, a drop of 11 percent from the 1995 share, while the proportion of these items exported to developing countries increased to about 34 percent, of which 20.5 percent of it went to Africa (by contrast, Asia's share was 12.7 percent). In 2009, however, the developed countries share dropped to 54 percent and that of developing countries was 42 percent, of which Africa got over 22 percent. This means that intra-African 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. While the EU's share of all food items exported from Africa declined, the US and Canada have marginally 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). This change in Africa's exports to the US could be due in part to the unilateral trade preferential granted to the continent through the African Growth and Opportunity Act (AGOA).

In the category of agricultural raw materials, most of these products were exported to developed countries from 1995 to 2000; but from 2005 to 2009, developing countries imported more of Africa's agricultural raw materials. More precisely, in 1995 about 60 percent of Africa's agricultural raw materials went to developed countries (47 percent to the EU), but by 2005 it fell to 48 percent (37 percent to the EU). The share going to the US fell marginally from 3.9 to 3.1 percent; Japan's from 6.4 to 6 percent. By 2009, developed countries' share in Africa's exports of agricultural raw materials

declined to 46 percent, with 38 percent going to the EU, while developing countries recorded an increase in their import of African agricultural raw materials. It rose to 50 percent in 2005 from 39 percent in 1995, and later increased to over 53 percent. Out of this, Asia the largest share with a rise from about 25 percent in 1995 to 35 percent in 2005 and later 41 percent in 2009, while Africa rose from 13 percent in 1995 to 14 percent in 2005 before declining to about 10 percent in 2009. The implication of this is that Japan opened her markets to Africa's agricultural raw materials more than the 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 sectors and the development of their various economies. Developed countries imported about 66 percent of Africa's ores and metal exports in 1995, and by 2005 it that figure rose to about 68 percent before dropping to 55 percent in 2009; of this the EU received 41.5 percent in 1995 and then 29 percent and 22 percent in 2005 and 2009, respectively. The US share rose from 7.7 percent in 1995 to about 13 percent in 2005, before declining to 6 percent in 2009, while Japan's share ranged from 10.6 percent to about 15 percent and then 7 percent, respectively. The developing countries' share in 1995 was 32.5 percent, with Asia receiving 23.5 percent while Africa received 7.7 percent. By 2005, however, the developing countries' share dropped to about 26 percent, of which Asia got about 18 percent while Africa got 7 percent. In 2009, the share of developing countries rose to 44 percent, with Africa receiving 10 percent of this category of export. The implication of this is that developing countries were restricting the imports of ores and metals to their economies until 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 USD)

Destination / Origin	Year	World	Total Developed Countries	EU	Canada	US	Japan	Total Developing Countries	Africa	America	Total Asia
All product (Millions USD)	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 (1995-2009).

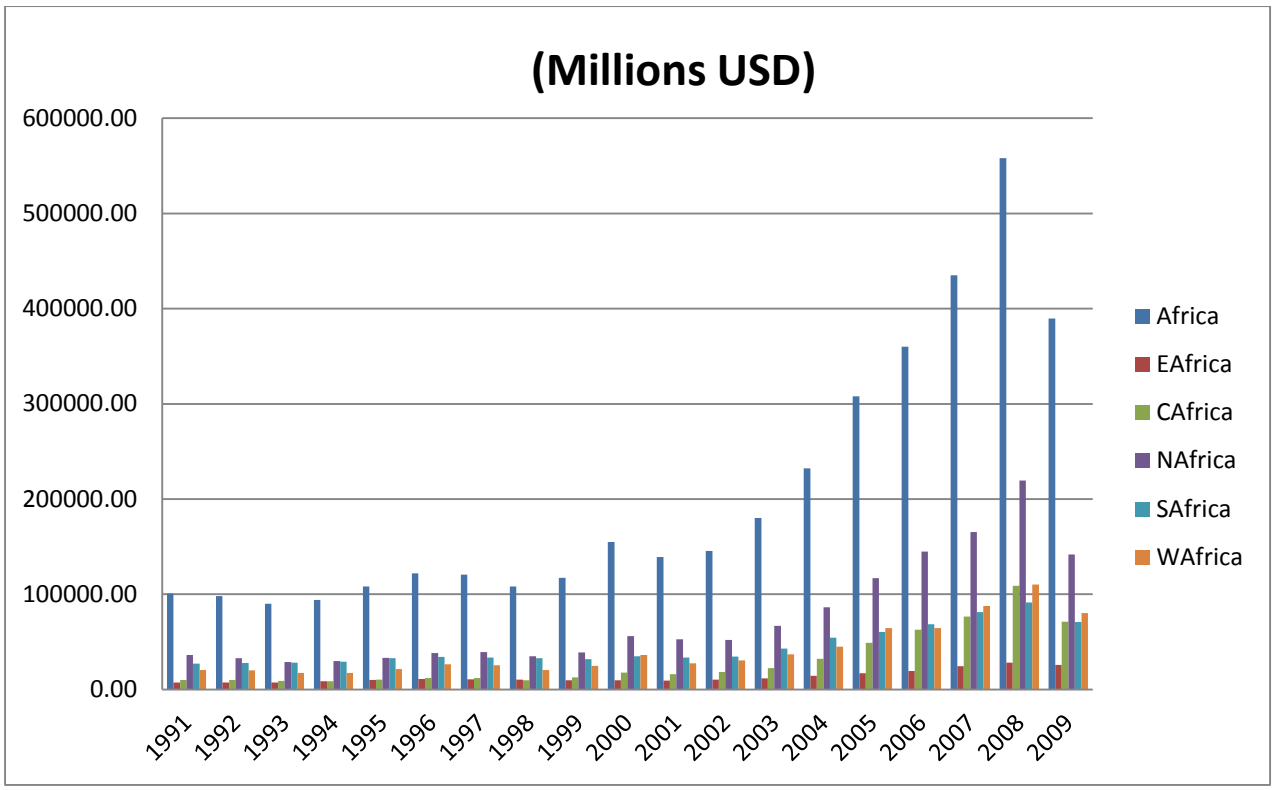
In the category of fuels (SITC3), developing countries have reduced the trade restrictions that will not allow the access of these products to their markets, improving levels of importation in Asia in particular. For instance, out of the 18 percent share of developing countries in 1995, Asia took more 9 percent, while by 2005 they got more than half of the share of developing countries for the year. The same trend was recorded in 2009 for developing countries. The share of the developed countries decreased from 78 percent in 1995 to about 69 percent in 2005, and further decreased to 64 percent in 2009. The EU accounted for the largest share out of developed countries with 46 percent in 1995, 37 percent in 2005 and 35 percent in 2009, while the US recorded 27, 26, and 24 percent in each of those years, respectively.

Africa's exports of manufactured goods were allowed access to the developed countries due to the low level of tariffs imposed in manufactured goods by the developed countries. Developed countries shares rose from 64 percent in 1995 to about 67 percent in 2005 before declining to about 53 percent in 2009. The EU recorded the highest share with 48, 51, and 41 percent in 1995, 2005, and 2009, respectively. The shares of US also increased, from 7 to 8 to 9 percent in the period under review, while Japan experienced a rise and fall from 2 to 3 to 1 percent, respectively. Surprisingly, African countries have been closing their borders to manufactured goods emanating from the continent: the share of African imports of African-produced manufactured good reduced from 20 percent in 1995 to 18 percent in 2005. By 2009, however, it increased to over 26 percent due to regional integration arrangements within the continent. Ultimately, though, Asian countries have allowed Africa's manufactured goods more access to their market than African countries themselves.

2.2.1 Agricultural Sector's Performance

The agricultural sector has been and will always be an important sector to many 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 the past three decades, most African economies were agrarian to the point that most of the foreign exchange earnings in most countries in Africa were from the sector. The discovery of natural resources in commercial quantities in many of the countries, however, led to neglect of the sector and dwindling performance.

Figure 4. Trends in Africa's Agricultural Exports



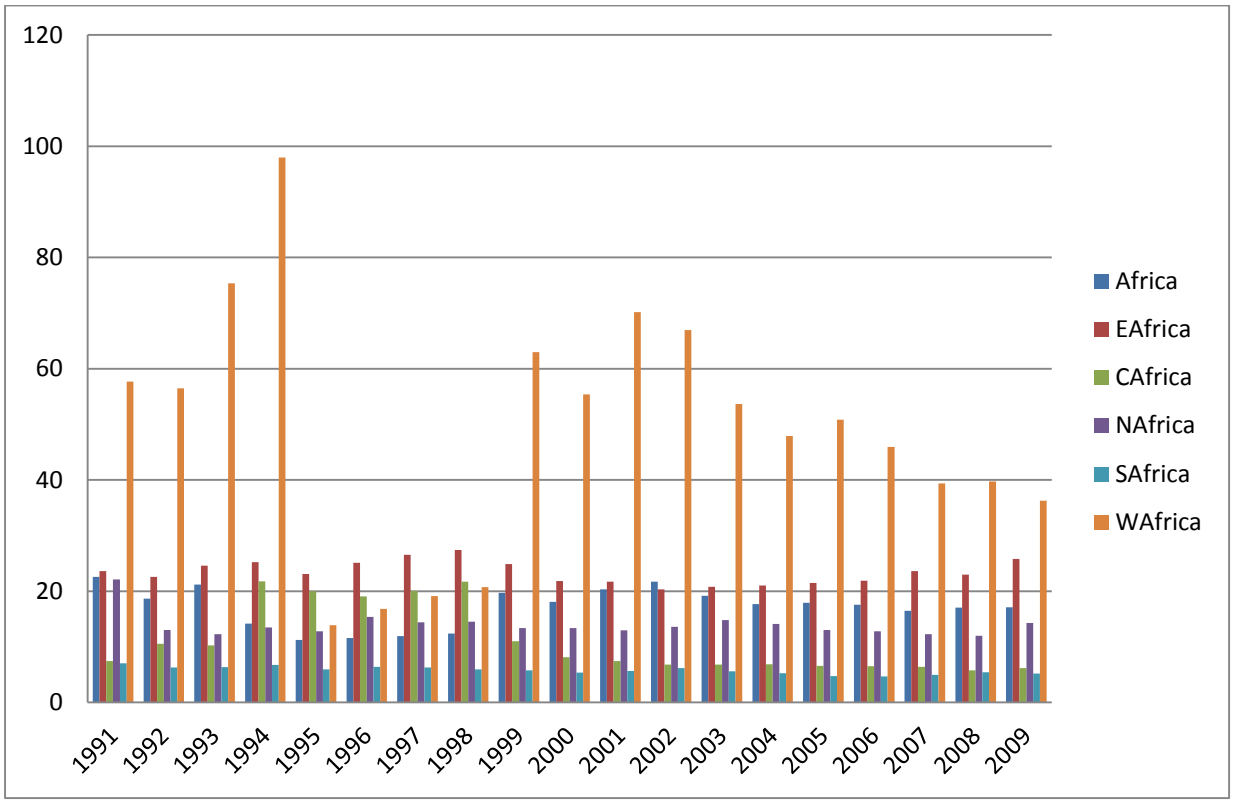
Source: FAO Statistics Database

This could be seen in terms of the sector's exports and contributions to the GDP in Africa. Figure 4 shows that in 1991, Africa exported $100.9 billion USD worth of agricultural products to the world and this later reduced to $93 billion in 1994. This reduction was a result of inadequate supports and infrastructure that would encourage agriculture production for export. By 2000, Africa's agricultural exports rose to $154.9 billion and further increased to $307.9 billion in 2005. These increases were due to efforts by various African governments to encourage and promote agriculture production for export, especially in their quest for diversification of their economies and expansion of export base. This yielded further positive developments as the value of exports increased to $558 billion in 2008; however, due to the global economic meltdown's effect on the demand for Africa's agricultural exports, 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, followed by Southern Africa (except for the period of 2007 to 2009, when West Africa recorded more agricultural exports).

Examining the contribution of agriculture to the GDP in Africa, it could be said that this contribution has not been encouraging in spite of the importance of agriculture to African economies. For instance, in 1991 its contribution to GDP was about 23 percent, and by 1995 it has declined to 11 percent (a reduction of over 50 percent). This actually complemented the reduction in the agricultural exports experienced in the same period. However, the little encouragement the agricultural sector got from

African governments in the subsequent years has a positive impact and the sector's contribution to GDP increased to 18 percent in 2000 before further increasing to about 22 percent in 2002. By 2009, the contribution of agriculture to Africa's GDP dropped to 17 percent (see Figure 5) as a result of inadequate investment promotion in the agricultural sector, which has the potential of boasting agricultural production as proposed by the Comprehensive Africa Agricultural Development Programme (CAADP) of the New Partnership for Africa's Development (NEPAD).

Figure 5. Trends in Agriculture Contribution to GDP in Africa (%)



Source: UNCTAD and FAO Statistics Databases

In terms of the level of employment in Africa, Table 2 presents the trends in employment in Africa's agricultural sector. In 1980, the total number of people engaged in one form of economic activity was over 174 million, with 118 million of them engaged in agricultural activities (68 percent). This complements the earlier assertion that agricultural sector serves as major employer in Africa. The number of people employed in this sector declined marginally in 1990 to 63 percent of the total employment in all sectors in Africa, although in nominal terms it has increased to over 145 million. By 2000, out of about 312 million people employed in all sectors in Africa, agricultural sector employed 179 million people (57 percent). In 2005, the agricultural sector had over 197 million people engaged in the sector out of about 360 million total people employed in Africa, maintaining the 57 percent share of all employment. The number of people *willing* to work in the agricultural sector increased to about 217 million from 413 million employments in Africa (52 percent). The trend in Africa's agricultural

sector employment shows that, in nominal terms, the sector has witnessed increases in people's engagement in agricultural activities; however, this has been increasing at a decreasing rate. The reason for the decline in agricultural sector employment in real terms is due to the neglect by African governments of the development of agriculture and rural areas in providing an enabling environment and infrastructures. This necessitated the rural-urban drift/migration that greatly affected agricultural sector production and trade.

The sub-regional agricultural sector employment indicates majority of the employment in the Eastern Africa between 1980 and 2010 took place in this sector. In fact, in 1980 the sector accounted for 85 percent of the total employment, which later declined to 75 percent by 2010. Central Africa's agricultural sector accounted for 74 percent of total employment in 1980, but later dropped to 57 percent in 2010. In Western Africa, the share was 66 percent in 1980 before it decreased to 45 percent in 2010. Agricultural sector employment was very low in Southern Africa in comparison to other sub-regions, dropping from 25 percent of the total employment in 1980 to 10 percent by 2010.

Table 2: Employment in Africa (in thousands)

	Africa			Eastern Africa			Central Africa			Northern Africa			Southern Africa			Western Africa		
	Total	**Agric**	**%***	**Total**	**Agric**	**%**	**Total**	**Agric**	**%**	**Total**	**Agric**	**%**	**Total**	**Agric**	**%**	**Total**	**Agric**	**%**
1980	174429.90	118067	68	63198.18	51935	82	21032.83	15559	74	32872.73	16745	51	9320.1	2348	25	48006.06	31480	66
1990	230780.64	145387	63	84804.87	68611	81	27623.35	19897	72	43454.53	17868	41	12774.2	2466	19	62123.69	36545	59
2000	311943.30	178755	57	113105.2	89049	79	37832.95	24484	65	58621.73	19937	34	18176.87	2490	14	84206.56	42795	51
2005	359851.77	197124	55	131280	100887	77	44086.41	27068	61	66900.41	20605	31	20473.56	2367	12	97111.37	46197	48
2006	369846.59	200698	54	134935.9	103146	76	45469.18	27547	61	68663.9	20726	30	20925.45	2339	11	99852.16	46940	47
2007	379913.58	204568	54	138714.9	105690	76	46877.63	27916	60	70265.22	20870	30	21392.71	2328	11	102663.1	47764	47
2008	390630.35	208567	53	142609.6	108327	76	48333.08	28369	59	72012.02	20977	29	22118.84	2306	10	105556.9	48588	46
2009	402632.05	212644	53	147546.1	111036	75	49901.14	28820	58	74142.03	21068	28	22323.39	2281	10	108719.4	49439	45
2010	413824.98	216787	52	152016.4	113801	75	51474.91	29276	57	75837.82	21133	28	22663.23	2257	10	111832.6	50320	45

Source: Computed from UNCTAD Statistics

*****Indicates the percentage of agricultural sector employment in the total employment.

Table 3: Africa's Agricultural Sector Employment by Gender (in thousands)

Year	1980		1990		2000		2005		2006	
	Total	Female	Total	Female	Total	Female	Total	Female	Total	Female
Africa	118067	52349	145387	66777	178755	84280	197124	94603	200698	96637
Eastern Africa	51935	25784	68611	34501	89049	45483	100887	51847	103146	53047
Central Africa	15559	7679	19897	10039	24484	12200	27068	13680	27547	13961
Northern Africa	16745	5036	17868	6387	19937	7860	20605	8518	20726	8679
Southern Africa	2348	1028	2466	1001	2490	1035	2367	1000	2339	993
Western Africa	31480	12822	36545	14849	42795	17702	46197	19558	46940	19957

Source: UNCTAD Statistics

Table 3: Cont.: Africa's Agricultural Sector Employment by Gender (in thousands)

YEAR	2007		2008		2009	2010		
	Total	Female	Total	Female	Total	Female	Total	Female
Africa	204568	98465	208567	100636	212644	102838	216787	105063
Eastern Africa	105690	54221	108327	55587	111036	56979	113801	58393
Central Africa	27916	14108	28369	14363	28820	14620	29276	14878
Northern Africa	20870	8761	20977	8870	21068	8968	21133	9049
Southern Africa	2328	983	2306	975	2281	967	2257	959
Western Africa	47764	20392	48588	20841	49439	21304	50320	21784

Source: UNCTAD Statistics

Looking at the participation rate of women in the agricultural sector in Africa overtime, it can be seen from Table 3 that out of the 118 million people engaged in Africa's agricultural activities in 1980, over 52 million of them were female, which represents 44 percent. The involvement of females in agricultural activities increased to about 46 percent in 1990, which means that about half of the people employed in the agricultural sector in Africa for that year were female. In 2000, over 82 million female workers were involved in the sector, out of about 179 million people engaged in all sectors. The percentage of females involved in agriculture-related activities increased in 2005 to about 48 percent, which in nominal term is over 197 million. This trend continues up till 2010 when the total number of female workers in the sector rose to over 105 million, which constituted about 49 percent of the total employment in Africa. This implies that women have progressively found the agricultural sector viable and lucrative to engage in, while in contrast their male counterparts have been withdrawing gradually from agricultural activities. If this trend should continue on the continent, then we shall have a female-dominated agricultural sector. It is important to note that it is the women that actually dominate the agricultural sector activities in Eastern and Central Africa, while their proportions in the total employment in the sector for other sub-regions were remarkable and impressive.

2.2.2 Trade Policies Confronting Africa's Agricultural Exports

The integration of countries, especially developing countries, into global markets offers the opportunity for rapid growth and reduction in the level of poverty. However, global trade in export products that is of interest to developing countries remains heavily protected. The market access restrictions and trade-distorting subsidies that are imposed by the industrialized economies tend to be skewed toward labour-intensive manufactures and agricultural products of which African countries have comparative advantage. The trade policies of the developing countries themselves target many of the same products, adding substantially to the burden they face in increasing and diversifying their exports.

Traditionally, Africa's major trade partners are the quad countries (Canada, EU, Japan, and US) as they constitute about 80 percent of Africa's trade. However, recent events have shown that there had been gradual shift in Africa's trade direction towards China and India. The trade policies in these countries would determine the volume of trade that the continent will record with them. In terms of the NTBs, the incidence of non-tariff measures indicates the case or number of imposition of non-tariff measures on Africa's agricultural exports. There are many non-tariff measures that could be imposed on imports of any given country. Some of them are technical barriers, sanitary and phytosanitary (SPS), countervailing, anti-dumping, rule of origin, safeguard measures, etc. Table 4 accounts for the rate of the incidence of these non-tariff measures (NTM) on Africa's exports. In Canada, products such as meat and edible meat; ornamental fish; dairy products; leeks and other alliaceous vegetable; vegetable seeds; edible fruits and nuts; cereals; gum Arabic as well as sugar beet were faced with 100% non-tariff measures. This means that all these products in Canada were confronted with virtually all the NTM that

are available in the Canadian market. However, products like coffee and tea; beer from malt; full grains; other vegetable materials; animal fats and oil; cocoa beans; and others were free from NTM incidences. In the EU, only meat and edible meat attracted 100 percent non-tariff measures incidences. Products such as ornamental fish and animal fats and oil and their fractions were faced with just 50% NTM incidence. Japan has no incidence of non-tariff measures on Africa's exports except for ornamental fish and preparation based on sausages and similar products that have 100 percent incidence of non-tariff measures. The US has no incidence of non-tariff measures on gum Arabic, full grains, brooms and brushes with twigs or other vegetable materials, sugar beet, cocoa beans, residues of starch manufactures, and tobacco that are not stemmed. There is a 50 percent incidence of NTM on ornamental fish and animal fats and oil and their fractions in the United States, while other Africa's exports in the products group in Table 4 attracted 100 percent NTM incidence.

Table 4: Non-Tariff Measure Incidences (%) in Quad Countries, China and India

Product Group	Canada	EU	Japan	US	China	India
Live Animals	-	-	-	-	-	-
Meat & Edible Meat	100	100	0	100	100	100
Ornamental Fish	100	50	100	50	0	100
Dairy Products	100	0	0	100	0	100
Leeks and other alliaceous vegetables	100	0	0	100	0	100
Vegetable Seeds	100	0	0	100	0	0
Edible Fruits & Nuts	100	0	0	100	0	100
Coffee, Tea	0	0	0	100	0	100
Cereal	100	0	0	100	0	0
Beer from Malt	0	0	0	100	0	100
Full Grains, Unsplit; Grain Splits	0	0	0	0	n.a	n.a.
Gum Arabic	100	0	0	0	0	0
Brooms & brushes with twigs or other vegetable materials	0	0	0	0	0	100
Animal fats & oils and their fractions	0	50	0	50	0	100
Preparation based on sausages & similar products, meat, meat offal/blood	25	0	100	100	0	100
Sugar Beet	100	0	0	0	0	100
Cocoa Beans	0	0	0	0	100	0
Preparation of tapioca & substitutes from starch	0	0	0	100	0	100
Machinery for the preparation animal or fixed or vegetable fats or oils	0	0	0	0	0	0
Ice Cream & Other Edible Ice	3	0	0	100	0	0
Fermented beverages; mixtures of fermented beverages & non-alcoholic beverage	0	0	0	100	0	
Residues of starch manufactures & similar residues	0	0	0	0	0	0
Tobacco not stemmed or stripped	0	0	0	0	100	0

Source: UNCTAD TRAINS Database

In China, there is very low incidence of non-tariff measures on Africa's exports. From Table 4, it can be seen that only three of Africa's exports-- meat and edible meat, cocoa beans and tobacco not stemmed or stripped-- attracted 100 percent NTM incidence in Chinese markets. There is contrary incidence of NTM in India: apart from vegetable seeds, cereal, gum Arabic, cocoa beans, vegetable fats and oil, ice cream and other edible ice, residues of starch manufactures, and tobacco not stemmed, all of which did not witness any incidence of NTM in Indian markets, all other products of Africa to their economies were faced with 100 percent NTM incidence. Thus, the US has the highest incidences of NTM, followed by India and Canada, while Japan has the lowest incidences, followed by the EU and China.

2.3 An Overview of Product Standards

Generally, standards requirements are used in the protection of human, animal, or plant health in any country from risk arising from additives, contaminants, toxins, disease-causing organisms in foods, beverages or foodstuffs. Another interest is reducing risk of diseases caused by animals, plants, or products thereof while limiting other damage caused by the spread of pests. Standards in international trade are used for the quality requirements of the products and the production process in order to safeguard human and animal life as well as the environment. They are used as the technical measures in trade between importing and exporting countries, or as a mechanism to facilitate compliance to technical regulations. Pedagogically, international trade standard is a formal document that is established by consensus and published by a recognized body that provides for repeated use, rules, guidelines, or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context (ISO, 2010). Thus, standards can apply to products and services as well as the process or systems that are utilized to provide them. The essence of the usage of standards is to ensure compliance, which will facilitate market access and ensure product safety and quality while preventing deceptive practices and protecting the environment (ISO/ITC, 2011).

In international trade there are also technical barriers to trade (TBT), which is part of non-tariff measures (NTMs). The TBT are comprised of technical regulations, standards, and conformity assessment (Kareem, 2010). The technical regulation is a document that provide legislative rules that is adopted by an authority (i.e. a regulator), which provides technical requirement, either directly or by referring to or incorporating the content of a standard, technical specification or code of practice. It should be noted that a technical regulation may be complemented by technical guidance that outlines some mechanisms of compliance with the requirements of the regulation. The WTO defines technical regulations as document that lays down product characteristics or their related processes and production methods, including the applicable administrative provisions, with which compliance is mandatory (ISO/ITC, 2010). This may include or deal exclusively with terminology, symbols, packaging, making or labeling requirements as they apply to a

product, process or production method. Standard is defined as a document that is approved by a recognized body that provides for common and repeated common use, rules, guidelines or characteristics for products or related processes and production methods, with which compliance is not mandatory (see ITC, 2011; ISO/UNIDO, 2010). Conformity assessment is said to be any procedure by producers, suppliers, clients, regulatory bodies or third parties, directly or indirectly to determine that relevant requirements in technical regulations or standards are fulfilled. It is a collective term that covers all the services needed to provide evidence that a product or service complies with a standard or technical regulation. This assessment could be provided by independent third parties, or by the supplier, depending on the purchaser of regulatory authority requirements. This includes testing, inspection, products or system certification, or any relevant combination of these (ISO/UNIDO, 2010).

International trade standards include product standards, which establish the fitness of products for a particular use; and process or management standards that deal with the quality of the production process. Aside this, there is documentary standards, which set specifications for the function and operation of a device or system (ISO/ITC, 2010). Also, test and measurement standards are broadly used for infra-technologies that support market efficiency. Further, there are different stages in the standards mechanism. First, there is the setting of standards for products and services, which is followed by the adoption of these standards by these setters. The next stage is the implementation of the standards by those setters. Another stage is the conformity assessment of the standards that involves testing, inspection and certification. Enforcement is the last stage in this mechanism and it involves rejection, withdrawal and sanctions of products and services (ISO, 2010).

In a broad analysis, standards could be categorized into product and process standards. Products standards are standards on goods and services while process standards are applicable to process of making or producing the products (Kareem, 2010). In line with the WTO agreements of SPS, this study deals with the product standards that are applied to food products in the EU.

Two types of these standards are identified in the literature: public and private standards (ITC, 2011; ISO/ITC, 2010)[2]. The public standards are the quality requirements set by the government in order to protect the people, animals, plants, and the environment from products that will have a harmful effect on their health and well-being. However, private standards are developed by companies, civil societies, other coalitions and collective organizations such as industry associations and NGOs, which are mainly for strategic reasons. There are also mandatory and voluntary standards. Mandatory standards are compulsory requirements that products or services must abide with before gaining access to the market. These standards are usually technical regulations that are given by the government which are required to be in conformity

[2] This section gives the taxonomy of standards in the literature and this is the reason for identifying private standards and not that it is the focus of this study.

with the WTO Technical Barriers to Trade (TBT) agreements. Voluntary standards are non-mandatory requirements that products are at liberty to abide with or fulfill; however, this could be demanded by contract or considered desirable by the marketplace. In short, public standards can be mandatory or voluntary standards depending on whether the standards are backed by legislation or not. The public standards that are backed by law of the country are the technical regulations and they are mandatory, while those not backed by law but introduced and implemented by the regulatory agencies in the country are voluntary (the private standards are usually voluntary).

In addition to all this, there is global governance to international trade standards that is facilitated by the World Trade Organization (WTO). WTO provides the framework with which standards are monitored and disputes are settled. The WTO had two international standards agreements: the Agreement on Technical Barriers to Trade (TBT) and the Agreement on Application of Sanitary and Phytosanitary (SPS) Measures. These agreements recognize the need for governments to establish regulations, but they did not set any standards (ISO/UNIDO, 2010). The TBT agreement recognizes that access to markets can be restricted through the use of technical regulations and standards, which are different across countries and could be said to be protective such as the non-tariff barriers to trade if they are used arbitrarily. This agreement acknowledges the right of a country to adopt those technical regulations, standards and conformity assessment procedures it considers appropriate to sustain and protect human, animal or plant life or health, to assure the protection of the environment, or to meet other consumer interests. Also, TBT agreement allows countries to employ other mechanisms such as equivalence and mutual recognition of the standards of others when developing technical regulations (see ITC, 2011).

The Sanitary and Phytosanitary agreement is put in place to protect human, animal or plant life from risks arising from additives or disease-causing organisms in food, and to protect a country from the damage caused by the spread of pests, which may, directly or indirectly, affect international trade. This agreement makes provision for the sovereign right of governments to take such measures, but requires that they should not be arbitrarily or unfairly discriminatory against other countries and be based on scientific evidence. It is recommended that countries should base their SPS measures and technical regulations on international standards, where they exist. The standards that are of particular relevance are that of the Codex Alimentarius Commission (CAC), the International Plant Protection Convention (IPPC) and the International Office Epizootics (OIE) (see ITC, 2011; ISO/ITC, 2010). These three inter-governmental organizations are commonly referred to as the "three sisters". The SPS agreement shows that for matters not covered by the sisters, appropriate standards, guidelines and recommendations promulgated by other "relevant international organizations open for membership to all Members, as identified by the agreement" may also be considered as "international standards". However, in reality, the WTO SPS committee has yet to identify such organizations (ISO/ITC, 2010).

In technical terms, there are differences between TBT and SPS measures. The major difference between these non-tariff measures is whether the measure is to address food safety risks from pest or disease, food-borne risks. For instance, the TBT deals with the regulation of quality, grading and labeling of imported vegetable while SPS regulates the treatment of imported vegetables to prevent pests. Also, the TBT provides regulation on label's position, letter size, nutrient content and quality, while the regulation of permitted food safety, health warnings and dosage are done by SPS. By and large, the SPS covers food safety and/or health protection measures; however, TBT cover all technical requirements for agricultural and industrial products except those covered by SPS measures.

Thus, a perusal of conceptual issues of international trade standards shows that there is different usage of the term "standards" in different contexts. At times, SPS is taken as the standard and used differently with TBT (while standards and technical regulations also have similar identification challenge), but most often they are used interchangeably by scholars, researchers, trade practitioners and authors(see Shepherd, 2007; 2013; Czubala et al. 2009; Fugazza, 2013; Asfaw et al. 2007). This is because of the very close definitions between the two terms, in facts, some scholars often confused their meanings, and in the empirical literature, there is divergence opinion with regards to their usage and definitions. Technically, to my understanding, this is not the case, as there are differences between technical regulations and standards[3] because the regulations deal with the laws and rules governing standards, which are mandatory while standards are the specific content requirements, vis a vis, the sanitary and phytosanitary requirements for every product that often set by the national standards agencies and said to be voluntary. For instance, many technical regulations often identified mycotoxins inspections for nuts and seeds, but the national standards agencies give the specificity of SPS by disaggregating the mycotoxins regulations into aflatoxins, Ochratoxin A, etc. Also, I discovered that private standards, though are voluntary but with the influence, technological and scientific orientation of the private standards setters on government, some of these standards are adopted as public standards. Thus, this makes private standards indirectly mandatory in many of the countries. More so, in a case where there is no provision for international public standards on a product, then the international private standards such as the ISO standards are often used and adopted as the international/ public standards if available for the product case (ITC, 2011; ISO/UNIDO, 2010), but this does not mean private standards are public.

2.4 EU Standard Requirements: Hurdles to Pass 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 placed on products

[3] Both are subset of the Technical Barriers to Trade.

before accessing the EU market[4]. Below, 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 5 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 5: 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			
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).

2.5 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 European Union has product standard requirements (i.e. HTP) for all

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

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 Six 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. Nuts and seed products recorded 244 rejected exports in 2002, which later increased to 707 in 2006 before declining to 468 in 2010, 424 in 2011, and 272 in 2012. Fruits and vegetables had 110 border rejections in 2002, and the volume of border rejection of products rose to 258 in 2006 before declining to 244 in 2010, later increasing to 360 in 2011 and 479 in 2012. Herbs and spices had 26 instances of exported products refused access to the European Union in 2002. This increased to 153 instances in 2012 before declining to 116 in 2011 and 83 in 2012, . In 2002, only two exported food and contact materials were denied access, but by 2006 it has increased to 109 before dropping to 88 in 2010, which later increased to 125 and 127 in 2011 and 2012, respectively. In relative terms, cocoa and cocoa preparation, as well as coffee and tea had low border rejections because in 2002, it recorded 15 rejections that later rose to 26 in 2006 before declining to 9 in 2010, however, by 2011 and 2012, the volume of rejection at the border increased to 16 and 52, 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 nuts and seeds, fish and fishery products, fruits and vegetables, and herbs and spices were mostly denied access many of the EU countries.

Table 6: 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 7 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 7: 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 8, 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 8: 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 be seen from table 9 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 9: 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 10 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 10: 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.

Africa's nuts and seeds border rejection is relatively high compared to other products. Egypt had the highest rejection of the products with 126 refusals, followed by 78 Nigeria's exports of these products denied access, 68 from Ghana, while South Africa, Sudan and Malawi witnessed 45, 39 and 20 border rejections.

Table 11: EU Rejections of Nuts and Seeds

Country	2002	2006	2007	2008	Total	% Share
Egypt	6	19	14	30	126	2.70
Nigeria	0	15	24	18	78	1.67
Ghana	1	23	5	8	68	1.45
South Africa	12	6	4	4	45	0.96
Sudan	0	10	2	0	39	0.83
Malawi	0	2	1	10	20	0.43
Total	244	707	619	744	4674	100.00

Source: Author's compilation and calculations from RASFF.

The prevalence of rejection of herbs and spices was mainly concentrated in Egypt with 34 number of refusal, Ghana and Morocco had 21 apiece.

Table 12: EU Rejections of Herbs and Spices

Country	2002	2006	2007	2008	Total	% Share
Egypt	0	3	4	2	34	4.04
Ghana	0	9	0	4	21	2.50
Morocco	2	7	2	3	21	2.50
Total	26	131	113	91	841	100.00

Source: Author's compilation and calculations from RASFF.

2.5 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 13, statistics from the rapid alert system for foods and feeds (RASFF) in table 13 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

Table 13: 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 the African products is presented in Table 14 for selected countries from 2002 to 2008. Product composition, mycotoxins, microbiological contaminants, unauthorized food additives, and presence of heavy metals were the main reasons for rejecting foods and feeds from continent.

Table 14: EU Reasons for Rejection 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

Figure 6 shows the reasons for the refusal of fish and fishery products for the selected African countries. None of the countries selected were affected by the veterinary drug residue; however, the major hazards to fish and fishery products resulting in rejection included microbiological contaminants (Morocco, Tunisia and Senegal), heavy metals (Namibia, Morocco and Tunisia), biotoxins (Morocco), and "Not determined/other hazards" (Morocco, Senegal and Angola).

The hazards that accounted for the rejections of fruits and vegetables, illustrated in Figure 7, varied more depending on the products' point of origin. For example, pesticide residues and foreign bodies accounted for rejection of Egypt's fruits and vegetables, while Tunisian 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 also were the primary reasons for rejection of Nigeria's fruits and vegetables.

Figure 6: EU Reasons for Rejections of Fish and Fishery Products, 2002-2008

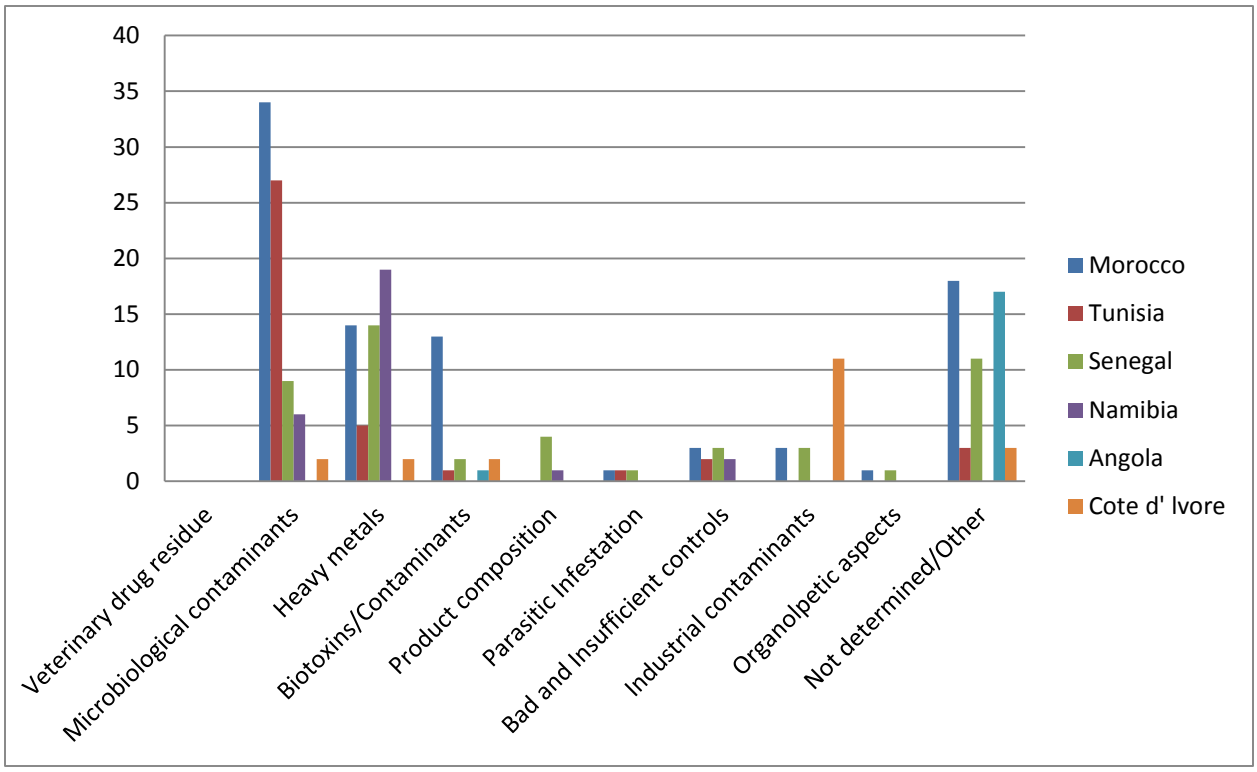
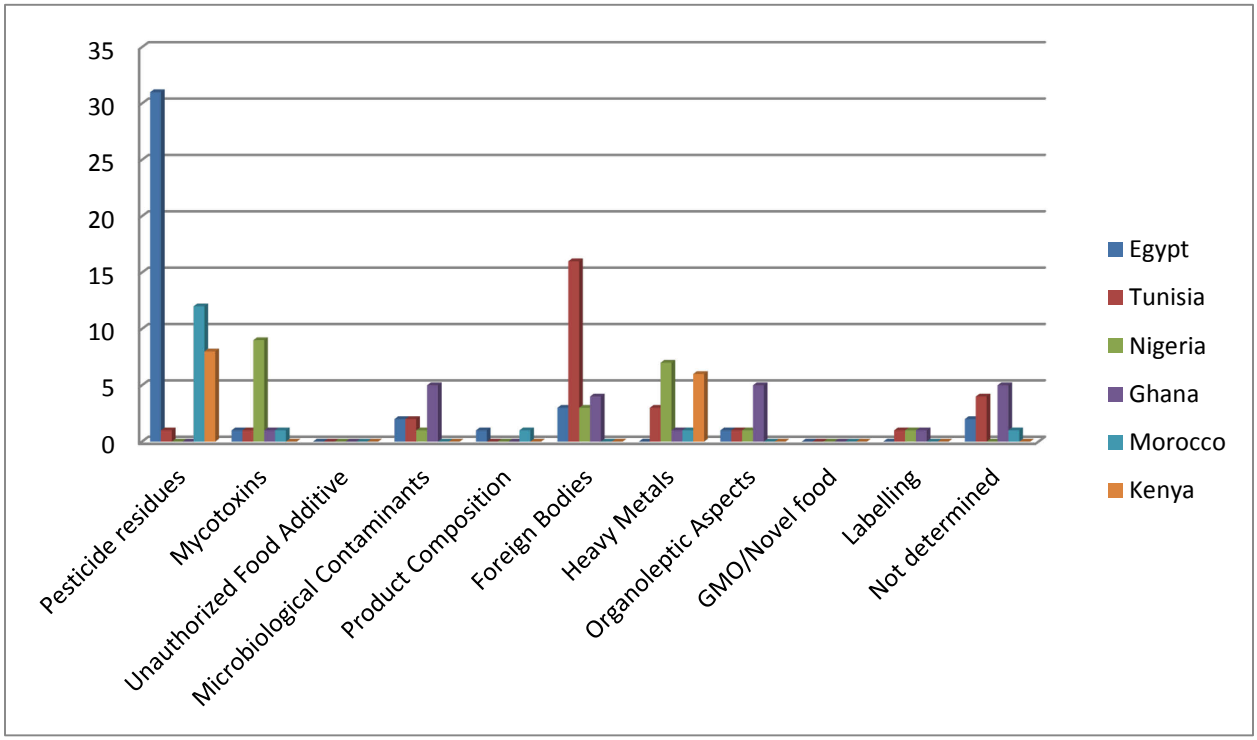


Figure 7: EU Reasons for Rejection of Fruits and Vegetables Products



The major hazard that accounted for nuts and seeds rejection was mycotoxins (see Figure 8). Among the reasons for rejection of herbs and spices (Figure 9), microbiological contaminants, unauthorized food additives, and pesticide residues were the major HTP that led to rejections of Egyptian products, while mycotoxins, unauthorized food additives, and foreign bodies were the main HTP for Ghana and Morocco faced rejection due to pesticide residues, microbiological contaminants, and foreign bodies.

Figure 8: Reasons for EU Rejections of Nuts and Seeds 2002-2008

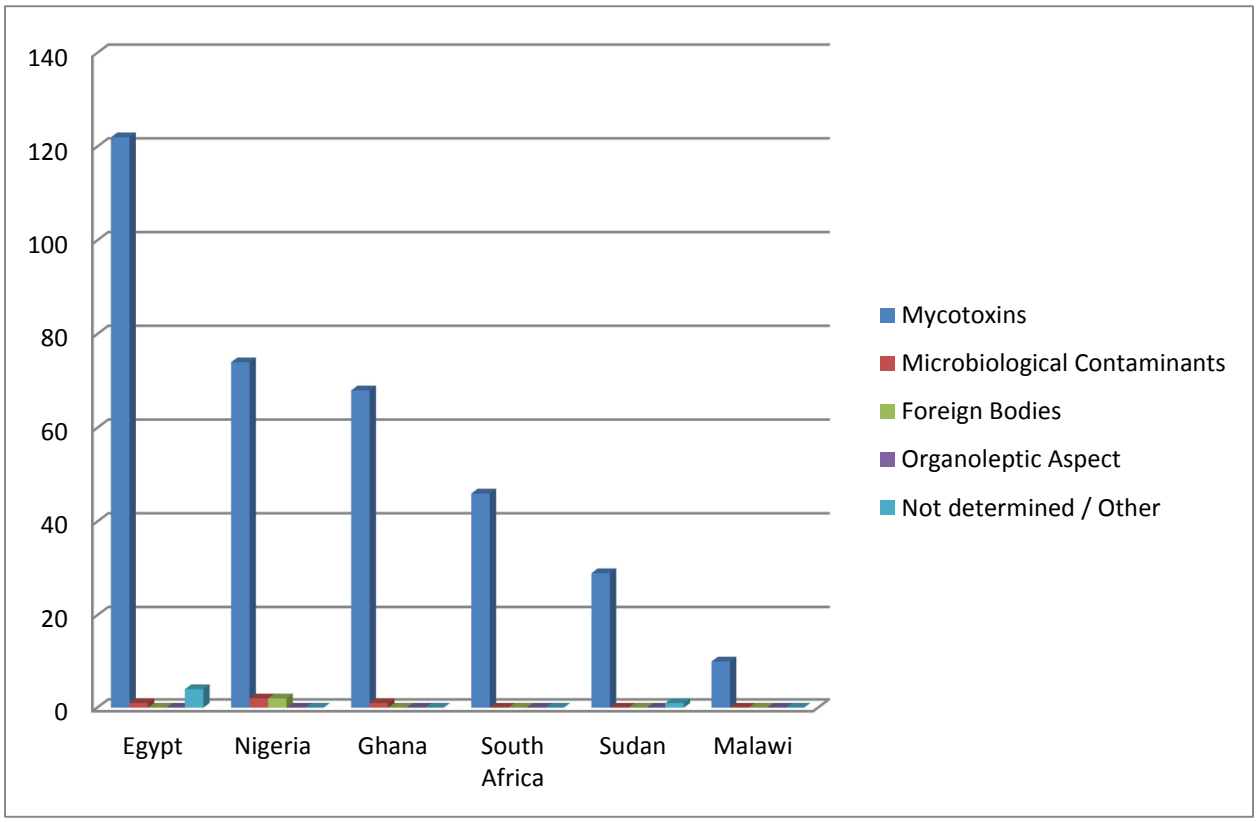
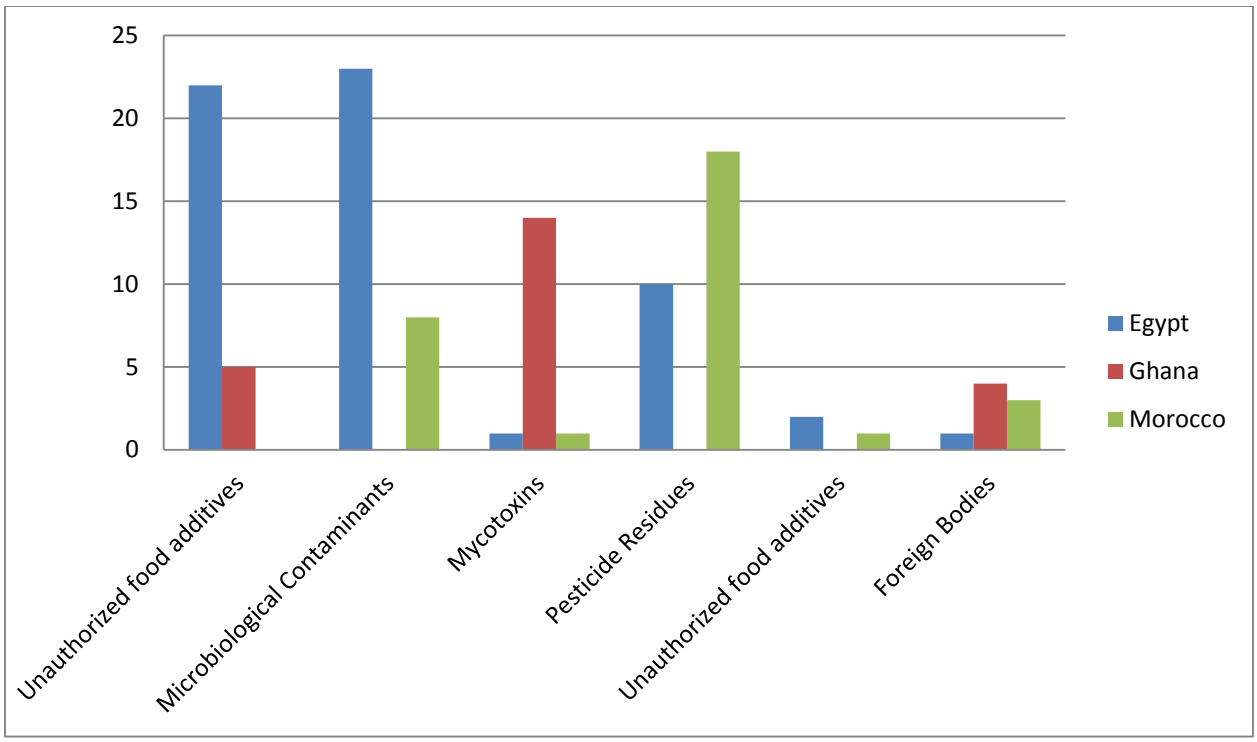


Figure 9: EU Reason for Rejections of Herbs & Spices



3. Review of the Literature

This review focuses on public standards studies of Africa, but since empirical studies related to Africa are rare, other developing economies trading with the EU also are examined. Recent studies are given priority, but references also are made to some studies in the past decades that are relevant. Although emphasis is given to review literature using gravity models, a quick overview of methodologies used in empirical studies also is included. The literature in this area for other regions is impressive, although still scant, given the importance and emergence of NTBs as major barriers to market access to countries, especially the developing ones.

The WTO (2012) report traced the genesis of the use of NTBs to the period of General Agreement on Tariffs and Trade (GATT), however, it is only in recent years that the frequency and incidence of NTBs have become pronounced, probably as a result of the continuous decline in tariffs and the recent global economic crisis, which affected most developed economies. A diagnostic analysis of literature on standards shows that many of the studies were conducted in order to determine its impact on African and other developing economies (see Chemnitz, Grethe, and Kleinwechter 2007; Shepherd and Wilson 2010; Brobery 2009; Henson and Humphrey 2009b; Rio and Jaffee 2008; Beghin et al. 2011; Crivelli and Groschi 2012; Schlueter et al. 2009; Martinez and Poole 2004; Henson and Jaffee 2006; Henson 2006). Many of the studies concluded that standards impede trade because the relatively poor development of science and technology,

institutions, management, absorptive capacity of producers, and other factors in these countries prevent them from conforming to the standards in the markets of their trading partners, particularly the developed countries.

Put differently, available evidence shows that tariffs have been decreasing and their impact is gradually becoming marginal, although they still can be significant as a result of bilateral, regional, and multilateral trade agreements (World Trade Organization 2012; UNCTAD 2013; Asci, Koc, and SukruErdem 2013; Kareem 2010). In contrast, recent studies have revealed the importance of nontariff measures in global trade (UNCTAD 2013; Fugazza 2013; Haveman and Thursby 2000; Fugazza and Maur 2006; Fontagne et al. 2010; Staiger 2011; Kareem 2012). Nontariff measures include anti-dumping, countervailing to rule of origin, procurement, subsidies, voluntary export restriction, quotas, and technical barriers to trade such as standards, technical regulations, conformity assessment, and certification (see UNCTAD, 2013). Technical measures have become the most important factor in the regulation of global trade (see Fugazza 2013; UNCTAD 2013) and their significance to Africa's exports has been analyzed by Otsuki, Wilson, and Sewadeh (2001); Okello and Roy (2007); and Maertens and Swinnen (2009).

Despite the importance of product standards to Africa and the region's quest for sustainable development through employment generation, poverty reduction, and growth, only a few studies have been conducted to actually determine the extent to which this technical barrier to trade has influenced market access of products originating from Africa. The paucity of empirical studies, acknowledged by Shepherd and Wilson (2010), has inhibited research and evidence-based policy formulation by African governments that could solve the problem of inadequate conformity and the inaccessibility of African exports to the markets of the region's trading partners. Studies conducted by Cheminitz, Grethe, and Kleinwechter (2007); Wilson and Abiola (2003); Czubala, Shepherd, and Wilson (2009); and Otski, Wilson, and Sewadeh (2001) show that Africa's exports were restricted to the developed markets because of 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 the region's market. Mutume (2006) opined that implicit efforts to raise African standards to the level of those in developed countries resulted in the development of extra layers of regulatory barriers in developed countries, which led to the exclusion of cheap African exports.

However, there are studies by Ignacio (2008), Jaffee, and Henson (2005); Henson and Jaffee (2009); Henson and Humphrey (2008); and Maertens and Swinnen (2009) that state that standards could serve as the impetus for long-term export growth in the agricultural and food sector. These authors believe that standards could act as a bridge between producers in Africa and consumer preferences in developed markets, which could then serve as catalysts for improving, upgrading, and modernizing the continent's food supply system and enhancing Africa's competitive capacity. Put differently, McCullough, Pingali, and Stamoulis (2008); Swinnen (2007); and Henson (2006) said that the trade impact of standards could be both

restrictive and enhancing, depending on the degree of adjustment by institutions regulating trade. They argue that the rise in standards, both private and public, has led to sudden change in the organization of exports, especially food exports, and that this increase has affected the distribution of welfare not only across countries but also along supply chains and among rural dwellers (World Bank 2005).

Further, a review of the literature on African standards indicates that most of the studies were conducted on horticultural products and focused primarily on Kenya and other East African countries (see Wilson and Abiola, 2003; Jaffee 2005). Wilson and Abiola (2003) analysed the impact of standards on the horticultural industry in Kenya and found that, apart from the changing consumer preferences, the major challenges 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) studied the challenges and opportunities for Kenya's fresh vegetable trade in the context of emerging food safety and other standards in Europe. He examined the challenges of changing regulatory and market requirements and the coping strategy adopted by Kenyan horticultural exporters and growers. He found they already presume that compliance with standards is a must, given the requirements by major importers and markets in the future, and have improved product quality to meet those requirements.

A case study by Minten, Randrianarisen, and Swinnen (2006) of a large contract-farming scheme with smallholder producers in Madagascar's vegetable export subsector 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 percent based on contracting with small holders to a reliance on 50 percent 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 et al. (2009) to evaluate the extent to which investment in standard 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 they were 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 commonality finding most 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), 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; their evolution had been traced by Henson and Humphrey (2009b). Among the studies that have worked on public standards, Vancauteren and de Frahan (2004), Shepherd and Wilson (2010), Swann (2010), An and Maskus (2008), Shepherd (2008), Shepherd and Wilson (2013), and Ferro et al. (2013) have used harmonized standards, 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 strategic, procedural and structural initiatives to solidify the confidence and trust of importing countries on the safety and quality of their exports. In a similar vein, Chemitz, Grethe and Kleinwechter (2007) developed an analytical framework that lays out the problem of whether, how, and to what extent small producers in developing countries are on 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 hinder developing countries' export of food products, Brobery (2009) proposes three specific measures that could serve as solutions to these problems. First is the improvement in the harmonization of food safety measures in the developed markets. Second, the European Commission should examine on a regular basis the consequence of any new proposed food safety measures on developing countries. Lastly, the Commission should strengthen its provision of development assistance to enable the developing countries to comply with the food safety standards.

In contrast to this, 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, and 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 is complemented by Henson and Humphrey (2009a) when they posit that the diversity food safety standards, in their institutional form, scope, and prevalence across value chains, belies attempts to draw general conclusions. They do however 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 are fuelled by misunderstanding of the reason for the evolution of such standards. In another study carried out by Henson and Jaffee (2008), they argue 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. The study does not deny the adverse effects that public and private standards may have on agriculture and food exports from developing countries, but rather emphasizes the need for a strategic orientation when considering the trade effects of food safety standards. The study presents limited evidence in terms of scope and scale and stresses the need for further research.

3.1 Methodological Review

This section reviews the models and estimation techniques utilized in the literature in this area of research. A critical examination of the literature shows that many of the empirical studies on trade and standards often adopt gravity models (Otsukietal, 2001; Wilson and Otsuki, 2004; Jun Yang and Findlay, 2008; Melo et al. 2012; Shepherd and Wilson, 2013, Peterson et al. 2013). The extent of the adoption and application of these models depend on the research questions and trade data (Head and Mayer, 2013; Baldwin and Taglioni, 2007; Henson and Loader, 2001). Given the theoretical framework of gravity models, its effectiveness in modelling trade relations (bilateral, regional and multilateral), investment, migration, aid, and regional integration has been widely acknowledged (Baldwin and Taglioni, 2007; Head and Mayer, 2013). Recently, some studies have investigated the extensive and intensive margins of trade in the product standards literature using gravity models (Helpman et al. 2008; Belenkij, 2009; Munasib and Roy, 2013), while other studies that have used other econometric models to study these margins of trade (Jongwanich, 2009; Xiong and Beghin, 2011; Liu and Yue, 2011; Schuster and Maerter, 2013; Grundke and Moser, 2013). The similarity in these studies is the Heckman specification, which was modified by Helpman et al. (2008).[5] A critical evaluation of these studies show that their results depend on the model specifications (Santos Silva and Tenreyro, 2006, 2011; Gomez-Herrera, 2011), estimation techniques (Santos, Silva and Tenreyro, 2009; Flam and Nordström, 2011; Helpman et al. 2008; Martinez-Zarzoso, 2013), data (Martinez-Zarzoso, 2013; Cipollina and Salvatici, 2008; Burger et al. 2009) and the countries or regions of focus (Martinez-Zarzoso, 2013).

As such, the focus of recent gravity modelling is on the appropriate specifications, including variables and types of data to be used in gravity models' estimation (Shepherd, 2012; UNCTAD-WTO 2011; Baldwin and Taglioni, 2007, 2011; Westerlund and Wilhelmsson, 2006; Santos Silva and Tenreyro, 2009; Martinez-Zarzoso, 2013). Although Anderson and Wincoop (2003) give a sound theoretical micro-foundation to the use of gravity model, the study uses cross-sectional data, which is not the type of data this study shall use. Mayer and Zignago (2005) use a panel data covering both developed and developing counties with their imports, GDPs, and prices in relative terms; however, Baldwin and Taglioni (2007) show the importance of using the nominal values of these variables at unidirectional trade and GDPs levels at an aggregated trade level. Haveman and Thursby (2000) specify a gravity model in unidirectional trade with nominal values of imports and GDPs at a disaggregated product levels and with the inclusion of trade policy variables, but it is also cross-sectional for two years, 1994 and 1998. A critical examination of all these studies and others was recently carried out by Head and Mayer (2013); after reviewing existing facts on gravity modelling and established sound estimation and interpretation of gravity equations for bilateral trade, they argue

[5] The implication of these specifications is that firms' heterogeneity was evaluated.

against the reliance on one particular method to modelling gravity equation and instead they advocate a workhorse, toolkit and cookbook approach.

Economic theory indicates that product standards could either inhibit or enhance trade (Maskus, Otsuki and Wilson, 2005) irrespective of the methodology. Available facts from empirical studies gave credence and support to this theoretical assertion. Some of the early and widely cited studies in the area are Gesiorek et al. (1992), Swann et al. (1996), Moenius (1999), Otsuki et al. (2001), Wilson and Otsuki (2003), and Wilson et al. (2002). An econometric model specified by Swann et al. (1996) constructs standards data through a simple count of the number in the industry to investigate the effects of standards on Britain's trade from 1995 to 1991. Prior to Swann et al. (1996), Gasiorek et al. (1992) used the computable general equilibrium (CGE) model for trade impact of standards. Wilson and Otsuki (2003) examine the effects of adopting food safety standards and the harmonization of standards on global food trade patterns. They estimate the effects of aflatoxin standards in 15 importing (four developing) countries on exports from 31 (21 developing) countries using a gravity model. Also, Mangelsdorf, Portugal-Perez, and Wilson (2002) investigate the impact of voluntary and mandatory standards on China's agricultural and food exports using a new dataset on Chinese food standards that covers seven products from 1992-2008 in a gravity equation.

Addtionally, Chevassus-Lozza et al. (2008) use a gravity model to find direct trade impact of sanitary measures, which they find to exert insignificant negative impact when phytosanitary and quality measures are used. Asfaw, Mithofer and Waibel (2007) examine the costs of compliance, the factors explaining the smallholder decision to adopt EU quality standards, and the impact of the standards on farm financial performance by developing a two-stage standard treatment effect model to account for self-selection as a source of endogeneity. The analysis is based on a random cross-sectional sample of 439 small-scale export vegetable producers in Kenya whose production was monitored in 2005/2006. Maerten and Swinnen (2009) quantify the income and poverty effects of such high-standards trade and integrationof labour market effects by using company and household survey data from the vegetable export chain in Senegal.

Liu and Yue (2011) use a novel nested variable elasticity of substitution (VES) utility model to determine the impact of SPS standards on trade. This utility model was used to investigate the impact of EU's Hazard Analysis Critical Control Point (HACCP) standards on EU orange juice trade and social welfare. It was found that the standards' effect on trade and welfare is underestimated when the elasticity of substitution is restricted to be constant. Chen, Otsuki and Wilson (2006) investigate the effects of standards on the propensity to exports and the market diversification in developing countries using the gravity model in a World Bank TBT survey database of 619 firms in 17 developed countries. In addition, the research by Jun Yang and Findlay (2008) measures the impact of food safety standards on China's agricultural exports following the experience China had in agricultural dispute with the developed countries. The study uses a gravity model of agricultural product trade to test the effects of the residue standards on China's exports of

vegetables (Chlorpyrifos MRL) and aquatic products (Oxytetracycline MRL). Also, Jongwanich (2009) determines the impact of food safety standards on processed food exports in developing countries using inter-country cross-sectional econometric analysis of processed food exports in developing countries. Melo et al. (2012) use a gravity model to investigate whether SPS regulation affects developing countries' exports by conducting a survey that asked Chilean fresh fruit exporters to evaluate the stringency for 16 countries and four fresh fruits and creating an index that incorporates several aspects of SPS regulation. Similarly, Wei, Huang and Yang (2012) assess the impact of food safety standards on tea exports from China, the world's largest tea producer and exporter. The study uses a gravity model to show that the MRL of pesticides imposed by the importing countries have significantly affected China's tea exports. Schuster and Maesters (2013) investigate the effects of food standards on export performance of individual firms at intensive and extensive margins of trade, using a unique 18 years panel data from 95 asparagus export firms in Peru and apply fixed effects and system GMM models.

Okello and Roy (2007) use a qualitative analysis to evaluate the impact of food standards in African Green Bean exports on small farmers in Ethiopia, Kenya and Zambia. Xiong and Beghin (2011) provide an ex-post econometric examination of the harmonization and the tightening of the EU maximum residue limit (MRL) of aflatoxins in 2002, and its impact on Africa's exports of groundnut products. Similarly, Ferro, Wilson and Otsuki (2013) determine the impact of food safety standards on agricultural exports by creating a standards restrictiveness index using newly available data on maximum residue levels of pesticides for 61 importing countries in a gravity model. Grundke and Moser (2013) examine the costs of non-compliance with the product standards for trading partners of the United States.

In another empirical study by Peterson et al. (2013), they evaluate the trade restrictiveness of SPS measures on the US fresh fruit and vegetable imports, constructing a novel database of US phytosanitary measures and matching these to 47 fresh fruit and vegetable products from 89 exporting countries over the period 1996-2008. A product-line gravity model that accounts for zero trade flows is developed to determine the trade impact of different pest-mitigating measures. Also using the gravity model, Shepherd and Wilson (2013) estimate the results with the Poisson pseudo–maximum likelihood (PPML) estimator to show that product standards in food and agricultural markets in the EU could have significant trade effects.

3.2 The Data

The data sources for the next section come from the following sources. Perinom is used to source for the EU harmonised product standards data. The import refusal used in the descriptive analysis is sourced from the Rapid Alert for Foods and Feeds (RASFF) and UNIDO's trade standards compliance database, while the export data comes from the World Integrated Trade Solution (WITS) database. The economic size of the trading partners, i.e. the GDP, is 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. This period includes the year of the establishment of World Trade Organisation (WTO) when decline of tariffs were pronounced among trading partners while the incidences of NTBs were on the increase[6]. The EU is used as bloc that is a unified entity in this study.

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[7] (see next section for the calculation). This study selected three commodities; two of them are high value, one low. The high value commodities are fish and vegetables while there other is the traditional cash crop, coffee. They were obtained from WITS at the HS 4 level. The economic mass variables are the nominal GDPs of the importing and exporting countries obtained from the WDI.

4. The Empirical Strategy

Many of the studies in the literature that look at the issue of bilateral and multilateral trade relations use gravity models in the determination and evaluation of the issues raised and in testing their various hypotheses. Major reasons cited for the use of this model are 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 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's model is derived from the new trade theory, which makes provisions for economics of scale and imperfect markets. 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 is 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 is be adopted. Heckman model has

[6] The WTO Report 2012 confirms this.

[7] 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 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 primarily make use standards data that are not often use in the previous studies, and this data is from the Perinom database. Specifically, this study shall test the null hypothesis that the EU standards are trade impeding to Africa's agricultural exports. 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[8], so I use 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)[9] 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. The EU harmonised cumulative standards data were used with the deduction of any withdrawal and addition of new regulations[10]. I have the following simple formulae for the calculation of the cumulative standards:

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

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. Furthermore, product fixed effects were not included due to the fact that the estimations were product specific and not product panel data.

[8] 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.
[9] These are the preferential trade agreements between Africa and the EU.
[10]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 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, 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) uses 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 go into the second-step estimation (an exclusion variable is the one that influences the selection process but does not affect the outcome equation). The inclusion of the exclusion variable is used to prove the robustness of the estimates; that is, that the estimation of the model is free of any bias (Gomez-Herrera, 2013). Thus, an exclusion variable is used in the probit model as a valid exclusion restriction that controls for the fixed costs of exporting and not its variable cost (Ferro, et al., 2013). Cameron and Trivedi (2010) opined that the exclusion restriction is used to correct the identification problem that could arise as a result of the nonlinearity implied by the probit selection model.

The estimation of gravity model with the flow of trade is often confronted with double biases (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. 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. 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. As such, in this study standards are fixed costs of exporting and thereby affect the extensive margins of trade.

On the other hand, although part of the trade policies used in the EU, tariffs are not included in the analysis: first, because this study actually focuses 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 (Czubala et al. 2009; Kareem, 2010; Fugazza, 2013).

Different methods have been used in the product standards literature to measure standards. Brenton et al. (2001), Henry DeFrahanVancauteren (2006), Chen and Matoo (2004), and Baller (2007) have used dummy

variables for standards; the dummies capture whether directives were given by the EU[11] on their selected products or not for the years considered. Some studies, such as Fontagne et al. (2005) and Disdier et al. (2007) use the TBT standards notification at the WTO, but these are usually found to be inaccurate (see Czubala et al. 2009) given that countries' notifications are often inadequate. Czubala et al. (ibid.), and Shepherd and Wilson (2010; 2013) use the frequency method and further aggregate 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. Munasib and Roy (2013) use the method of "the bridge to cross." They use the difference between the standards in the exporting and importing countries as the bridge to cross, which indicates the remaining standard requirements that will be faced by exporters in the importing countries after complying the with their domestic standards. I, however, found this method inappropriate for the trade relations between developing countries (especially Africa) and developed countries. 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 is used by Ferro et al. (2013) and Li and Beghin (2013); they use the stringency of MRLs for pesticides and a few veterinary drugs in agricultural and food trade. This study, however, uses cumulative or aggregated standards for the selected food products, similar to Czubala et al. (2009), taking into consideration all the amendments and/or withdrawals to the standards during the period under consideration. In contrast to Czubala et al. (2009), who applied these standards to textiles products, this study focuses on selected food products in a Heckman model. It also goes beyond their data point of 1995 to 2003 by extending the data point to include recent information at the Perinorm database for 1995 to 2012.

5. 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 results. The estimated results have been 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 variable in order to know whether any selection bias has been corrected or mitigated. The second-step equation was estimated with the generalised least squares method in order to mitigate the problem of heterogeneity associated with panel regression.

[11] EU committee for standardization (CEN)

Extensive Margin of Export: Fish

Table 15 presents the results of the selected agricultural products-- 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. One can observe that Africa's economic growth 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 EU expenditure on Africa's fish remains insignificant. The EU standards on fish hinder export at the extensive margins, which means that the standards are restrictive such that they significantly prevent export of fish at the extensive margin. 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 does not significantly affect export of fish at this margin of trade, while the regional trade agreements are significant in propelling trade. Common language and domestic demand of locally produced fish are not significant factors to consider at the extensive margins of export. This implies that the demand for domestically produced fish does not hinder the consumption of imported ones. Inverse relationship exists between language and extensive margins of fish export.

Table 15: Extensive Margin of Trade

Variable	Fish	Vegetable	Coffee
Exporter GDP	0.2526* (0.1436)	0.2620*** (0.1092)	0.2143*** (0.0850)
Importer GDP	-1.3528 (0.9927)	-0.1072 (0.2144)	-2.8061*** (0.9024)
EU Standard	-0.8606* (0.4983)	0.2922** (0.1358)	-0.5270*** (0.1958)
Distance	-0.2190 (0.6497)	-0.0164 (0.5514)	0.4154 (0.4064)
RTA	1.5513** (0.7977)	-0.6543 (0.8009)	-0.1284 (0.4574)
Domestic Substitute	01436 (0.8145)	-0.2086 (0.3156)	0.9551 (0.6445)
Language	-0.1671 (0.5603)	-0.2455 (0.5936)	0.1106 (0.3489)
Constant	15.2451 (11.1523)	0.9639 (4.7165)	23.1229*** (9.2458)
Wald Chi^2	48.91 (0.0000)	14.01 (0.0814)	54.09 (0.0000)
Observation	808	684	665
Rho	0.6911	0.6204	0.3755

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. The figures in the parentheses are the standard errors of the estimates except for the Wald Chi^2 which is the p-value.

Vegetables

Africa's economic size has a significantly positive impact 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 vegetables are a high value commodity, many African countries (especially those in the East and West Africa) often promote and encourage export of the commodity through improved and investment-friendly domestic policies. The demand for Africa's vegetables is insignificant in the EU. This means that tastes in this market are not in favour of the commodity such that it discourages new exporters to enter the market, while those exporters who have abandoned the market are also not motivated to export and existing exporters are further de-stimulated. The results also show that the EU standards on vegetables have significant positive effects on the extensive margin of export. This could be due to some supports and assistance from Africa-developing partners (the EU, UNIDO, etc.) that provide market information and technical capacity to Africa. The magnitude of the effects of the trade costs is negligible and 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, and common language and the EU's domestically produced substitute are also insignificant at this extensive margin of export. This means that the domestically produced vegetables do not significantly affect export of the commodity at the extensive

margin. In conclusion, the results for vegetables show that the economic size of the exporters and the standards in place are the significantly relevant factors that determine vegetable exports at this extensive margin of export.

Coffee

The coffee results suggest that the economic mass of the Africa significantly contributes to the improvement in coffee export at the extensive margin, while that of the EU did not significantly propel export at this extensive margin. EU standards, on the other hand, have significant negative impact on coffee extensive margin such that for every additional standard requirement, export at this extensive margin will decline by about 0.52%. This confirms the findings of Chevassus-Lozza et al. (2008) and Disdier and Marette (2010). Distance is insignificant at this extensive margin of export; and the same can be said of regional trade agreements. Domestic substitute is also insignificant at this margin of trade. Common language is a factor that enhances trade of this commodity, although it is not significant. In conclusion, at the extensive margins of export, economic mass of the trading partners as well as standards are the relevant determining factors of coffee export to the EU. They constitute significant factors to be considered by potential, disappearing and existing exporting countries of coffee in Africa to the EU markets.

Thus in all the commodities selected for the extensive margins of export analysis, except for fish and vegetables where the EU's incomes are insignificant, the economic mass of the trading partners is important and enhances export, and standards are statistically significant for all the commodities. Only the EU standards on vegetables enhance export at the extensive margin. In a nutshell, the impact of standards at this margin of export is commodity specific, so generalization cannot be made of the impact of standards from the analysis of a single commodity to others. Also, the domestically produced products do not affect export of these products to Africa's exporters at this margin.

Intensive Margins of Exports: Fish

The results of the intensive margins of exports are presented in Table 16, where one can see that the intensive export of fish has not been significantly encouraged by the continent. This implies that income in Africa has not been used to propel the volume of fish export to the EU such that for every percentage rise in growth, there will be 0.7% corresponding neglect of fish export, despite the demand in this market. This indicates that the commodity is not of priority to the continent, especially those countries that are landlocked. Furthermore, 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 be promoted for export to the market. In other words, expenditures on African 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 did not

significantly hinder the flow of this commodity. The trade costs associated with the flow of export of this commodity are not significant. Regional trade agreements do not contribute significantly to the flow of exports of this commodity, while the consumption of domestic fish in the EU significantly affects the import of fish from Africa, indicating that as more domestically produced fish are consumed there is lower importation of African fish. The results show that there is no selection bias in the model going by the coefficient of the inverse mills ratio, indicating that I have correctly specified the selection equation.

Vegetables

This is the other high value commodity considered in this study besides fish. Africa's economic size has not been used to promote the export of vegetables to the EU. This implies that there is low motivation to export vegetables to the EU for every percentage increase in the income level. In contrast, there is absorptive capacity in the importing countries for this commodity. In other words, expenditures on vegetables in the importing countries does encourage exports at the intensive margins for Africa.

The results show that it is very necessary to comply with the standard requirements before market access can be assured. Wilson and Otsuki (2004), Ganslandt and Markusen (2001), and Anders and Caswell (2009) echo this observation. Distance does not significantly affect this commodity at this margin of export. Domestically produced vegetables do not significantly affect import of Africa's vegetables, which means any rise in the consumption of domestically produced vegetable would not affect import of the commodity 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 sanitary and phytosanitary measures in the EU are important to vegetable export at this intensive margin. In addition to this, the 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 16: Intensive Margin of Trade

Variable	Fish	Vegetable	Coffee
Exporter GDP	-0.7719*** (0.1273)	-0.2618 (0.3682)	0.4324 (0.3337)
Importer GDP	10.1431*** (1.5367)	0.1259 (0.1710)	-18.6924*** (4.7616)
EU Standard	6.0768*** (1.1501)	-1.3224*** (0.3930)	-2.5663*** (0.8169)
Distance	0.5169** (0.2629)	-0.2972 (0.3323)	2.5309*** (0.7134)
RTA	-4.2814*** (1.0416)	2.9860*** (1.0510)	-0.9589** (0.4739)
Domestic Substitute	-4.1650*** (1.2024)	1.0215** (0.4589)	5.0232** (2.2317)
Inverse Mills	-4.3314*** (0.6766)	-7.0248*** (1.9364)	2.5492 (2.4844)
Constant	-104.8358*** (15.6924)	10.9598*** (2.5059)	158.2046*** (39.0565)
Wald Chi^2	155.19 (0.0000)	326.05 (0.0000)	256.99 (0.0000)
Observation	274	296	359

Note: All variables are in log form except the dummy variables. The equations were estimated with FGLS using the country and time fixed effects[12]. The estimations corrected for heteroscedasticity and autocorrelation. *, ** and *** denote significant level at 10%, 5% and 1%, respectively. The figures in the parentheses are the standard errors of the estimates except for the Wald Chi^2 which is the p-value.

Coffee

The exporters' economic mass directly impacts export of coffee to the EU: there is a positive degree of association between exporters' income and export of the commodity, with the degree of responsiveness of coffee export to change in income being insignificantly inelastic while the degree of responsiveness of export to change in expenditure in the importing countries is elastic. There is significant decline in the absorptive capacity in the EU for this product. One could also observe that coffee in the EU countries is an "inferior good" given the coefficient of the income elasticity of export in the EU. The standards imposed on the commodity are significant barriers at this margin of export. This indicates that these standards are problematic to exporting coffee. Trade costs did not significantly discourage coffee export at this intensive margin. There might be some improvement in the bottlenecks associated with trade flows and facilitation. The domestic substitute has significant direct relationship with coffee export, while regional trade agreements significantly did not contributed to improve export of coffee to this market.

Thus, the major determinants of Africa's export of coffee to the EU market are the level of income in the importing countries, trade costs, standards, and consumption of domestically produced substitute. The

[12] FGLS is good in correcting for heteroscedasticity and autocorrelation.

results for all the selected commodities at the intensive margins of exports show that the products' standard requirements are significant factors determining market access to the EU countries for all the products. Additional critical factors for these exports include the economic mass of the trading partners, regional trade agreements, and the consumption of domestic substitute.

6. The Importance of the Findings to CAADP

The empirical findings of this study suggest that the trade impact of the EU standards is commodity-specific, so, it might not be plausible to generalize the impact from the analysis of a product. At the extensive margins of export, the income growth experienced by many African countries in recent years have not substantially translated into improvement in the quality of export base, number of exporting firms, and revitalization of the moribund exporting firms. These results show that many of the purported investments aimed at improving agricultural outputs and exports of these commodities have not yielded the necessary and expected outcomes as contained in the CAADP Pillar II document. It could be that the selected commodities used in the analyses might have received little of these investments. As is often found in many studies, the supply capacity of the continent is inadequate for these commodities, especially vegetable and fish. This is usually attributable to the supply constraints faced by producers, especially from the domestic policies. CAADP, as a driving force in propelling growth in agricultural outputs and exports, could ensure that outputs of agriculture are of the quality standards required in the importing markets (especially in the EU). Partnering with science and technology institutions at both the domestic and international level will provide the technologies that are required to comply with the product standards, in addition to enhancing the output of these products. CAADP should go beyond focusing only on aflatoxins, e.g. in 'Partnership for Aflatoxins Control in Africa (PACA)' since standard requirements, particularly those that affect Africa are many and are not limited to aflatoxins alone. There should be intensive and comprehensive efforts from CAADP in mitigating as well as controlling the incidences of unwanted elements in export commodities.

This study also finds that there is demand for the selected commodities in the EU if only quality exports could get to the market, particularly fish export. In other words, taste and preferences are in favour of the selected African commodities in this market. This shows that the continent needs to increase exports by motivating exporters at the extensive margins, particularly the disappearing exporting firms, through investment-friendly domestic policies and improvement in trade facilitation. CAADP should not only ensure adequate budget allocation to agricultural sector, but should also see that such allocations go to the development of commodities that have potential and probability of accessing this market with the standard requirements.

Although standards seem to be trade inhibiting at the extensive margins of export, except for vegetables, compliance to these standards should be the ultimate priority for Africa. CAADP could assist in this under Pillar II with lead institutions and country implementing agencies by building the capacity of producers, particularly educating them on the quality issue and providing them with adequate market information on the technical regulations and standards in their prospective and/or current export markets. This could go a long way towards the level of compliance, especially at the smallholder farmers' level. The findings further show that export of these products at the extensive margins have great potential. CAADP could encourage export of these products through adequate investments and technological supports to the agricultural food sector specifically for these products.

In the intensive margins of exports, the selected commodities have the potential of accessing this market if outputs could be improve upon at the domestic levels. Despite the potential that Africa has in this market, the degree of responsiveness of fish exports to African income is not encouraging in relation to the export potential of the commodity. This calls for specific intervention by CAADP to increase export of fish by the continent by providing technical and institutional supports to exporting countries. Furthermore, the findings show that there is adequate absorptive capacity for fish export from Africa in the EU if only the export volume could be increased and quality improved upon. Thus, efforts must be made to improve production at this margin of trade. Each CAADP country's collaborating institution could be used to facilitate the improvement in the level of fish output in the country through adequate investments with domestic and international supports for improved production technology. Education and adequate training should also be given to illiterate smallholder farmers, especially those in the rural areas, if possible to organize them into exporting groups. This might enhance export since it will reduce cost of exporting to each farmer. Standards might be trade restrictive at the margin of export (except in the case of fish), but farmers must be encouraged to produce quality outputs with the assistance of commodity-specific research institutions at the local, regional, and international levels. CAADP could also improve exports African exports of these selected commodities by improving the partnership and alliance between the African Union and the EU, particularly in regional trade agreements, which presently do not really contribute to exports of these commodities at this margin of trade. Trade assistance and support could be solicited from the EU through preferential trade arrangement or agreements that have the potential of accelerating the propensity to import from Africa.

The findings of this study give support and credence to the output of research funded by NEPAD-CAADP in 2005 (see CAADP document, 2003) which projected that foreign demand for commodities and high-value exports would grow from $8 billion USD and $3 billion USD in 2000, respectively, to roughly $10 billion USD in each category by 2030. Since taste and preference for these selected commodities are in favour of Africa, as found in this study, the projected export growth as cited above is feasible. There is a caveat, however: the attainment of this projected export growth and the potential income of $4.5 billion

USD from all exporting markets in 2030 could only be achieved if concerted efforts are geared towards accelerating exports at both extensive and intensive margins. The inadequate export of these commodities to this market thus far indicates an implementation deficiency of the CAADP Pillar II, which seeks to attain at least a 4 percent annual growth of agricultural outputs and exports so as to induce a growth rate of 6 percent in the rest of the economy. This study affirms that some achievements have been made in the CAADP Strategic Area B, which aimed to improve the investment in commercial and trade infrastructure to lower the cost of supplying national, regional, and international markets. I found that the costs of trading in all the commodities are favourable and did not inhibit trade. Trade costs, though shown to be insignificant in its impact on exports from Africa, are still an obvious challenge due to the enormous infrastructure and technology requirements involved; for instance, harvesting the commodity on the farm and adequately preserving to be transported the same day by specialized van to the airport for onward delivery by the specialized cargo aircraft to the importing country. The costs incurred using these technologies are high and involve huge capital not easily secured. The CAADP-Pillar II country agency could assist producers with the provision of these technologies, especially by partnering and engaging in alliance with international institutions so that these technologies could be available at affordable costs.

In this way, this study reaffirms the ultimate objective of CAADP Pillar II: accelerating growth in the agricultural sector by raising the capacity of private entrepreneur, including commercial and smallholder farmers, to meet the increasingly complex cost, quality and logistical requirements of domestic, regional, and international markets. Focus on strategic value chains with the greatest potential to generate broad-based income growth and create wealth in the rural areas and the rest of the economy has not yet been fully realized due to inadequacies in the implementation of the programme.

7. Conclusion

This study investigates the export effects of EU product standards on the agricultural sector of the African economy. The issue of standards among the non-tariff barriers is very vital to Africa, and compliance has been the necessary condition in accessing this market. In order to boost Africa's exports and their quality, the CAADP Pillar II strives to build the capacity of producers, both the commercial and smallholder farmers, and encourage infrastructural development through adequate policy and regulatory actions, while also partnering and engage in alliances with development partners in order to meet the rising compliance costs and logistic requirements in the importing markets in general and in the EU in particular. To investigate the impact of standards on Africa's agricultural exports, this study evaluates the macroeconomic performance of Africa vis-a-vis trends in aggregate output, growth, the structure of exports, and the trends and contribution of agricultural exports to the GDP. Labour participation in this sector and the engagement by gender are also evaluated, with the examination of the contribution of employment in agriculture to total

employment in the continent. An evaluation of the incidences of non-tariff barriers confronting Africa's exports in its major foreign markets is done as well; and the analysis shows that exports of Africa origin often face more incidences of NTBs in India, the US, and Canada than other foreign markets.

An overview of product standards is also carried out to ascertain the importance and reasons for the use of these standards. This study has given a vivid definition of standards and their different types, while also enumerating the confusion and overlapping definitions of standards among international institutions and scholars. Different stages of export assessment prior to accessing the market were enunciated. The standard requirements in the EU market, which this study refers to as the "hurdle to pass" before market access, are highlighted and discussed. Standard requirements for selected products of relevance to Africa are analysed as well. The analysis indicates that there are many applicable standards on every product, although at any point in time, a particular standard requirement might dominate the reasons for border rejection (e.g. mycotoxins). I discovered that the hazards were product-specific.

The volume of export rejection faced by Africa in the EU market is also presented, relative to other continents of the world. The border rejections witnessed by ten most affected countries in Africa are highlighted, with Morocco, Egypt, Ghana, and Nigeria ranking as the most affected countries. The study disaggregates the border rejections and hazards/reasons for the rejection by some selected products where it was discovered that apart from the product-specific rejection, the import refusal hazards were different across the countries.

An empirical review of previous studies boils down to three schools of thought on standards: they are either are trade-inhibiting, trade-enhancing, or 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 supports the argument that the impact of standards on trade is product-specific and the generalization of conclusions on market access from analysis of a specific product is not appropriate. Besides, without applying all required standards to products of interest in the empirical estimations, inferences on the market access from such selected standard can be inaccurate. To this end, the empirical analysis in this study used all the applicable standards in two high valued commodities-- fish and vegetables-- and a traditional crop—coffee-- in a Heckman model. At the extensive margins of export, standards are trade-enhancing in vegetables while trade-inhibiting for exports of fish and coffee. The incomes of exporting countries have not substantially boosted export of these products despite the potential, taste, and preferences favouring these products in the importing countries. These observations support the argument that Africa has inadequate export, which is due in turn to some constraints. Regional trade agreements have not contributed meaningfully to trade in these products except for fish.

Similar results are obtained at the intensive margins of exports. Standard requirements do not constitute restriction to fish export, but they significantly hinder the flow of vegetable and coffee. The income of the

exporting countries does not contribute to the volume of export, nor does it really stimulate the flow of these commodities except for coffee, and the regional trade agreements do not really contribute to trade. The consumption of domestically produced substitute products is a major determinant of import of the selected products.

Thus, this study finds that product standards in vegetables are trade-enhancing at the extensive and trade-inhibiting at intensive margins of exports. This implies that new producers of the commodity are able to comply with the standards, possibly due to institutional and technological supports from the governments and development partners; but after accessing the market, the standards of the commodity cannot be sustained. Standards are trade-inhibiting at both the extensive and intensive margins of exports for coffee, which indicate that the compliance level has been inadequate and makes access to this market difficult. Fish standards are trade-restrictive at the extensive margins but trade-enhancing at the intensive margins. This study therefore concludes that the impact of standards on trade is product-specific.

Africa must ensure adequate standards compliance not only in the EU market, but in all its markets. Efforts must be engineered in partnering and engaging in alliances with local and international institutions and development partners across the globe to provide technological, institutional, and human capacity development support and assistance to the agricultural sector, particularly to commercial and smallholder farmers. Design and adequate implementation of institutional, regulatory, and domestic policies that will stimulate quality outputs for export are a critical next step.

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