MACIE PAPER SERIES

Marburg Centre for Institutional Economics

MACIE

Nr. 2017/07

European Union's Product Standards and Africa's Food Exports: Implications for the Comprehensive Africa Agricultural Development Programme

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April 2017

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 International. A high-value commodity (fish) and traditional cash crop (coffee) are selected. The findings show that at the extensive margin of export, standards are trade-inhibiting for fish and coffee. At the intensive margin, the standards are trade-inhibiting in coffee exports while trade-enhancing in fish exports.

Keywords: Product Standards, Food Exports, Heckman Model, EU, Africa, CAADP

JEL Classification: C33, C87, F13, F42

1.0 Introduction

The development aspiration of developing 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). This quest for sustainable development among other factors is the reason for most developing countries' continual global integration, especially through trade relations. Trade has been identified among other channels[1] through which countries could integrate into the global market (Kapslinky, 2008). Many countries have been participating in global trade in order to benefit from the embedded gains. However, there are often obstacles to the attainment of full potential benefits of trade, as trade measures prevail, which sometimes could be barriers, especially to commodities that developing countries and Africa, in particular have a comparative advantage. This is due to inadequate science and technological advancement in Africa, which often affect the quality of exported commodities. As

a result of these trade measures, Africa has found it difficult to take full advantage of the opportunities embedded in global trade. The gradual 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, the NTMs, in particular, technical barriers to trade (TBT) standards are considered trade protective because they add to the costs faced by 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 (e.g 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's (AU) New Partnership for African Development (NEPAD) initiated the Comprehensive Africa Agriculture Development Programme (CAADP) as part of its objectives, 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 each

member country allocate 10 percent of its national budget to agriculture investment/sector with aim of attaining 6 percent average annual growth rate of the economy.

Although member countries are making strides towards meeting the 10% budgetary allocation to promote agriculture exports, lack of access to markets due to NTBs, specifically, product standards, create major hurdles for African economies to break through and reach global markets, especially in industrialized countries. Out of the 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 African origin have been granted preferential tariff rates. The main restrictions to Africa's exports access to develop and developing countries' markets are the non-tariff barriers, specifically the product standards (Kareem, 2010; Czubala et al., 2009).

Studies such as Czubala et al. (2009), Otsuki et al. (2001), Mutume (2006) and Shepherd and Wilson (2010) have found that standards inhibit exports of Africa origin, since many of the exports do not meet the standards set by these countries. This is associated with inadequate technical capacity in terms of advanced technology and sciences to produce commodities that will meet international standard requirements. The imposition of these market access conditions on agricultural exports, especially those that African countries have a comparative advantage, could serve has hindrance to the extent to which the sector contributes 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 is likely to have consequences on 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 have not been yielding expected results

due to the fact that, the already defined and detailed set of project activities in the programme did not allow for a decentralised and bottom-up implementation.

It is noteworthy that there are scanty 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 studies that consider the impact of domestically produced commodities on the imported - that is the EU consumption of or demand for their domestically produced products - in any empirical literature in this area. Besides, the consideration and/or implication of product standards for CAADP have not been considered in the previous studies. Thus, the objective of this study is to close these gaps by determining the effects of standards in the European Union's market on Africa's food exports, specifically coffee and fish, in the light of the CAADP agenda.

1.1 Food Import Refusal in the EU

The access of a commodity to any import market will depend largely on its fulfillment of the conditions required for market access. The European Union has standard requirements for all product lines. Table 1 presents the EU border rejection of foods products, which include coffee and fish, in terms of the number of exports that were prevented from accessing the EU market. In absolute terms, the EU total border refusal for all products in 2000 was 437, which later increased to 2,621 in 2012.

Table 1: EU Refusal of Foods and Feeds Products (Selected Years)

Product	**2000**	**2005**	**2010**	**2012**

Nuts and Seeds	92	858	468	272
Fish and Fishery Products	165	417	183	166
Fruit and Vegetables	65	244	244	479
Herbs and Spices	21	230	153	83
Food and Contact Materials	2	116	88	127
Cereal and Bakery Products	5	27	52	69
Poultry meat and Poultry meat products		39	15	53
Meat and Meat products	52*	71	52	40
Confectionery	2	30	13	37
Feed for food-producing animals	0	0		0
Animal Nutrition	0	36	0	2
Cocoa and Cocoa preparation, Coffee and Tea	19	8	9	52
Others	50	219	1277	1241
Total	**473**	**2295**	**2566**	**2621**

Source: Author's compilation from Rapid Alert System for Food Feed (RASFF) and United Nations Industrial Development Organisation

*****The figure is for meat and meat products as well as poultry meats and products.

An evaluation of the EU border refusal at the regional level could be seen in table 2 where Asia food imports had the highest border rejections totalling 15,639 from 2000 to 2012, which was followed by the European products with the total number of refusal for the same period being 10,810. While Asia border refusal was about 46% of total EU rejections, Europes was 32% and Africa's was 2,614, which is 8%. This trend analysis indicates that the EU has been denying products into its market due to non-compliance to the standards requirements in the destination

countries. Jouanjean et al. (2012) opined that trade and border rejections are positively related; which simply means that the consequences of border rejection to Africa might be greater than the regions with higher trade, e.g. Asia, Europe and Latin America. This is because the percentage of export rejected in total exports might be higher for Africa, in real term of export rejection (the impact of border rejection) compared to larger exporting continents[2].

Table 2: EU Product Refusal by Region of Origin (Selected Years)

Region	2000	2005	2010	2012	Total: 2000 to 2012	% of EU Total
Africa	57	226	290	286	2614	7.64
Asia	123	978	1410	1400	15639	45.73
Europe	123	978	1180	1210	10810	31.61
Latin America	78	237	410	310	3153	9.22
Northern America	6	86	196	120	1749	5.11
Oceanic	3	31	19	10	232	0.68
EU Total Rejection	390	2536	3505	3336	34197	100.0

Source: Author's Compilation and Calculations from RASFF

Statistics of 10 most affected countries in Africa is shown in table 3. Morocco had the highest food export rejections between 2002 and 2012 followed by Egypt, Ghana and Nigeria. By and large, during the period, a total of 432 food exports (17% of total Africa rejection) were refused entry from Morocco, followed by 16% from Egypt, 13% from Ghana, and 10% from Nigeria.

Table 3: Food Imports Refusal of Ten Most Affected African Countries in the EU (Selected Years)

Country	2002	2005	2010	2012	Total: 2002 to 2012	% Share of Total
Tunisia	5	17	13	15	160	6.45
Morocco	17	15	51	61	432	17.41
Egypt	9	24	39	55	405	16.32
Nigeria	1	31	25	13	241	9.71
South Africa	13	11	25	26	170	6.85
Mauritania	1		22	10	54	2.18
Senegal	4	8	20	47	185	7.46
Ghana	1	59	18	14	317	12.78
Namibia	16	12	6	12	83	3.35
Cote D' lvoire	7	2	6	4	64	2.58
Others	24	45	38	-	370	14.91
Total	98	224	261	310	2481	100.00

Source: Author's compilation and calculations from RASFF.

2.0 Review of the Literature

The WTO (2012) report traced the genesis of the use of NTBs to the period of the General Agreement on Tariffs and Trade (GATT). However, it is only in recent years that the frequency and incidence of NTBs have become pronounced. Probably, as a result of the continuous decline in tariffs and the recent global economic crisis, this affected many developed economies. A diagnostic analysis of the literature on standards shows that many of the studies were conducted

in order to determine its impact on developing economies (see Shepherd and Wilson, 2013; Brobery, 2009; Henson and Humphrey, 2009; Rios and Jaffee, 2008; Beghin et al., 2012; Crivelli and Groschl, 2012; Schlueter et al., 2009; Martinez and Poole, 2004; Henson, 2006). Majority of these studies concluded that standards impede trade due to inadequate development of science and technology, institutions, management, absorptive capacity of producers, and other factors in these countries, which 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; Kareem 2014). 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); with Maertens and Swinnen (2009).

In spite of 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 deal with the problem of inadequate conformity and the inaccessibility to the preferred markets. Studies conducted by 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, 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 (2004); 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. Besides, 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).

2.1 The Data

Perinorm International is used to source for the EU harmonised product standards data. The import refusal data are from the Rapid Alert System for Foods and Feeds (RASFF) and UNIDO's trade standards compliance publication, and the export data come from the World Bank's World Integrated Trade Solution (WITS) database. The economic size or mass of the trading partners, i.e. the GDP is from the World Development Indicators (WDI). This study covers the period from 1995 to 2012 for 49 African countries as exporters across all the estimations. The product standards information was 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. Standards are set of rules and regulations that govern the content requirements of any given products, which compliance are mandatory before market access. Kareem (2014) opined that the use (the stringency) of the content requirements will show whether the market has become difficult to access or not. Furthermore, the alignment or otherwise of the market standards to international standards will show whether the standards are protective or not. Cumulative harmonised standards data were used with the deduction of any withdrawal and addition of new regulations[3] (see next section for the calculation). This study selected two commodities; a high value commodity (fish) and a traditional cash crop (coffee). The data were obtained from WITS at the HS 6 level.

2.2 The Empirical Strategy

Many of the studies in the literature that empirically examine the issue of bilateral and multilateral trade relations used gravity models in the determination and evaluation of the issues raised and in testing their various hypotheses. Major reasons 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; Kareem and Kareem, 2014). 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 those that consider increasing returns. The theoretical framework for this study's model is derived from the new trade theory, which makes accounts 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.

The framework for the model in this study is adapted from Heckman (1979) that corrected the sample selection bias and specification error with non-random zero trade. However, a new dimension was brought to the Heckman model with the contribution of Helpman, Melitz and Rubinstein (2008, hereafter called HMR) when they argued that there will be estimation bias whenever only positive trade flows are considered in trade relations without considering countries that do not trade due to the fact that vital information in the data must have been lost. The HMR provide theoretical underpinning for the firms' heterogeneous behaviour. The framework assert that the estimation of bilateral trade flows using the gravity equation is not only subjected to sample selection bias (if the non-zero exports do not occur randomly), but that estimates may also be vulnerable to omitted variable bias if the number of exporting firms within

an industry (extensive margin of trade) is not accounted for (Kareem et al., 2015). The idea is that, due to trade costs, firms differ in productivity (firm heterogeneity) and only firms with productivity level beyond a threshold end up exporting.

This study investigates the agricultural food export effects of standards in the EU. A two-stage Heckman gravity model specification is adopted. Heckman model has the ability of dealing effectively with the zero trade observations and enables differentiation of 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 make use of data on trade standards from Perinorm International database, which are not often used in previous studies. Specifically, this study tests the null hypothesis that the EU standards are trade impeding to Africa's agricultural food exports. To test this hypothesis, a modified Munasib and Roy (2013) Heckman gravity model is adopted for the period from 1995 to 2012.

$$T_{ijt} = \beta_1 + \gamma_i + \rho_t + C_{ijt}\vartheta + \pi E_{ij} + \alpha STD_{tijt} + \varepsilon_{ijt} \quad (1)$$

$$V_{ijt} = \beta_2 + \gamma_i + \rho_t + \pi STD_{tjt} + C_{ijt}\vartheta + \varphi\sigma_{ijt} + \mu_{ijt} \quad (2)$$

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 zero, and V_{ijt} is the export value from country i to j at time t.

The intercepts are $\beta_1$and β_2; the multilateral trade resistance terms are not fully used because of the fact that the importer, the EU is used as a bloc[4], so I use only exporters and time fixed-effects, which are γ_i and ρ_t, respectively; C_{ijt} is a vector of pair varying control variables such as distance, language, preferential/regional trade agreements (RTA)[5] 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_{ijt} is the inverse Mills ratio from the first stage regression. The EU harmonised cumulative standards data are constructed accounting for the deduction of any withdrawal and addition of new regulations. I used the following simple formulae for the calculation of the cumulative standards:

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

Where Z_{t-1} is the previous cumulative number of standards, δ_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 onwards.

The probit regression equation is the first step 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 exclusion variable in the first step is the one that is correlated with a country's propensity to export but not 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).

2.3 The Findings

The estimated results have corrected the robust cluster errors that often arise in this type of model. The exporter and time fixed effects are included in the estimation but not reported due to the large number 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 is used in the second-step regression (intensive margin estimation) as an additional explanatory variable. This will enable us to know whether any presence of selection bias has been corrected or mitigated. Although, the insignificance of the inverse Mills ratio in the coffee equation suggests bias could be mitigated using OLS estimators, there is still the issue of firm heterogeneity (i.e. different production capacity) which gives credence to the two-step approach used. The second-step equation was estimated with the feasible generalised least squares (FGLS) method in order to mitigate the problem of heterogeneity associated with panel regression.

2.3.1 Extensive Margin of Export: Fish

Table 4 presents the result of the extensive margin of export estimation. The economic mass of the exporting countries (exporters' GDPs) increases the probability of exporting African fish to

the EU. There is an 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 fish exporters 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 margin, which means that the standards are restrictive. This implies that, compliance to the standard requirements often increase the fixed costs substantially that it discourages, especially potential new firms, from exporting. Also, regional trade agreements are significant in propelling trade.

Table 4: Regression Estimates of Extensive and Intensive Margins of Africa's Exports

	Extensive Margin		**Intensive Margin**	
Variable	**Fish**	**Coffee**	**Fish**	**Coffee**
Exporter GDP	0.2526*	0.2143***	-0.7719***	0.4324
	(0.1436)	(0.0850)	(0.1273)	(0.3337)
Importer GDP	-1.3528	-2.8061***	10.1431***	-18.6924***
	(0.9927)	(0.9024)	(1.5367)	(4.7616)
EU Standards	-0.8606*	-0.5270***	6.0768***	-2.5663***
	(0.4983)	(0.1958)	(1.1501)	(0.8169)
Distance	-0.2190	0.4154	0.5169**	2.5309***
	(0.6497)	(0.4064)	(0.2629)	(0.7134)
RTA	1.5513**	-0.1284	-4.2814***	-0.9589**

	(0.7977)	(0.4574)	(1.0416)	(0.4739)
Domestic Substitute	01436 (0.8145)	0.9551 (0.6445)	-4.1650*** (1.2024)	5.0232** (2.2317)
Language	-0.1671 (0.5603)	0.1106 (0.3489)		
Inverse Mills ratio			-4.3314*** (0.6766)	2.5492 (2.4844)
Constant	15.2451 (11.1523)	23.1229*** (9.2458)	-104.8358*** (15.6924)	158.2046*** (39.0565)
Wald Chi^2	48.91 (0.0000)	54.09 (0.0000)	155.19 (0.0000)	256.99 (0.0000)
Exporter effect	Yes	Yes	Yes	Yes
Time effect	Yes	Yes	Yes	Yes
Observations	808	665	274	359
No. of Countries	49	30	49	30
Rho	0.6911	0.3755	-	-

Note: All variables are in log form except the dummy variables. The equations are 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. FGLS that corrects for heteroscedasticity and autocorrelation is used for the estimates in the intensive margin.

2.3.2 Extensive Margin of Export: Coffee

The coffee results suggest that the economic mass of Africa significantly contributes to the improvement in coffee exports 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 one percent increase in the

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).

2.3.3 Intensive Margin of Exports: Fish

The result of the intensive margin of exports is presented in the last two column of Table 4, where the intensive export of fish to the EU actually declined with economic growth. For every one percent rise in growth, there will be 0.7% decrease in fish exports. On the other hand, the absorptive capacity of this commodity in the EU is very high because demand for this commodity increases with EU income. Thus, EU's expenditures on African fish in this market encourage exports, and this could be due to the adequate compliance to the EU standards, which positively affected supply to this market. The standards compliance that is achieved in this area is probably due to the export diversification programme being promoted in many countries given the impetus from CAADP and supports from development partners that provided the technology and technical knowhow. Regional trade agreements as well as the consumption of domestic fish in the EU lowered the flow Africa's exports of fish significantly. The results show that there is no selection bias in the model based on the significance of the coefficient of the inverse Mills ratio.

2.3.4 Intensive Margin of Exports: Coffee

Although, 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, which is probably due to the poor quality of the commodity. The standards imposed on the commodity are significant barriers at this margin of export. This indicates that these

standards are problematic to exporting coffee, because this commodity does not comply with the EU directive on reduction of mycotoxins, which is not allowed. Besides, the maximum residual limit of pesticides in this commodity is higher than the acceptable requirement for market access. Part of the reasons for non-compliance is due to the inadequate science and technology in the continent. Trade costs, in the form of distance are, unexpectedly, associated with lower exports at the intensive margin. The domestic substitute has significant direct relationship with coffee export, while regional trade agreements are associated with lower export of coffee to this market.

2.4 The Implication 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 or trade margin. At the extensive margin of export, the income growth experienced by many African countries in recent years have translated into improvement in the quality of export base, number of exporting countries, or revitalization of the moribund exporters. These results show that while many of the investments aimed at improving agricultural outputs and exports of these commodities have yielded some positive expected outcomes, there is still room for improvement. It could be that, the selected commodities in the analyses might have received little of these investments. As it is often found in many studies, the supply capacity of the continent is inadequate for these commodities. 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 required in the importing markets (especially in the EU). Partnering with science and technology institutions both at the domestic and international level will provide the

necessary technologies that are required to comply with the product standards, in addition to enhancing the output of these products. CAADP should go beyond the establishment of only aflatoxins control unit called 'Partnership for Aflatoxins Control in Africa (PACA)' because standard requirements, particularly those that affect Africa are many and are beyond only aflatoxins control. 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 the quality of exports could be improved for both coffee and fish. Thus, the continent can increase exports by motivating exporters at the extensive margin, 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 margin of export, compliance with these standards should be a priority for Africa. CAADP can assist in this with the 'Pillar II lead institutions and countries implementing agency' 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 achieving certain level of compliance, especially at the smallholder farmers' level. The findings further shows that export of these products at the extensive margin have great potential. CAADP could encourage export of these products through

adequate investments and technological supports to the agricultural food sector specifically for these commodities.

In the intensive margin of exports, the selected commodities have the potential of accessing this market if outputs could be improved with economic output. Despite the potential that Africa has in this market, the degree of responsiveness of fish exports to African income is negative. This calls for specific intervention by CAADP to increase export of fish from 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 to EU that can be enhanced by improving quality.

Thus, efforts must be made to improve production at the intensive margin. Each CAADP country's collaborating institution could be used to facilitate improvement in fish output in the country through adequate investments with domestic and international supports for improved production technology. Education and adequate enlightenment on the use of modern technologies 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 exports since it will reduce cost of exporting to each farmer. Because the standards are trade restrictive at the margin of export for coffee, 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 Africa's 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. 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.

3. Conclusion

This study investigates Africa's food export effects of the EU product standards. The issue of standards among the non-tariff measures is very vital to Africa, and compliance has been a 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 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.

The empirical analysis in this study used all the applicable standards on two commodities - fish and coffee - in a Heckman model. At the extensive margin of export, EU standards are trade-inhibiting for Africa's exports of fish and coffee. Divergent results are obtained at the intensive margin of exports as standard requirements promote fish exports, but they significantly hinder the flow of coffee. Put differently, 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 margin but trade-enhancing at the intensive margin. This study therefore concludes that the impact of standards on trade is commodity-specific.

Thus, 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.

Endnotes

[1] Other channels includes; investment, migration, finance, global governance and environment.

[2] For instance, if Africa sends 100 consignments to the EU and 10 of them are rejected, that is 10%, while Asia ships 1000 consignments with 20 rejections, which is 2% of its total consignments. The hypothetical example indicates that Africa will be more affected than Asia.

[3] 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, there is 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.

[4] Since the EU is used as a bloc, the importer fixed-effects are applied, so it was dropped.

[5]These are the preferential trade agreements between Africa and the EU. I have used the date of the implementation of the following trade agreements and partnerships that Africa and Africa, Caribbean and Pacific (ACP) had with the EU: Lome conventions (I-IV), Cotonou agreements, everything but arms (EBA) and global system of preference (GSP). Note that not all African countries are in EBA, but many of them fall within the Lome and by extension Cotonou agreements. At the end of the Cotonou agreements, when some countries were foot-dragging on the EPA, they were asked to go back to the GSP or EBA. Lome I was from 1976 to 1980, Lome II was between 1981 to 1985, Lome II started from 1986 and end in 1990, while Lome IV was from 1990 to 1999. The GSP was instituted in 1976 and temporarily expired on July 31st, 2013 before recently reauthorization on June 29, 2015. EBA started from 2001 up till date. Any African country in these RTA is assigned 1, otherwise 0.

References

Anderson, J. E. (1979), 'A Theoretical Foundation for the Gravity Equation', *American Economic Review, Vol.* 69.

Asci, S., Ali Koc, A. and SukruErdem, M. (2013), '*The Impact of Non-Tariff Barriers on Trade: The Gravity Model of Turkish Agri-Food Producers'*, Poster prepared for presentation at the Agricultural and Applied Economics Association's 2013 AAEAA and CAES Joint Annual Meeting, Washington, DC., August.

Beghin, J.C., Disdier, A. C., Marette, S. and Van Tongeren, F. (2012), 'Welfare Costs and Benefits of Non-Tariff Measures in Trade: a Conceptual Framework and Application', *World Trade Review*, Vol.11, No.03, 356-375.

Bergstrand, J.H. (1990), 'The Heckscher-Ohlin-Samuelson Model, the Linder Hypothesis, and the Determinants of Bilateral Intra-Industry Trade', *Economic Journal*, Vol. 100, December, 1219-1229.

Broberg, M. (2009), 'European Food Safety Regulations and the Developing Countries: Regulatory Problems and Possibilities', *DIIS Working Papers* 2009:09.

Chevassus-Lozza, E., Latouche, K., Majkovic, D., and Unguru, M. (2008), 'The Importance of EU-15 Borders for CEECs Agri-Food Exports: The role of tariffs and non-tariff measures in the pre-accession period', Food Policy, Vol.33, No. 6, 596-606.

Cipollina, M. and Salvatici, L. (2008), 'Measuring Protection: Mission Impossible?', *Journal of Economic Survey*, Vol. 22, no.3, 577-616.

Crivelli, P. and Groschl, J. (2012), 'The Impact of Sanitary and Phytosanitary Measures on Market Entry and Trade Flows', *IFO Working Paper*, No. 136, August.

Czubala, W., Shepherd, B., and Wilson, J.S. (2009), 'Help or Hindrance? The Impact of Harmonised Standards on African Exports', *Journal of African Economies*, Vol. 18, 711-44.

Disdier A. C., and Marette, S. (2010), 'The Combination of Gravity and Welfare Approaches for Evaluating Non-Tariff Measures', *American Journal of Agricultural Economics*, Vol. 92, No. 3, 713-726.

Fugazza, M. and Maur, J. (2006), 'Non-Tariff Barriers in a Non-Tariff World." *Conference Proceedings of the Ninth GTAP Annual Conference on Global Economic* Analysis, Addis Ababa.

Fugazza, M. (2013), 'The Economics Behind Non-Tariff Measures: Theoretical Insights and Empirical Evidence', *UNCTAD Policy Issues in International Trade and Commodities Studies Series*, 57. UNCTAD.

Gomez-Herrera, E. (2013), 'Comparing Alternative Methods to Estimate Gravity Models of Bilateral Trade', *Empirical Economics*, Springer, Vol. 44, No. 3, 1087-1111.

Haveman, J. and Thursby, J.G. (2000), 'The Impact of Tariff and Non-Tariff Barriers to Trade in Agricultural Commodities: A Disaggregated Approach', *Purdue CIBER Working Paper* 143.

Head, K and Mayer, T. (2013), Gravity Equations: Workhorse, Toolkits and Cookbook, in '*Handbook of International Economics*', Gropinath, Helpman, and Rogoff (eds.), Vol. 4. Elsevier.

Heckman, J. (1979), 'Sample Selection Bias as a Specification Error', *Econometrica*, Vol. 47, 153-161.

Helpman, E. and Krugman, P. (1985), *Market Structure and Foreign Trade*. Cambridge, MA, US: MIT Press.

Helpman, E., Melitz, M. and Rubinstein, Y. (2008), 'Trading Partners and Trading Volume', *Quarterly Journal of Economics*, Vol. 123, No. 2, 441-487.

Henson, S .J. (2006), 'The Role of Public and Private Standards in Regulating International Food Markets', Paper presented at the IATRC Symposium. Bonn, Germany, May 28-30, 2006

Henson, S. J. and Humphrey, J. (2009), 'The Impacts of Private Food Safety Standards on the Food Chain and on Public Standard-Setting Processes', ALINORM 09/32/9D-Part II. (Rome: Codex Alimentarius Commission).

Henson, S. J. and Humphrey, J. (2008), 'Understanding the Complexities of Private Standards in Global Agri-Food Chains', Paper presented at the workshop: Globalization, Global Governance and Private Standards, University of Leuven, November.

Henson, S. and Jaffee, S. (2008), 'Understanding Developing Country Strategic Responses to the Enhancement of Food Safety Standards', *The World Economy*, Vol. 31,No. 4, 548-568.

Ignacio, L. (2008), 'Implications of Standards and Technical Regulations on Export Competitiveness'. Available at:http://dspace.africaportal.org/jspui/bitstream/123456789/32209/1/IgnacioL_Implicati.pdf?1

Jaffee, S. and Henson, S. (2004), 'Standards and Agri-food Exports from Developing Countries: Rebalancing the Debate', *World Bank Policy Research Working Paper* 3348. Washington, DC: The World Bank.

Jouanjean, M., Jean-Christophe, M. and Shepherd, B. (2012), 'Reputation Matters - Spillover Effects in the Enforcement of US SPS Measures', *World Bank Policy Research Working Paper 5935*

McCullough, E. B., Pingali, P. L. and Stamoulis, K. G. (2008), 'The Transformation of Agri-Food Systems: Globalization Supply Chains and Smallholder Farmers', *Quarterly Journal of International Agriculture*, Vol. 48, No. 3, 286-287.

Kaplinsky, R. (2008), 'What Does the Rise of China Do for Industrialization in Sub-Saharan Africa?', *Review of African Political Economy*, Vol. 35,No. 115, 7–22.

Kareem, O.I. (2014), 'Product Standards and Africa's Agricultural Exports', *AGRODEP Working Paper* 0009, December.

Kareem, O.I. (2010), The Effects of Market Access Conditions on Africa's Exports, Unpublished Ph.D thesis Submitted to Faculty of the Social Sciences, University of Ibadan, Nigeria.

Kareem, O.I (2014) "Protectionism Trade Policy Instrument in the Global Crisis: An Impact Analysis from Africa – EU and Africa – US Trade Relations", in Evenett, S.J., eds., "Beggar – Thy – Poor Neighbour: Crisis – Era Protectionism and Developing Countries", The 15th Global Trade Alert (GTA) Report, CEPR, London, UK. Available at: http://www.globaltradealert.org/sites/default/files/GTA15_LDCs2_4.pdf

Kareem, F.O. and Kareem, O. I. (2014), 'Specification and Estimation of Gravity Models: A Review of the Issues in the Literature', *European University Institute RSCAS Working Papers*, RSCAS 2014/74, Series 118. Available at: www. http://cadmus.eui.eu/bitstream/handle/1814/31893/RSCAS_2014_74.pdf?sequence=1

Kareem, F. O., Bruemmer, B. and Martinez-Zarzoso, I. (2015), 'The Implication of European Union's Food Regulations on Developing Countries: Food Safety Standards, Entry Price System and Africa's Exports', *GlobalFood Discussion Paper*, No.61.

Maertens, M. and Swinnen, J.F.M. (2009), 'Trade, Standards, and Poverty: Evidence from Senegal', *World Development* 37: 161-178.

Martinez, G.M. and Poole, N. (2004), 'The Development of Private Fresh Produce Safety Standards: Implications for Developing Mediterranean Exporting Countries', *Food Policy*, Vol. 29, No. 3, 229-255.

Moise, E. and Le Bris, F. (2013), 'Trade Costs-- What Have We Learnt: A Synthesis Report', *OECD Trade Policy Paper* No.150. OECD Publishing.

Munasib, A., and Roy, D. (2013), Non-Tariff Barriers as Bridge to Cross, *Selected paper prepared for presentation at the 2013 AAES & CAES Joint Meeting*, Washington DC, August.

Mutume, G. (2006), 'New Barriers Hinder African Trade', *Africa Renewal*, Vol. 19, No. 4, 18 – 19.

Nicita, A. and Gourdon J (2013), 'A Preliminary Analysis on Newly Collected Data on Non-Tariff Measures', *Policy Issues in International Trade and Commodities Study Series no. 53.*

Okello, J.J. and Roy, D. (2007), 'Food Safety Requirements in Africa Green Bean Exports and Their Impact on Small Farmers', *IFPRI Discussion Paper* 00737.

Otsuki, T., Wilson, J., and Sewadeh, M. (2001), 'Saving Two in a Billion: Quantifying the Trade Effect of European Food Safety Standards on African exports', *Food Policy*, Vol. *26*, No. 5, 495–514.

Rios, L. B. D., and Jaffee, S. (2008), 'Barrier, Catalyst, or Distraction? Standards, Competitiveness, and Africa's groundnut exports to Europe', *The World Bank, Agriculture and Rural Development Discussion* Paper 39.

Schlueter, S., Wieck, C., and Heckelei, T. (2009), 'Regulatory Policies in Meat Trade: Is There Evidence for Least Trade-Distorting Sanitary Regulations?', *American Journal of Agricultural Economics*, Vol. 91, No.5, 1484-1490.

Shepherd, B. and Wilson, N. L. (2010), "Product Standards and Developing Country Agricultural Exports: The Case of the European Union', available at: http://iatrc.software.umn.edu/activities/annualmeetings/themedays/pdfs2010/2010Dec-ShepherdWilson.pdf

Shepherd, B. and Wilson, N.L.W. (2013), 'Product Standards and Developing Countries Agricultural Exports: The Case of the European Union', *Food Policy,* Vol. 42: 1-10.

Swinnen, J. F. M. (2007) Global supply chains. Standards and the poor. (Oxon: CABI Publishing).

UNCTAD. (2013), .*Non-Tariff Measures to Trade: Economic and Policy Issues for Developing Countries.* United Nations Publications ISSNN 1817-1214.

World Bank. (2005), *Food Safety and Agricultural Health Standards: Challenges and Opportunities for Developing Country Exports*. Report No. 31027. Washington, DC: Poverty Reduction and Economic Management Trade Unit, Agriculture and Rural Development Department.

World Trade Organization. (2012), World Trade Report 2012. Geneva, Switzerland: WTO.

APPENDIX

Table A: The descriptive Statistics of variables in the Empirical Strategy

Variable	Definition	Mean	Standard Deviation	Min.	Max.
Export dummy-Fish	Equals 0 if there are no exports of fish from Africa to the EU, otherwise 1.	0.34	0.48	0.00	1.00
Export dummy-Coffee	Equals 0 if there are no exports of coffee from Africa to the EU, otherwise 1.	0.54	0.50	0.00	1.00
Export-Fish	Total Africa's fish exports to the EU ($'bn)	183.42	649.22	0.00	0.01
Export-Coffee	Total Africa's coffee exports to the EU ($'bn)	10310.19	42335.04	0.00	0.39
Exporter GDP	This is the economic size of exporters ($'bn)	22.22	47.59	0.07	408.24
Importer GDP	This is the economic size of importers ($'bn)	12622.96	3581.17	8480.43	18271.45
Distance	Distance from each selected African country capital city to largest sea port in EU- Rotterdam (Klm).	5503.03	1845.11	1722.73	9187.47
EU Standards-Fish	Cumulative standard requirements (see p.13)	33.06	9.41	18.00	49.00
EU Standards-Coffee	Same above	2.22	0.71	1.00	4.00

RTA	This is regional trade agreement. It takes the value of 1 if the country is part of the preferential trade agreement/arrangement, otherwise 0.	0.87	0.34	0.00	1.00
Language	Common language. It takes the value of 1 if the countries speak common language, otherwise 0.	0.67	0.47	0.00	1.00
Domestic Substitute	This is EU import from itself. That is, intra-EU imports, which represents domestic substitute ($'bn).	1.14	0.48	0.66	2.18
Inverse Mill Ratio-Fish	The ratio of the probability density function (PDF) and the cumulative density function (CDF) of the normal distribution	1.26	0.64	0.07	3.48
Inverse Mill Ratio-Coffee	Same above	0.74	0.32	0.06	1.96