GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN

GlobalFood
www.uni-goettingen.de/globalfood

RTG 1666 GlobalFood

Transformation of Global Agri-Food Systems:
Trends, Driving Forces, and Implications for Developing Countries

Georg-August-University of Göttingen

GlobalFood Discussion Papers

No. 87

EU-African Regional Trade Agreements as a Development Tool to Reduce EU Border Rejections

Dela-Dem Doe Fiankor
Malte Ehrich
Bernhard Brümmer

August 2016

RTG 1666 GlobalFood · Heinrich Düker Weg 12 · 37073 Göttingen · Germany
www.uni-goettingen.de/globalfood

ISSN (2192-3248)

Suggested Citation:

Fiankor, D.D.D., M. Ehrich, B. Brümmer (2016). EU-African Regional Trade Agreements as a Development Tool to Reduce EU Border Rejections. GlobalFood Discussion Paper 87, University of Göttingen. http://www.uni-goettingen.de/de/213486.html.

EU-African Regional Trade Agreements as a Development Tool to Reduce EU Border Rejections

Dela-Dem Doe Fiankor[a], Malte Ehrich[b], and Bernhard Brümmer[c]

[a]Corresponding author: Research Assistant, deladem fiankor@hotmail.com
[b]Doctoral Researcher, malte.ehrich@agr.uni-goettingen.de
[c]Professor for Agricultural Market Analysis, bbruemm@gwdg.de,

Department of Agricultural Economics and Rural Development, RTG 1666: GlobalFood, Georg-August-University of Göttingen, Germany

August 30, 2016

Abstract

The integration of developing countries into the world trading system is an important development mechanism to reduce poverty in these countries. Regional Trade Agreements (RTAs) have recently spread in terms of quantity and type. Some of these, like the Economic Partnership Agreements (EPAs) differ from previous RTAs as they explicitly support export capacities of developing countries. Therefore, it is particularly relevant to investigate the effect of eligibility for various types of RTAs first on exports and second on rejections at EU borders. Empirical analysis is carried out on 52 African countries' exports of fruits, nuts and vegetables and fish to the EU-27 from 2008 to 2013. Adopting the gravity framework we find that only EBA eligibility has induced significantly exports of fruits, nuts and vegetables from Africa to the EU-27. Estimating different count models using border rejection data from the EU Rapid Alert System for Food and Feed database, we also find other trade enhancing effects of RTAs that go beyond tariff reductions, as all EU-Africa RTAs have negative effects on border rejections. The effects nevertheless differ across agreements and products. Specifically, EPA eligibility decreases rejections on both products, GSP decreases rejections on fish and fish products and FTA (TDCA and Euro-Med) decreases rejections on fruits, nuts and vegetables.

Keywords: Agricultural trade, Border rejections, Regional trade agreements, Africa

JEL Classification: F13, F14, F15, Q17

The authors are thankful for the overall support of Dr. Fatima Kareem. Financial support from the German Research Foundation (DFG, grant number RTG 1666) is gratefully acknowledged.

1 Introduction

Regional trade agreements (RTAs) are more frequently signed to complement the currently stagnating multilateral negotiating rounds. Almost all members of the World Trade Organization (WTO) belong to at least one RTA. Via these agreements, which mostly imply tariff reductions, developed regions especially the European Union (EU) and the United States (US) offer reciprocal or preferential trade to developing countries. As a primary objective RTAs are expected to increase trade flows among participating countries by guaranteeing preferential market access.

RTAs have succeeded in eliminating tariffs, but it remains unclear how RTAs affect trade if non-tariff barriers (NTBs) gain in relevance and stringency. Although NTBs like food safety standards also have the potential to increase trade (Henson and Jaffee, 2008), they can be more inhibiting than tariffs and can be used for protectionist intents (Shepherd and Wilson, 2013; Jaffee and Henson, 2004). Producers especially in developing regions often lack the technical and financial capacity to meet standards (Kareem et al., 2015). In Sub-Saharan Africa, the average investment costs of complying with product standards as a percentage of firm sales could be as high as 124% (Czubala et al., 2009). For a region dominated by small-scale producers, this is enormous and significantly undermines the region's ability to export high value agri-food products with the inability to meet EU food standards resulting in persistent export rejections.

As a result, developing countries are frequently protesting against stricter standards imposed by developed countries (Disdier et al., 2008). Hence, negotiating tariff reductions might not be sufficient to improve regional integration as long as market access granted under RTAs remains conditional on compliance with food safety regulations (Jouanjean et al., 2015). In other words, the expected trade enhancing effect due to tariff reductions among participating countries might be offset by stricter food safety standards which are usually not addressed in RTAs. For example, from 2008 to 2013 there were 1142 border rejections of Africa's agri-food exports to the EU. These import rejections offset nearly a quarter of the gains in trade from tariff reductions (Baylis et al., 2012) and continuous rejections result in increased loss of export revenue.

The EU and most African countries are engaged in various reciprocal and non reciprocal trade agreements. These include the standard General Scheme of Preferences (GSP), Everything but Arms (EBA), Economic Partnership Agreements (EPA), the Euro-Med Agreement and the Trade, Development and Corporation Agreement (TDCA). Whilst most African countries enjoy tariff free access to EU markets under these agreements, the EU in turn imposes a series of SPS standards that products must meet before access is granted. There is a growing view that specific provisions included in economic integration agreements should be reconsidered from broader perspectives (Disdier et al., 2015); in effect, recent trade negotiations - e.g. the EU-ACP EPAs - have been broadened to include more diverse policy measures (Hayakawa and Kimura, 2015).

In contrast to previous RTAs, EPAs address non-tariff aspects like copyright and environmental issues, poor infrastructure, inefficient customs and border controls, inadequate standards and aim at empowering producers and exporters to adhere with SPS standards (European Commission, 2008). These are expected to help developing countries overcome a number of NTBs and facilitate their ease of penetrating EU markets. However, according to the authors' knowledge, no studies have been conducted to analyze the effect of different types of RTAs on trade by considering border rejections in particular.

The contribution of this article is two-fold. First, as regional trade liberalization is gaining prominence, it is important to ascertain its implications for EU-Africa trade. Whilst the EU's trade preferences and their impact on beneficiary countries have been subject to research, studies focusing on EU trade preferences with Africa have mostly been confined to the context of developing countries (Cardamone, 2011; Koroma and Ford, 2006) with the majority focusing on the non reciprocal GSP (Gradeva and Martínez-Zarzoso, 2015; Aiello and Demaria, 2012; Aiello et al., 2010). Unlike earlier works, we intend to analyze the differences in trade effects of the EU's GSP, EBA, FTA (Euro-Med and TDCA) and EPA trade preferences for African countries.

Secondly, we contribute to the growing body of literature on import refusals (Fontagné et al., 2016; Kareem et al., 2015; Baylis et al., 2011, 2009; Buzby et al., 2008) by investigating the impact of EU-Africa trade agreements on EU border rejections. As a measure of compliance with food standards, we use border rejections recorded in the Rapid Alert System for Feed and Food (RASFF) database. Hence, border rejection data allows us to analyze whether and which types of RTAs increase or reduce border rejections.

We proceed by investigating the impacts of trade agreements on exports within a gravity framework and on rejections using a series of count models. We use a panel of 52 African countries' exports of fruits, nuts and vegetables (HS07+HS08) and fish products (HS03) to the EU over six years (i.e. 2008 - 2013). The choice of these commodities is because they are heavily affected by increasing standards - attracting the highest counts of border rejections - and are important in the agriculture of both the EU and Africa.

The remainder of the article is structured as follows. Sections two and three provide an overview of existing EU-Africa trade agreements and the EU food rejection system respectively. Section four discusses the econometric model specifications before the empirical results are presented in section five. Section six concludes.

2 EU-Africa Regional Trade Agreements

The GSP initiated in 1971 is the pioneer trade agreement between the EU and Africa. It is governed by the Lomé convention and subject to the WTO's "Enabling Clause" which allows for an exception to the "Most Favoured Nation"[1] (MFN) principle. Thus, the GSP allows preferential access for specific developing country products into the EU without reciprocal liberalization. It consists of a general and two special arrangements. The general or standard GSP offers beneficiaries 66% tariff reductions on all EU tariff lines. The first special arrangement called Everything But Arms (EBA) was introduced in 2001. It offers all products from least developed countries (aside from weapons) duty-free and quota-free access to EU markets. The second special arrangement introduced in 2012 is the Special Incentive Arrangement for Sustainable Development and Good Governance (known as the GSP+). It offers deeper tariff cuts for countries implementing international conventions on human and labor rights, the environment and good governance.

The Lomé Convention expired in 2000 and was replaced by the Cotonou Agreement. Under this scheme the EU and its African, Caribbean and Pacific (ACP) partners agreed to maintain the Lomé Convention until the end of 2007 and replace them with Economic Partnership Agreements (EPA). These were to replace the WTO incompatible unilateral preferences, granted by the EU under the Lomé Conventions. Getting to the end of 2007, negotiations to initialize full EPAs were still not finalised, thus interim EPAs were concluded by some African

[1]Under WTO agreements, member countries are not normally allowed to discriminate between their trading partners. Special favours granted to one partner must be extended to all members

countries on mostly bilateral or sub-regional levels (Vollmer et al., 2009). For non LDC African countries that failed to initialize the interim EPAs, they reverted to the standard GSP. Till date, the EPAs represent the single most significant free trade negotiations between developed and developing countries (Bartels et al.). As a primary focus, EPAs aim to encourage economic development, regional integration, poverty reduction and gradual integration of ACP countries into the global economy (Koroma and Ford, 2006). These agreements cover about 80% of trade in all goods, services and investments and offer duty-free quota-free export access into the EU from countries which have initialled the agreement. To ensure consistency with WTO regulations, EPAs are reciprocal and signatory ACP countries must gradually open up 80% of their markets to EU imports.

Some African countries also have free trade agreements (FTA) in place with the EU. Under the European and Mediterranean (Euro-Med) partnership agreement, the EU has FTAs with Tunisia, Morocco, Egypt and Algeria. These agreements cover trade in goods and are complemented with ongoing negotiations and preparations for future negotiations. South Africa, the EU's largest trading partner in Africa also has an FTA with the EU governed by the Trade, Development and Co-operation Agreement (TDCA). The agreement covers 90% of all bilateral trade between the EU and South Africa.

The debate concerning the role of RTAs is still open. In principle, they are expected to increase trade flows; indeed, this has been the conclusion of the major strand of RTA literature. Nevertheless, the empirical evidence especially for North-South agreements has been rather mixed. We proceed to review the literature on trade agreements with a focus on EU-ACP trade agreements.

Aiello and Demaria (2012) provide evidence that the EU GSP, EBA and Euro-Med agreements have positive and significant effects on the agricultural exports of preferred countries. Cardamone (2011) shows that RTAs are effective in increasing EU imports of fruits from eligible countries, but the effects are commodity specific. The GSP boosts trade in apples and mandarins and the Cotonou Agreements enhance EU imports of grapes and mandarin. Cipollina and Salvatici (2010) use data on 161 developing countries' exports to the EU-15 and find evidence for the impact of EU preferences on bilateral trade flows. Aiello et al. (2010) study the effects of the GSP and other trade preferences on 184 developing countries' exports to eight OECD countries and find evidence of positive impacts on the total exports of beneficiaries. The effects are, however, not robust to dis-aggregated data.

Although, most developing countries seek North-South trade agreements to enhance their access to developed countries' markets, in practice this goal is not always achieved (Brenton and Ikezuki, 2004). Some researchers argue that developing countries have not made the best use of the preferences they are offered (Cardamone, 2011), while others blame restrictive policies of the Northern partners such as the corresponding strict rules of origin introduced as part of the agreements (Cieślik and Hagemejer, 2009; Candau and Jean, 2005). Brenton and Ikezuki (2004) opine that developed countries' trade preferences have not transformed the export performance of developing country beneficiaries but agree that performance may have been worse without them. Using an augmented gravity model, Cieślik and Hagemejer (2009) study the trade effects of the Euro-Med agreement and find that they increased significantly imports of the Middle East and North African countries from the EU but had no corresponding positive impact on their exports to the EU. Cardamone (2011) find negative and significant effects of GSP preferences on exports of pear and fresh grapes to the EU and recently, Gradeva and Martínez-Zarzoso (2015) have shown that EBA preferences actually reduce ACP LDCs' exports to the EU.

3 EU Border Rejection System and Africa's Agri-Food Exports

Food safety is a primary objective of the EU and agri-food trade is legally bound to the Union's General Food Law or regulation number EC/178/2002. Agricultural food exports reaching the EU are checked for a number of standard requirements including mycotoxins, microbial contaminants, veterinary drug residues, heavy metals, unauthorized food additives, pesticide residues, product composition, industrial contaminants, GMOs, foreign bodies, biotoxins, radiations, and parasitic infestation. Normally multiples of these requirements must be passed before a product is allowed entry. The EU uses the RASFF database to enforce these food safety policies and enable efficient information sharing on food safety risks among members. Four types of notifications are registered in the RASFF. *Alert* notifications are sent when food and feed that pose serious threats are identified on the market and require rapid action. *Information* notifications are used when one member state identifies a risk, but other members are not required to take immediate action because the product might not have yet reached their markets. *Border rejections* are the severest and concern food and feed consignments that have been tested and rejected at EU borders because of health risks. Lastly, any information related to food and feed safety that has not been communicated as an alert or information but is considered interesting for the control authorities, is transmitted to members as *News*.

However, the EU only started reporting explicit border rejections of third country exports in 2008. Through the period of 2008 to 2013, products of nut origin, fruits and vegetables and fish products have accrued the highest number of rejections (Table 1). Unsurprisingly, Buzby et al. (2008) identified vegetable products (20.6%), fishery and seafood products (20.1%), and fruits and fruit products (11.7%) as the three food groups with the most violations of US food standards between 1998 and 2004. This explains this study's focus on "nuts, nut products and seeds" and "fruits and vegetables" (henceforth referred to as fruits, nuts and vegetable products) and fish and fish products, as these commodities have demonstrated high tendencies to violate developed countries' food standards.

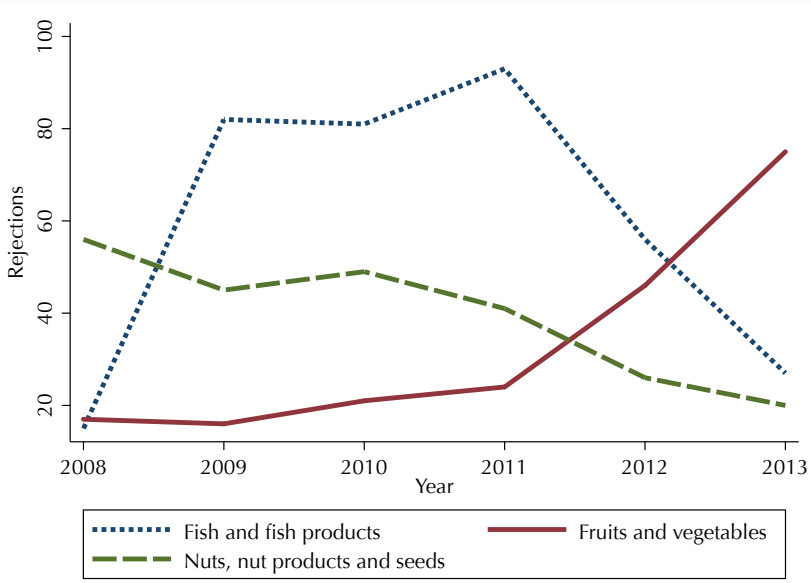
Table 1: Count of border rejections by product category

Product Category	2008	2009	2010	2011	2012	2013	Total
Nuts, nut products and seeds	673	505	468	424	272	215	2557
Fruits and vegetables	192	197	244	360	479	402	1874
Fish and fish products	153	351	183	217	166	86	1156
Feed materials	41	68	38	133	103	65	448
Total	1059	1121	933	1134	1020	768	6035

Source: RASFF (2015)

Figure 1 shows the trend in border rejections of African countries' exports of fish and fish products and fruits, nuts and vegetables to the EU. From 2008 to 2013, there was a total of 199 border rejections of fruits and vegetables, 237 border rejections of nuts, nut products and seeds and 354 border rejections of fish and fish products. While border rejections of fish and fish products and nuts, nut products and seeds have been witnessing declines, the rejections of fruits and vegetables have been soaring. These changes in the number of rejections could be as a result of African countries adapting to EU food standards or withdrawing from EU markets.

Figure 1: EU border rejections of fish and fish products and fruit, vegetable and nut exports from Africa (2008 - 2013)



Source: RASFF (2015), own graph

These rejections have obvious ramifications for Africa's exports to the EU because consistent rejections result in outright bans[2] which in turn restrict trade. In the short run, these bans result in exporting countries losing export earnings while risking damage to their reputations in the long run (Maertens and Swinnen, 2009). As a result while the EU is still the largest market for agri-food exports from Africa, bilateral trade volumes in the last couple of years have been stable at best or declining in some instances. Alternatively, Africa's exports to other parts of the world are catching up with exports to the EU. A lot of intra-African trade is being undertaken, while the Middle East, East Asia and India are emerging as substitute destinations for agri-food exports from Africa.[3]

4 Methods and Data

4.1 Gravity Model of Trade

In order to assess the differential effect of EU-Africa RTAs on African countries' exports to the EU-27, we use a gravity model of international trade. Formulating the gravity model dates as far back as Ravenstein (1885), but it was not until Tinbergen (1962) that the model was applied empirically. Over time, the model has emerged as the preferred workhorse for analyzing trade related policies. It has dominated the international trade literature as the main econometric approach to estimating the effects of econometric integration on bilateral trade (see Bureau and Jean, 2013; Aiello and Demaria, 2012; Sarker and Jayasinghe, 2007). In its basic form, the gravity model estimates bilateral trade between two countries as proportional to the product of their masses (normally proxied by their GDPs), and inversely proportional

[2]E.g. South Africa - a significant exporter of oranges - has been banned on many occasions by the EU commission because of failure to meet standards. Mango and citrus imports from Ghana were also temporarily banned by the EU in 2014 due to fruit fly and angular leaf spot infestations

[3]Estimates are based on authors' own calculation using UN Comtrade data on HS 03 (Fish, crustaceans, molluscs, aquatic invertebrates), HS 07 (Edible vegetables and certain roots and tubers) and HS 08 (Edible fruits and nuts, peel of citrus/melons.)

to their distance apart.

The model has been through a series of empirical and theoretical developments. Earlier applications (McCallum, 1995; Otsuki et al., 2001) did not account for multilateral trade resistance (MTR) which was introduced by Anderson and van Wincoop (2003). Intuitively, MTR refers to the barriers which countries face in trading with all their trading partners. These MTRs are unobservable and various authors have developed different techniques to capture them. So-called "remoteness variables" can be calculated and importer and exporter fixed effects could also be used to capture MTR (Feenstra, 2004; Redding and Venables, 2004). Alternatively, Baier and Bergstrand (2009) recommend linearly approximating MTR by means of a first-order Taylor-series expansion.

One advantage of the gravity model is its ease of use. Aside from the standard gravity variables, the model allows the inclusion of other variables that affect trade. In this study, we augment the model and include EU trade preferences extended to African countries. While no single approach has been identified in literature on how to measure the RTA intensity of a country, for simplicity we follow most studies on regionalism (see Disdier et al., 2015; Baghdadi et al., 2013; Aiello et al., 2010; Helpman et al., 2008; Carrère, 2006) and define four dummies EBA, GSP, EPA and FTA (we use FTA to encompass the TDCA and Euro-Med agreements) to capture the existence of an RTA between country pairs. Thus, similar caveats apply to our results as to most of the literature that has employed this approach.[4] Throughout the empirical analysis we can only estimate the effect of eligibility for preferences because the nature of the data does not allow us to take into account actual utilization rates.

Bilateral Trade Model

One predominant issue in trade analysis is the issue of zeroes. Even at aggregate levels, trade data often includes large numbers of reported zeroes or missing trade flows. While some of these zeroes are rounding errors, most reflect a true absence of trade between countries (Will and Pham, 2008). Such zeroes are informative and disregarding them gives up important information resulting in biased estimates (Helpman et al., 2008). Even though we use trade data at the two digit HS level, our dataset still has a significant number of zeroes; 76.5% in the fish and fish products and 61.4% in the fruit, nut and vegetable products trade matrices. Proper handling of these zeroes is important as excluding them (truncation) creates a selection bias, while adding an arbitrary small positive value (censoring) introduces a measurement error.

To accommodate the zero trade flows, we adopt the Poisson Pseudo Maximum Likelihood (PPML). This allows us to estimate the gravity model in its multiplicative form and use the dependent variable in levels rather than in logs (Silva and Tenreyro, 2006). Due to heteroskedasticity, log-linearization changes the properties of the error term and results in inefficient estimations. If data are homoskedastic, both the variance and expected value of the error term are constant. As in most trade data, the Breusch-Pagan test performed on our data suggests the presence of heteroskedasticity; the expected value of the error term is therefore a function of the regressors. Log-linearization in this case alters the conditional distribution of the dependent variable and OLS is rendered inefficient. Besides providing a natural way of dealing with zeroes in the dependent variable, PPML is consistent under heteroskedasticity.

[4]These include the one-off, uniformity and homogeneity assumptions. For a review see Bureau and Jean (2013)

We specify an augmented gravity model as follows:

$$X_{ijt}^{l} = \exp(\beta_0 + \beta_1 \ln \text{GDP}_{jt} + \beta_2 \ln \text{GDP}_{it} + \beta_3 \ln \text{Dist}_{ij} + \beta_4 \ln(1 + \text{Tariff}_{ijt}^{l}) + \beta_5 \Omega_{ij} + \beta_6 \text{EBA}_{ijt} + \beta_7 \text{GSP}_{ijt} + \beta_8 \text{FTA}_{ijt} + \beta_9 \text{EPA}_{ijt}) \varepsilon_{ijt}^{l} \quad (1)$$

Where subscripts i, j, l and t refer to exporters, importers, products and year respectively. X_{ijt}^{l} is the US dollar value of l imported from i in t. GDP is the Gross Domestic Product in current US dollars. Dist_{ij} is the geographical distance between j and i, Tariff_{ijt}^{l} is the average *ad valorem* tariffs and Ω_{ij} contains the traditional covariates i.e. dummies for common language, colonial ties, landlocked and island countries. GSP_{ijt}, EBA_{ijt}, FTA_{ijt} and EPA_{ijt} are dummies indicating eligibility for GSP, EBA, EPA and FTA (Euro-Med and TCDA) preferences respectively. ϵ_{ijt}^{l} is the error term.

To control for MTR we apply a first-order Taylor-series expansion technique to all trade cost variables in equation (1), as shown in Baier and Bergstrand (2009). Using distance as an example and following Egger and Nelson (2011), we transform bilateral trade cost proxies using the following approximation:

$$\ln \widetilde{\text{Dist}}_{ij} \equiv \ln \text{Dist}_{ij} - \frac{1}{N} \sum_{j=1}^{N} \ln \text{Dist}_{ij} + \frac{1}{2} \frac{1}{N^2} \sum_{i=1}^{N} \sum_{j=1}^{N} \ln \text{Dist}_{ij} \quad (2)$$

The transformed variable $\widetilde{\text{Dist}}$ is defined as exporter and importer time fixed effects. A similar definition holds for all trade cost variables (i.e. β_3 - β_9).

Border Rejection Model

Our second objective is to investigate the effect of EU-Africa RTAs on EU border rejections. We test the hypothesis that having a trade agreement with the EU decreases border rejections, especially through the financial, capacity and institutional building benefits that the EU extends to countries it has such agreements with. The dependent variable, $\text{Rejections}_{ijt}^{l}$, is a count of events with positive predictions. This count nature is neither a necessary or sufficient condition to use count models, however, count data is normally plagued with issues that render standard linear regression models inappropriate. Such models ignore the discrete nature of the regressand, allow for negative outcomes (whereas counts are non-negative) and ignore heteroskedasticity inherent in count data (Winkelmann, 2008).

Our empirical strategy is to estimate a series of count models. The standard distribution for count data is the Poisson probability distribution because it explicitly recognizes the non-negative integer character of the dependent variable (Winkelmann, 2008). However, the estimator is only consistent when the conditional mean of the dependent variable is proportional to its conditional variance (i.e. $\text{VAR}(Y_{ijlt}) = E(Y_{ijlt}) = \mu_{ijlt}$); an assumption that is unlikely to hold in many cases (Cameron and Trivedi, 2014) as the estimator does not account for unobserved heterogeneity. As evident in Table (2), our data exhibits over-dispersion as $\text{Rejection}_{ijt}^{l}$ exhibits a lower mean relative to the variance in both products.

In such cases, a natural extension of the Poisson distribution is the negative binomial (NB) distribution which relaxes the assumption of equi-dispersion in the dependent variable (Burger et al., 2009). The NB probability distribution function for y is given as:

$$P[Y_{ijlt} = y_{ijlt} | x_{ijlt}, \alpha] = \frac{\Gamma(\alpha^{-1} + y_{ijlt})}{\Gamma(\alpha^{-1})\Gamma(y_{ijlt} + 1)} \left[\frac{\alpha^{-1}}{\alpha^{-1} + \mu_{ijlt}}\right]^{\alpha^{-1}} \left[\frac{\mu_{ijlt}}{\alpha^{-1} + \mu_{ijlt}}\right]^{y_{ijlt}}, \alpha > 0 \quad (3)$$

Γ is the gamma function, $\mu = \exp(X_{ijlt}\beta)$ and α is the dispersion term which allows the conditional variance to exceed the conditional mean, thereby explicitly taking care of over-dispersion (Winkelmann, 2008). With the estimator's over-dispersion assumption, its conditional variance function is specified as:

$$\text{VAR}\left[y_{ijlt}|x_{ijlt}\right] = \left(1 + \alpha^{-1}\right)\mu_{ijlt} \tag{4}$$

The expected value of the observed count of border rejections in the NB model is given as that of the Poisson model. However, the variance is specified to include the mean μ and an unobserved heterogeneity term given as a dispersion parameter α. Thus, the NB model reduces to the Poisson model as α approximates zero. While the NB model is often criticized for being scale dependent[5](Bosquet and Boulhol, 2014), in our case the unit choice of the dependent variable is not arbitrary.

We restrict data to only country pairs that were engaged in bilateral trade over the period of study since only these exporting countries were affected by the refusal regime or stood the chance of attracting a rejection.[6] While food standards are the same across all EU borders, we expect enforcement to differ between members. Unlike in Fontagné et al. (2016), we collect rejection data at the country-pair level and do not treat the EU as a single unit.[7] Adopting a specification similar to Baylis et al. (2009), we model the probability of a rejection as follows:

$$Pr(\text{Rejections}^{l}_{ijt}) = \beta_0 + \beta_1 \text{RTA}_{ijt} + \beta_2 \Omega_{jt} + \beta_3 \Delta_{it} + \beta_4 \Psi_{lt} + \varepsilon^{l}_{ijt} \tag{5}$$

Where i refers to exporters, j to importers, l to product and t to time. We include three sets of control variables. RTA_{ijt} contains our variables of interest (i.e. dummies for EBA_{ijt}, GSP_{ijt}, EPA_{ijt} and FTA_{ijt}) which we hypothesize to reduce border rejections. In the following section, we describe the other sets of control variables.

It is important to control for other possible drivers of border rejections. Ω_{jt} and Δ_{it} include proxies for importing and exporting countries' characteristics respectively. To control for economic masses, we deviate from the convention of using GDP and instead use the level of specific agricultural commodity production (Prod^{l}_{jt} and Prod_{ilt}). Prod^{l}_{jt} could also be a driver of protection because if EU countries produce large amounts of the studied products, domestic producers may be more concerned about competition from imports. To control for the level of development, we use GDP per capita (Gdppc_{it} and Gdppc_{jt}) in constant 2011 USD, with the assumption that as exporter income increases, the risk associated with that country decreases and as importing economies develop, citizens' demand for safer food will lead governments to introduce stricter border checks. We control for tariffs using *ad valorem* tariffs charged on exports to the EU (Tariff^{l}_{ijt}). Functioning domestic institutions will determine border rejections and we control for these using the level of corruption in exporting countries (Corrupt_{it}) and regulatory quality in importing countries (RegQual_{jt}).

Ψ_{lt} includes controls for specific product characteristics. Here we draw on the sector reputation effects of Jouanjean et al. (2015), measured as the correlation between present notifications and past import notifications affecting closely related products. We consider a one year lag of *Alert* notifications (Alert_{ijt-1}) because it is assumed that alerts will trigger rejections. We control for the relationship between import levels and rejections using a one year lag of imports (X^{l}_{ijt-1}) since more exports will likely be associated with more rejections. Given the perishable nature of the commodities we study, we consider transport costs proxied

[5]Measuring the dependent variable in dollars or in thousands of dollars will lead to different elasticity estimates

[6]Including the zero trade flows does not change our story as the estimated coefficients remain very close to the baseline in sign, significance, and magnitude

[7]Alvarez-Coque et al. (2015) argue that while they find signs that EU Member States behavior is becoming more uniform, the EU cannot be considered as a single unit when studying Non-Tariff Measures.

by the geographical distance (Dist_{ij}) between country-pairs to be an important control variable.

The fully specified model is as follows:

$$\begin{aligned}\text{Rejection}^{l}_{ijt} = {} & \beta_0 + \beta_1 \text{EBA}_{ijt} + \beta_2 \text{GSP}_{ijt} + \beta_3 \text{EPA}_{ijt} + \beta_4 \text{FTA}_{ijt} + \beta_5 \ln \text{Gdppc}_{jt} \\ & + \beta_6 \ln \text{Gdppc}_{it} + \beta_7 \ln \text{Prod}^{l}_{jt} + \beta_8 \ln \text{Prod}^{l}_{it} + \beta_9 \ln \text{X}^{l}_{ijt-1} \\ & + \beta_{10} \ln(1 + \text{Tariff}^{l}_{ijt}) + \beta_{11} \text{RegQual}_{jt} + \beta_{12} \text{Corrupt}_{it} + \beta_{13} \text{Alert}_{ijt-1} \\ & + \beta_{14} \ln \text{Dist}_{ij} + \delta_t + \epsilon^{l}_{ijt}\end{aligned} \tag{6}$$

4.2 Data

We use data from various sources on members of the EU-27 and 52 African countries (Table A1). Our data starts from 2008 - a year which marks the coming into force of the first interim EPAs and the beginning of the EU RASFF's data on explicit third country border rejections - and ends in 2013. Table (2) shows summary statistics for the sample.

Border rejection data is taken from the RASFF (2015) however, there are peculiarities with this database that should be mentioned. RASFF data are not categorized according to the HS code. This required that we match rejection data to HS code classified import data downloaded from UN Comtrade. To achieve this, we match rejection of fish and fish products to imports categorized under HS 03 (i.e. fish and crustaceans) and rejections of fruits, nuts and vegetable products to the aggregation of imports categorized under HS 07 (i.e. edible vegetables) and HS 08 (i.e. edible fruits and nuts). The data is collected on rejections notified by members of the EU-27 and corresponding exporting African countries. Secondly, most African countries received no rejections because their exports met all EU food standards or more generally a reflection of African exporters' inability to trade with the EU. This gives rise to large counts of zeroes.

To construct our RTA dummies, we consulted a database on Economic Integration Agreements constructed by Baier and Bergstrand (Baier et al., 2014) and augmented it with data from the WTO Preferential Trade Agreements database. A breakdown of RTA participation is presented in appendix A2. We make a distinction between EBA and standard GSP because they offer different preference regimes and LDCs are also of particular interest. Data in the Baier and Bergstrand dataset is classified into Non Reciprocal Preferential Trade Arrangement, Preferential Trade Arrangements and Free Trade Areas. Hence, to distinguish between the GSP and EBA (which are both non reciprocal) we consider the LDC status of the countries in different years.

GDP and GDP per capita data are taken from the World Bank World Development Indicators database, agricultural production data is from FAOSTAT and average *ad valorem* tariffs are downloaded from the International Trade Center. Country specific data on distance, colonial ties and common language are derived from CEPII and data on geographical features of landlocked and island countries are derived from the CIA World Fact Book. For data on corruption and regulatory quality, the World Bank Worldwide Governance Indicators were consulted.

Table 2: Summary Statistics

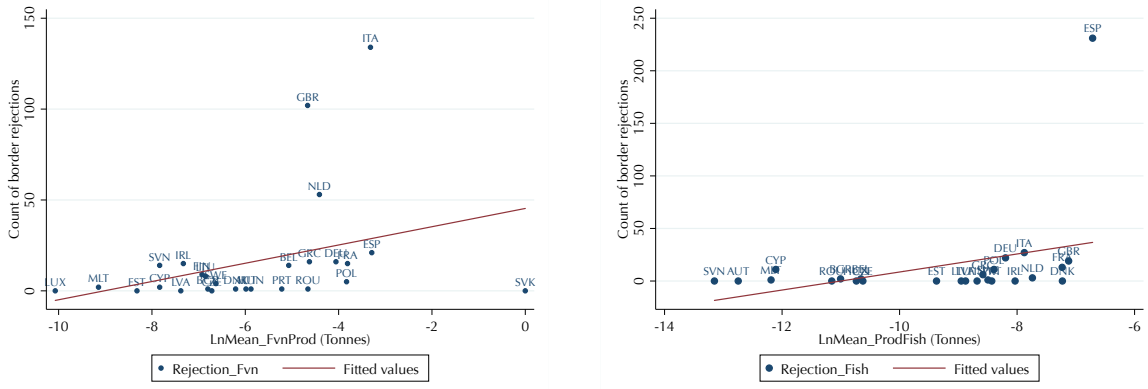
Variable	Obs.	Mean	Std. Dev.	Min.	Max.	Unit
Rejection_Fish	8424	0·041	0.62	0	27	n.a.
Rejection_Fnv	8424	0·052	0.63	0	26	n.a.
Notification_Fish	8424	0·05	0.66	0	27	n.a.
Notification_Fnv	8424	0·07	0.72	0	28.00	n.a.
Import_Fish (logs)	1983	11·88	3.40	0	20.25	USD
Import_Fnv (logs)	3266	11·94	3.56	0	20.57	USD
GDP_Importer (logs)	8424	26·13	1.59	22.82	28.95	USD
GDP_Exporter (logs)	8424	23·06	1.65	19.06	26.97	USD
EBA	8424	0·63	0.48	0	1	n.a.
GSP	8424	0·12	0.32	0	1	n.a.
EPA	8424	0·33	0.47	0	1	n.a.
FTA	8424	0·10	0.29	0	1	n.a.

*Fnv = fruits, nuts and vegetables

5 Results

As an initial exploratory analysis, we identify which EU countries are more likely to issue rejections (Figure 2) and which African countries attract these border rejections. Unsurprisingly, Spain, one of the largest domestic producers of fish products in the EU issued the most rejections of fish and fish products followed by Italy, Germany, the UK and France. For fruit, nut and vegetable products, Italy issued the most notifications with 134, closely followed by the UK with 102 rejections. These are followed by the Netherlands, Greece and Germany. In both cases, we observe a positive relationship between domestic production and the tendency to issue rejections.

Figure 2: EU rejection of exports from Africa by notifier (2008 - 2013)



(a) Fruits, nuts and vegetables

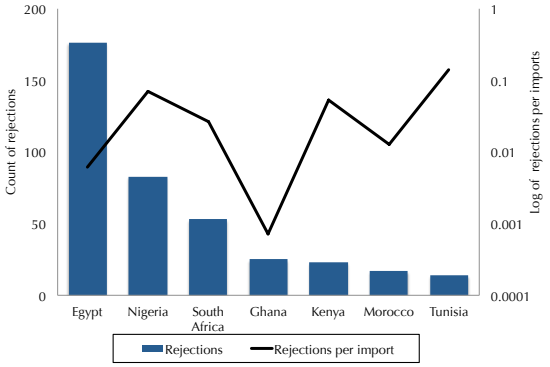
(b) Fish and Fish products

Source: RASFF (2015); FAOSTAT (2015), own graph

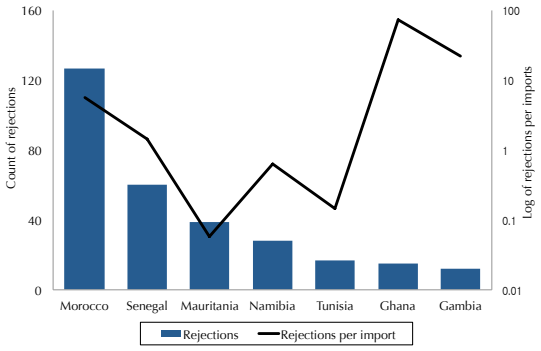
We also present the seven African countries with the most border rejections over all the six years. For reasons of comparison, we also calculate rejections relative to actual imports (Figure 3). While African countries exporting high volumes of both products are more prone to rejections, rejections do not appear to be just a function of quantity exported. Egypt exports twice as many fruits, nuts and vegetables to the EU compared to Nigeria, yet exports from Nigeria stand a greater risk of facing a rejection. The same holds for the Gambia and Ghana

in their export of fish and fish products; they export relatively fewer fish products to the EU compared to Morocco, Senegal and Mauritania but still attract more rejections per export.

Figure 3: EU rejection of exports from Africa by product origin (2008 - 2013)



(a) Fruits, nuts and vegetables



(b) Fish and Fish products

Source: RASFF (2015); UN Comtrade (2015), own graph

Turning to our econometric models, Table (3) presents the results of the standard gravity estimations. We also estimate OLS, Fixed Effects and Random Effect models which do not account for zero trade flows but base our discussions on the results of the PPML estimation presented in columns (4) and (8).

The overall fit of the regressions are consistent with literature. The gravitational variables have the expected signs. Both exporter and importer GDPs have positive and significant effects on bilateral trade. However, the elasticity of trade to exporter GDP is larger for fruits, nuts and vegetables relative to fish and fish products. Geographic distance and being a landlocked country impedes trade in fish and fish products more than trade in fruits, nuts and vegetable products, implying that economically even as transportation costs are still constraining Africa's trade with the EU, the situation is worse in terms of fish related transport. Common language and being an island country have no significant effect. The existence of past colonial ties increases trade in fruit, nuts and vegetable products but has no significant effect on trade in fish and fish products. Tariffs increase trade in both products, albeit not significantly.

In answering the first objective of this study, we find evidence of a differential effect of the various agreements for trade in both products. Over the period of study, there is no variation in the FTA variable at the bilateral level that we could exploit. The variable is dropped out of the regression because of a lack of within-sample variation. We note that EU-Africa trade agreements have much more positive effects on trade flows in fruits, nuts and vegetables while their role in fish and fish products is less clear. Eligibility for EBA preferences has a positive and significant effect on trade in fruit, nut and vegetable products, but has no significant effect on trade in fish and fish products. The standard GSP has a positive but insignificant effect on trade in fruits, nuts and vegetables, but has a negative effect on trade in fish products. The role of the interim EPAs on trade is less clear as they appear to significantly restrict trade by 35.6%[8] in fish and fish products and 26.45% in fruits, nuts and vegetable products.

Overall, we observe that aside from the EBA preferences and their positively significant effect on exports of fruits, nuts and vegetables to the EU-27, the effects of the other trade

[8]Parameter estimates of dummy variables are interpreted as $\exp(\beta) - 1 * 100$

preferences are either positive but insignificant or have negative effects on trade flows.[9] Our results show that there are other behind the border issues hindering Africa's trade with the EU. Exports to the EU are becoming increasingly competitive and sophisticated with European consumers and large importing chains insisting on traceability, pesticide residue limits, organic food, aesthetics and food produced under good agricultural practices. In effect, while stricter import regimes have applied to exports to the EU-27 during the study period, African countries do not seem to have fully adjusted their production and supply procedures to the requirements of their destination markets. This mismatch could explain why RTAs have failed to enhance trade flows from Africa to the EU-27.

Table 3: Trade effect of EU-Africa regional trade agreement

	Fish and Fish Products				Fruits, Nuts and Vegetables			
	OLS	FE	RE	PPML	OLS	FE	RE	PPML
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GDP_i	0.48***	-0.45*	0.43***	0.36***	1.18***	0.13	1.00***	0.99***
	(0.08)	(0.25)	(0.08)	(0.10)	(0.07)	(0.20)	(0.07)	(0.09)
GDP_j	0.65***	1.54***	0.72***	0.99***	0.98***	1.58***	0.99***	0.92***
	(0.09)	(0.49)	(0.09)	(0.10)	(0.06)	(0.39)	(0.07)	(0.11)
$Dist_{ij}$	-1.67**		-2.11**	-3.51***	-0.83		-1.01	-1.33*
	(0.82)		(0.89)	(0.72)	(0.58)		(0.67)	(0.77)
Language	-0.97		-1.04*	0.01	1.14**		1.24**	0.13
	(0.61)		(0.61)	(0.45)	(0.47)		(0.49)	(0.75)
Colony	0.65		0.93	-0.01	0.93*		1.06*	2.00***
	(0.67)		(0.70)	(0.44)	(0.54)		(0.60)	(0.69)
Island	1.05		0.84	-0.31	1.15		0.40	-0.56
	(1.22)		(0.91)	(1.03)	(0.97)		(0.91)	(1.73)
Landlock	-3.33***		-1.71*	-2.15***	0.78		0.93*	-1.48***
	(1.13)		(1.03)	(0.42)	(0.49)		(0.53)	(0.47)
$Tariff_{ijlt}$	0.88**	0.12	0.31*	0.02	0.32***	0.16*	0.30***	0.04
	(0.35)	(0.17)	(0.17)	(0.03)	(0.12)	(0.09)	(0.08)	(0.08)
EBA	1.20	-0.05	0.25	-0.60	1.07	0.37	1.28	2.20**
	(0.74)	(0.30)	(0.32)	(0.39)	(1.28)	(1.06)	(0.96)	(0.96)
GSP	0.23	0.25	0.27	-0.39*	0.04	-0.14	-0.06	0.13
	(0.25)	(0.20)	(0.20)	(0.21)	(0.22)	(0.16)	(0.16)	(0.17)
EPA	0.07	0.12	-0.07	-0.44**	-0.23	0.03	-0.15	-0.33***
	(0.15)	(0.14)	(0.13)	(0.17)	(0.17)	(0.12)	(0.12)	(0.09)
Cons	-14.38***	-16.95***	-15.53***	-14.15***	-18.26***	-18.61***	-18.43***	-15.29***
	(0.66)	(2.93)	(0.61)	(0.79)	(0.47)	(2.27)	(0.47)	(0.81)
N	1983	1983	1983	8424	3266	3266	3266	8424
R^2	0.17	0.04	0.16	0.37	0.37	0.15	0.37	0.34

Note: Clustered standard errors (robust to heteroskedasticity) in parentheses.
***, **, * denote significance at 1%, 5% and 10% respectively

Turning now to the second objective of this study, Table (4) presents the results of the count models. As a formal test for over-dispersion, we compute the log-likelihood ratios.[10] In all cases, the Random Effect Poisson model (columns 1 and 4) fits the data poorly compared to the Random Effect NB model (columns 2 and 5). A β coefficient from the NB model can be interpreted as follows: a one unit change in the explanatory variable is associated with a β change in the difference in logs of the dependent variable. One may be concerned about the count nature of our dependent variable. As a robustness check to see if our results are driven by the number of rejections or simply the presence of a rejection, we re-estimate the baseline model using a dichotomous dependent variable (i.e. whether or not importer j rejected

[9]These conclusions can nevertheless change if products are considered at much more disaggregated levels.

[10]The test statistic is negative two times the difference of the log-likelihood from the Poisson model and the NB model.

product l from exporter i in year t) by employing a Random Effect Logit model. The results are presented in columns (3) and (6) of Table 4.

Domestic production in the importing countries has a positive effect on border rejections of both products. This confirms our preliminary comments on Figure (2). Rejections appear to be driven by protection for EU domestic producers of fish products especially. This finding is consistent with Baylis et al. (2012) who find that EU importing countries who produce large amounts of seafood domestically have a higher probability of issuing a notification on fish imports. Domestic production in the exporting countries has no effect on rejections of fish and fish products but has a positive and significant effect on border rejections of fruits, nuts and vegetable products. Here we observe that increases in production capacities of exporting countries are hindered by poor supply conditions in Africa (Xiong and Beghin, 2012). As an empirical confirmation of the descriptive analysis, import volumes have a positive and significant effect on rejections. Lagged alerts have a positive and statistically significant effect on rejections of fish and fish products but have no effect on rejections of fruits, nuts and vegetables. EU border officials seem to be paying closer attention to fish products originating from countries reputed for not meeting standards. Tariff rates have a negative effect on border rejections of fish and fish products but have a positive effect on rejections of fruits, nuts and vegetables. The effects are nevertheless marginally significant only in the NB model.

Corruption in the exporting countries has a positive but insignificant effect on rejection of both products. Surprisingly (or maybe not), EU border rejections seem to be little influenced by the level of economic development measured by per capita GDP in the exporting African countries. It appears economic fortunes being enjoyed by many African countries are not being invested in these specific agricultural sectors. Importer per capita GDP has no significant effect on rejections of fish and fish products but significantly increases the chances of rejecting fruit, nut and vegetable products. Regulatory quality in the importing country has a positive effect on rejections of fish and fish products but contrary to our expectation has a negative effect on rejections of fruit, nut and vegetable products. Distance, contrary to expectations, has a negative and significant effect on border rejections.

Last, we focus on whether and which types of RTAs increase or decrease border rejections. Overall, we observe that all our RTA variables have negative effects on border rejections. Specifically, EBA eligibility has a negative but insignificant effect on EU border rejections of both products. It seems intuitive that EBA beneficiaries - who are predominantly LDCs - are more likely to lack the technical and financial abilities to comply with EU standards. Usually, LDCs seem to have less strict domestic food standards and regulations (Henson, 2003) and are dominated by poor small-scale farmers who by themselves are unable to comply with emerging food safety standards (Asfaw et al., 2010), but these supply-side issues are not initiatives the EBA preferences are committed to (Karingi et al., 2005). Eligibility for GSP preferences has a negative effect on rejections of both products although only significant for fish and fish products. For fish and fish products, the negative effects of the EPA preferences are only significant albeit marginally when we consider the NB model. However, the interim EPAs have a robust negative and significant effect on rejection of fruits, nuts and vegetables across the Poisson, NB and Logit models. This finding is expected as EPAs provide for a broader approach to trade barriers by addressing issues of poor infrastructure, inefficient customs and border controls and inadequate standards. The EU-West Africa EPA deserves a notable mention in this case; as part of its focus on agriculture, the EU provides technical support to farmers in West Africa by sending Food and Veterinary Office inspectors to give recommendations on compliance with SPS standards and solve export problems (European Commission, 2015). FTA preferences have negative effects on border rejections of both products. The effects are robust, negative and highly significant

across all models for trade in fruits, nuts and vegetables.

Table 4: Effect of EU-Africa trade agreements on **EU border rejections**

	Fish and Fish Products			Fruits, Nuts and Vegetables		
	Poisson	NB	Logit	Poisson	NB	Logit
	(1)	(2)	(3)	(4)	(5)	(6)
EBA	-0.53	-0.87	-1.06	-0.77	-0.44	-0.49
	(0.78)	(0.63)	(0.82)	(0.68)	(0.74)	(0.84)
GSP	-0.91	-1.36*	-2.70**	-1.62*	-0.67	-0.54
	(0.82)	(0.77)	(1.17)	(0.95)	(0.93)	(1.12)
EPA	-0.82	-0.90*	-0.38	-1.90***	-1.35**	-1.48**
	(0.63)	(0.50)	(0.68)	(0.68)	(0.69)	(0.76)
FTA	-0.63	-1.08	-1.41	-4.18***	-3.22***	-3.24***
	(0.73)	(0.74)	(1.03)	(1.11)	(1.03)	(1.22)
Gdppc_i	0.21	-0.09	-0.17	0.69*	0.38	0.40
	(0.36)	(0.33)	(0.46)	(0.38)	(0.40)	(0.46)
Gdppc_j	-1.48	-1.40	-1.67	1.25*	1.50**	1.50*
	(1.55)	(1.15)	(1.48)	(0.66)	(0.62)	(0.79)
Prod_j	0.29	0.33**	0.50***	0.08	0.12	0.19
	(0.19)	(0.13)	(0.17)	(0.12)	(0.10)	(0.12)
Prod_i	0.07	-0.01	0.01	0.91***	0.85***	0.89***
	(0.09)	(0.14)	(0.19)	(0.27)	(0.19)	(0.21)
Import_{t-1}	0.43***	0.45***	0.50***	0.43***	0.39***	0.43***
	(0.12)	(0.08)	(0.10)	(0.08)	(0.07)	(0.08)
Alert_{t-1}	0.34*	0.44**	1.06***	-0.21	-0.10	0.072
	(0.18)	(0.18)	(0.36)	(0.14)	(0.20)	(0.30)
Tariff	-1.06***	-0.70*	-0.53	0.46*	0.50*	0.46
	(0.37)	(0.41)	(0.56)	(0.27)	(0.26)	(0.40)
Distance	-0.57*	-0.69*	-1.23**	-0.63**	-0.79***	-0.90**
	(0.33)	(0.38)	(0.52)	(0.26)	(0.27)	(0.35)
Corruption_i	-0.01	0.39	0.87	0.01	0.45	0.33
	(0.52)	(0.43)	(0.59)	(0.53)	(0.45)	(0.55)
RegQual_j	0.92	1.25*	1.22	-0.77	-1.14**	-1.12*
	(1.17)	(0.68)	(0.87)	(0.60)	(0.47)	(0.60)
Constant	-17.15	-20.40	-31.26*	21.99**	18.66**	16.65
	(-0.91)	(-1.39)	(-1.65)	(-2.27)	(-2.08)	(-1.48)
N	1,585	1,585	1,585	2,578	2,578	2,578
χ^2	246.7***	119.3***	71.40***	387.5***	148.2***	104.1***
Log likelihood	-404.4	-386.9	-234.3	-594.2	-539.1	-339.6

Note: Clustered standard errors (robust to heteroskedasticity) in parentheses.
***, **, * denote significance at 1%, 5% and 10% respectively
Year fixed effects included in all regressions but are not reported for brevity
Dependent variable is count of rejections

As a further check of robustness we extend our dependent variable to count of all notifications on exports reaching the EU. This takes into account all data on *Alerts*, *Information*, *Border rejection* and *News*. As discussed in section 3, increased or consistent notifications can damage the reputation of exporting countries in the long run. Therefore, even as border rejections are the severest form of notifications, the importance of the other forms of import notification cannot be underestimated.

Here again, the NB model is preferred over the Poisson model. Our main findings remain unchanged. All RTA variables have negative effects on border rejections. However, it should be noted that the EBA variable in particular becomes significant for fish and fish products. Eligibility for GSP is still associated with a significant decrease in notification of fish and fish products. EPA eligibility has a negative and significant effect on notifications for both products and eligibility for FTA preferences has a significant effect on notifications for fruits, nuts and

vegetable exports.

Table 5: Effect of EU-Africa trade agreements on **EU notifications**

	Fish and Fish Products			Fruits, Nuts and Vegetables		
	Poisson	NB	Logit	Poisson	NB	Logit
	(1)	(2)	(3)	(4)	(5)	(6)
EBA	-1.18**	-1.35***	-1.54**	-0.56	-0.28	-0.34
	(0.57)	(0.51)	(0.66)	(0.56)	(0.52)	(0.63)
GSP	-0.91	-1.12*	-2.19***	-1.00	-0.39	-0.54
	(0.67)	(0.60)	(0.85)	(0.71)	(0.66)	(0.84)
EPA	-0.83*	-0.80**	-0.70	-1.29***	-0.83*	-0.97*
	(0.44)	(0.40)	(0.55)	(0.48)	(0.45)	(0.53)
FTA	-0.66	-0.84	-1.16	-2.50***	-1.82**	-1.96**
	(0.63)	(0.60)	(0.80)	(0.77)	(0.73)	(0.93)
Gdppc_i	-0.06	-0.36	-0.42	0.44	0.29	0.34
	(0.28)	(0.28)	(0.37)	(0.28)	(0.29)	(0.36)
Gdppc_j	0.26	0.87	0.92	0.68	1.04**	0.98
	(1.08)	(0.95)	(1.17)	(0.57)	(0.52)	(0.67)
Prod_j	0.28**	0.26***	0.36***	0.22**	0.22***	0.29***
	(0.12)	(0.09)	(0.12)	(0.10)	(0.08)	(0.10)
Prod_i	0.08	0.08	0.09	0.48***	0.41***	0.47***
	(0.09)	(0.12)	(0.15)	(0.15)	(0.11)	(0.14)
Import_{t-1}	0.34***	0.34***	0.38***	0.31***	0.31***	0.37***
	(0.08)	(0.06)	(0.07)	(0.07)	(0.05)	(0.06)
Alert_{t-1}	0.13	0.23	0.68**	-0.25**	-0.06	0.01
	(0.14)	(0.15)	(0.30)	(0.11)	(0.15)	(0.24)
Tariff	-0.65**	-0.39	-0.16	0.32	0.41**	0.52*
	(0.32)	(0.29)	(0.36)	(0.23)	(0.21)	(0.31)
Distance	-0.66**	-0.65**	-0.94**	-0.66***	-0.62***	-0.63**
	(0.30)	(0.31)	(0.39)	(0.24)	(0.22)	(0.30)
Corruption_i	-0.03	0.52	0.82*	0.15	0.33	0.31
	(0.40)	(0.36)	(0.47)	(0.44)	(0.33)	(0.42)
RegQual_j	0.07	0.09	-0.21	0.17	-0.17	-0.00
	(0.67)	(0.54)	(0.68)	(0.53)	(0.38)	(0.50)
Constant	-2.30	1.87	-1.86	9.22	11.58	10.73
	(-0.19)	(0.16)	(-0.13)	(1.21)	(1.60)	(1.41)
N	1585	1585	1585	2578	2578	2578
χ^2	322.9***	136.6***	90.68***	375.9***	182.7***	128.5***
Log likelihood	-555.1	-535.5	-329.3	-865.7	-793.8	-499.1

Note: Clustered standard errors (robust to heteroskedasticity) in parentheses.
***, **, * denote significance at 1%, 5% and 10% respectively
Year Fixed Effects included in all regressions but are not reported for brevity
Dependent variable is count of all notifications

6 Conclusions

Regional Trade Agreements (RTAs) have proliferated over the last two decades. The EU and most African countries are engaged in various trade agreements including the standard General Scheme of Preferences (GSP), Everything but Arms (EBA), the more recent Economic Partnership Agreements (EPA), the Euro-Med Agreement and the Trade, Development and Corporation Agreement (TDCA). These agreements have succeeded in eliminating tariffs, but their effects on trade under increasing stringency and relevance of NTBs was hitherto unclear. In this study, we fill this gap by using data on 52 African countries' exports of fruits, nuts and vegetables and fish and fish products to the EU-27 from 2008 to 2013. We estimated the effect of eligibility for these trade preferences first on exports to the EU and second on rejection of agri-food products at EU entry borders.

The empirical analysis shows that additional trade enhancing effects are feasible with RTAs, which transcend tariff reductions. We show that RTAs can assist in development through trade by increasing both trade volumes and reducing border rejections. Specifically, the empirical estimation of a gravity model shows that eligibility for EBA preferences has induced trade in fruits, nuts and vegetables whereas eligibility for EPA and GSP preferences do not contribute significantly to increasing exports of both products from Africa to the EU-27. Secondly, using counts of border rejections recorded in the EU Rapid Alert System for Food and Feed (RASFF) database and estimating different count models, we show that eligibility for EU-Africa trade agreements is associated with a reduction in border rejections. The effects nevertheless differ in significance and magnitude across agreements and products. Precisely, eligibility for EBA preferences has no significant effect on border rejections and being eligible for GSP preferences decreases border rejections of fish and fish products. Eligibility for EPA preferences reduces border rejections of both products. Finally, eligibility for FTA (i.e. Euro-Med and TDCA) preferences reduces rejection of fruit, nut and vegetable products.

Our finding that eligibility for the GSP and EPA trade preferences have not generated significant trade flows reflect the tendency of many African countries to under-utilize developed countries' trade preferences. As noted by Cardamone (2011) this is due in part to the importance of exporting countries' export capacity on exports to the EU. It is also possible that given the choice between trade preferences, African countries especially LDCs are preferring EBA over the EPA because the latter has been in existence much longer, offers duty-free quota-free access to EU markets as the EPA but with no need for reciprocal liberalization. Protectionist intents can also not be ruled out as we observe increased rejection and notification rates for importing countries with high domestic production. For total notifications, the effects are positive and significant across all products. Even in the case of border rejections where much stronger bases are required for outright rejection, increased domestic fish production is associated with an increase in border rejection of fish and fish products. We also note that eligibility for EPA has significant negative effects on both African exports and EU border rejections. By implication, while more products from EPA eligible countries are being allowed entry into EU markets, the absolute volume of exports from these countries have not increased. This is an indication that domestic sectors in Africa are still not competitive enough and will shrink under further trade liberalization (which happens to be one of the driving principles of the EPA negotiations).

Overall, trade agreements between the EU and Africa are still relevant development tools, which can be employed to increase trade flows and decrease border rejections. Nevertheless, improved supply side capacities of exporting African countries will ensure optimum use of preferences granted under these agreements.

References

Aiello, F., Cardamone, P., and Agostino, M. R. (2010). Evaluating the impact of nonreciprocal trade preferences using gravity models. *Applied Economics*, 42(29):3745 – 3760.

Aiello, F. and Demaria, F. (2012). Do trade preferential agreements enhance the exports of developing countries? Evidence from the EU GSP. *Economia Internazionale*, 65(3):371.

Alvarez-Coque, J. M. G., Marco, L. T., and Selva, M. L. M. (2015). Investigating differences in safety border notifications on fruit and vegetables imports by selected EU Member States. Paper presented at the 29th International Conference of Agricultural Economists (ICAE), August 8 -14, Milan.

Anderson, J. E. and van Wincoop, E. (2003). Gravity with gravitas: A solution to the border puzzle. *American Economic Review*, 93(1):170 – 192.

Asfaw, S., Mithöfer, D., and Waibel, H. (2010). What impact are EU supermarket standards having on developing countries' export of high-value horticultural products? Evidence from Kenya. *Journal of International Food and Agribusiness Marketing*, 22(3-4):252–276.

Baghdadi, L., Martinez-Zarzoso, I., and Zitouna, H. (2013). Are RTA agreements with environmental provisions reducing emissions? *Journal of International Economics*, 90(2):378 – 390.

Baier, S. L. and Bergstrand, J. H. (2009). Bonus vetus OLS: A simple method for approximating international trade-cost effects using the gravity equation. *Journal of International Economics*, 77(1):77–85.

Baier, S. L., Bergstrand, J. H., and Feng, M. (2014). Economic integration agreements and the margins of international trade. *Journal of International Economics*, 93(2):339–350.

Bartels, L., Silva, S., Hijazi, H., Schloemann, H., and Cottier, T. Re-thinking reciprocity: A new framework for WTO disciplines on north-south regional trade agreements. NCCR Working Paper 2013/20, Swiss National Centre of Competence in Research.

Baylis, K., Martens, A., and Nogueira, L. (2009). What drives import refusals? *American Journal of of Agricultural Economics*, 91(5):1477–1483.

Baylis, K., Nogueira, L., and Pace, K. (2011). Food imports refusals: Evidence from the European Union. *American Journal of of Agricultural Economics*, 93(2):566 – 572.

Baylis, K., Nogueira, L., and Pace, K. (2012). Something fishy in seafood trade? The relationship between tariff and Non-Tariff Barriers. Unpublished paper. Available at `http://works.bepress.com/kathy_baylis/34/`.

Bosquet, C. and Boulhol, H. (2014). Applying the GLM variance assumption to overcome the scale-dependence of the Negative Binomial GQPML estimator. *Econometric Reviews*, 33(7):772–784.

Brenton, P. and Ikezuki, T. (2004). The impact of agricultural trade preferences, with particular attention to the least-developed countries. In Jaffee and Henson (2004).

Bureau, J. C. and Jean, S. (2013). The impact of regional trade agreements on trade in agricultural products. OECD Food, Agriculture and Fisheries Papers 65, OECD Publishing.

Burger, M., van Oort, F., and Linders, G.-J. (2009). On the specification of the gravity model of trade: Zeros, excess zeros and zero-inflated estimation. *Spatial Economic Analysis*, 4(2):167–190.

Buzby, J. C., Unnevehr, L. J., and Roberts, D. (2008). Food safety and imports. an analysis of FDA food-related import refusals report. Report 39, Economic Research Service. United States Department of Agriculture.

Cameron, A. C. and Trivedi, P. K. (2014). Count panel data. In Baltagi, B., editor, *Oxford Handbook of Panel Data Econometrics*. Oxford University Press.

Candau, F. and Jean, S. (2005). What are EU trade preferences worth for Sub-Saharan Africa and other developing countries? Working Paper 18863, TRADEAG - Agricultural Trade Agreements.

Cardamone, P. (2011). Preferential trade agreements granted by the European Union: an application of the gravity model using monthly data. *European Review of Agricultural Economics*, 38(4):553–586.

Carrère, C. (2006). Revisiting the effects of regional trade agreements on trade flows with proper specification of the gravity model. *European Economic Review*, 50(2):223–247.

Cieślik, A. and Hagemejer, J. (2009). Assessing the impact of the EU-sponsored trade liberalization in the MENA Countries. *Journal of Economic Integration*, 24(2):343–368.

Cipollina, M. and Salvatici, L. (2010). The trade impact of European Union agricultural preferences. *Journal of Economic Policy Reform*, 13(1):87–106.

Czubala, W., Shepherd, B., and Wilson, J. S. (2009). Help or hindrance? The impact of harmonised standards on African exports. *Journal of African Economies*, 18(5):711–744.

Disdier, A.-C., Fontagné, L., and Cadot, O. (2015). North-South standards harmonization and international trade. *The World Bank Economic Review*, 29(2):327–352.

Disdier, A. C., Fontagné, L., and Mimouni, M. (2008). The impact of regulations on agricultural trade: Evidence from the SPS and TBT agreements. *American Journal of Agricultural Economics*, 92(3):713–726.

Egger, P. and Nelson, D. (2011). How bad is antidumping? evidence from panel data. *The Review of Economics and Statistics*, 93(4):1374 – 1390.

European Commission (2008). How Economic Partnership Agreements benefit both consumers and producers in Europe and developing countries. Technical report, European Commission. Available at `http://trade.ec.europa.eu/doclib/docs/2013/april/tradoc_151010.pdf`.

European Commission (2015). EU-West Africa trade and development: a partnership that counts. Available at `https://ec.europa.eu/europeaid/sites/devco/files/epa-brochure_en.pdf`.

FAOSTAT (2015). Food and Agriculture Organization of the United Nations. Statistics Division. `http://faostat3.fao.org/home/E`.

Feenstra, R. C. (2004). *Advanced International Trade: Theory and Evidence*. Princeton University Press.

Fontagné, L., Disdier, A.-C., and Beestermöller, M. (2016). Impact of European food safety border inspections on agri-food exports: evidence from Chinese firms. Technical report, CEPII research center.

Gradeva, K. and Martínez-Zarzoso, I. (2015). Are trade preferences more effective than aid in supporting exports? evidence from the 'Everything But Arms' preference scheme. *The World Economy*.

Hayakawa, K. and Kimura, F. (2015). How much do free trade agreements reduce impediments to trade? *Open Economic Review*, 26(1):711–729.

Helpman, E., Melitz, M., and Rubinstein, Y. (2008). Estimating trade flows: Trading partners and trading volumes. *Quarterly Journal of Economics*, 123(2):441–487.

Henson, S. (2003). Food safety issues in international trade. In Unnevehr, L., editor, *Food safety in food security and food trade*. International Food Policy Research Institute Washington, DC.

Henson, S. and Jaffee, S. (2008). Understanding developing country strategic responses to the enhancement of food safety standards. *The World Economy*, 31(4):548–568.

Jaffee, S. and Henson, S. (2004). Agro-food exports from developing countries: The challenges posed by standards. In Aksoy, M. A. and Beghin., J. C., editors, *Global Agricultural Trade and Developing Countries*. Washington, DC: The World Bank.

Jouanjean, M.-A., Maur, J.-C., and Shepherd, B. (2015). Reputation matters: Spillover effects for developing countries in the enforcement of us food safety measures. *Food Policy*, 55:81–91.

Kareem, F., Brümmer, B., and Martinez-Zarzoso, I. (2015). Food safety standards, compliance and European Union's rejection of African exports: The role of domestic factors. GlobalFood Discussion Papers 74, RTG 1666 GlobalFood. Georg-August-University of Goettingen.

Karingi, S., Lang, R., Oulmane, N., and Perez, R. (2005). Economic and welfare impacts of the EU-Africa Economic Partnership Agreements. ATPC Work in Progress 10, African Trade Policy Centre. Economic Commission for Africa.

Koroma, S. and Ford, J. D. (2006). The agricultural dimension of the ACP-EU Economic Partnership Agreements. FAO Commodity and Trade Technical Paper 8, Food And Agriculture Organization Of The United Nations.

Maertens, M. and Swinnen, J. (2009). Food standards, trade and development. *Review of Business and Economics*, 54(3):314–326.

McCallum, J. (1995). National borders matter: Canada-U.S. regional trade patterns. *The American Economic Review*, 85(3):615–623.

Otsuki, T., Wilson, J. S., and Sewadeh, M. (2001). Saving two in a billion: quantifying the trade effect of European food safety standards on African exports. *Food Policy*, 26(5):495 – 514.

RASFF (2015). Rapid Alert System for Food and Feed. Food Safety Alerts Portal. `http://ec.europa.eu/food/safety/rasff/index_en.htm`.

Ravenstein, E. G. (1885). The laws of migration. *Journal of the Statistical Society of London*, 48(2):167–235.

Redding, S. and Venables, A. J. (2004). Economic geography and international inequality. *Journal of International Economics*, 62(1):53–82.

Sarker, R. and Jayasinghe, S. (2007). Regional trade agreements and trade in agri-food products: evidence for the European Union from gravity modeling using disaggregated data. *Agricultural Economics*, 37(1):93–104.

Shepherd, B. and Wilson, N. L. (2013). Product standards and developing country agricultural exports: The case of the European Union. *Food Policy*, 42:1–10.

Silva, J. M. C. S. and Tenreyro, S. (2006). The log of gravity. *The Review of Economics and Statistics*, 88(4):641–658.

Tinbergen, J. (1962). *Shaping the World Economy; Suggestions for an International Economic Policy*. Twentieth Century Fund, New York.

UN Comtrade (2015). United Nations commodities trade database. `www.comtrade.un.org`.

Vollmer, S., Martínez-Zarzoso, I., Nowak-Lehmann D., F., and Klann, N. (2009). EU-ACP Economic Partnership Agreements: Empirical evidence for Sub-Saharan Africa. In *Proceedings of the German Development Economics Conference, Frankfurt*, number 39.

Will, M. and Pham, C. (2008). Estimating the gravity model when zero trade flows are important. Policy Research Working Paper 7308, The World Bank.

Winkelmann, R. (2008). *Econometric Analysis of Count Data*. Springer, fifth edition.

Xiong, B. and Beghin, J. (2012). Does European aflatoxin regulation hurt groundnut exporters from Africa? *European Review of Agricultural Economics*, 39(4):589–609.

7 Appendix

Table A1: Importing and Exporting Countries

Importers	Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Malta, the Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden, United Kingdom
Exporters	Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cape Verde, Cameroon, Central African Republic, Chad, Comoros, Congo (Democratic Republic), Congo (Republic), Cote d'Ivoire, Djibouti, Egypt (Arab Republic), Equatorial Guinea, Eritrea, Ethiopia, Gabon, The Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Tunisia, Uganda, Zimbabwe, Zambia

Table A2: List of African country beneficiaries of Trade Agreements

EBA	Angola, Benin, Burkina Faso, Burundi, Central African Republic, Cape Verde[c], Chad, Comoros, Congo (Democratic Republic of), Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gambia, Guinea, Guinea Bissau, Lesotho, Liberia, Malawi, Mali, Mauritania, Madagascar, Mozambique, Niger, Rwanda, Sao Tome and Principe, Senegal, Sierra Leone, Sudan, Tanzania, Togo, Uganda, Zambia
GSP	Botswana, Cape Verde, Cameroon[a], Cote d'Ivoiré[a], Congo (republic of), Gabon, Ghana[a], Libya, Kenya[b], Mauritius[b], Namibia[b], Nigeria, Seychelles[b], Swaziland[b], Zimbabwe[b]
EPA	Botswana, Burundi[d], Cameroon, Comoros[d], Ghana, Cote d'Ivoiré, Kenya, Lesotho[d], Madagascar[d], Mauritius, Mozambique[d], Namibia, Rwanda[d], Seychelles, Swaziland, Tanzania[d], Uganda[d], Zambia[d], Zimbabwe
FTA	Euro-Med (Algeria, Egypt, Morocco, Tunisia), TDCA (South Africa)

Notes: We make no assumptions regarding the trade preference an exporting country uses when faced with a choice between multiple preference regimes.
[a] exporting country eligible for GSP in 2008
[b] exporting country eligible for GSP in 2008 and 2009
[c] exporting country eligible for EBA between 2008 and 2011
[d] exporting country eligible for both EPA and EBA preferences.