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Impact of GlobalGAP Certification on EU Banana Imports: A Gravity Modeling Approach

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Abstract

Adopting a gravity framework and using data from 2010 to 2012 for 74 countries, we investigate whether the intensity of GlobalGAP standard adoption has a positive impact on EU banana import values. Intensity is measured by using number of GlobalGAP certified producers and hectares harvested under GlobalGAP certification. Using random and fixed effect estimation we find that intensity of certification, in terms of producers and hectares are associated with higher banana imports. However the estimated elasticities of imports in all models are less than 1 indication an inelastic response of imports to GlobalGAP certification intensity. This also indicates that the small farmers in developing countries who find it difficult to comply with the GlobalGAP standard requirements are driven out of the international banana market. For the gravity variables distance is found to have negative impact, but banana production in the exporting countries and presence of common language and RTA between the trading countries improves trade.

Keywords: Banana imports of EU; Private food standard; GlobalGAP; Gravity model

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1 Introduction

Food trade between agriculture based economies and the developed economies constitutes a significant portion of the global trade. The recent evolutions in regulatory practices due to new standards and certification schemes is one of the major factors which are affecting the pace and pattern of global trade. Private standards are playing an increasing role in the governance of agricultural and food supply chain (Henson, 2006). Private standards have become much more important in global agri-food value chains over the last decades, and these standards can be seen as filling a void in international rules. For example, in countries where national regulatory standards are scarce, private standards are seen to define standard requirements in primary production (Henson and Humphrey, 2009). In fact, private standards set a higher standard for particular food product attributes, and provide additional requirements for the end-product than the requirement lay down by public regulations. The contents of private regulations are readily reviewed, in order to incorporate consumers' varying preferences, for the sake of product differentiation and price premium. Hence, in spite of the pre-existence of public regulations, private standards emerged rapidly during last decades.

Even though standard adoption has become an integral part of international food trade, especially to the developed countries mainly due to quality concerns, according to the literature, standards can have positive and negative effects. One body of literature suggests that standard could lead to export gains, by modernizing the food supply chains through innovation and upgrading (Swinnen, 2007). Also, as a result of increasing number of food standards, comprehensive value chain system between large food companies and developing country producers could be developed (e.g. Gulati et al., 2007; Jaffee, 2003; Minten et al., 2006; Swinnen, 2005). Recent empirical studies have demonstrated beneficial effects of participation in high-standards contract production in terms of productivity gains, increased household income, reduced volatility; technology and employment spillovers, etc. (Dries and Swinnen (2004) for small dairy farmers; Maertens and Swinnen (2009) for Senegalese horticulture export and Minten et al. (2006) for vegetable exporters). Another strand of literature highlights how standards constitute impediments to country's' export, especially through high compliance cost, thereby acting as non-tariff barriers to trade (Olper and Raimondi, 2008; Li and Beghin, 2012; Blind and Jungmittag, 2005; Swann, 2010; Augier et al., 2005; Brenton and Manchin, 2002; Ferrantino,

2006). Also standards pose new financial constraints, such as, increased monitoring cost, certification cost with small exporters (Maertens et al. (2007) and small farmers leaving the market (Gibbon, 2003; Reardon and Barrett, 2000; Reardon et al., 1999).

Furthermore, few studies have also been discussing the impact of standards on international competitiveness of domestic farmers. Since standards serve as quality signals in international food trade they can stimulate product competitiveness (Maertens and Swinnen, 2009; Henson et al. 2011). On the other hand, standards can also have anti-competitive effects in international trade as those who are unable to meet the high cost of standards compliance are often driven out of international market. Finally, standards can help to overcome the 'lemons' problem in international trade, by reducing the degree of asymmetric information on the quality of products (Leland, 1979).

Above review of literature suggests that standards could either be a catalysts or impediment to international trade. In general, our study aims to reveal the impact of private standards on trade flows and tests these two concurrent hypotheses on negative and positive impact of standards on international trade. In particular, this study examines the impact of GlobalGAP in agrifood sector. We contribute to the existing debate on "standards are barriers or catalyst?" in several ways. First, empirically the trade effect of private food standards has been largely studied within the framework of gravity models. However, little attention has been paid so far to the relationship between the intensity of private standards and the trade volume. This could be important because the enhancement of traded products occurs not only from standard adoption but also from intensity of certification. Second, so far, on the impact of standards on trade volume, the literature has mostly been catering around public food safety and quality standards and very little has been done in the area of private standards. Our study takes the case of private standards and examines the impact of GlobalGAP certification intensity on the banana imports of European Union. To this end, we use disaggregated data on banana import from 74 countries to the European Union (EU) using a gravity modeling framework. Finally, there are few studies that have analyzed the welfare effects of GlobalGAP certification. For example, Asfaw et al. 2009 and Kersting and Wollni, 2012 analyzed GlobalGAP adoption by small-scale farmers in Kenya and Thailand respectively. These studies focus mainly on firm level data and identified factors such as household characteristics, cost to comply, private-public partnership, and support from donor

(Kertsting and Wollni, 2012) as crucial determinants of standard adoption. We on the other hand focus more on macro level factors affecting trade between countries. Finally, in the area of impact analysis of policy regulation on trade, there is a large body of literature available which considers macro variables. However, most of the studies focused on regulations such as SPS, TBT, and HACCP standards and some other consider ISO standard, for example, Otsuki et al. (2001); Wilson and Otsuki (2004); Anders and Caswell (2009); Xiong and Beghin (2011) and Ferro et al. (2013). So far there is not a single study on the impact of GlobalGAP on international trade. We take this case by analyzing the GlobalGAP certified banana imports of EU using a three year panel data from 2010 to 2012 for 74 banana exporting countries.

Main finding of the paper suggests GlobalGAP intensity, measured by number certified producers and hectares harvested under banana certification, has a positive impact on imports i.e. increase in intensity leads to increased banana imports. Therefore, GlobalGAP acts as a catalyst. However, such import response to certification is inelastic in nature. It might reflect the fact that GlobalGAP probably have a crowding out impact on the non-certified producers.

Rest of the paper is organized in the following manner. Section 2 provides an overview of GlobalGAP certification in general agricultural commodities and in banana. In Section 3 we develop a conceptual framework of our analysis. Section 4 and 5 and describes the methodology and the data respectively. Section 6 explains the results of the gravidity models and finally Section 7 concludes the study.

2 Overview of GlobalGAP Certification in Banana

GlobalGAP is a pre-farm-gate business to business voluntary standard. It has established itself as a key reference for Good Agricultural Practice (GAP) that concerns aspects of food safety, environmental protection, workers' health, safety and welfare, and traceability (FoodPLUS and GTZ, 2008) in the global market place. The GlobalGAP standard outlines requirements for 'good agricultural practices' in the phase of primary production where international standards are scarce (Henson and Humphrey, 2009). In countries including Austria, Chile, Denmark, France, Germany, Japan, Kenya, Mexico, New Zealand, Spain, and the UK, the GlobalGAP has been incorporated into their domestic GAP standards, usually in the form of public-private joint

ventures (Mitchell, 2008). Initially started as EUREPGAP in 1997 by retailers associated to the Euro-Retailer Produce Working Group (EUREP), it was renamed as GlobalGAP in 2007 as more and more producers and retailers around the globe got connected over time.

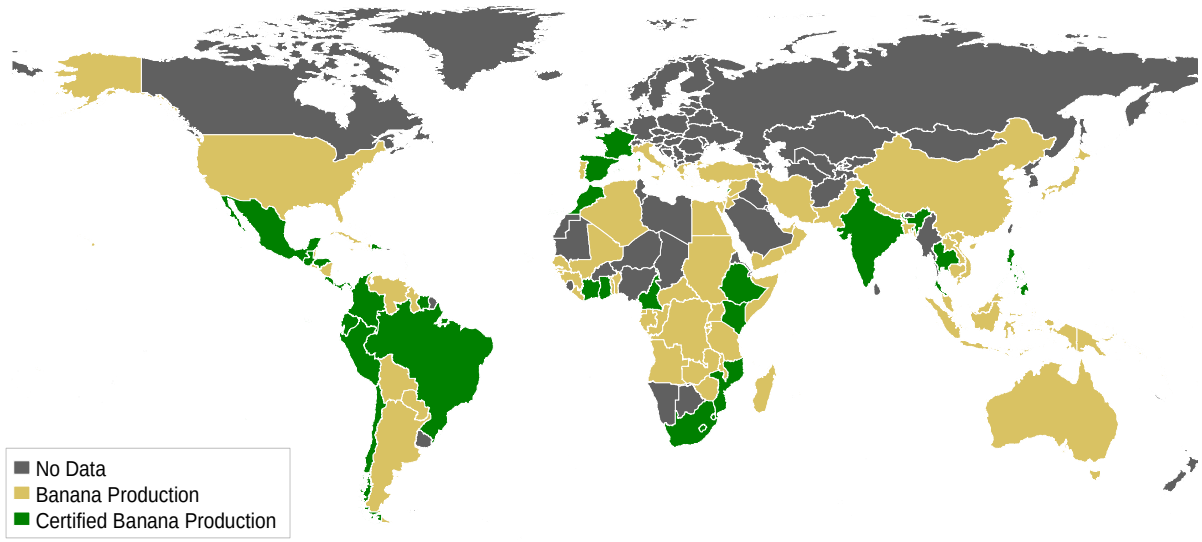
According to GlobalGAP Annual Report 2012, the standards possess a network of 1400 trained inspectors and auditors working for 142 accredited certification bodies certifying 409 agricultural products in 112 countries. However, the worldwide spread of GlobalGAP is quite uneven. There are countries like Chile, Italy, Kenya, Peru, South Africa, with relatively high coverage of GlobalGAP. On the other hand, out of the 112 countries with GlobalGAP membership, there are several countries (e.g. Jamaica, Venezuela, and Indonesia) with only one or few certifications. Among continents, Europe accounts for the largest portion of GlobalGAP coverage, 74 percent. The percent shares of Asia, Africa, Americas, and Oceania are 8 percent,5 percent, 12 percent, and 1 percent respectively(GlobalGAP, 2012). Because of its extensive coverage, GlobalGAP is an appropriate scheme to analyze the impact of private food standards on international trade flows.

The certification of the standard also varies among different agriculture sectors. GlobalGAP covers 8 percent of livestock suppliers, 22 percent of aquaculture and majority of GlobalGAP suppliers are crop growers with a share of 20 percent. Within crops, the most important area is vegetables and fruits having 78% share (GlobalGAP, 2012).

There are a total of 29 countries where GlobalGAP certification in banana exists. These countries are Brazil, Chile, Côte d'Ivoire, Cameroon, Colombia, Costa Rica, Dominican Republic, Ecuador, Egypt, Spain, Ethiopia, France, Ghana, Guatemala, Honduras, India, Kenya, Lebanon, Saint Lucia, Morocco, Mexico, Mozambique, Panama, Peru, Philippines, Suriname, Swaziland, Thailand and South Africa. Figure 1 shows the GlobalGAP coverage of banana cultivation in various countries. The green shade represents countries who cultivate at least some of their banana under GlobalGAP certification scheme. Other countries which do cultivate banana but there is not a single GlobalGAP certificate exits are shown in yellow shade. Grey shade on the map marks no banana production[3].

[3] The map is based on banana production data reported by FAO. “No Data” mean no production reported.

Figure 1 - GlobalGAP Certification of Banana around the World



Source: Authors own depiction based on the data for year 2012

Among GlobalGAP products, banana has the highest magnitude of coverage with 243,400 hectares of certified cultivation (GlobalGAP, 2011). Of all the fruits, banana has the highest volume of production among all fruits, and is amongst the five most consumed fruits (FAO, 2011), hence and an important product in the vegetables and fruit sector. Therefore, banana has a high significance as a food item as well as it is the best commodity to represent the GlobalGAP certification coverage in fruit vegetable sector. Furthermore, banana is a tropical fruit. There is nearly no banana production within European Union[4] Therefore most of the banana is imported from tropical and subtropical countries into the EU. This marks our strategy for specification of product for our analysis. Most of banana is traded as a fresh fruit. There are plantains and banana chips as well but they are traded in marginal quantities. This adds a computational advantage. Therefore we focus on the trade in fresh bananas in our analysis whose

[4] A small quantity of bananas are grown some tropical and subtropical territories of EU states which include the Canary Islands, the French overseas departments of Guadeloupe and Martinique, Madeira and the Azores, whereas banana produced in Cyprus, Greece and continental Portugal constitutes almost 1% of the total EU. This banana production within the EU accounts in 2012 for about 12% of total EU consumption(EU commission, 2013)

3 Impact of Standards on International Trade

In current scenario the prevailing standards are huge in number and diverse in nature, and they are implemented along the supply chain right from the production of any commodity to its ultimate consumption. These standards can behave like trade facilitators, or they may be trade restrictors (Reardon et al., 2009; Maertens and Swinnen, 2009). Based on the existing literature in this section we develop a conceptual framework on the probable impacts of standards on international trade.

There have a number of studies that have discussed the impact of standards on trade and the evidence on the probable direction of impact is ambiguous.

From the supply side on one hand standards could facilitate international trade by improving access to new markets; increasing price premium; enhancing product quality, product differentiation and increasing cooperation between producers and agribusinesses (Giovannucci and Ponte, 2005; Asfaw et al., 2007; Kersting and Wollni, 2012). On the other hand, adoption of a standard usually requires substantial investments in technological and infrastructural changes. Compliance to certain standards may raise fixed costs, variable costs or both[5]. The presence of fixed costs suggests the presence of scale economies, and imperfect competition. It also requires a dynamic perspective, for instance, the fixed costs for adopting standard which will occur only once. Resource-poor farmers might not be able to finance these investments, if they do not have access to credit or other sources of liquidity. Moreover, farmers in developing countries often do not have sufficient access to market information and extension services which are could be useful to comply with standards (Boselie and van de Kop, 2005; Narrod et al., 2009; Vorley and Fox, 2004). Therefore, due to financial constraints, lack of technical knowledge and market information standards might drive small farmers of export market. Also, for the exporters, increased costs of monitoring and providing technical support due to standard adoption might act a barrier to entry in the international market (GTZ, 2010; Ouma, 2007; MacGregor and

[5] Fixed costs are the initial investment costs incurred only once, such as the costs for physical upgrading, initial trainings and the development and establishment of new procedures and management systems. Variable costs, in contrast, are the costs that have to be incurred on a regular basis, such as, the additional costs for laboratory analyses, management and annual certification costs (Kersting and Wollni, 2012). While fixed costs are the main barriers to initial adoption of standards, variable costs affect the sustainability of standard compliance (Chemnitz et al., 2007; Jaffee et al., 2005).

Graffham, 2009). Finally, on the other end of market chain, the certified products may earn a higher consumer satisfaction because of better matching consumer preferences but discourages demand for the higher price. Thus private food safety standards might act as barriers to entry for the small farmers and exporters, effectively precluding access to potentially lucrative export markets (World Bank, 2005).

In case of GlobalGAP several authors conclude that GlobalGAP certification has positive effects for producers and it provides developing countries with potentially valuable opportunities in the global agrifood market. GlobalGAP promotes access to high-value export markets and improve farming knowledge and thus increasing price received by farmers (Graffham & MacGregor, 2007; Graffham et al., 2007; Henson et al., 2011). Jaffee and Henson (2004) show how Peru exerted efforts to upgrade food safety capacity in line with GlobalGAP and resultantly could positioned itself as a globally competitive exporter of fresh and processed asparagus. As another case, UNCTAD (2007) presents the case of Thailand, Malaysia and Vietnam, which have been historically less reliant on EU markets than some of their international competitors, but they could easily enable themselves to comply with private standards such as GlobalGAP.

There is certain cost of compliance for GlobalGAP as well as it need certain activities in order to need to attain certified banana cultivation. With these extra efforts on the part of growers, there are benefits in term of product differentiation. With the certification, a quality signaled towards the consumer market. European Union constitutes main demand of GlobalGAP certified products. For this reason, we expect a net positive impact of GlobalGAP standard on the considered trade flow i.e. EU imports.

In Table 1 we summarize the above mention discussion and the potential effects of standards are decomposed into its ‘effect components’ in order to analyses its possible impact on trade flow. Notably, these ‘components’ are not considered in this study to be modeled directly as the traditional gravity variable, rather , these are considered to reveal analytical analogy in terms of their role in trade flows as these components ultimately constitutes towards the ‘enhanced demand effect’ and ‘trade cost effect’, hence modifying the net trade flows.

Table 1 - Potential Impacts of a Standard on Trade Flow

Standard's effect	**Trade flow**	**Theoretical reasoning**
Harmonization	+	Mutual recognition smoothens trade and reduce transaction cost
Safety & Quality	+	Signals for consumer evaluation foe enhanced
Product differentiation	+	Broadens consumer market and enables firms to claim for its products superiority
Cost Effect	–	Enhanced fixed cost for upgrading equipment and practice codes as well as variable cost such as cost of inspection procedures at
Delaying Effect	–	Analogical to fixed and variable cost but in terms of time
Drive out effect	–	Small exporters unable to comply might be driven out of market

4 Methodology

Over the course of time, gravity trade model has been developing both in terms of addition of new explanatory variable as well as econometric techniques of estimations. Traditional gravity equation has been applied in log-linearized unless Santos Silva and Tenreyo (2006) put forward a seminal work arguing that gravity model should rather be used in multiplicative for, not be estimated in logarithmic form- as under heteroskedasticity, the parameters of log-linearized models estimated by OLS lead to biased estimates of the true elasticities. French (2011) implicates that the gravity trade model analysis should be estimated at product level and then should be re-aggregated. He analytically demonstrates that gravity trade model estimated over product level do not converge, on aggregation, to the standard aggregate Anderson and van Wincoop (2003) gravity trade model. The underlying reason is that the outward multilateral resistance term of the AvW Model should be non-constant varying by importer. French's work underlines the importance of deeper statistical analysis, hence more accurate estimation techniques provokes. In addition to the log transformation, treatment of excessive zero trade and over dispersion are other two complications in gravity estimations. Zero trade occurs because of no actual trade between two countries or the magnitude of trade has been rounded to zero, while

overdispersion occurs whenever conditional variance is larger than the value expected by the given statistical model.

In order to deal with the problem of excess zeros, there are two types of statistical approaches: zero-inflated Count Data models and Two-Part models. Rose (2004) use Tobit model in order to treat zero trade flows. Santos Silva and Tenreyo (2006) use Poisson Pseudo Maximum Likelihood PPML) estimator for dealing zero trade flows, yet Martinez-Zarzoso et al. (2007) find PPML not always best estimator as it is outperformed by other estimators such as OLS.

In order to incorporate the multilateral resistance terms for exporter and importer, we applied remoteness approach. According to Head (2003), remoteness measures a country's weighted distance from its trading partners where the share of world GDP of the partner countries are taken as the weights. However, Baier and Bergstarand (2009) advanced this concept using Taylor series approximation to linearized estimation of the multilateral residence terms. This linearization implies that bilateral trade between the country pair depends upon the bilateral trade cost in proportion to multilateral trade cost and multilateral tare cost relative to world trade cost.

Decisions on random or fixed effect models to be applied are taken on the basis of Hausman test under the null hypothesis that random effects model is consistent as the unobserved heterogeneity is uncorrelated with the regressors (Greene, 2012, p. 421). In case of rejection only the fixed-effect model is considered unbiased and consistent. The fixed effect estimator, however, omits the coefficients of time invariant variables. One solution for this is to use the Mundlak approach (Mundlak, 1978) which proposes approximating the country specific effects as a function of the mean of time-variant variables.

Considering the above mentioned discussion, we specify our gravity trade equation as given below.

$$ln\text{bnimp}_{ijt} = \beta_0 + \beta_1 ln\text{bngp}_{it} + \beta_2 ln\text{bnprv}_{it} + \beta_3 ln\text{bncon}_{jt} + \beta_4 ln\text{dist}_{ij} + \beta_5 ln(1 + \text{tariff}_{ijt}) + \beta_6 \text{col}_{ij} + \beta_7 \text{rta}_{ijt} + \beta_8 \text{lang}_{ij} + \delta_i + \varphi_j + \gamma_t + \varepsilon_{ijt}$$

Here, $bnimp_{ijt}$ is the banana imports from exporter i to importer j at time t; $bngp_{it}$ is number of banana producers under GlobalGAP certification process for exporter i at time t;

$bnprv_{it}$ is banana output for exporter j at time t; bncon_{jt} is banana consumption for importer j at time t; $tariff_{ijt}$ is ad valorem import tariff applied by importer j on exporter i at time t; $dist_{ij}$, col_{ij}, rta_{ijt}, $and\ lang_{ij}$ are common gravity variables for distance, colonial ties, regional trade agreement and common language respectively; δ_i, φ_j and γ_t are fixed effects; ε_{ijt} is error term; and βs are the coefficients to be estimated.

5 Data and Descriptive Statistics

Secondary data is used for the estimations in this study. We have a panel of three years 2010, 2011 and 2012 with 74 banana countries which produces as well as exports banana and 27 EU states as importers[6]. For the magnitude of GlobalGAP certification, we have data in two forms: number of banana producers per country accepted under the certification process and total area harvested per country under GlobalGAP certified banana cultivation[7]. Data on banana imports of EU27 is sourced from International trade center (ITC) Trade Map database. This data is taken at HS4 level i.e. HS-0803 which is bananas and plantains, fresh or dried. Ideally there must be segregation between banana and plantains. Unfortunately the database is differentiated to higher HS levels only since 2012. However, major trade occurs only in banana, not in plantains[8]. Hence we find estimation at HS-0803 level is still appropriate in our case. Banana production data in a country is taken from FAO. Traditional gravity variables including distance, colonial relationship, common language between country pair is sourced from CEPII. We also include WTO data on regional trade agreement between trading partners. We consider ad valorem equivalent tariff on banana imports by EU27. Data on tariffs is taken from ITC Market Access Map (MAcMap) database.

[6] As we are primarily interested in the impact of GlobalGAP, a pre-farm gate standards. So a country which does not produce banana but only re-export is not included as an exporter in our estimation.

[7] GlobalGAP data in terms of producers is available for the all 29 countries listed above. However, data availability in terms of number of hectares of certified banana is restricted, due to GlobalGAP data privacy policy, to only 14 countries including Côte d'Ivoire, Colombia, Costa Rica, Dominican Republic, Ecuador, Spain, France, Guatemala, Honduras, India, Saint Lucia, Panama, Peru, and South Africa.

[8] EU27 imports only 5% plantains in 2012 and 4% in 2013 and the rest is banana (source: International Trade Centre).

Table 2 shows mean, standard deviation, mimumum and maximum value of different vatriables used in the study. As our sample includes countries with no certification as well . So we have zero values for GlobalGAP variables, first two variables here in the list under minimum value column. Zero import is a common trade fact. Maximum import value is marked by banana import of Belgium from Colombia in 2011. Gross banana production value is taken in 1000 USD. The minimum banana production value in the sample is 20 thousand USD for Rwanda. Last three are dummy variables. There we see that colonial relationship exists for 4 percent of country pairs where as the presence of common language is slightly higher i.e. 7 percent.

Table 1 - Descriptive Statistics

Variable	Mean	SD	Min	Max
GlobalGAP certified producers	48.75	183.73	0	978
GlobalGAP certified hectares	2266.25	8777.02	0	70982
Banana imports (1000 USD)	245.04	2215.12	0	65863.1
Banana production (1000 USD)	4.63E+05	1.33E+06	20	1.10E+07
Banana consumption (1000 USD)	1.31E+05	1.85E+05	5050	8.10E+05
Distance (km)	7405.84	3191.83	36.18	18190.62
AVE tariff on imports	0.05	0.07	0	0.18
1 if regional trade agreement	0.34	0.47	0	1
1 for common official of primary language	0.07	0.26	0	1
1 for pairs ever in colonial relationship	0.04	0.19	0	1

6 Results

Table 3 and 4 present the estimation of gravity models for banana imports. As discussed above, we utilize two different measures of intensity of certification: (1) number of producers accepted under GlobalGAP certification process; (2) number of hectares harvested under GlobalGAP certification. We argue that number of certified producers is a better of intensity than actual number of certificates. This is primarily because certification could be obtained by farmers either individually (Option 1and 2) or as group (Option 3and 4). As a result two countries with equal number of certificates, does not necessarily reflect similar magnitude of GlobalGAP penetration due variation in the group size. In such cases, number of producers accepted under GlobalGAP

certification process shows better spread of GlobalGAP. Furthermore, landholding size differs among producers as well as among countries, other than number of certified producer another measure of intensity of certification could be landholding by the certified producer. This would capture heterogeneous effects of landholding under GlobalGAP certification.

Since, the process of GlobalGAP adoption and diffusion is not entirely random, methodologically we are contended with the possibility of GlobalGAP endogeneity. For example, existing trade relation between countries in a particular period could affect import value of banana through certification and also the other way round; endogeneity could arise due to such reverse causality between these variables. Resultantly, the estimated impact of GlobalGAP is likely to be biased. However, we argue that by taking lag in our certification variable we could surpass the possibility of such reverse causality. Therefore, we additionally provide our estimation results with one period lag in GlobalGAP certification. We argue that with lagged measure of certification reverse causality is likely to be absent.

Table 3 presents the gravity estimation of certified producers with and without lag. First and second model report the estimation results for random effect models without and with lag in number of certified producers; and third and fourth models reports the similar estimation using Mundlak approach. As the dependent and independent variables are all in logarithms the estimated coefficients indicate the elasticities.

Looking at the RE models we find that depending on model specification due to 1% change in number of certified producers import value increases by 0.2% to 0.3%. Thus GlobalGAP intensity has an inelastic impact on EU banana imports. On the other hand, when estimated in Mundlak approach these elasticities decreases even further in magnitude. However, the significance of the coefficients of GlobalGAP producers across all models confirms the positive relationship between the GlobalGAP intensity and banana imports for all EU countries. Most of the standard gravity variables display the expected signs. For example, while longer distance affects trade negatively, countries with higher production capacities export more. Similarly, countries having regional trade agreement and using common language trade more.

Table 1 - Impact of Number of GlobalGAP Certified Producers on Value of Banana Imports

	Random Effect		Mundlak	
GlobalGAP producers	0.242***		0.019**	
	(0.033)		(0.009)	
GlobalGAP producers (lagged)		0.308***		0.054***
		(0.038)		(0.006)
Banana production (1000 USD)	1.209***	1.182***	2.761***	2.672***
	(0.204)	(0.205)	(0.509)	(0.513)
Banana consumption (1000 USD)	2.077**	1.612	1.324	0.748
	(1.057)	(1.058)	(1.137)	(1.157)
Distance (km)	-0.766***	-0.775***	-0.786***	-0.776***
	(0.203)	(0.205)	(0.205)	(0.208)
1 if regional trade agreement	0.317***	0.334***	0.081*	0.096**
	(0.050)	(0.053)	(0.044)	(0.048)
1 for common official of primary language	0.385**	0.411**	0.446***	0.453***
	(0.174)	(0.171)	(0.169)	(0.169)
1 for pairs ever in colonial relationship	0.319	0.263	0.179	0.172
	(0.285)	(0.278)	(0.261)	(0.260)
AVE tariff on imports	-0.398	-0.213	-0.225	0.945
	(0.354)	(0.344)	(1.051)	(1.128)
lremIMP	1.874*	1.391	1.378	0.824
	(1.058)	(1.059)	(1.141)	(1.159)
lremEXP	1.088***	1.072***	2.801***	2.762***
	(0.203)	(0.204)	(0.510)	(0.514)
Constant	-85.967**	-70.788**	-82.509**	-68.660*
	(34.190)	(34.230)	(37.078)	(37.676)
Observations	5,940	3,942	5,940	3,942
Number of PAIR	1,998	1,998	1,998	1,998

Note: Robust standard errors are reported in the parentheses; all models include time fixed effects. *, ** and *** indicate level of statistical significance at 10%, 5% and 1%, respectively.

With regard to the impact of hectares under certified banana production on trade value also we find similar impact of GlobalGAP in Table 4. Similar to number of certified producers, this variable has positively signed coefficient confirming positive impact of certification intensity on trade value. Estimated elasticities are again less than one indicating inelastic response of imports to GlobalGAP. Production still appears with significant positive coefficient, but negative impact of distance and positive impact of common language survives only for EU27. Again, positive

impact of regional trade agreements is observed only in random effect models and vanishes in Mundlak models.

Table 2 - Impact of Hectares under GlobalGAP Certification on Value of Banana Imports

	Random Effect		Mundlak	
GlobalGAP area harvested (hectares)	0.233***		0.002	
	(0.020)		(0.009)	
GlobalGAP area harvested (lagged hectares)		0.253***		0.024***
		(0.019)		(0.005)
Banana production (1000 USD)	1.015***	0.998***	2.968***	2.989***
	(0.199)	(0.201)	(0.558)	(0.559)
Banana consumption (1000 USD)	2.066**	1.624	1.359	0.785
	(1.029)	(1.061)	(1.133)	(1.168)
Distance (km)	-0.768***	-0.780***	-0.797***	-0.788***
	(0.201)	(0.205)	(0.203)	(0.206)
1 if regional trade agreement	0.139***	0.139***	-0.040	-0.038
	(0.047)	(0.050)	(0.042)	(0.047)
1 for common official of primary language	0.438**	0.456***	0.496***	0.490***
	(0.175)	(0.174)	(0.175)	(0.175)
1 for pairs ever in colonial relationship	0.255	0.205	0.104	0.108
	(0.275)	(0.271)	(0.267)	(0.265)
AVE tariff on imports	-0.441	-0.361	-0.350	0.528
	(0.336)	(0.331)	(1.052)	(1.117)
lremIMP	1.857*	1.400	1.413	0.861
	(1.030)	(1.061)	(1.138)	(1.172)
lremEXP	0.934***	0.921***	3.010***	3.059***
	(0.198)	(0.201)	(0.559)	(0.560)
Constant	-80.629**	-66.305*	-78.158**	-64.960*
	(33.283)	(34.261)	(36.367)	(37.418)
Observations	5,940	3,942	5,940	3,942
Number of PAIR	1,998	1,998	1,998	1,998

Note: Robust standard errors are reported in the parentheses; all models include time fixed effects. *, ** and *** indicate level of statistical significance at 10%, 5% and 1%, respectively.

7 Conclusions

This paper adds to the exiting literature on private standards by analyzing the impact of GlobalGAP certification on banana trade intensity. GlobalGAP is an international standard that direct trade mostly to EU countries. Since, private standards directly affects trade, even if adoption of GlobalGAP is voluntary in nature, its compliance could be quasi-mandatory for exporters competing in the international market.

With a three year panel data from 2010 to 2012 we use OLS estimation of gravity trade model to understand the possible impact of GlobalGAP certification on banana export to EU. We use two measures of GlobalGAP certification intensity, namely, number of certified producers and hectares harvested under certified banana production. Methodologically, we recognize the issue of possible reverse causality of banana trade of GlobalGAP adoption and diffusion. However, such effect is likely to be absent if instead of considering GlobalGAP at level; one used its lagged value. There we provide our estimation results for level as well as lag GlobalGAP certification. Since we use a three year panel, only one year lag in the certification could be used to tackle the reverse causality.

The first finding of the gravity estimation indicates a positive impact of GlobalGAP certification on value of trade. Thus GlobalGAP promotes banana exports to EU. This result remains robust across all model speciation with and without lag in GlobalGAP at aggregated and disaggregated levels of EU countries. Finally from the gravity estimations of the aggregated and disaggregated EU samples we find that for none of the measures of GlobalGAP certification, magnitude of the coefficients differ much for top EU importers and all EU importers. This suggests that impact of GlobalGAP has been affecting banana imports of all EU country in a similar fashion.

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