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Exports and Governance: the Role of Private Voluntary Certification

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Abstract:

Empirical evidence on the trade-governance nexus tends to show that institutional differences restrict bilateral trade flows. In this paper, we introduce "governance gap" as a measure of the degree to which governance and institutions differ between countries. Using a sample of EU imports from 193 exporting countries, we examine the potential of voluntary food certification as surrogate institutions to overcome the governance gap at the country level. Our results show that while widening governance gaps lead to lower bilateral exports, the interaction of certification and the governance gap is positively associated with bilateral exports, hence partially offsetting the direct trade-inhibiting effects

Acknowledegment: This research was financially supported by the German Research Foundation (DFG) through the GlobalFood Program (grant number RTG 1666). We thank the GlobalGAP Head Office, Cologne for providing us data on certification. Dela-Dem Doe Fiankor gracefully acknowledges financial support from the Katholischer Akademischer Ausl¨ander-Dienst (KAAD), Germany

JEL Codes: Q17, L15

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Abstract

Empirical evidence on the trade-governance nexus tends to show that institutional differences restrict bilateral trade flows. In this paper, we introduce "governance gap" as a measure of the degree to which governance and institutions differ between countries. Using a sample of EU imports from 193 exporting countries, we examine the potential of voluntary food certification as surrogate institutions to overcome the governance gap at the country level. Our results show that while widening governance gaps lead to lower bilateral exports, the interaction of certification and the governance gap is positively associated with bilateral exports, hence partially offsetting the direct trade-inhibiting effects.

Keywords: agricultural trade, GlobalGAP, private food standards, gravity model

JEL Classification: F14, L15, Q17, Q18

1 Introduction

International trade remains an important channel to integrate developing countries into the global economy. Yet, missing or weak institutional or governance arrangements complicate international trade for firms in many developing countries (Goedhuys and Sleuwaegen, 2016). Meanwhile, with rapid proliferation of private standards, producers in many developing countries are embracing voluntary product certification, as a quality signalling mechanism to access high-value markets. There is robust evidence that good institutions enhance trade (Berden et al., 2014) and countries with similar institutional structures trade more with each other (De Groot et al., 2004; Dimitrova et al., 2017; Álvarez et al., 2018). However, it is not clear to what extent market access provisions of voluntary product certification hold for exporting countries with low levels of domestic public institutions. Two sets of outcomes are possible; voluntary product certifications may have increased signalling effects among countries with extreme institutional quality differences or the effectiveness of certification may be dampened under extreme institutional quality differences[1]. This is an empirical question that to our knowledge has not been studied in the agricultural trade literature.

The question of whether or not there is an effect of institutional quality differences among countries on bilateral trade is important and has been studied extensively in the trade literature (e.g. Huchet-Bourdon and Cheptea, 2011; Berden et al., 2014). Equally important, but one which has received much less attention is whether countries can do anything to overcome these differences (Dimitrova et al., 2017). This is especially important because small and medium-scale producers dominate developing countries and need to work around this institutional void (Goedhuys and Sleuwaegen, 2016). We take up this question in this paper and make an empirical contribution to the literature by examining the potential of private voluntary standards as alternative governance mechanisms to bridge bilateral governance gaps at the country level. Rather than focusing on public sector led policy initiatives, much less attention has been devoted to the role of private initiatives like voluntary standards and product certification in the context of institutional gaps[2]. The increasing use of third-party audited standards to govern agrifood trade is an attempt to normalize agribusiness practices according to prescriptive models of supply chain management (Ouma, 2010). In this paper, we hypothesize that through voluntary food certifications, countries can bridge the North-South public institutional quality differences and enhance trade.

We study this in the context of business-to-business relationships in the agricultural sector; specifically considering the case of agrifood producers targeting high-value markets in the European Union (EU). This is important because agrifood exports are a significant share of total exports in many developing countries and the EU is their major trading partner and export destination. We focus on GlobalGAP standards, which are increasingly becoming *de facto* mandatory to access EU markets despite their *de jure* voluntary nature. As a pre-farm gate process standard, they are involved in all stages of the value chain ("from farm to fork") and address a variety of issues including quality management, food safety

[1] Montiel et al. (2012) argue that corruption weakens governmental efforts to regulate conducts of firms, thereby increasing the signalling value of private certifications. However, widespread corruption can also extend distrust to private certification systems and render them less credible and of low signalling value.

[2] Exceptions include Goedhuys and Sleuwaegen (2016).

and worker occupational health. The EU member states as importers provide a good setting for our study because they are arguably one of the destinations with strict food safety standards and regulations globally (Kareem et al., 2018).

Our unique contributions to the literature are two folds. First, we aggregate country-pair differences in the six dimensions of the World Bank Worldwide Governance Indicators (WGI) into an index (which we call Governance Gap) and investigate the direction of the effect of increasing bilateral governance gaps on trade flows. In doing this, we extend the literature by contributing a panel data analysis given that many of the existing studies are cross-sectional (see e.g. De Groot et al., 2004; Goedhuys and Sleuwaegen, 2016; Dimitrova et al., 2017). In the agrifood sector specifically, Huchet-Bourdon and Cheptea (2011) studies how institutional quality and similarity across trading partners affect agricultural and food trade in Europe, at the time of the monetary integration. However, they limit their choice of institutional quality proxy to just the Rule of Law measure of the WGIs. Second, voluntary standards and product certification have proliferated, becoming almost a universal phenomenon (Busch, 2011). This can be seen as private sector response to potential market failures due to information asymmetries along the value chain. Retailers in many developed countries need to be able to protect their integrity and reputation by demonstrating "due diligence" from food safety scandals (Lockie et al., 2015). Amidst this rapid spread, there is the need for further research on the merits and limits of voluntary product certification as mechanisms to signal desirable firm or product characteristics (Montiel et al., 2012). We introduce and interact a private food certification (i.e. GlobalGAP) variable with the above mentioned index and assess the differential effect of bilateral governance gap on trade flows for certified and non-certified exporting countries. In doing so, we also deviate from the usual "standards-as-barriers or catalysts" debate.

We estimate a structural gravity model using OLS and PPML estimators on a sample of 193 countries' exports to the EU-27 over the period 2008 to 2015. Our results demonstrate a trade impeding effect of governance gaps on agrifood exports to the EU, but the effect of the interaction between governance gap and private food certification has a trade enhancing effect. Thus, conditional on certification the trade impeding effect of bilateral governance gap is reduced. From a policy angle voluntary certifications are viable means to improve exporting country reputations and increase trade even with differences in country-pair institutional quality.

The rest of the paper is structured as follows: Section two discusses conceptual issues related to institutional distance and private food certifications. Section three develops the structural gravity equation augmented with our governance and certification measures. In section four we describe the data and develop an index of time-varying bilateral institutional quality differences. The data is described in Section four. Section five presents the estimation results and section six concludes.

2 Conceptual discussion and hypotheses

In our empirical setting, we will test various hypotheses related to whether bilateral governance gaps affect trade flows and the role of voluntary product certification as a means to bridge these gaps. In this section, we conceptualize our definition of governance gaps

and the pathways through which voluntary food certification can improve the differences in cross-country institutional quality.

2.1 Governance and exports

The quality of institutions does not only affect economic development, but also influences trade flows among countries (see e.g. De Groot et al., 2004; Yu, 2010; Berden et al., 2014). The roles of governments include creating and maintaining institutions that facilitate the functioning of markets. In the agrifood sector, these include regulations that protect the health and safety of humans, animals and plants, and facilitate market transactions (Baldwin et al., 2000). The protection of property rights and functioning legal jurisdictions to enforce contracts create incentives for investment, production, and trade (Lio and Liu, 2008). For instance, democratic countries tend to have better institutions regarding consumer and food safety regulations, and provisions for their legal enforcement. These will improve product quality and the reputation of a country's exports generally.

The quality of governance and institutions have the potential to reduce trade costs, e.g. transaction costs and costs associated with the risks of trading, by improving importers' trust in exporters (Yu, 2010). A similar argument can be made for the reverse scenario; for exporting countries with weak institutions, importers will have little or no trust in their products and this will have a negative effect on their exports. De Groot et al. (2004) were one of the earliest studies to extend the notion of poor governance and its transaction cost increasing effect to international trade. International trade generally involves multiple countries that usually have different governance systems. The institutional frameworks surrounding firms also vary across countries. Thus, naturally relationships between firms residing in different countries are subject to multiple difficulties. Hence, the effectiveness of domestic institutions in economic exchange and the bilateral familiarity of trading partners across country pairs are important in determining trade costs. If levels of institutional effectiveness are similar in both countries, traders can easily use and operate in each other's institutional environment. This reduces adjustment costs arising from natural unfamiliarity with international partners, and lowers the insecurity related to transaction contingencies. The implication is that countries with similar ethical business environments will tend to trade more bilaterally, suggesting that a shared understanding of what is seen as acceptable practice is an important factor in international trade (Horsewood and Voicu, 2012).

Firms under different governance environments may also face different costs. Using the case of rule-based and relation-based countries, Li and Samsell (2009) show that firms located in rule-based countries tend to have fewer distortions and lower marginal costs of trading than firms in the former. As a result, trade flows between rule-based countries are higher than those between relation-based countries. Márquez-Ramos and Martínez-Zarzoso (2018) investigate whether similarity in governance indicators makes a difference in bilateral trade flows for 18 countries in Middle East and North Africa (MENA). They find that similarities between two trading partners in the capacity of their governments to effectively formulate and implement sound policies matter for bilateral trade in general, and for MENA countries in particular. Specifically, MENA countries trade more with countries that have similar levels of regulatory quality and rule of law. Huchet-Bourdon and Cheptea (2011) also show that for the 11 founding members of the European Mon-

etary Union, trade in agricultural products is sensitive to the quality and similarity of institutions. In a seemingly related study, Felbermayr and Toubal (2010) conceptualized in a gravity framework two channels via which cultural proximity influences bilateral trade flows: a preference channel and a trade cost channel. Cultural proximity correlates with a higher mutual interest for the goods produced in culturally similar countries and also lowers trade costs as it facilitates the formation of business and social networks, reduces the need for communication-related services and increases the level of trust. Álvarez et al. (2018) also confirm the hypothesis that institutional quality influence trade, regardless of whether the institutional quality of the importing country or the institutional distance between the exporting and importing countries is considered. Better institutional quality in the importing country eases bilateral trade and this result is reinforced when the institutional distance with the exporter increases in favor of the importing country. In general, they show that institutional quality fosters bilateral trade and, from a dynamic perspective, the effect on trade has waxed rather than waned with time.

Hence, conceptually differences in bilateral governance will pose extra costs for both exporters and importers thereby discouraging trade. We, therefore, hypothesize that larger bilateral governance gaps have a negative effect on agrifood trade between country pairs *ceteris paribus*. The reasoning behind this hypothesis is intuitive; as argued by Li and Samsell (2009) the time and cost of learning new rules and regulations are minimal for countries with similar domestic institutions.

2.2 Voluntary food standards as private governance institutions

Many countries are increasingly becoming aware that differences in quality of governance structures with their trading partners create negative reputation effects for their exports. This as argued above is because large differences in bilateral institutional qualities increases the transaction costs for importers dealing with domestic suppliers. At the macro level some countries have resorted to "country-of-origin" effects to enhance their reputations (Dimitrova et al., 2017). Firms operating in institutionally weak countries that have no such country-level initiatives, face difficulties in this regard, as buyers tend to infer the quality of their products partly from the generally poor reputation of their home countries (Montiel et al., 2012). They are disproportionately hampered by information asymmetries and negative reputation effects (Goedhuys and Sleuwaegen, 2013) which necessitates signalling quality to their international partners through other means. For example, Dimitrova et al. (2017) show that when the differences in country-pair quality of institutions increase, uncertainty about exchanges heighten, and importers tend to rely more on an exporter's reputation for its people as a reassurance that exporting firms will be honest in their dealings. Put differently, the more distant the formal institutional environments between countries, the more beneficial the additional use of informal arrangements (Abdi and Aulakh, 2012).

Our point of departure is our argument that voluntary certification to a process standard that is accepted in the importing country enhances exporting country reputations. Signalling becomes even more important when information asymmetries exist between sellers and buyers in vertical relationships. Governance gaps may increase information asymmetries, in which case a certificate may improve reputation, open up market access opportunities and raise competitiveness of firms (Goedhuys and Mohnen, 2017). Producers

in the exporting country will use certificates to strategically signal to importers that they are reliable suppliers even though they suffer negative reputation effects by virtue of being geographically located in countries with low quality of public institutions. In agrifood production and trade, importers can in many cases only judge the final product. Because, they do not have full information, importers look for proxies to assess product quality and exporters that can provide quality assurance gain a competitive edge (Cao and Prakash, 2011). When the effectiveness of government regulation is weak in one or both countries, or the quality of government effectiveness differs widely between two countries, standards can act as a surrogate governance institution. They put firms on a common ground in terms of managerial practices, business language and conflict-settling procedures, reducing the institutional distance between them (Goedhuys and Sleuwaegen, 2016). For example, when seeking suppliers of a particular agrifood product, an importer may see the country's certification status as a signal that a particular producer from that country is likely to produce goods that satisfy food safety requirements in the importing country.

Increasingly, retailers are becoming interested in the guarantee that not only final products, but also production processes meet good agricultural practices. Thus, producers have incentives to reveal information about their characteristics through informative signals from certification schemes (Goedhuys and Sleuwaegen, 2013) such as GlobalGAP. The case of GlobalGAP standards is particularly interesting because it is fast becoming quasi-mandatory to assess high-value markets despite being voluntary by law. As a business-to-business standard, GlobalGAP certification resembles an attempt by retailers, especially in the EU, to enforce a market-based mode of self-regulation through which individual farmers' skills are bench-marked against each other. This provides a mechanism for retailers to identify producers—regardless of country of origin—producing according to industry accepted standards, i.e. those who can signal quality through the possession of a certificate of conformity. This enhances the scopes of importers to gauge the quality performance of their suppliers and ensure the legibility of distant suppliers (Ouma, 2010).

Supply chain governance via GlobalGAP standards can be seen as an attempt to normalize spatially dispersed farming practices across countries (Ouma, 2010). For all producers seeking certification, GlobalGAP has "major" and "minor" musts that should be met along each stage of the production chain before certification is granted[3]. This harmonizing of production processes across farms overrides to some extent the institutional quality differences between high-value importing countries in the North and suppliers in countries with low domestic food safety regulations, especially in the South. This is also intuitive, because GlobalGAP certification provides a shared frame of reference for both parties, importers will have improved trust in products they know or can prove are produced to their specification, irrespective of the country of origin. By increasing the visibility of actions of actors on the supply-side (i.e., producers and suppliers) to actors on the demand-

[3] "Major" control points of GlobalGAP include traceability (e.g., producers must guarantee that the product can be traced back to the farm by registering exact planting and harvesting dates), record keeping (e.g., producers are required to keep records on all substances applied to crops, exact amounts, and application dates), varieties and fertilizers (e.g., only certified/authorized seed varieties and fertilizers may be used; inorganic and organic fertilizers have to be stored separately from crops and seeds), irrigation (e.g., without contaminated water), Integrated Pest Management (e.g., pests must be dealt with in ecologically sensitive ways, crops must be treated with pesticides punctually if affected, and producers must ensure a minimum time between spraying and harvesting), harvesting and produce handling (e.g., hygienic treatment of harvested produce must be ensured).

side (i.e., retailers and importers) of the value chain, standards enable the maintenance of trust in distant relationships (Lockie et al., 2015). Because GlobalGAP standards are subordinate to state legislation whenever the requirements of that legislation exceed those of the standard, GlobalGAP acts as a private institution enforcing food safety and quality whenever such food safety regulations are weak or missing. Based on these arguments, we hypothesize that private voluntary food certifications improve the reputation of producing countries, and enhances exports even if their exists substantial bilateral governance gaps.

3 Empirical application

3.1 The gravity model

To test our hypotheses we estimate a structural gravity model of international trade. The gravity model describes one of the most stable relationships in economics: "interaction between large economic clusters is stronger than between smaller ones, and nearby clusters attract each other more than far-off ones" (van Bergeijk and Brakman, 2010, p. 1). Following Anderson and van Wincoop (2003), our gravity model assumes a constant elasticity of substitution across all goods (σ) and product differentiation by place of origin. In addition, prices differ among locations due to symmetric bilateral trade costs. In its reduced form the structural gravity model is specified as:

$$\ln X_{ijt} = \ln E_{jt} + \ln Y_{it} - \ln Y_t + (1-\sigma)\ln \tau_{ijt} - (1-\sigma)\ln P_{jt} - (1-\sigma)\ln P_{it} + \varepsilon_{ijt} \quad (1)$$

where X_{ijt} is trade flows from exporting country i to importing country j in year t. E_{jt} is nominal GDP, which proxies the import demand of j in t. Y_{it} is the level of domestic production in i. Y_t is aggregate world production and P_{jt} and P_{it} are the importing and exporting country Multilateral Resistance (MR) terms respectively. ϵ_{ijt} is the error term. τ_{ijt} are trade costs, which we define as a linear function of trade barriers, namely, distance, common border, colonial ties, common language and common religion. As argued in the conceptual discussion, institutional quality differences pose extra costs for both exporter and importers. Simultaneously, the compliance costs of certification also mean they are extra costs for producers in the exporting country. Thus, we argue that the effects of both institutional quality differences and certification on trade is via the trade cost channel and augment the trade cost component of our model with GG_{ijt} which proxies institutional quality differences between country pairs and a dummy variable, $\mathrm{Certificate}_{it}$, which is our measure of GlobalGAP certification in the exporting country[4]. $\mathrm{GG}_{ijt} \times \mathrm{Certificate}_{it}$ is the interaction of the two variables. Our log-linear trade cost function is thus specified as:

$$\ln \tau_{ijt} = \gamma_1 \ln \mathrm{Distance}_{ij} + \gamma_2 \mathrm{GG}_{ijt} + \gamma_3 \mathrm{Certificate}_{it} + \gamma_4 \mathrm{GG}_{ijt} \times \mathrm{Certificate}_{it} + \sum_{k=1}^{4} \gamma_k \Omega_{ij} \quad (2)$$

Ω_{ij} is a vector of traditional gravity covariates including dummies for sharing a common language, colonial ties, a common border and religion.

[4]In sensitivity tests, we replace the certification dummy with the number of certified producers per country.

3.2 Estimation issues and model specification

For estimation purposes, we introduce the trade cost component, t_{ijt} into equation (1) and specify a standard augmented gravity model in its log-linear form as:

$$\begin{aligned}\ln \mathrm{X}_{ijt} = \alpha_t + \psi_i + \rho_j + \beta_0 + \beta_1 \ln \mathrm{Production}_{it} + \beta_2 \ln \mathrm{GDP}_{jt} + \beta_3 \ln \mathrm{Distance}_{ij} \\ + \beta_4 \mathrm{GG}_{ijt-1} + \beta_5 \mathrm{Certificate}_{it-1} + \beta_6 \mathrm{GG}_{ijt-1} \times \mathrm{Certificate}_{it-1} + \beta_k \Omega_{ij} + \varepsilon_{ijt}\end{aligned} \tag{3}$$

where $\mathrm{Production}_{it}$ is the level of domestic production in the exporting country, GDP_{jt} is Gross Domestic Product of the importing country and $\mathrm{Distance}_{ij}$ is the bilateral distance between the capital cities of country-pairs. Ω_{ij} includes $\mathrm{Language}_{ij}$, Colony_{ij}, $\mathrm{Contiguity}_{ij}$ and $\mathrm{Religion}_{ij}$. To deal with the potential endogeneity of institutions and certifications, we use a one year-lag of both variables (see e.g. Dimitrova et al., 2017; Álvarez et al., 2018). α_t, ψ_i and ρ_j are year, exporting country and importing country fixed effects respectively to control for multilateral resistance terms.

The model as specified in equation (3) is at best atheoretical because it does not account fully for the theoretical multilateral resistance terms P_{jt} and P_{it} in equation (1) (Anderson and van Wincoop, 2003). In panel data settings these terms should be time varying (Baldwin and Taglioni, 2007). This implies that the country fixed effects in equation (3) must vary with time. The specification as in equation (3) also requires taking log of trade flows. This results in significant lose of information in micro-settings like agriculture where zero valued trade flows are ubiquitous. Hence, as an alternative to the log-linear specification we adopt the Poisson pseudo-maximum likelihood (PPML) estimator. It allows us to accommodate zero trade (i.e., about 26% of the sample)[5] flows and is consistent under heteroskedasticity (Santos Silva and Tenreyro, 2006, 2011). Using the PPML estimator and accounting for multilateral resistance using time-varying importer and exporter fixed effects we specify our baseline model as:

$$\begin{aligned}\mathrm{X}_{ijt} = \exp\Big(\gamma_{jt} + \lambda_{it} + \beta_0 + \beta_1 \ln \mathrm{Distance}_{ij} + \beta_2 \mathrm{GG}_{ijt-1} + \beta_3 \mathrm{GG}_{ijt-1} \times \mathrm{Certificate}_{it-1} \\ + \beta_k \Omega_{ij} + \varepsilon_{ijt}\Big)\end{aligned} \tag{4}$$

Similar variable definitions hold as in equation (3). The importer-time (γ_{jt}) and exporter-time (λ_{it}) fixed effects also account for all observable and unobservable country-specific time varying variables including the size and income effects (i.e. GDP and Production) and the GlobalGAP certification variable[6]. Our first hypothesis is confirmed when $\beta_2 < 0$. For our second hypothesis we expect a positive coefficient on the interaction term (i.e. $\beta_3 > 0$), but smaller in magnitude than the direct effect of GG_{ijt} (i.e., $|\beta_3| < |\beta_2|$). Holding all other factors constant, the complete effect of the bilateral governance gap on exports in time t for certified countries is given as $\hat{\beta}_2 + \hat{\beta}_3 \times \mathrm{Certificate}_{it-1}$.

[5]We drop from the sample country-pairs that had no observed trade flows over all eight years. This reduces our original sample from 41,688 to 28,752 but has no effect on our interest variables.

[6]We are unable to account explicitly for effects of RTA. Since, we use EU countries as importers, trade agreements do not vary across EU countries, and the RTA dummies are absorbed by the exporter-year fixed effects.

4 Data

Our dataset covers bilateral trade flows from 193 agrifood producing countries (exporters) to all member states of the EU-27 (importers) over a period of eight years (2008 - 2015). The agrifood trade flow data is obtained from the World Integrated Trade Solution database by summing up six digit HS 2007 data on different fruits and vegetable products listed in Table A1. A list of included countries is also presented in the Table A2.

Growing interest in studying the quality of governance and public institutions has driven an explosion in the use of quantitative governance indicators from different sources. This includes data from the International Country Risk Guide rating systems, Freedom House, Transparency International's Corruption Perception Index, and the World Bank's World Governance Indicators (WGI) (Arndt and Oman, 2006). The WGIs are recognized by many researchers as the most effective tools for assessing the status of governance in different countries (Arndt and Oman, 2006; Lio and Liu, 2008; Huchet-Bourdon and Cheptea, 2011; Berden et al., 2014). Hence, to calculate our governance gap measures we use data on the WGIs constructed by Kaufmann et al. (2011). The six aggregate indicators (Table 1)[7] are based on several hundred of variables obtained from 31 underlying data sources reporting the perceptions of governance of a large number of survey respondents, and expert assessments of non-governmental organizations, commercial business information providers, and public sector organizations worldwide (Kaufmann et al., 2011).

Table 1: Brief description of the components of the Worldwide Governance Indicators

1. Voice and accountability: the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, association, and a free media.
2. Government effectiveness: the quality of public services, the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.
3. Control of corruption: the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as the state by elites and private interests.
4. Regulatory Quality: the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.
5. Political stability: captures perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means.
6. Rule of Law: the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.
Source: Kaufmann et al. (2011)

Each of these indicators, measured in units ranging from -2.5 (worst) to 2.5 (best), represents a different dimension of governance in a country which can potentially affect trade. The indicators are highly correlated and many studies use a principal component analysis (e.g. Globerman and Shapiro, 2002) or calculate mean rescaled values over the six indices (e.g. Lio and Liu, 2008) to generate a single index. Since, we are interested in

[7]Since these variables are more or less standard in the literature, we do not extensively discuss them here. We refer the interested reader to De Groot et al. (2004), Arndt and Oman (2006), and Berden et al. (2014).

how these measures vary across country-pairs, we need an index to transform the country varying WGIs into country-pair varying variables. Recently, Márquez-Ramos and Martínez-Zarzoso (2018) investigate whether similarities in governance indicators between countries affect trade flows using a newly developed fuzzy index. Álvarez et al. (2018) on the other hand, estimate institutional quality differences across countries simply as the difference in country specific WGI indicators; thus the better (if positive) or worse (if negative) is the quality of the institutions in the importing country with respect to that of the exporter. Both indices vary bilaterally over time across each of the individual WGIs. We, on the other hand, are interested in a composite measure of bilateral and time varying institutional quality. Following Kogut and Singh (1988), Abdi and Aulakh (2012), and Dimitrova et al. (2017), and introducing the time dimension t, we calculate the governance gap between country pairs as the standardized differences between the importing and exporting country scores on each of the six WGIs:

$$\mathrm{GG}_{ijt} = \sum_{k=1}^{6} (\mathrm{WGI}_{jkt} - \mathrm{WGI}_{ikt})^2 / 6V_{kt} \tag{5}$$

where GG_{ijt} is governance gap between exporter j and importer i in year t, WGI_{jkt} and WGI_{ikt} are the values for the kth WGI indicator for i and j, respectively, and V_{kt} is the variance of the kth WGI indicator across all countries in the dataset. The indicator is minimized at zero for countries with similar institutional qualities and maximised for countries that are institutionally furthest apart.

Using the case of Germany as an importing country, Figure (1) shows the average bilateral governance gaps over the period 2008 to 2015. The darker regions, i.e. countries in Africa and the Middle East, imply large institutional quality differences with Germany. Countries with the lowest governance gaps include other countries in the European Union, the United States, Canada, and Australia. Nevertheless, there is significant heterogeneity in the governance measure across the EU member states to necessitate our choice of studying them as individuals and not as an aggregate.

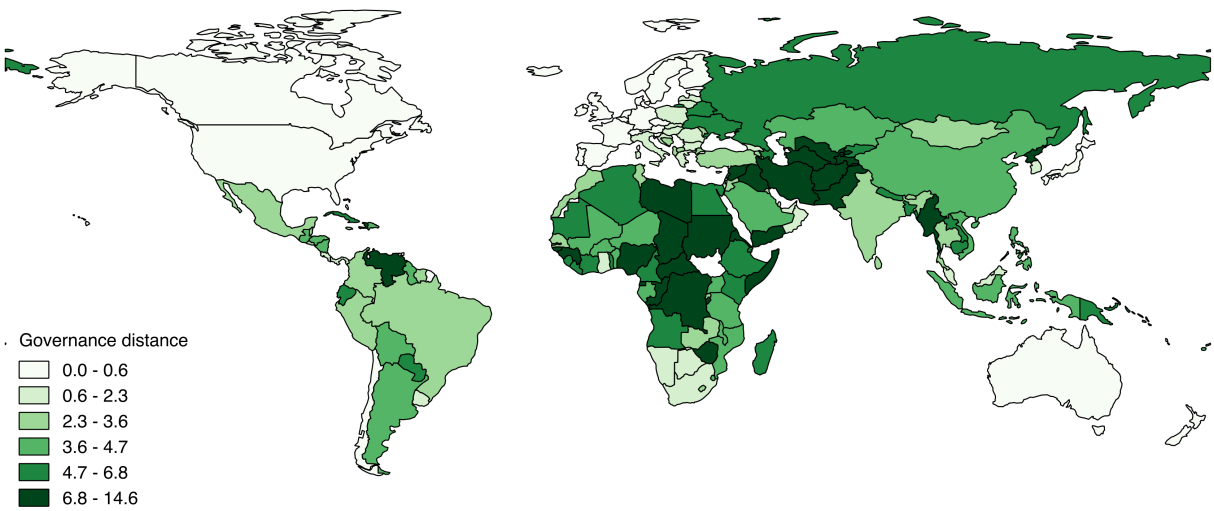

Figure 1: Bilateral Governance Gap (using Germany as importer)

To test the second hypothesis we use GlobalGAP certifications as our preferred private

voluntary standard. This is premised on the observation that GlobalGAP has become the most widely applied private agrifood quality assurance scheme since its inception in 1997[8]. The choice of GlobalGAP also allows us to use the EU as as an example of an importing destination with high food standards, because GlobalGAP is considered a minimum requirement to access EU agrifood markets. In 2007, in an attempt to mark their global relevance they effected a name change from EUREPGAP to what is now known as GlobalGAP. Certification to GlobalGAP is carried out by third-parties who are themselves not party to the final exchange between the producer and the importer. Our GlobalGAP dataset includes 122 producing countries that were certified at one point in time over the study period. The dataset on certification of fruits and vegetables was provided by the GlobalGAP Secretariat in Cologne, Germany.

The remaining gravity model data are derived from different sources. GDP and agricultural production data are from the World Bank World Development Indicators database and, FAOSTAT of the Food and Agricultural Organisation respectively. Country-specific data on distance, colonial ties, common language, and contiguity are derived from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII). Detailed summary statistics on all included variables are presented in the appendix (Table A3).

5 Results and discussion

As PPML has gained wide acceptance in the gravity literature, we will base the presentation of the results mainly on this estimation method, occasionally using OLS as a comparison.

5.1 Main results

Table 2 reports the estimated coefficients in equations (3) and (4). Columns (1) - (5) differ in the choice of estimator and controls for multilateral resistance. The first four columns show the pooled OLS estimations and column (5) shows the results of the PPML estimation. Columns (1) - (3) include time-invariant importing and exporting country fixed effects and column (4) - (5) includes time-varying importing and exporting country fixed effects. The main right-hand side variables of interest (i.e. GG_{ijt}, Certificate_{it} and $\text{GG}_{ijt} \times \text{Certificate}_{it}$) are introduced into the model specifications in stages.

The signs and magnitudes of the traditional gravity control variables are all consistent with the literature. GDP of the importing countries has a positive effect on trade and countries with larger production capabilities export more. Import demand and export supply are both inelastic with respect to importer GDP and production in the exporting country, respectively. Regarding the other sources of trade costs, bilateral distance decreases trade but linguistic and religious similarity, contiguity and countries that share past colonial ties are more likely to trade than otherwise. In many cases, except for our main variables of

[8]In international agri-food trade, private standards are ubiquitous nevertheless, GlobalGAP standards are more widespread, e.g. Mohammed and Zheng (2017) show that for the 131 countries they study, the number of GlobalGAP certified sites is normally several times larger than that certified to other private standards (i.e. BRC, FSSC 22000, ISO 22000, PrimusGFS, SQF).

interest, the estimates in the PPML model are smaller than in the OLS specification. This is consistent with the PPML literature (Santos Silva and Tenreyro, 2006).

For our main variables of interest, we begin by confirming the effects of GlobalGAP certification on exports to the EU. The coefficient estimates are visible in columns (3) and (4) where we include time-invariant country and year fixed effects. In all cases GlobalGAP certification is found to have a positive and significant effect on exports. This result is consistent with findings in the literature that increasing spread of GlobalGAP certification within countries enhance exports to high-value markets (See e.g. Masood and Brümmer, 2014; Fiankor et al., 2017). In columns (4) and (5) where we control for time-varying multilateral resistance terms, the coefficient estimates of GlobalGAP certification are accounted for by the exporter-time fixed effects.

To test our first hypothesis i.e., the relationship between governance and trade flows, we focus on the coefficient estimates of GG_{ijt-1}. We observe negative and statistically significant effects of governance gap on agrifood exports to the EU in all model specifications. Thus, country-pairs with larger governance gaps trade less with each other, and vice versa. EU retailers in deciding where to source their agrifood products prefer producers in countries with institutional qualities similar to those existing in the EU.

Next, we test the effect on the interaction of governance gaps and GlobalGAP certification. We enter the interaction term $\mathrm{GG}_{ijt-1} \times \mathrm{Certificate}_{it-1}$, and the constitutive terms of the interaction into the models in columns (3) - (5). In support of our hypothesis, the coefficient estimate of the interaction term is positive and statistically significant. Hence, the more distant the governance gap between country pairs, the more effective the use of certification. We also assess the differential effect of bilateral governance gap on trade flows based on the certification status of the exporting country. From equations (3) and (4), the effect for certified countries includes the direct effect of the governance gap proxy and the coefficient on the interaction term. Thus, empirically based on our a priori expectation, a negative governance gap effect becomes less negative if the interaction term is positive. Specifically, for non-certified countries the effects on trade are the direct GG_{ijt-1} effects (i.e. -0.12 in column 3 and -0.43 in column 5). For certified countries, the total trade effect of the governance gap is negative and statistically significant, but smaller in magnitude (i.e. -0.02)[9]. This finding holds in both the OLS models in column (3) and the PPML model in column (5).

Our results imply that even though institutional distance has a trade impeding effect on trade flows, the effects are smaller for certified compared to non-certified countries. This suggests that product certification, which signals product quality, plays a significant role in enhancing exports even for country pairs with big differences in institutional quality; however, the effect is not sufficiently large to completely eliminate the negative effects of governance gaps. A somewhat surprising result is in column (4) where the coefficient of the interaction term outweighs the direct GG_{ijt-1} effect so as to make the aggregate effect of GG_{ijt-1} for certified countries positive. We should, however, be able to address this in a series of robustness checks.

To put the findings into perspective using our preferred specification in column (5), a one

[9] $\frac{\partial \mathrm{X}_{ijt}}{\partial \mathrm{GG}_{ijt-1}} = \hat{\beta}_2 + \hat{\beta}_3 \times \mathrm{Certificate}_{it-1} = 0.411 + (-0.432) = 0.021$

standard deviation decrease in the bilateral governance gap index (=2.48), doubles trade flows from non-certified countries[10], all else remaining equal. This effect approximately corresponds to a change in GG_{ijt} from Germany - Serbia (=2.65) to that of Germany - USA (=0.08). But, for certified countries, a one standard deviation decrease in bilateral governance gap increases trade by 5%, ceteris paribus.

Table 2: The effect of private food safety standard on institutional quality

	OLS				PPML
	(1)	(2)	(3)	(4)	(5)
Dependent variable	$\ln X_{ijt}$	$\ln X_{ijt}$	$\ln X_{ijt}$	$\ln X_{ijt}$	X_{ijt}
ln GDP_{jt}	0.335	0.280	0.268		
	(0.210)	(0.212)	(0.212)		
ln $Production_{it}$	0.455***	0.518***	0.469***		
	(0.136)	(0.130)	(0.131)		
ln $Distance_{ij}$	-1.430***	-1.392***	-1.405***	-1.439***	-0.251**
	(0.103)	(0.100)	(0.100)	(0.105)	(0.124)
$Language_{ij}$	0.732***	0.711***	0.710***	0.708***	0.109
	(0.155)	(0.151)	(0.151)	(0.156)	(0.178)
$Contiguity_{ij}$	0.580***	0.593***	0.595***	0.596***	0.526***
	(0.198)	(0.193)	(0.193)	(0.201)	(0.164)
$Colony_{ij}$	0.971***	0.963***	0.964***	0.984***	0.769***
	(0.160)	(0.158)	(0.157)	(0.163)	(0.168)
$Religion_{ij}$	0.227**	0.207**	0.216**	0.246**	0.259*
	(0.104)	(0.102)	(0.102)	(0.107)	(0.146)
GG_{ijt-1}	-0.068**	-0.058*	-0.115***	-0.281***	-0.432***
	(0.031)	(0.030)	(0.034)	(0.040)	(0.065)
$Certificate_{it-1}$		1.210***	0.950***		
		(0.071)	(0.105)		
$GG_{ijt-1} \times Certificate_{it-1}$			0.096***	0.363***	0.411***
			(0.028)	(0.030)	(0.057)
Observations	18,721	18,721	18,721	18,721	24,777
R-squared	0.737	0.743	0.744	0.760	0.880
α_t, ψ_i, ρ_j	Yes	Yes	Yes	No	No
$\gamma_{jt}, \lambda_{it}$	No	No	No	Yes	Yes

Notes: Robust country-pair clustered standard errors in parentheses. ***, **, * denote significance at 1%, 5% and 10% respectively.

As a final exercise we assess how our findings vary depending on the level of development by splitting our sample into developed (i.e., high income) and developing (i.e., middle and low income) exporting countries. The results presented in Table 3 are in line with our benchmark specification. However, we find that a one unit increase in the governance gap measure decreases trade by -0.03% (column 2) for certified developed countries and by 0.24% (column 4) for certified developing countries. In both cases, the trade impeding effects are larger in magnitude for non-certified countries, nevertheless, the trade impeding effects are not trivial for developing countries even when they are certified.

[10] $2.48 \times 0.432 = 1.07$

Table 3: Results by development status

	Developed countries		Developing countries	
	(1)	(2)	(3)	(4)
	OLS	PPML	OLS	PPML
Dependent variable	$\ln X_{ijt}$	X_{ijt}	$\ln X_{ijt}$	X_{ijt}
ln Distance$_{ij}$	-1.340***	-0.299**	-1.989***	-1.496***
	(0.124)	(0.130)	(0.191)	(0.236)
Language$_{ij}$	0.078	0.275	1.055***	0.208
	(0.240)	(0.204)	(0.190)	(0.244)
Contiguity$_{ij}$	1.039***	0.589***	0.343	-0.882
	(0.224)	(0.188)	(0.336)	(0.548)
Colony$_{ij}$	1.112***	0.373*	0.631***	0.928***
	(0.239)	(0.206)	(0.206)	(0.218)
Religion$_{ij}$	0.127	0.313*	0.377***	0.207
	(0.163)	(0.183)	(0.133)	(0.204)
GG$_{ijt-1}$	-0.591***	-1.688***	-0.328***	-0.538***
	(0.145)	(0.438)	(0.081)	(0.129)
GG$_{ijt-1}$ $\times$ Certificate$_{it-1}$	0.540***	1.656***	0.319***	0.299***
	(0.135)	(0.455)	(0.031)	(0.059)
Observations	6,863	8,594	11,854	16,163
R-squared	0.797	0.896	0.742	0.762
$\gamma_{jt}, \lambda_{it}$	Yes	Yes	Yes	Yes

Notes: Robust country-pair clustered standard errors in parentheses. ***, **, * denote significance at 1%, 5% and 10% respectively. Developed countries include all high income countries. Developing countries include upper middle income, lower middle income and low income countries.

5.2 Robustness checks

In this section, we conduct two robustness checks to confirm the reliability of our findings. First, because GlobalGAP standards originated from the EU, it can be argued that EU producers have an advantage over their peers outside the customs union. Therefore, we re-estimate our baseline model without exporters in the EU. The results presented in columns (1) - (2) of Table (4) confirm both hypotheses. However, we observe that the total effect of GG$_{ijt}$ for certified countries is larger (i.e. about -0.07 in both OLS and PPML models) once we exclude EU exporters. This subsample also addresses the somewhat surprising finding in the OLS estimations in columns (4) of Table (3) where the total GG$_{ijt}$ effect was positive for certified countries. Second, we have so far used a dummy variable to indicate the GlobalGAP certification status of the exporting countries. As a robustness check we use instead the spread of certification within a country, measured by the number of certified producers in each exporting country. The results presented in columns (3) - (4) of Table (4) are consistent with our prior findings and confirm our main hypotheses.

Table 4: Robustness checks

	Without EU exporters		Number of certified producers	
	(1) OLS	(2) PPML	(3) OLS	(4) PPML
Dependent variable	$\ln X_{ijt}$	X_{ijt}	$\ln X_{ijt}$	X_{ijt}
ln Distance$_{ij}$	-1.732***	-1.214***	-1.453***	-0.272**
	(0.172)	(0.198)	(0.105)	(0.127)
Language$_{ij}$	0.768***	-0.062	0.724***	0.109
	(0.169)	(0.258)	(0.155)	(0.178)
Contiguity$_{ij}$	0.537*	-0.586	0.590***	0.526***
	(0.315)	(0.518)	(0.199)	(0.164)
Colony$_{ij}$	0.731***	0.882***	0.986***	0.762***
	(0.188)	(0.209)	(0.160)	(0.167)
Religion$_{ij}$	0.255**	0.025	0.247**	0.280*
	(0.124)	(0.205)	(0.107)	(0.146)
GG$_{ijt-1}$	-0.385***	-0.399***	-0.247***	-0.210***
	(0.049)	(0.080)	(0.039)	(0.062)
GG$_{ijt-1}$ × Certificate$_{it-1}$	0.329***	0.330***	0.075***	0.030***
	(0.031)	(0.059)	(0.006)	(0.011)
Observations	14,342	19,947	18,721	24,777
R-squared	0.751	0.728	0.760	0.880
$\gamma_{jt}, \lambda_{it}$	Yes	Yes	Yes	Yes

Notes: Robust country-pair clustered standard errors in parentheses. ***, **, * denote significance at 1%, 5% and 10% respectively.

6 Conclusion

Much of the existing literature has shown that governance and institutions are important drivers of trade and economic growth. Similarities in governance and institutional quality measures across countries enhance bilateral trade flows. The reverse is also true. Hence, retailers in countries with good institutions will choose to source their products from countries with similar or better domestic institutions. Aside from the reputational damage that is associated with potential food scares, institutional dissimilarities also impose significant costs for both importers and exporters. Hence, the more dissimilar country-pairs the less trade will be observed. Much less attention has however, been paid to how exporting countries in low quality institutional regimes can overcome these differences. This paper evaluates on the one hand, the effect of bilateral differences in governance and related institutions across countries on agrifood trade. Retailers especially in high-value markets such as the EU are increasingly becoming concerned about traceability, quality of production processes and final products. Thus, we argue that private food standards and certifications act as surrogate institutions that help to overcome these differences at the country level. We are not aware of any existing studies that test this hypothesis empirically in the agrifood sector specifically or the agricultural trade literature more broadly.

Empirically, from our gravity model estimations, our results confirm the trade reducing effect of bilateral governance gaps on trade flows. However, we also find that the trade

impeding effects of increasing institutional quality differences on exports vary depending on whether the country is certified to GlobalGAP standards or not. For certified countries, the trade impeding effects are very much lower compared to their non-certified counterparts. Hence, we show that certification exerts a pro-export effect that partially offsets the trade-inhibiting effects of governance gaps at the country level. This supports our hypothesis that the bigger the institutional quality difference among countries the more pronounced the signalling effect of voluntary certification.

These findings have important policy implications. For producers and firms targeting high-value markets in the EU but happen to be located in countries with low quality of existing domestic public institutions, getting certified to a standard that is accepted in the importing country can help overcome the negative reputation effects associated with their geographical locations. Undoubtedly, certification in itself is not enough to overcome the total bilateral governance gap at the country level. Nevertheless, it is a viable alternative.

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7 Appendix

Table A1: Products

HS codes	Short HS description
0701	Potatoes, fresh or chilled
0702	Tomatoes, fresh or chilled
0703	Onions, shallots, garlic, leeks and other alliaceous vegetables
0704	Cabbages, cauliflowers, kohlrabi, kale and similar edible brassicas
0705	Lettuce (*Lactuca sativa*) and chicory (*Cichorium spp.*)
0706	Carrots, turnips, salad beetroot, salsify, celeriac, radishes and similar roots
0707	Cucumbers and gherkins, fresh or chilled
0708	Leguminous vegetables, shelled or unshelled, fresh or chilled
0709	Other vegetables, fresh or chilled
0710	Vegetables (uncooked or cooked by steaming or boiling in water)
0711	Vegetables provisionally preserved
0713	Dried leguminous vegetables, shelled, whether or not skinned or split
0714	Manioc, arrowroot, salep, Jerusalem artichokes, sweet potatoes
0801	Coconuts, Brazil nuts and cashew nuts, fresh or dried
0802	Other nuts, fresh or dried, whether or not shelled or peeled
0803	Bananas, including plantains, fresh or dried
0804	Dates, figs, pineapples, avocados, guavas, mangoes and mangosteens
0805	Citrus fruit, fresh or dried
0806	Grapes, fresh or dried
0807	Melons (including watermelons) and papaws (papayas), fresh
0808	Apples, pears and quinces, fresh
0809	Apricots, cherries, peaches (including nectarines), plums and sloes, fresh
0810	Other fruit, fresh
0811	Fruit and nuts, uncooked or cooked
0813	Mixtures of nuts or dried fruit
0904	Pepper of the genus Piper; dried or crushed or ground fruits
0905	Vanilla
0908	Nutmeg, mace and cardamoms
0909	Seeds of anise, badian, fennel, coriander, cumin or caraway; juniper berries
0910	Ginger, saffron, turmeric (curcuma), thyme, bay leaves, curry and other spices

Notes: Products are used at the HS06 level but are reported here at the HS04 level to save space. To allow merging with the GlobalGAP certification dataset, trade flow data is summed up across all products.

Table A2: List of importing and exporting countries

Country groups	Members
Importers	Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden, United Kingdom
Exporters	Afghanistan, Albania, Algeria, Angola, Antigua and Barbuda, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahamas, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Belize, Benin, Bermuda, Bhutan, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Bulgaria, Burkina Faso, Burundi, Cabo Verde, Cambodia, Cameroon, Canada, Cayman Islands, Central African Republic, Chad, Chile, China, Colombia, Comoros, Congo, Cook Islands, Costa Rica, Croatia, Cuba, Cyprus, Czech Republic, Cote d'Ivoire, Democratic People's Republic of Korea, Democratic Republic of the Congo, Denmark, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Fiji, Finland, France, Gabon, Gambia, Georgia, Germany, Ghana, Greece, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hong Kong, Hungary, Iceland, India, Indonesia, Iran, Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kiribati, Kuwait, Kyrgyzstan, Laos, Latvia, Lebanon, Lesotho, Liberia, Libya, Lithuania, Luxembourg, Macao, Macedonia, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Marshall Islands, Mauritania, Mauritius, Mexico, Micronesia, Moldova, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Nauru, Nepal, Netherlands, New Caledonia, Niue, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Palestine, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Republic of Korea, Romania, Russian Federation, Rwanda, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Samoa, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia/Montenegro, Seychelles, Sierra Leone, Singapore, Slovakia, Slovenia, Solomon Islands, Somalia, South Africa, Spain, Sri Lanka, Sudan, Swaziland, Sweden, Switzerland, Syria, Tajikistan, Tanzania, Thailand, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Tuvalu, Uganda, Ukraine, United Arab Emirates, United Kingdom, United States of America, Uruguay, Uzbekistan, Vanuatu, Venezuela, Viet Nam, Yemen, Zambia, Zimbabwe

Table A3: Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Contiguity$_{ij}$	0.03	0.16			28752
Language$_{ij}$	0.06	0.24			28752
Colony$_{ij}$	0.04	0.20			28752
Religion$_{ij}$	0.16	0.36			28752
GlobalGAP dummy$_{it}$	0.59	0.49			28752
GlobalGAP producers$_{it}$	811.79	3072.78	0	35117	28752
Exports$_{ijt}$ ('000000)	28.46	188.04	0	6741.25	28752
GG$_{ijt}$	2.54	2.48	0	18.94	28644
ln GDP$_{jt}$	26.39	1.54	22.87	28.99	28752
ln Distance$_{ij}$	8.30	0.94	4.09	9.88	28752
ln Production$_{it}$	14.91	2.34	5.3	20.69	28752