The Impact of Services Trade Restrictiveness on Food Trade

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Abstract

International trade in goods requires service inputs such as transport, banking and financial services for production and transportation. Trade in goods and services are now closely linked and contribute to the growth of international trade. The goal of this study is to investigate the effects of restrictions in the banking, accounting, transportation and logistics sectors (cargo handling and custom brokerage) on food trade. We use a gravity model with panel data from 2014 to 2018 for 36 OECD countries, the OECD indices of individual country restrictions and regulatory difference by country pair to capture the level of restrictions in these sectors. Our results suggest that importing and exporting country restrictions have non-significant effects on aggregate food exports, but negative and significant impacts on exports of agricultural raw materials and perishable products (meat, dairy products, eggs, etc.). The regulatory disparity between countries in logistics and banking sectors emerge as the main barrier for food exports. However, these results can be mitigated through regulatory cooperation or harmonization of regulations.

Keywords: Food trade, service sector, heterogeneity of standards, gravity model.

JEL *Classification*: F13, F14, K23, Q17.

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I. Introduction

Following the GATT agreements in 1948 (General Agreement on Tariffs and Trade), tariffs have been significantly decreased in world trade. For decades, high tariffs were the main obstacle to trade. However, under many implemented trade agreements (multilateral, bilateral and regional), tariffs have fallen to low levels (the simple average world tariff rate declined from 10.13% in 2000 to less than 7% in 2015, cf. figure 1)[1]. In the meantime, we observe a huge increase of non-tariff barriers (NTBs), particularly production standards, which represent the main obstacle to global economic growth, (Kee et al., 2009; IMF, 2017).

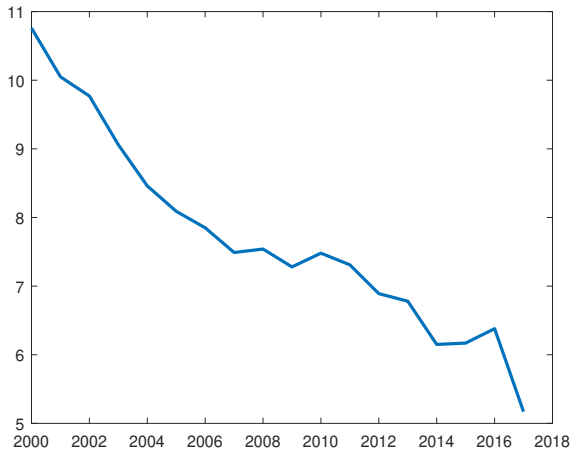


Figure 1: Tariff rate, applied, simple mean, all products (%)

Considered as rules that establish production characteristics and procedures, they are intended to optimize product reliability. The most restrictive of these standards remain the SPS and TBT measures, which considerably affect agricultural production. Indeed, when each country imposes its own market access standards, exporters and suppliers must comply with them. However, compliance with these technical, health and quality regulations generates in most cases high fixed costs (cost of product adaptation), WTO (2005). It is not just adapting the products, but also having necessary equipment, technology and skills. Therefore, the existence of fixed costs may affect the decision to export, Riker (2014). For some authors, the level or stringency of standards is not an obstacle, but the regulatory heterogeneity between countries appears to be restrictive, Kox and NordÅs (2007). However, it is not the level of regulation that discourages foreign suppliers, but rather the difference in regulation between origin and destination markets. Thus, additional compliance costs to establish a firm in a foreign country would be minimal if standards and qualifications were recognized in the home country.

For services, the consequences of this disparity remain very significant, UNCTAD (2010). Indeed, the regulatory environment in the services shows a sector highly regulated

[1]Data provided by the World Bank through the World Integrated Trade Solution database.

because faced of increased competition. As for goods sector, services are also affected by national regulations and trade in services is more impacted by these restrictions than trade in goods, Kox and NordÅs (2007). Moreover, for goods and commodities, production and quality requirements only apply to goods. For services, this includes the supplier, its foreign personnel and equipment. The regulatory restriction on services not only prevents foreign suppliers to access domestic service markets, but can also deter them from undertaking further investment after establishment in the market, so-called **regulation behind borders**. Regulatory divergences between nations in this sector generate not only fixed costs, but also maintenance costs or operational restrictions[2]. To summarize, the disparity of standards between nations forces service providers to adapt their business model in each export market and as a firm's business model is often the vector of its competitiveness, these regulatory barriers represent a high cost for firms.

This paper examines the different effects of services restrictions on food trade and discusses how to mitigate these restrictive impacts [3]. Our study contributes to the literature about the impacts of non-tariff barriers on international trade. It differs from the existing literature because we focus on the impact of restrictions and regulatory disparity between OECD countries in the banking, accounting, transports and logistics sectors on food exports, a topic has not been studied in the literature. Indeed, the literature has focused on the effects of services restrictions on trade in services (NordÅs and Rouzet (2016); Ingo and al. (2012)), and no study has so far examined food trade. These sectors, considered as service providers, have a strong and close link with food export activities. Food sector intermediate consumption of services is higher than goods and commodities. The consumption of agriculture, industry and services by the food sector is respectively 30%, 34% and 37% (see Table A.3).. In addition, Figure A.2 shows significant restrictions in the banking, accounting and transport sectors.

International trade is a risky activity, importers may not pay after receiving the goods and exporters may not deliver if they pay in advance. To reduce the risk of international trade, banks offer specific trade finance products[4]: the most important are letters of credit (LC) and documentary collections, Amiti and Weinstein (2011)[5], Paravisini and al (2014)[6]. According Copeland and Mattoo (2007), the development of financial services can promote the effectiveness of service sectors by competition and thus support economic growth.

The global financial crisis is an example of a strong impact of credit on trade (see figure A. 4). However, the credit crunch led to a significant reduction in the availability of external financing, thus reducing firms' production and export capacities. The weak economic outlook resulted in slower global demand and imports. Using monthly US import data, Chor and Manova (2012) find that countries with higher interbank rates and stricter credit conditions less exported to United States during the crisis. These

[2]Maintenance costs include: costs related to the tax burden, the social security system, limiting the variety of services, imposing fixed prices for certain services.

[3]We will focus on the effects of regulatory difference on food trade.

[4]We use trade finance to refer to formal borrowing by firms from banks or other financial institutions to facilitate international trade activities.

[5]They showed that, in Japan, firms linked to under-performing banks reduced their exports.

[6]They found that reduction of credit supply to firms led to decline of exports in Peru.

effects have been particularly pronounced in sectors that require significant external financing. Moreover, Bricongne et al (2010) find that French firms' exports in sectors most dependent on external financing have been more affected by the recent global crisis. Using time-varying bilateral data on foreign bank ownership for many countries, Claessens, Hassib and Horen (2017) show that a greater domestic presence of foreign banks, associated with an increase of exports in sectors more dependent on external financing. Another alternative to letters of credit is trade credit insurance, Fabrice Morel (2010). According to Moore (2000), a large number of factors such as good prudential regulation, supervision, or appropriate legal and accounting systems can be a key condition for maintaining open trading systems. However, restrictions in the banking sector can constitute very significant fixed costs and can affect agri-food exports.

Transport and logistics are also major factor in international trade. Choosing the appropriate mode of transport and logistics is essential to ensure efficient and cost-effective import or export operations, so-called "transit time". It provides vital distribution for production, as well as essential personal mobility, by connecting firms to global markets. Transport is a crucial element for economic growth and competitiveness, the most important of which are maritime, road and air transport (cf. figure A.3). We use food products because affected by SPS and TBT standards and require important services as inputs.

To conduct this study, we use a gravity model based and OECD restrictiveness index, which measures the recent level of restriction in services sector. The latter is a robust measure compared to the World Bank index because it is a sectoral index (covering 22 sectors in 46 countries), while the World Bank index includes 5 service sectors in 103 countries. Our results suggest that individual country restrictions have non-significant effects on aggregate food exports, but negative and significant impacts on exports of agricultural raw materials and perishable products (meat, dairy products, eggs, etc.). The restrictions implemented by the exporting country have significant negative effects on exports higher than the importing country's restrictions. Regulations in the logistics and banking sectors are restrictive for food trade.

The remainder of this paper is structured as follows: in the first part, we review the literature on the effects of these restrictive measures on trade flows. In the second part, we describe our econometric model with data, sources, and the type of regression used. The last section presents our different results.

II. Literature review

In this section, studies that examined the impact of restrictive policies on international trade used two essential methods: the analysis on restriction index and analysis on tariff equivalent. Indeed, the economic literature that studied the impact of standards in services on trade, used the OECD/World Bank Trade Restrictiveness Index, and the computation of tariff equivalent.

i. Service Trade Restrictiveness Index (STRI) and service trade: Gravity Analysis

The existing literature on service restrictions and trade is exclusively empirical. To evaluate the effects of regulatory barriers in services on international trade measured by sectoral STRI index, we use gravity model. Although specific to trade flows in goods and commodities, some authors applied it to services and found it adapted to trade in services, Head et al, 2009; Walsh, 2008. However, Kox and NordÅs (2009) using a gravitational approach, examine trade flows in transport and business services, and their interaction with an overall regulatory indicator. The analysis of Kox and NordÅs (2007) considers financial services and other business services in their model.

The authors that apply the gravity model to analyze the impacts of STRI index and the regulatory heterogeneity index on service trade are NordÅs and Rouzet (2016), NordÅs (2016). Based on a gravity model with aggregate data and the PPML (Pseudo-Maximum Likelihood Estimator) as the estimation method, they find that the most restrictive countries in the service sector, import and export significantly less services. In addition, the negative impact of restrictions in services on exports is about twice as large as on imports. The most affected sectors are the banking, financial and transport sectors, considered as service providers. Considering the regulatory disparity between countries, they finds that regulatory heterogeneity in services has negative impacts on cross-border trade in services. In this case, countries trade more with partners with similar regulations. A low heterogeneity index (harmonization or convergence of standards) is associated with a strong stimulation of services trade. According to their study, if the STRIs of importer and exporter countries are low, harmonization stimulates trade in services, but if the STRIs are high, harmonization attempts to limit trade.

Another approach that differs from the first is the analysis of Ingo and al. (2012). They use the restrictiveness index developed by the World Bank, and not the OECD measure, to capture the impact of regulatory policies on trade in services[7]. Through the PPML estimate, they find that higher levels of STRI discourage investment. Van der Marel and Shepherd (2013) in his analysis (very similar to the previous one) also finds a negative relationship between the World Bank's bilateral restrictiveness index and cross-border trade in transport and financial services. Riker, D (2014), in his study highlights the impact of restrictions on foreign suppliers (import restrictiveness index) and cross-border trade in services. He also finds negative effects of the latter on cross-border trade in services. Further, it simulates the effect on U.S. financial services exports if its trading partner eliminated restrictions on these imports from all countries. He notes that, while China and India do not apply any barriers to market entry, the United States is recording a significant rise of its financial services exports, both in dollars ($186.0 million and $42.2 million) and rate change (10.14% and 3.76%). On the other hand, in a country like Germany, US exports have increased slightly (7.7 million dollars or 0.23%). Indeed, according to him, in the financial services sector, Germany is a relatively important export market for the United States, after the United Kingdom, but the impact on trade is less, because the level of restrictiveness in this country is relatively low compared to

[7]Foreign investment inflows and access to financial services through the provision of bank lending.

countries like China or India.

Another analysis that differs from those mentioned above and that is part of our paper remains Ariu and al (2018). They explore the interaction between international goods trade and restrictions on services. They consider data from Belgian firms from 1995 to 2005, data on PMR index (Product Market Regulation) and customs duties on goods and services. They come to the following conclusion: when import barriers for goods and commodities rise, we have a decrease of firms'import of services. Further, these authors use their results to quantify the impacts of lowering barriers to goods and services on trade between US and EU. They find that liberalization of services sector has direct and significant effects on goods trade.

Our paper also contributes to recent literature on firm-level trade in services (Breinlich and Criscuolo, 2011; Crozet et al, 2016; Ariu, 2016; Conti et al., 2010; Gaulier et al., 2011; Walter and Dell'mour, 2010). These studies describe characteristics of firms exporting services and find that very few firms are able to export services due to regulatory barriers in the market.

ii. Analysis of the Tariff Equivalent of Restrictive Policies in Services

The literature formerly discussed shows that the restrictions of services has negative effects on international trade. However, we do not specify the transmission channels through which these negative effects work. At this level, we assume that all restrictions on trade in services can be converted into tariff equivalents, Whalley (2004).

In this section, two methodologies are used : the analysis by the residues obtained from the gravity equation, Park (2000) and the fixed effects method of importing countries [8], Fontagné, Guillin and Mitaritonna (2011); Guillin, A (2013) and Fontagné, Mitaritonna and Signoret (2016). For them, the difference in trade flows between the presence of market entry restrictions and so-called "Benchmark" restrictions explains these tariffs [9]. In other words, tariff equivalents are deducted by comparing importing country fixed effects or residues of model with restrictions against "benchmark" restrictions. They come to the same conclusion that developed countries have low levels of restrictions in their markets and developing and emerging countries apply high tariffs on services. Although this methodology has data advantages (to fill data gaps), it also has important weakness: this method implies that the unobserved importer-level demand factors, other than GDP and price index measures, are captured by the trade barrier estimations. In this case the fixed effects of importing countries do not only consider non-tariff barriers but also the demand factors of the importing country, Deardorff and Stern (2007). The computation of tariff equivalents using the importing country's fixed effects not reflect the correct tariff computation because the latter covers all unobservable events and not just restrictions. Therefore, it is better to use the residual method.

In order to provide solutions to omitted variables bias in previous analyses, Gooris

[8] extension of Park (2002).

[9] The "benchmark" restrictions are compared to countries with the largest positive difference between the average effective value of imports and the average expected value.

and Mitaritonna (2015) add importing country price index to the classical variables. They compute the tariff equivalents by assessing the ratio of service flows at a given restrictiveness level over benchmark flows without restrictions.

The second-analysis of computation of tariff equivalents, which differs from the first, is based on a standard econometric model. Authors such as Jafari and Tarr (2017); Rouzet and Spinelli (2016) and Khachaturian (2015) compute the tariff equivalents of restrictive policies through a price-cost margin of foreign firms. They use the price performance index as a variable to capture tariffs for restrictive policies in services. According to their interpretation, a positive impact increasing the price-cost margin is considered as a consumption tax (paid by the consumer and seen as a rent for the producer) and a negative coefficient of STRI index on price-cost margin is production tax, supported by the producer and not imposed on the consumer. Moreover, after the econometric analysis, they compute the tariff equivalent of regulation by differentiating the price with restrictions from price without restrictions. Their results suggest that in all sectors, high-income countries have lower tariff equivalents than emerging and least developed countries. However, the analysis of tariff equivalent by prices is very limited, because it is necessary to identify the appropriate prices to use and this is likely to be problematic. While it is fairly easy to obtain information on the price paid by the importers of a good, it might become difficult to obtain the domestic market price especially at a disaggregated level [10].

The review's analysis shows a negative impact of STRI index on trade flows, and significantly affects the banking and transport sectors. The divergence of regulations between countries has a significant negative impact on trade. Our work is a extension of previous studies that addressed the issue of standards in international trade.

III. Gravity Model of Bilateral Trade

In order to conduct an empirical analysis of effects of restrictive measures on trade flows, we use gravity model developed by Anderson (1979). It is based on the assumption that products are differentiated by the origin of country, i.e. by location (Armington's hypothesis), where consumers have defined preferences for these differentiated products. In this approach, each country can import a good from another country at any market price. In this case all goods are traded, all countries trade and in balance, national income is the sum of domestic and foreign demand for the single good produced. In its model, trade costs are considered as transport costs.
After Anderson's theoretical approach, authors started from trade theories to find a theoretical framework for the gravity equation. Bergstrand (1989) shows that a gravity equation remains a direct implication of a trade model based on monopolistic competition by Paul Krugman (1980). Identical countries manage to exchange differentiated goods because consumers prefer variety. According to concept of monopolistic competition, it is not the location of firms that determines differentiated goods trade but the preference of consumers for variety. Eaton and Kortum (2002) derive a gravitational equation from a Ricardian model, and Helpman and al (2008); Chaney, T (2008) obtained it from a theoretical model of international trade by firm heterogeneity.

[10] This becomes even more difficult if data collection has to be done for a large set of countries.

The general formulation of the gravity equation is as follows:

$$X_{ij}=GS_iM_j\Phi_{ij}$$

Where X_{ij} is the value of exports from country i to country j, M_j represents demand of importing country (importing country's GDP), S_i is the value of exporting country's GDP, G is a variable that does not depend on i or j and represents the level of global liberalization, Φ_{ij} represents the ease of access by exporter i to market j.

Anderson and van Wincoop's (2003) show that the control of trade costs remains crucial in order to properly specify the gravity equation. However, trade costs are very important for the gravity equation. Two countries will trade less if they were separated by an ocean or by vast stretches of deserts and mountains. Trade between two nations for this purpose is determined by relative trade costs, i.e. trade costs between the two nations (absolute costs) and trade costs between the country (importer, exporter) and the rest of the world, which will be called the MTR (Multilateral Trade-Resistance). However, the multilateral resistance can be controlled through the time fixed effects of importing and exporting country, (Anderson and Yotov, 2012) or using a proxy.
To estimate this equation, we need to linearize it. Using the logarithm of each variable in the model, the equation becomes :

$$LnX_{ij} = a_0 + a_1 lnY_i + a_2 lnY_j + a_3 lnt_{ij} + a_4 ln\Pi_i + a_5 lnP_j + \epsilon_{ij} \quad (1)$$

Where a_0 is the constant, a_3= 1- σ, X_{ij} is the value of exports from country i to country j, Y_i and Y_j the GDP of exporting and importing countries, t_{ij} bilateral costs between our pairs of countries, Π_i terms measuring barriers to trade between each country and the rest of the world, P_j the price index of importing country, ϵ_{ij} is the error term. In practice, the gravity equation links the logarithm of monetary value of trade between two countries to logarithm of their respective GDPs, a composite term reflecting barriers and trade incentives between these two countries, and terms measuring barriers to trade between these countries and rest of the world.

IV. Individual STRIs and Food Exports : Augmented gravity models

Using Anderson and Van Wincoop's (2003), Anderson and Van Wincoop (2004), our baseline regression equation is the following:

$$X_{ij,t} = exp[\beta_0 + \beta_1 t_{ij} + \beta_2 Z_{ij,t} + \beta_3 STRI_{i,kt} + \beta_4 STRI_{j,kt} + \mu_{it} + \gamma_{jt} + \alpha_t + \epsilon_{ijt}] \quad (2)$$

Where (i) and (j) denote trading partners, (t) to is year.
$X_{ij,t}$ denotes nominal food exports from exporter (i) to importer (j) in year (t). We use nominal exports and not those deflated by U.S. aggregate price indexes to avoid bias

problems. Since there are global trends in inflation rates, inclusion of this term probably creates biases via spurious correlations, Baldwin and Taglioni (2006). t_{ij} is the vector of time-invariant bilateral control variables (bilateral distance, common language, common border) [11], $Z_{ij,t}$ is a time-variant vector of bilateral variables. We have Real Effective Exchange Rate (REER), binary variable equals 1 if i and j share the same regional trade agreement (RTA) and 0 otherwise [12]. $STRI_{i,kt}$ and $STRI_{j,kt}$ are the STRI indices of respectively the exporter and the importer on a scale of 0 to 1, they represent our explanatory variables of interest and capture the level of restrictions in exporter and importer countries in the sector k (banking, accounting, transport and logistics sectors), μ_{it} and γ_{jt} are other variables that vary respectively of exporting and importing country in year t, α_t is a year fixed effect (capture the global macroeconomic cycle) and ϵ_{ijt} is a error term.

V. Data sources

As mentioned above, our paper attempts to analyse the effects of restrictive measures in services on food trade flows. Indeed, we use panel data on trade in food products between 36 OECD countries (bilateral trade between countries) from 2014 to 2018. Indeed, panel data have the advantage of reducing the bias generated by heterogeneity between countries. While in a cross-section, trade between pairs of countries can only be controlled by the observed characteristics of pairs of countries (such as common language, common border). In a panel the heterogeneity of country pairs can be controlled using country pair fixed effects. The data for 2014-2018 are based on the implementation and evolution of the STRI index. We focus on food products to examine the impacts of services restrictions on this sector, so it is heavily affected by sanitary and phytosanitary (SPS) standards and technical regulations (TBT). SPS standards have significant effects on food trade than TBT requirement. The most affected products are food and live animals, Oil seeds, oleaginous and perishable products, see Table A.4.

To perform this study, we use informations about bilateral food exports (annual frequency) from United Nations Conference on Trade and Development database (UNCTADstat) which uses the Classification Standard International Trade (SITC Rev.4)[13]. The choice of service sector is essential because it accounts for almost 2/3 of world GDP and nearly 80% of total employment in OECD countries. We consider the banking, accounting, transport and logistics sectors due to their significant role in the movement of goods and commercial presence Ariu and al (2018). We also introduce an index that captures the level of restrictions in services sector (STRI). The STRI Index provides a database of regulations affecting trade in 22 service sectors in 46 countries[14]. For each sector the database covers 5 policy areas: restrictions on the entry of foreigners, restrictions on the movement of persons, other discriminatory measures, barriers to competition and regulatory transparency. The qualitative information on these 5 areas

[11] Dummy variables equal 1 if countries share a common border, comman language and 0 otherwise.

[12] We include dummy variables that represent European Economic Area (Intra EEA) to control the deeper integration in services, and NAFTA, which is a major trade agreement on commodities.

[13] Data can be accessed at: https://unctadstat.unctad.org/wds/TableViewer/dimView.aspx

[14] 36 OECD countries plus Brazil, People' s Republic of China, Colombia, Costa Rica, India, Indonesia, Malaysia, Russia, South Africa and Thailand

has been converted into quantitative indices by sector ranging from 0 to 1 (where 0 corresponds to no restrictions and 1 to a sector completely closed to service providers). Data are available on the OECD STRI database[15]. The data of real effective exchange rate are extracted of WORLD BANK database. Bilateral resistance variables such as the bilateral distance between the two capitals, common border, and language from CEPII database, binary variables that materialize regional trade agreements[16] extracted from WTO (Regional Trade Agreements Information System, RTA-IS).

VI. Econometric Issues

Several questions related to estimation of standard gravity equation are considered in our study. Recently, researchers identified three problems inherent in gravitational models: zero trade flows, terms of multilateral trade resistance and endogeneity issue. The estimation of gravity equation will be conducted with an OLS estimator. However, the results of this estimator may constitute a bias in the presence of "Zero trade" also in the presence of heteroscedasticity, OLS estimation may not be consistent. Indeed, this estimator not including countries not trading with each other, compromises our results, because zero trade reveals crucial information (lack of information, high transport costs, landlocked countries) so omitting it can constitute a considerable bias in our study[17]. If we look at our database, zero trade represents less than 5% of all trade. But the question of heteroskedasticity leads us to consider better estimator.

One way to deal a zero trade issue consists of using a two-step estimation procedure. The decision to export is evaluated in the first step, while the second step focuses on the value of exports. Heckman's model appears to be the best in the literature. However, in the presence of fixed effects in the first stage, the Heckman model leads to the incidental parameter problem. Helpman et al. (2008) also developed a two-stage estimation procedure that focuses both on extensive estimation (export decision from i to j) and intensive margins (export volume) of trade. While this approach offers a better understanding of the determinants of trade flows, it provides biased estimates in the presence of heteroscedasticity in the trade data, Santos Silva and Tenreyro, 2013. To avoid biased estimation results, we use the Poisson estimator suggested by Silva and Tenreyro (2006) [18]. The PPML is used in our case in order to face the constraints of zero trade between States, it also estimates the non-linear shape of the gravity model in the presence of heteroscedasticity. However, important assumption of PPMLs estimator is equidispersion, which means the conditional variance of dependent variable and its conditional mean are equal. PPML estimation can be assessed by solving the following condition:

$$\sum_{p}(X^{p}\text{-}exp(Z^{p}\beta)) = 0 \tag{3}$$

where p is the country pairs, X^{p} is the unilateral trade (i.e. exports or imports) between

[15] https://stats.oecd.org/Index.aspx?DataSetCode=STRI.

[16] We use trade agreements on both goods and services, as we study the effects of restrictions in services on food products.

[17] Indeed, zero commerce is associated with high bilateral fixed costs of trade.

[18] Pseudo-Maximum Likelihood Estimator (PPML).

country pairs in non-logarithmic levels and Z^p is complete vector of gravity equation as defined above.

To obtain a consistent estimate, the literature stipulates to include both exporter-year and importer-year fixed effects in the estimations, to take account inward and outward multilateral resistance, Feenstra, 2004; Baldwin and Taglioni 2006; Baier and Bergstrand 2007. This method is not feasible in our study because country fixed effects would absorb the effect of STRI and preclude us from dissociating its impact from that of other country-specific characteristics. Indeed, these fixed effects consider multilateral trade resistance terms (MTRs) and size effects such as severity, but also other determinants of origin and destination country that are not considered in the specific mode[19]. This method will be considered in section 8, where we will use the index of regulatory heterogeneity between pairs of countries with importer and exporter year fixed effects.

To solve the endogeneity issue between our dependent variable and the interest variable STRI[20], literature suggests using an instrument for service trade restrictiveness. Section 10 discusses the endogeneity issue.

VII. Empirical Results

We estimate the effects of restrictions in 6 service sectors on food trade using a gravity model with PPML as estimate. The results are presented in Tables A.5 to A.8. Table A.5 shows the results on overall food trade (columns 1 to 6). In other cases, we have the results on disaggregated food trade according to the Standard International Trade Classification (SITC) for disaggregated trade flows.
In the different specifications, we find the following effects: our dummy variables representing the common border, regional trade agreements, Intra-EEA, and and importer's and exporter's GDP have positive and significant impacts on food trade between OECD member countries. Bilateral distance have restrictive effects on trade flows (significant result), Disdier and Head, 2008, Head and Mayer, 2014. The real effective exchange rate has not significant effect on trade flows. We think that the bilateral exchange rate does not have significant effects, but exchange rate volatility has significant negative effects on trade flows, Jong Woo Kang and Suzette Dagli (2018).

If we look at our control variables, service restrictions in both importing and exporting countries have no significant effects on aggregate food trade. These effects become significant and negative when we consider bilateral trade in disaggregated food products. A careful analysis shows that the products most affected by its restrictions remain agricultural raw materials and perishable products (meat, dairy products, eggs, etc.). The restrictions of the exporting country have a greater limitative effect on disaggregated food exports. A higher STRI of the exporting country is associated with significantly lower exports. In services, restrictions in logistics customs brokerage, accounting, banking and road transport impact food exports (respectively significant at least at the 10, 5 and 1 per cent level in customs brokerage, banking, accounting and road transport on perishable products and least at 1 per cent on agricultural raw materials).

[19] We have :GDPs, population, most favored nation (MFN), tariffs.

[20] More open economies are encouraged to implement more liberal policies, which creates reverse causality between these policies and trade.

Banking and accounting activities have a very key role in the export of food and manufacturing products through commercial presence. Exporters have less incentive to establish in an area with huge barriers in the banking and accounting sector. One reason is that large restrictions in the OECD countries' banking sector hamper export financing. In this case, the lending is costly and therefore does not allow the establishment of a commercial presence abroad, Paravisini et al (2014). In road transport and logistics sectors, restrictions in these sectors affect food trade than maritime sector. Food products are sensitive and perishable over time. Road transport appears as a mode of transport with a long transit time. More transport time is longer due to restrictions; more the product will have a poor quality on arrival.

This study shows the detrimental impact of services restrictions on global value chains and quality of products. The novel conclusion is that services are strongly linked to commodities through their use as inputs in the production and trade of goods. It also shows that services restrictions implemented by a country have negative effects on export performance, NordÅs and Rouzet (2016). The negative correlation assumes a competitiveness channel linking services regulation and exporter performance. These restrictions particularly excludes small food exporters because export costs are very high.

VIII. Regulatory Difference in Services and Food Trade

In this section, we investigate the impact of the regulatory difference in services between pairs of countries on food exports. Following Kox and NordÅs (2007), the regulatory difference between pairs of countries emerges as the most restrictive trade policy compared to individual country restrictions. Indeed, this regulatory disparity is considered as bilateral trade costs and affects trade through gravity estimation.

Using the index of regulatory heterogeneity between country pairs of OECD countries in services[21], we estimate its effects on aggregate food exports. The index is constructed as follows: from the database of country specific STRIs, for each sector we create a matrix where each cell contains country i and j for measure m [22]. If the pair of countries has the same answer for measure m, the cell is scored as zero and 1 otherwise. For each country pair and each measure, a heterogeneity index is created by computing a weighted average of these scores (an average of the 5 measures).

We have two types of index, one based on qualitative responses on the presence or absence of regulations and another on the score that highlights the restrictiveness of regulations. Similar the individual STRI measures, they are scored on a scale of 0 to 1 (less restrictive to services closed to foreign suppliers).
To capture the effect of the regulatory difference on bilateral food flows, we construct an interaction variable between individual STRI variable (exporter and importer) and the regulatory heterogeneity variable. Indeed, the regulatory disparity has less important effects on trade if the importer or exporter country is completely closed to service providers and significant impacts if the countries are open to services, NordÅs and

[21] STRI regulatory heterogeneity indices.

[22] Barriers to entry, competition, restrictions on movement of persons, other discrimination, regulatory transparency.

Rouzet (2016).
Our gravity equation is as follows

$$X_{ij,t} = exp[\alpha_0 + \alpha_1 t_{ij} + \alpha_2 Z_{ij,t} + \alpha_3 STRIheter_{ij,kt} + \alpha_4 STRIheter_{ij,kt} * STRI_{i,kt} + \alpha_5 STRIheter_{ij,kt} * STRI_{j,kt} + \mu_{it} + \gamma_{jt} + \epsilon_{ijt}] \quad (4)$$

With $STRIheter_{ij,kt}$ the regulatory difference between country pair in sector k at year t [23], $STRIs_{i,kt}$, $STRI_{j,kt}$ are STRIs of exporting and importing country, μ_{it}, γ_{jt} dummy variables that represent the exporter-importer year fixed effects (inward and outward multilateral resistance). The inclusion of country year fixed fixed effects in the gravity equation accounts for the multilateral price terms at the same time as well as variation in all time-varying country variables, Feenstra, 2004; Baldwin and Taglioni 2006; Baier and Bergstrand 2007.

The results with PPML as estimate is presented in Table A.9 and Table A.10. Columns 1 to 6 represent the results of the regulatory disparity on trade flows and the rest the effects of our interaction terms. The regulatory difference in cargo handling, customs brokerage and banking sectors have negative and significant values in our regression. In addition, our interaction variables have negative and significant signs in cargo-handling, customs brokerage and banking sectors. The negative sign of the regulatory difference and our interaction terms suggest that the regulatory difference has negative effects on food exports although both exporting and importing countries are totally closed or opened to service providers.
Regulatory disparity has important effects on services trade if countries are open to services suppliers and less important effects if they are completely closed, NordÅs and Rouzet (2016) . In this case individual country restrictions remain the main barrier to entry for service suppliers. In food trade, disparity of regulation in services, sanitary and technical standards are the main barrier to entry of products.

IX. Robustness check

Our main gravity estimates suggest negative and significant results for the impact of regulatory heterogeneity on food exports. We performed four robustness tests to evaluate the sensitivity of our results by focusing on the level of restrictions between countries.

The first test considers the regulatory disparity between EEA countries. Using an interaction variable between the binary variable EEA and the regulatory disparity, we estimate the effects on aggregate trade in food products. The EEA reflects a fully integrated internal market governed by the free movement of goods and services.
The results are presented in Table A. 11. They are positive and significant in all sectors. The low regulatory disparity between EEA countries boosts food trade contrary to countries with high disparity.

Second, we estimated the consequences of the regulatory difference between OECD and non-OECD (emerging) countries on their food trade. We consider OECD countries

[23] We use score index to compare it to individual country restrictions based on the score

as exporting countries and emerging countries as importing countries. The results presented in Table A.12 show negative and significant impacts at less than 10% in the cargo handling sector, banking and very significant in the maritime sector. Compared these results to the third test (Table A.13) where the exporting are the emerging countries and the importing are the OECD countries, we find negative and significant impacts in the logistics sector (cargo handling and customs services) and the maritime sector. The regulatory disparity in services has greater negative effects on North-South or South-North trade. The disparity in logistics and maritime services emerge as restrictive on trade flows. Regulatory cooperation between North-South countries would be beneficial for international food trade.

The third test investigates the impact of the regulatory difference on bilateral food trade between net food exporting and importing countries as classified by UNCTADstat [24]. Table A.14 presents the results and shows the limiting and significant effects of restrictions in logistics, banking and road transport services. This confirms our results and strengthens evidence that the regulatory disparity in services affects food trade.

The last robustness test examines the consequences of the regulatory disparity on bilateral trade in manufactured and intermediate goods[25]. The aim is to compare the effects of the regulatory disparity on food and on manufactured and intermediate goods. The results presented in Table A.15 show negative and more significant effects on manufactured and intermediate goods than food trade.

X. Endogeneity Issue

To solve the endogeneity issue between the regulatory heterogeneity in services and the independent variable, the literature suggests using an instrument that is correlated with the regulatory heterogeneity variable and uncorrelated with the error term. This endogeneity occurs when we consider liberal policies in the EU. EU countries trade more with each other because the restrictions are lower (so we have an reverse causality between these restrictions and food trade). Despite the free movement of goods and services, disparities in banking, accounting and legal services among EU Member States negatively affect trade, NordÅs and Rouzet (2016).
Regulatory Disparity are composite measures that capture each country's restrictive policies to create a composite index by country pair. However, it is very difficult to find an instrument that is closely related to our variable of interest. But to reduce the risk of bias caused by endogeneity, we will consider the lagged variable of regulatory disparity. Indeed, the index of regulatory disparity remains invariant in some sectors, so the measure implemented this year explains the measure for the following year.
The results are reported in Table A.16 and show negative and significant effects of regulatory disparity in the logistics and banking sector on trade in food commodities.

[24] United Nations Conference on Trade and Development (UNCTAD).
[25] Data extracted from UNCTADstat for manufacturing goods and OECDstat for intermediate goods

XI. Conclusion

This study is an extension of previous studies based on the impacts of services restrictions on international trade. However, it differs from earlier studies because we examine restrictions in 6 service sectors on trade of food products, topic not studied in the literature. As a result of this analysis, harmonization policies have been highlighted.

Indeed, our paper aims to study the impacts of service standards on food trade, presented a tool for quantifying services restrictions and evaluated these effects on trade flows. We started from a gravity modeling using panel data on bilateral trade in food products between OECD countries from 2014-2018. We find that restrictions in services have non-significant effects on overall food trade. However, there are negative and significant effects on the disaggregated trade in food goods, particularly on agricultural raw materials and perishable products. The restrictions implemented by the exporting country have greater restrictive effects on exports than the importing country's restrictions. Regulations in the logistics, banking, accounting and road transport sectors are restrictive on food trade.
The regulatory difference between countries in logistics and banking negatively impact overall food export.

The results seem robust to alternative specifications. Four different aspects were analyzed. First, we estimate the effects of the regulatory difference in EEA countries on food trade, second, the effects of regulatory difference on trade between OECD and emerging countries (North-South), and third, the impact on trade between emerging and OECD countries (South-North). Finally, estimate the consequences of the regulatory difference on trade between net food exporting and importing countries.
The results of our robustness checks show significant and positive effects of EEA countries regulations on trade. The regulatory disparity has negative and more significant effects on South-North than North-South trade. It profoundly affects trade between major food exporters and importers. The more restrictive rules of the emerging countries have negative effects on their export performance.

Our study differed from existing literature, however, it has limitations based on the data. Indeed, the restrictiveness indices in services are composite measures that invariant over time for some sectors, so the data are very short (2014-2018). Regulations are adjustment policies that require time if a firm or exporter does not have resources to conform. Therefore, the data would not capture the effects on trade over the long term. However, we can improve our study by considering subsidy policy coupled with regulation. It may be useful to consider a binary variable reports the existence of a "Most favoured nation" MFN and "National treatment" clause to take account treatment subject to foreign export once on the domestic market.

This study of impacts of services restrictions on food products shows that regulatory cooperation between countries has become an increasingly key element in international food trade. Regulatory harmonization in economic integration areas or harmonization of regulations between emerging and developed countries, net food exporters and importers countries significantly stimulate trade flows.

XII. APPENDIX

Table A. 1:
OECD, non OECD, EEA and Major net food-exporting countries

OECD countries	Non-OECD Emerging countries	EEA countries	Major net food-exporting economies
Australia	*China*	*Austria*	*Australia*
Austria	*(People'sRepublicof)*	*Belgium*	*Belgium*
Belgium	*Colombia*	*CzechRepublic*	*Brazil*
Canada	*CostaRica*	*Denmark*	*Canada*
Chile	*India*	*Estonia*	*Chile*
CzechRepublic	*Indonesia*	*Finland*	*CostaRica*
Denmark	*Malaysia*	*France*	*Denmark*
Estonia	*Russia*	*Germany*	*Hungary*
Finland	*SouthAfrica*	*Greece*	*Iceland*
France	*Thailand*	*Hungary*	*Indonesia*
Germany		*Iceland*	*Ireland*
Greece		*Ireland*	*Mexico*
Hungary		*Italy*	*Netherlands*
Iceland		*Latvia*	*NewZealand*
Ireland		*Lithuania*	*Norway*
Israel		*Luxembourg*	*Poland*
Italy		*Netherlands*	*SouthAfrica*
Japan		*Norway*	*Spain*
Korea		*Poland*	*Thailand*
Latvia		*Portugal*	*Turkey*
Lithuania		*SlovakRepublic*	*UnitedStates*
Luxembourg		*Slovenia*	*of America*
Mexico		*Spain*	
Netherlands		*Sweden*	
NewZealand		*Switzerland*	
Norway		*UnitedKingdom*	
Poland			
Portugal			
SlovakRepublic			
Slovenia			
Spain			
Sweden			
Switzerland			
Turkey			
UnitedKingdom			
UnitedStates			

Table A.2:
Descriptive statistics

Variables	obs.	Mean	Std. Dev.	Min	Max
$Aggregated food$	6,298	4.06e+08	1.67e+09	0	2.63e+10
$Manufacturing\ goods$	6,297	4270767	1.56e+07	4.034	3.01e+08
$Intermediate\ goods$	6,297	2763745	1.06e+07	0	2.30e+08
Disaggregated food products					
$Foods\ live\ animal$	6,258	422482.8	1617761	0.006	2.50e+07
$Beverages$	6,051	56961.86	229428.3	0.002	5440184
$Animal\ and\ vegetable\ oil$	5,245	25735.59	122478.2	0.001	2191775
$Oils\ seeds$	3,987	20541.02	114354	0.002	2175221
$Agricultural\ raw\ materials$	6,158	79133.7	358488.1	0	9402706
$Perishable\ products$	6,300	148378.6	496587.5	0	8289848
Traditional variables of the gravity model					
RTA	6,300	0.8009524	0.3993156	0	1
$lang_{ij}$	6,300	0.0587302	0.2351376	0	1
$border_{ij}$	6,300	0.0642857	0.2452807	0	1
$Ln\ dist_{ij}$	6,300	3.469138	0.5056946	1.775372	4.29195
$GDP_{i,t}$	6,300	1.39e+12	2.92e+12	1.50e+10	1.79e+13
$GDP_{j,t}$	6,300	1.39e+12	2.92e+12	1.50e+10	1.79e+13
$Intra\ EEA$	6,300	0.4777778	0.4995456	0	1
$NAFTA$	6,300	0.0047619	0.0688475	0	1
$Ln\ REER$	5,599	1.989038	0.0534931	1.841338	2.194555
Heterogeneity STRI					
$Logis\ cargo\ hand_{ij,t}$	6,300	0.237079	0.0679761	0.063	0.472
$Logis\ customs\ bro_{ij,t}$	6,300	0.2320959	0.147744	0.03	0.822
$Accounting_{ij,t}$	6,300	0.3021184	0.1321572	0.083	0.867
$Banking_{ij,t}$	6,300	0.2225016	0.0617251	0.055	0.426
$Road_{ij,t}$	6,300	0.2035533	0.1104277	0.024	0.646
$Sea_{ij,t}$	4,350	0.2569039	0.0770907	0.061	0.501
Exporter STRI					
$Logis\ cargo\ hand_{i,t}$	6,300	0.2174444	0.0637243	0.12	0.41
$Logis\ customs\ bro_{i,t}$	6,300	0.2171111	0.1312967	0.11	1
$Accounting_{i,t}$	6,300	0.2858889	0.1610676	0.1	1
$Banking_{j,t}$	6,300	0.2031111	0.053766	0.13	0.37
$Road_{i,t}$	6,300	0.2002778	0.0852739	0.1	0.62
$sea_{i,t}$	5,250	0.236	0.0604927	0.15	0.35
Importer STRI					
$Logis\ cargo\ hand_{j,t}$	6,300	0.2174444	0.0637243	0.12	0.41
$Logis\ customs\ bro_{i,t}$	6,300	0.2230556	0.14338	0.13	1
$Accounting_{i,t}$	6,300	0.286	0.1609945	0.1	1
$Banking_{i,t}$	6,300	0.2033889	0.053568	0.13	0.37
$Road_{i,t}$	6,300	0.2003333	0.0852639	0.1	0.62
$sea_{i,t}$	5,250	0.2360667	0.0604364	0.15	0.35

Figure A. 1:
Tariff rate, applied, simple mean, all products (%)

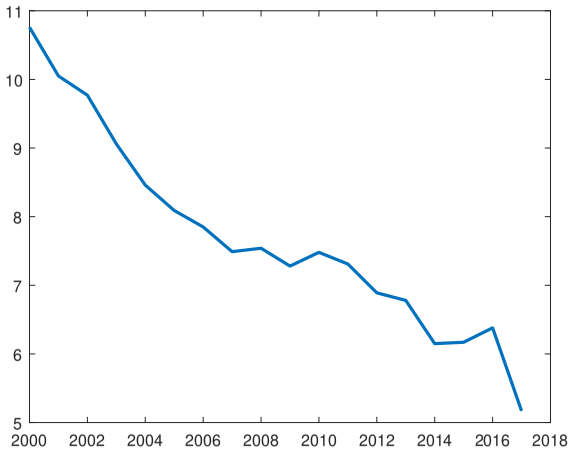


Figure A. 2:
OECD countries' sectoral STRIs in 2017

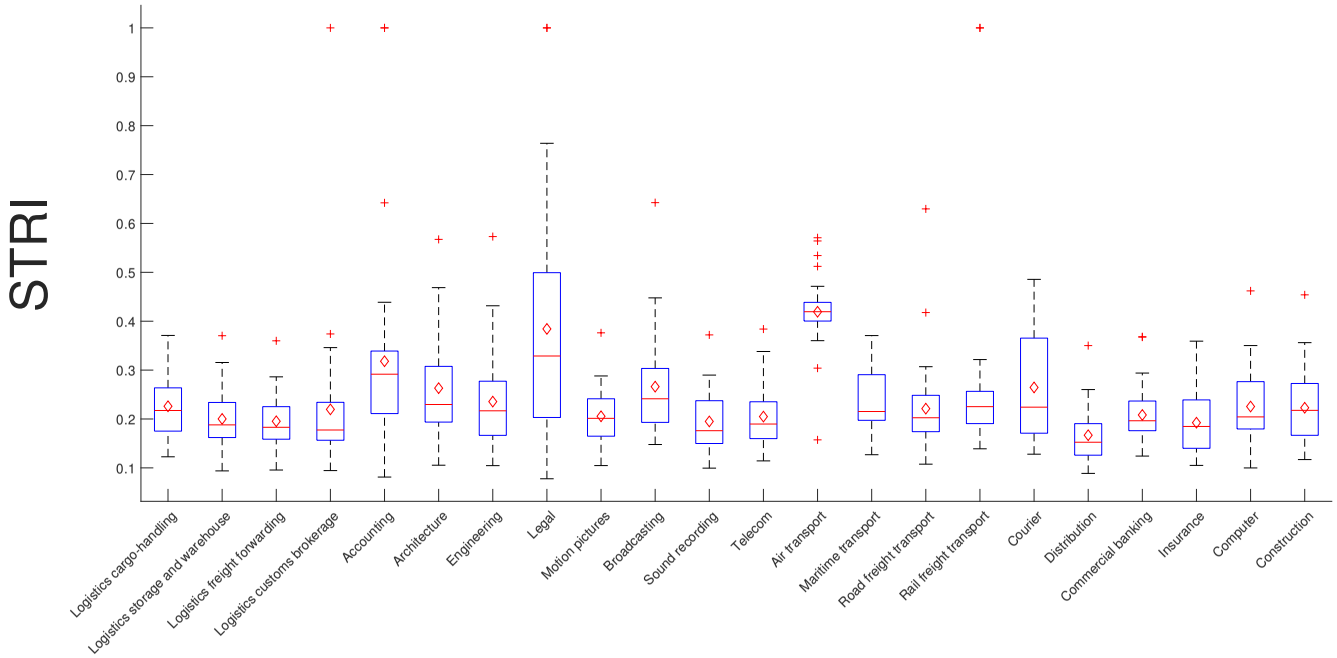
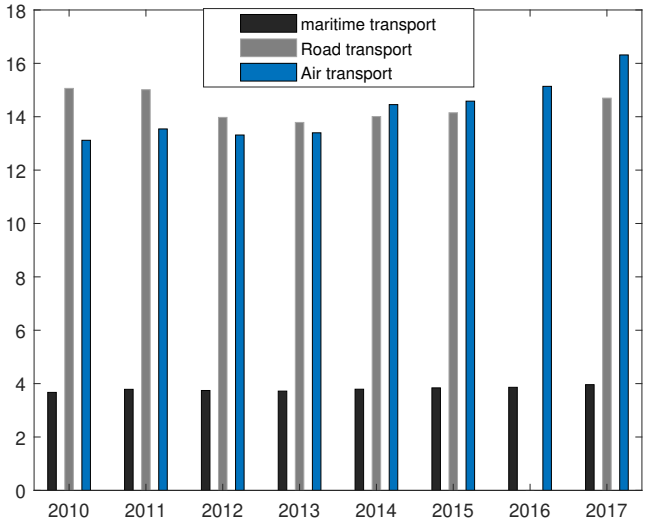


Figure A. 3:
Extra European Union goods transported in thousands of tonnes



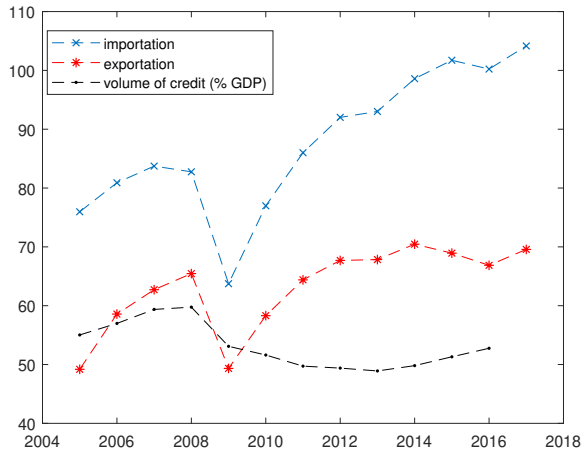


Figure A. 4: US import, export and credit volumes from 2005 to 2017

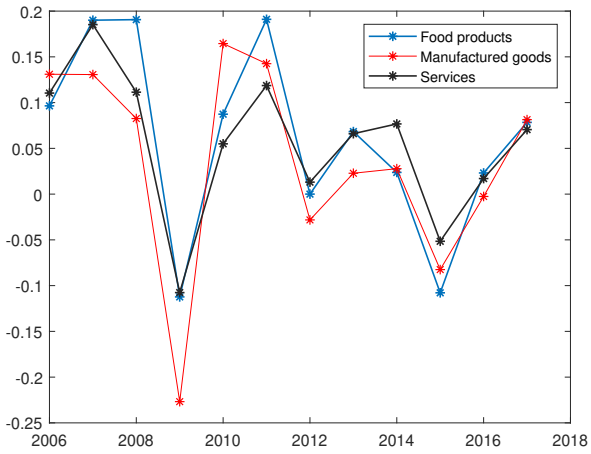


Figure A. 5: OECD countries' annual export growth from 2005 to 2017

Table A.3:
Intermediate Consumption of Food Products, beverages and tobacco in 2015 : Input-Output Table

		Australia	Austria	Belgium	Canada	Chile	Czech	Denmark	Estonia	Finland	France	Germany	Greece	Hungary	Iceland	Ireland
Agriculture forestry and fishing	Consumption in millions US	22848,2	3750,3	7719,7	27050,9	7908,2	3873,2	3273,4	485,9	2094,2	34108	32038,1	5069,5	3789,7	1055,9	2128,4
	% of Total intermediate consumption	**42.64**	**23.60**	**23.27**	**30.62**	**37.36**	**38.62**	**21.65**	**37.33**	**23.74**	**28.52**	**23.35**	**45.40**	**44.16**	**50.16**	**8.7**
Industry	Consumption in millions US	12033,8	5809,6	12282,8	36169,8	6686	2873,6	4820,7	378,5	3284	38012,7	54322,9	2567,7	2406,9	452,2	10241,1
	% of Total intermediate consumption	**22.46**	**36.56**	**37.02**	**40.94**	**31.58**	**28.65**	**31.88**	**29.08**	**37.23**	**31.79**	**39.60**	**22.99**	**28.04**	**21.48**	**41.97**
Services	Consumption in millions US	18690,6	6328,7	13169,5	25122,7	6570,9	3282,2	7024,6	437,1	3442,5	47442,1	50798,8	3528	2384,5	596,6	12026,1
	% of Total intermediate consumption	**34.88**	**39.83**	**39.70**	**28.43**	**31.04**	**32.72**	**46.46**	**33.58**	**39.02**	**39.67**	**37.03**	**31.59**	**27.78**	**28.34**	**49.29**

		Israel	Italy	Japan	Korea	Latvia	Lithuania	Luxembourg	Mexico	Netherlands	New Zealand	Norway	Poland	Portugal	Slovak Republic	Slovenia
Agriculture forestry and fishing	Consumption in millions US	3693,4	25603,7	52428,8	27898,7	526,8	1101,8	174,5	30244,9	14273,7	9312,2	5776,3	11969,4	3733,8	1323,4	426,3
	% of Total intermediate consumption	**28.02**	**22.25**	**26.83**	**34.22**	**37.09**	**38.08**	**23.72**	**36.04**	**24.90**	**45.17**	**28.63**	**27.74**	**28.57**	**44.03**	**29.57**
Industry	Consumption in millions US	5404,7	42480,9	67895	33380,4	350,6	682,6	93,3	24143,9	19793,8	5358,3	7273,6	16684,2	4580	739,5	483,7
	% of Total intermediate consumption	**41**	**36.93**	**34.75**	**40.94**	**24.68**	**23.59**	**12.68**	**28.77**	**34.54**	**25.99**	**36.05**	**38.67**	**35.04**	**24.60**	**33.55**
Services	Consumption in millions US	4081,7	46944,3	75052,6	20247,3	542,9	1108,9	467,8	29512,7	23238,2	5941,6	7121,5	14489,3	4753,6	942,4	531,3
	% of Total intermediate consumption	**30.96**	**40.81**	**38.41**	**24.83**	**38.22**	**38.32**	**63.59**	**35.17**	**40.55**	**28.82**	**35.30**	**33.58**	**36.37**	**31.35**	**36.86**

		Spain	Sweden	Switzerland	Turkey	United Kingdom	United States	**OECD Average**
Agriculture forestry and fishing	Consumption in millions US	28000,8	2929,1	6726,9	26654,4	17709,6	221344,9	
	% of Total intermediate consumption	**22.54**	**23.01**	**26.26**	**43.47**	**19.73**	**32.58**	**29.55**
Industry	Consumption in millions US	56118,3	3832,7	9600,3	17954,4	32573,2	197451,4	
	% of Total intermediate consumption	**45.18**	**30.11**	**37.48**	**29.28**	**36.29**	**29.06**	**33.66**
Services	Consumption in millions US	40064,4	5965,4	9281,2	16705,6	39464,9	260525,8	
	% of Total intermediate consumption	**32.26**	**46.87**	**36.24**	**27.24**	**43.97**	**38.35**	**36.78**

Table A.4:
SPS, TBT and Cross-Border Exports of Food Commodities: PPML Estimates

	Total food products SITC $0+1+22+4$	*Food and live animals SITC* 0	*Beverages SITC* 11	*Animal ,vegetable oils, fats and waxes SITC*4	*Oil seeds and oleaginous fruits STIC* 22	*Agricultural raw materials SITC* 2 *less* 22 *,27 and* 28	*Perishable products STIC* $01+02+03$
$Ln\ GDP_{i,t}$	1.4759***	1.4543***	1.6042***	1.4103***	1.4736***	1.1901***	1.2438***
	(0.0985)	(0.1098)	(0.1431)	(0.1550)	(0.2313)	(0.1247)	(0.1227)
$Ln\ GDP_{j,t}$	1.8255***	1.7657***	2.1190***	1.6451***	1.6410***	1.7038***	1.8850***
	(0.1158)	(0.1252)	(0.1522)	(0.2235)	(0.2438)	(0.1527)	(0.1281)
$Ln\ REER_{ij,t}$	0.9251	0.9167	1.0249	-1.3683	1.3180	1.6508	0.0145
	(0.7818)	(0.7856)	(1.2129)	(1.7109)	(2.0062)	(1.4936)	(1.1995)
$RTA_{ij,t}$	0.2907	0.5528**	-0.0665	-0.4222	-0.8749*	-0.0815	0.8126***
	(0.2138)	(0.2452)	(0.1858)	(0.3868)	(0.4856)	(0.2616)	(0.2800)
$NAFTA$	0.8088**	0.7444**	0.0546	1.1733***	1.5942***	1.1370***	0.1414
	(0.3352)	(0.3170)	(0.7164)	(0.3634)	(0.5968)	(0.2800)	(0.3227)
$Intra-EEA$	0.8011***	0.6587***	0.7075***	1.1777***	0.2934	0.5969***	0.5418***
	(0.1452)	(0.1589)	(0.1766)	(0.2581)	(0.3554)	(0.1828)	(0.2003)
$Ln\ dist_{ij}$	-0.9617***	-0.9640***	-1.0356***	-1.6352***	-0.2578	-1.0756***	-0.7640***
	(0.2080)	(0.2144)	(0.3220)	(0.3557)	(0.3898)	(0.2516)	(0.2250)
$lang_{ij}$	0.1376	0.0855	0.4212	-0.1377	-0.5197*	0.0040	0.1841
	(0.2048)	(0.2141)	(0.3002)	(0.3634)	(0.2877)	(0.1893)	(0.2129)
$border_{ij}$	0.8645***	0.9320***	0.3603	0.8310**	1.4564***	0.9006***	0.8251***
	(0.2118)	(0.2187)	(0.2488)	(0.3731)	(0.3939)	(0.2665)	(0.2166)
$SPS_{j,t}$	-0.0308*	-0.0352**	0.0227	-0.0371*	-0.1424***	-0.0233	-0.0545**
	(0.0161)	(0.0165)	(0.0211)	(0.0221)	(0.0386)	(0.0186)	(0.0213)
$TBT_{j,t}$	-0.0081	-0.0144	0.0558***	0.0301	-0.2287	-0.0261	-0.0236
	(0.0144)	(0.0150)	(0.0144)	(0.0261)	(0.1928)	(0.0295)	(0.0291)
R^2	0.725	0.694	0.381	0.413	0.362	0.637	0.539
Observations	5472	5449	5298	4688	3508	5349	5474
$Year-FE$	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes : *The dependent variable is bilateral food product.*
Columns (1), (2), (3), (4), (5), (6) *are performed using PPML estimation.*
Standard errors are reported in parentheses and clustered by country $-$ *pair level.*
$*$, $**$, $***$ *denote signicance respectively at the* 10% 5%*nd* 1%*levels.*

Table A.5:
STRI and Cross-Border Exports of Food Commodities: PPML Estimates

	Total food products ($SITC\ 0+1+22+4$)						*Food and live animals* $SITC\ 0$					
Model	*Cargo Handling*	*Custom Brokerage*	*Accounting*	*Banking*	*Road*	*Sea*	*Cargo Handling*	*Customs Brokerage*	*Accounting*	*Banking*	*Road*	*Sea*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	11	(12)
$Ln\ GDP_{i,t}$	1.4921***	1.5048***	1.4950***	1.4751***	1.4892***	1.2601***	1.4774***	1.4830***	1.4721***	1.4521***	1.4620***	1.2075***
	(0.0966)	(0.0961)	(0.0937)	(0.1013)	(0.0975)	(0.1202)	(0.1086)	(0.1077)	(0.1013)	(0.1136)	(0.1083)	(0.1365)
$Ln\ GDP_{j,t}$	1.7891***	1.8198***	1.8574***	1.7973***	1.7929***	1.6943***	1.7255***	1.7470***	1.8185***	1.7217***	1.7168***	1.6234***
	(0.0984)	(0.0977)	(0.1083)	(0.0982)	(0.0988)	(0.1206)	(0.1078)	(0.1080)	(0.1201)	(0.1084)	(0.1079)	(0.1290)
$LnREER_{ij,t}$	1.0946	1.2087	2.1564**	1.0468	1.0780	2.2260**	1.1306	1.2344	2.4630**	0.9843	1.0617	2.2066**
	(0.8407)	(0.8604)	(1.0259)	(0.8316)	(0.8549)	(0.9244)	(0.8410)	(0.8614)	(1.0958)	(0.8318)	(0.8617)	(0.9703)
$RTA_{ij,t}$	0.3026	0.2416	0.5352***	0.3331	0.3249	0.3435	0.5668**	0.5396**	0.8297***	0.6084**	0.6389**	0.5898**
	(0.2074)	(0.2297)	(0.2046)	(0.2174)	(0.2335)	(0.2103)	(0.2405)	(0.2594)	(0.2301)	(0.2480)	(0.2576)	(0.2358)
$NAFTA$	0.7355**	0.6116**	0.4304	0.7092**	0.7074**	0.6379	0.6765**	0.5841**	0.3283	0.6614**	0.6839**	0.5219
	(0.2959)	(0.2462)	(0.3224)	(0.3168)	(0.2958)	(0.4006)	(0.2864)	(0.2578)	(0.3136)	(0.3155)	(0.3150)	(0.3953)
$Intra-EEA$	0.8377***	0.8380***	0.7814***	0.7758***	0.7997***	0.4729**	0.7006***	0.6816***	0.6394***	0.6111***	0.6435***	0.2348
	(0.1491)	(0.1537)	(0.1452)	(0.1951)	(0.1524)	(0.2178)	(0.1615)	(0.1651)	(0.1568)	(0.1979)	(0.1614)	(0.2091)
$Ln\ dist_{ij}$	-0.9660***	-1.0869***	-0.9158***	-0.9826***	-0.9846***	-1.0785***	-0.9612***	-1.0450***	-0.9068***	-0.9692***	-0.9403***	-1.1531***
	(0.2052)	(0.2180)	(0.2016)	(0.2038)	(0.2080)	(0.2332)	(0.2172)	(0.2340)	(0.2062)	(0.2163)	(0.2199)	(0.2383)
$lang_{ij}$	0.1167	0.1664	0.1195	0.1036	0.1079	0.1141	0.0662	0.0941	0.0729	0.0451	0.0185	0.0520
	(0.2032)	(0.1928)	(0.1941)	(0.2104)	(0.2076)	(0.2353)	(0.2099)	(0.2156)	(0.1998)	(0.2265)	(0.2343)	(0.2398)
$border_{ij}$	0.8706***	0.8329***	0.8878***	0.8838***	0.8800***	0.9259***	0.9361***	0.9156***	0.9562***	0.9565***	0.9748***	1.0023***
	(0.2137)	(0.2138)	(0.1983)	(0.2131)	(0.2167)	(0.2275)	(0.2207)	(0.2259)	(0.2016)	(0.2223)	(0.2266)	(0.2326)
$STRI\ importer$	-1.6071	0.3360	-0.5589	-0.1405	-0.2704	-0.9301	-1.9092*	0.0683	-0.4298	-0.8263	-0.8637	-1.0900
	(1.1393)	(0.4105)	(0.4886)	(1.3449)	(1.0372)	(0.9915)	(1.1587)	(0.4657)	(0.5025)	(1.3317)	(1.1613)	(1.0624)
$STRI\ exporter$	1.4828	0.5939*	-1.5281***	-0.3725	0.1504	-1.4498	1.7268	0.4674	-2.0019***	-0.4010	-0.1863	-1.4062
	(1.2610)	(0.3556)	(0.4754)	(1.5827)	(0.7761)	(1.3102)	(1.3061)	(0.3717)	(0.5129)	(1.5099)	(0.8227)	(1.4572)
R^2	0.728	0.748	0.744	0.719	0.723	0.728	0.699	0.709	0.719	0.688	0.683	0.705
Observations	5597	5597	5597	5597	5597	3769	5568	5568	5568	5568	5568	3756
$Year-FE$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: *The dependent variable is bilateral food product.*
Columns (1), (2), (3), (4), (5), (6), (7), (8), (9), (10), (11), (12) *are performed using PPML estimation.*
Standard errors are reported in parentheses and clustered by country − pair level.
$*$, $**$, $***$ *denote signicance respectively at the* 10% 5%*nd* 1%*levels.*

Table A.6:
STRI and Cross-Border Exports of Food Commodities: Continued

	*Beverages SITC*11						*Animal and vegetable oils, fats and waxes SITC*4					
Model	*Cargo Handling* (1)	*Custom Brokerage* (2)	*Accounting* (3)	*Banking* (4)	*Road* (5)	*Sea* (6)	*Cargo Handling* (7)	*Customs Brokerage* (8)	*Accounting* (9)	*Banking* (10)	*Road* 11	*Sea* (12)
Ln $GDP_{i,t}$	1.5879***	1.6282***	1.6442***	1.6015***	1.6795***	1.4785***	1.3871***	1.3670***	1.4189***	1.2691***	1.3356***	1.1442***
	(0.1268)	(0.1167)	(0.1552)	(0.1242)	(0.1147)	(0.1544)	(0.1547)	(0.1528)	(0.1622)	(0.1474)	(0.1539)	(0.1785)
Ln $GDP_{j,t}$	2.2375***	2.2377***	2.0801***	2.2506***	2.1963***	2.0799***	1.6807***	1.7301***	1.7202***	1.6489***	1.7245***	1.4381***
	(0.1756)	(0.1620)	(0.1319)	(0.1853)	(0.1573)	(0.1633)	(0.2135)	(0.2114)	(0.2272)	(0.1907)	(0.2136)	(0.2229)
Ln $REER_{ij,t}$	1.0304	1.7330	-0.8121	0.9529	1.4480	2.5624*	-1.4583	-1.8051	-1.0095	0.0235	-1.5113	3.8543**
	(1.0796)	(1.0956)	(1.5300)	(1.1798)	(1.0261)	(1.5122)	(1.5041)	(1.2304)	(2.0611)	(1.2888)	(1.3448)	(1.8845)
$RTA_{ij,t}$	-0.1782	-0.3966**	-0.0942	-0.1770	-0.4117*	-0.2128	-0.3356	-0.4267	-0.2941	-0.2644	-0.2451	-0.3034
	(0.1727)	(0.1970)	(0.2147)	(0.1953)	(0.2239)	(0.2077)	(0.4197)	(0.4507)	(0.4353)	(0.4186)	(0.4490)	(0.3349)
NAFTA	0.1250	-0.0193	0.1642	0.1853	0.0225	0.4437	1.1960***	1.0684***	0.9880**	1.1779***	1.0841***	0.9496**
	(0.5936)	(0.4082)	(0.7093)	(0.5966)	(0.3816)	(0.7290)	(0.3475)	(0.3408)	(0.4892)	(0.3973)	(0.3746)	(0.4047)
$Intra - EEA$	0.7770***	0.8534***	0.7611***	0.8174***	0.8456***	0.9369***	1.0669***	1.1654***	1.1667***	0.8449***	1.1160***	0.6206*
	(0.2160)	(0.1885)	(0.1935)	(0.3136)	(0.1876)	(0.3385)	(0.2706)	(0.2783)	(0.2660)	(0.3054)	(0.2723)	(0.3594)
Ln $dist_{ij}$	-1.0741***	-1.2708***	-0.9889***	-1.0368***	-1.2306***	-0.8847**	-1.6022***	-1.6911***	-1.6068***	-1.5771***	-1.5778***	-1.7748***
	(0.2533)	(0.2193)	(0.3255)	(0.2595)	(0.2124)	(0.3802)	(0.4041)	(0.4200)	(0.3508)	(0.3773)	(0.3897)	(0.3758)
$lang_{ij}$	0.4586*	0.6023***	0.4890	0.4812**	0.6232***	0.4317	-0.1557	-0.1363	-0.1267	-0.1976	-0.1782	-0.1640
	(0.2787)	(0.1699)	(0.3130)	(0.2379)	(0.1639)	(0.3444)	(0.3484)	(0.4159)	(0.3418)	(0.4258)	(0.4314)	(0.3416)
$border_{ij}$	0.3251	0.2233	0.3308	0.3204*	0.2129	0.3458	0.8505**	0.8237**	0.8312**	0.8853**	0.8699**	0.9337**
	(0.2212)	(0.1587)	(0.2587)	(0.1929)	(0.1551)	(0.2575)	(0.3780)	(0.4074)	(0.3551)	(0.3735)	(0.3988)	(0.3856)
STRI importer	-0.0151	0.3352	-2.0702***	1.5056	-0.5760	1.9961	1.5736	1.1654*	0.1748	1.6752	1.3919	1.7851
	(1.1651)	(0.3886)	(0.4139)	(1.3181)	(0.9047)	(1.4254)	(2.1506)	(0.6863)	(0.9846)	(2.1173)	(1.2313)	(2.2325)
STRI exporter	2.7422	2.0581***	1.1427**	1.4282	3.6205***	-1.8040	-4.1272*	-1.6135	-1.4159	-11.2385***	-5.2190**	-5.6461**
	(2.9338)	(0.4788)	(0.5203)	(4.0683)	(0.8755)	(1.6559)	(2.1463)	(0.9909)	(1.1805)	(3.3214)	(2.5434)	(2.7622)
R^2	0.410	0.549	0.407	0.410	0.575	0.372	0.432	0.447	0.420	0.470	0.458	0.502
Observations	5411	5411	5411	5411	5411	3656	4759	4759	4759	4759	4759	3322
Year − FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes : *The dependent variable is bilateral food product.*
Columns (1), (2), (3), (4), (5), (6), (7), (8), (9), (10), (11), (12) *are performed using PPML estimation.*
Standard errors are reported in parentheses and clustered by country − pair level.
∗, ∗∗, ∗ ∗ ∗ *denote signicance respectively at the* 10% 5%*nd* 1%*levels.*

Table A.7:
STRI and Cross-Border Exports of Food Commodities: Continued

	Oil seeds and oleaginous fruits STIC 22						*Agricultural raw materials (SITC 2 less 22, 27 and 28)*					
Model	*Cargo Handling* (1)	*Custom Brokerage* (2)	*Accounting* (3)	*Banking* (4)	*Road* (5)	*Sea* (6)	*Cargo Handling* (7)	*Customs Brokerage* (8)	*Accounting* (9)	*Banking* (10)	*Road* 11	*Sea* (12)
$Ln\ GDP_{i,t}$	1.6147***	1.5461***	1.5265***	1.5807***	1.4110***	1.6426***	1.1953***	1.1498***	1.1852***	1.1202***	1.1197***	0.9857***
	(0.2390)	(0.2480)	(0.1896)	(0.2427)	(0.2439)	(0.2781)	(0.1284)	(0.1231)	(0.1116)	(0.1257)	(0.1193)	(0.1532)
$Ln\ GDP_{j,t}$	1.3173***	1.4733***	1.4581***	1.3962***	1.5250***	1.4415***	1.6566***	1.6614***	1.7810***	1.6327***	1.6735***	1.5959***
	(0.2019)	(0.1918)	(0.2072)	(0.1974)	(0.1872)	(0.2950)	(0.1450)	(0.1344)	(0.1665)	(0.1365)	(0.1349)	(0.1524)
$Ln\ REER_{ij,t}$	1.7379	0.7548	2.9837	1.3461	1.8988	1.8259	1.7134	1.4776	3.3994	1.9714	1.5915	2.8780**
	(2.2874)	(2.4638)	(2.8761)	(2.4060)	(2.5383)	(1.6236)	(1.5164)	(1.1508)	(2.4922)	(1.2053)	(1.2055)	(1.3090)
$RTA_{ij,t}$	-0.7279*	-0.8488**	-0.3948	-0.7550*	-0.7473*	-0.4741	-0.0255	0.0719	0.0929	0.0721	0.1681	0.0417
	(0.4358)	(0.4067)	(0.4557)	(0.4215)	(0.3887)	(0.4477)	(0.2567)	(0.2570)	(0.2569)	(0.2502)	(0.2447)	(0.2489)
$NAFTA$	1.3303**	0.6824	0.6555	1.0698*	0.8140	1.1936	1.1023***	1.1764***	0.7993**	1.0942***	1.1698***	0.9154***
	(0.5795)	(0.5880)	(0.6052)	(0.5751)	(0.6663)	(0.8241)	(0.2457)	(0.2415)	(0.3251)	(0.2535)	(0.2598)	(0.3046)
$Intra-EEA$	0.3194	0.2726	0.3431	0.2722	0.3091	-0.2354	0.5731***	0.5211***	0.5656***	0.3636*	0.5176***	0.1896
	(0.4021)	(0.3559)	(0.3522)	(0.3717)	(0.3726)	(0.4855)	(0.1886)	(0.1775)	(0.1758)	(0.1891)	(0.1789)	(0.1953)
$Ln\ dist_{ij}$	-0.1556	-0.4764	-0.1876	-0.3014	-0.3765	-0.0675	-1.0392***	-0.9487***	-1.0723***	-1.0382***	-0.9334***	-1.2307***
	(0.4003)	(0.4690)	(0.3590)	(0.4099)	(0.4665)	(0.4497)	(0.2644)	(0.2749)	(0.2484)	(0.2558)	(0.2630)	(0.2548)
$lang_{ij}$	-0.7048**	-0.4249	-0.6644**	-0.6391*	-0.5061	-0.7857**	-0.0171	-0.1254	-0.0047	-0.0993	-0.1998	-0.0036
	(0.3128)	(0.3261)	(0.2769)	(0.3341)	(0.3587)	(0.3727)	(0.1800)	(0.2098)	(0.1744)	(0.1984)	(0.2180)	(0.1873)
$border_{ij}$	1.5865***	1.4411***	1.5642***	1.5514***	1.5315***	1.7419***	0.9214***	0.9973***	0.9336***	0.9800***	1.0435***	0.8866***
	(0.4060)	(0.4389)	(0.3907)	(0.4258)	(0.4590)	(0.4803)	(0.2683)	(0.2789)	(0.2515)	(0.2725)	(0.2757)	(0.3031)
$STRI\ importer$	-1.5564	1.7719**	-0.9930	3.0567	2.4561	-7.7812**	-0.7488	-0.0028	0.6495	-0.4905	-0.4732	-0.7603
	(2.5825)	(0.7262)	(1.0024)	(2.4512)	(1.6362)	(3.0212)	(1.3732)	(0.4133)	(0.4471)	(1.2777)	(0.6795)	(1.4301)
$STRI\ exporter$	-1.3964	-3.4664*	-3.9924***	-4.2406	-8.2135***	-1.7754	-0.8397	-2.3388***	-2.6566***	-4.9270***	-4.7867***	-1.4197
	(3.7898)	(1.8097)	(1.2337)	(3.3949)	(2.8551)	(2.9366)	(1.7967)	(0.6177)	(0.7608)	(1.3595)	(1.0241)	(1.8458)
R^2	0.330	0.389	0.362	0.382	0.393	0.338	0.645	0.707	0.613	0.698	0.711	0.676
Observations	3565	3565	3565	3565	3565	2446	5464	5464	5464	5464	5464	3678
Year − FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes : The dependent variable is bilateral food product.
Columns (1), (2), (3), (4), (5), (6), (7), (8), (9), (10), (11), (12) *are performed using PPML estimation.*
Standard errors are reported in parentheses and clustered by country − pair level.
*, **, *** *denote signicance respectively at the* 10% 5%*nd* 1%*levels.*

Table A.8:
STRI and Cross-Border Exports of Food Commodities: Continued

	Perishable products $STIC\ 01+02+03$					
Model	*Cargo Handling*	*Custom Brokerage*	*Accounting*	*Banking*	*Road*	*Sea*
	(1)	(2)	(3)	(4)	(5)	(6)
$Ln\ GDP_{i,t}$	1.2535***	1.2377***	1.2856***	1.1982***	1.2270***	0.9480***
	(0.1257)	(0.1243)	(0.1108)	(0.1312)	(0.1213)	(0.1545)
$Ln\ GDP_{j,t}$	1.8040***	1.8381***	1.9253***	1.7840***	1.8173***	1.6911***
	(0.1220)	(0.1129)	(0.1217)	(0.1142)	(0.1101)	(0.1400)
$Ln\ REER_{ij,t}$	0.1042	-0.2026	2.4621	-0.0612	-0.2143	1.9477*
	(1.3301)	(1.2660)	(1.5910)	(1.3286)	(1.2802)	(1.0502)
$RTA_{ij,t}$	0.8493***	0.9149***	1.0952***	0.9535***	0.9980***	0.8862***
	(0.2777)	(0.2869)	(0.2373)	(0.2760)	(0.2738)	(0.2678)
$NAFTA$	0.1120	0.0216	-0.3505	0.0195	0.0589	-0.1583
	(0.2832)	(0.2969)	(0.2778)	(0.3696)	(0.3789)	(0.3908)
$Intra-EEA$	0.5517***	0.5034**	0.5222***	0.3316	0.4769**	-0.0786
	(0.2006)	(0.2024)	(0.2009)	(0.2204)	(0.1991)	(0.2024)
$Ln\ dist_{ij}$	-0.7195***	-0.7646***	-0.7492***	-0.7785***	-0.7290***	-1.0963***
	(0.2254)	(0.2395)	(0.2101)	(0.2274)	(0.2272)	(0.2188)
$lang_{ij}$	0.1769	0.1262	0.1509	0.1340	0.0800	0.1940
	(0.2078)	(0.2266)	(0.1861)	(0.2332)	(0.2380)	(0.2097)
$border_{ij}$	0.8327***	0.8634***	0.8676***	0.8689***	0.8988***	0.8605***
	(0.2161)	(0.2238)	(0.1966)	(0.2227)	(0.2254)	(0.2104)
STRI importer	-3.2135**	0.0213	-0.1585	-2.1635	-0.9171	-1.7108
	(1.3971)	(0.7126)	(0.4386)	(1.9617)	(1.6597)	(1.1202)
STRI exporter	0.7684	-0.6748*	-2.9320***	-2.7525**	-1.8046***	-3.1338**
	(1.3819)	(0.3548)	(0.5176)	(1.0708)	(0.6501)	(1.5361)
R^2	0.531	0.543	0.597	0.537	0.540	0.585
Observations	5599	5599	5599	5599	5599	3770
$Year-FE$	Yes	Yes	Yes	Yes	Yes	Yes

Notes: *The dependent variable is bilateral food product.*
Columns (1), (2), (3), (4), (5), (6) *are performed using PPML estimation.*
Standard errors are reported in parentheses and clustered by country − pair level.
$*, **, ***$ *denote signicance respectively at the* 10% 5%*nd* 1%*levels.*

Table A.9:
Food Exports, Heterogeneity and Exporter STRI, PPML Regressions

	Regulatory heterogeneity						*STRI and Regulatory heterogeneity*					
Model	*Cargo Handling*	*Custom Brokerage*	*Accounting*	*Banking*	*Road*	*Sea*	*Cargo Handling*	*Customs Brokerage*	*Accounting*	*Banking*	*Road*	*Sea*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$RTA_{ij,t}$	0.5146***	0.5991***	0.6640***	0.6386***	0.6588***	0.6801***	0.5324***	0.6162***	0.6594***	0.6469***	0.6737***	0.7137***
	(0.1471)	(0.1481)	(0.1493)	(0.1540)	(0.1452)	(0.1433)	(0.1464)	(0.1467)	(0.1481)	(0.1530)	(0.1467)	(0.1417)
Ln $dist_{ij}$	-1.8137***	-1.8532***	-1.9676***	-1.8496***	-1.9614***	-1.9570***	-1.8322***	-1.8965***	-1.9664***	-1.8707***	-2.0092***	-1.9714***
	(0.1355)	(0.1285)	(0.1204)	(0.1134)	(0.1350)	(0.1300)	(0.1347)	(0.1235)	(0.1205)	(0.1142)	(0.1297)	(0.1279)
$lang_{ij}$	0.0491	0.0604	0.1062	0.0866	0.1057	0.0341	0.0494	0.0777	0.1079	0.0968	0.1270	0.0636
	(0.1238)	(0.1226)	(0.1235)	(0.1197)	(0.1254)	(0.1476)	(0.1253)	(0.1218)	(0.1234)	(0.1199)	(0.1254)	(0.1512)
$border_{ij}$	0.7305***	0.7396***	0.7319***	0.7506***	0.7312***	0.7365***	0.7329***	0.7269***	0.7291***	0.7325***	0.7154***	0.7359***
	(0.1143)	(0.1126)	(0.1121)	(0.1050)	(0.1140)	(0.1218)	(0.1146)	(0.1125)	(0.1121)	(0.1069)	(0.1119)	(0.1200)
Heterogeneity $score_{ij,t}$	-3.1090***	-2.1816***	0.0704	-2.3665***	-0.0865	0.2542						
	(0.7821)	(0.7212)	(0.4652)	(0.8414)	(0.8400)	(0.7596)						
Heterogeneity $score_{ij,t}$ $*STRI_{i,t}$							-12.4783***	-7.7586***	-0.0941	-10.3077**	4.1275	4.1869
							(3.2738)	(2.4186)	(1.2815)	(4.0711)	(3.6436)	(3.4320)
R^2	0.938	0.940	0.936	0.940	0.936	0.940	0.938	0.940	0.936	0.940	0.937	0.941
Observations	6298	6298	6298	6298	6298	4349	6298	6298	6298	6298	6298	4349
$Exporter - Year - FE$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
$Importer - Year - FE$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes : *The dependent variable is bilateral food product.*
Columns (1), (2), (3), (4), (5), (6), (7), (8), (9), (10), (11), (12) *are performed using PPML estimation.*
Standard errors are reported in parentheses and clustered by country − pair level.
*, **, *** *denote signicance respectively at the* 10% 5% *and* 1% *levels.*

Table A.10:
Food Exports, Heterogeneity and Importer STRI, PPML Regressions

	STRI and Regulatory heterogeneity					
Model	*Cargo Handling*	*Custom Brokerage*	*Accounting*	*Banking*	*Road*	*Sea*
	(1)	(2)	(3)	(4)	(5)	(6)
$RTA_{ij,t}$	0.5190***	0.6419***	0.6702***	0.6446***	0.6632***	0.7048***
	(0.1471)	(0.1471)	(0.1493)	(0.1546)	(0.1458)	(0.1390)
Ln $dist_{ij}$	-1.8289***	-1.9079***	-1.9699***	-1.8581***	-1.9740***	-1.9698***
	(0.1337)	(0.1262)	(0.1197)	(0.1141)	(0.1301)	(0.1277)
$lang_{ij}$	0.0429	0.0760	0.1048	0.0939	0.1114	0.0578
	(0.1249)	(0.1233)	(0.1244)	(0.1195)	(0.1262)	(0.1470)
$border_{ij}$	0.7357***	0.7380***	0.7354***	0.7387***	0.7269***	0.7353***
	(0.1148)	(0.1142)	(0.1116)	(0.1063)	(0.1137)	(0.1203)
Heterogeneity score$_{ij,t}$						
$*STRI_{j,t}$	-13.5829***	-5.2164**	0.7586	-11.3970***	0.7075	3.4072
	(3.3629)	(2.5431)	(1.1795)	(4.2192)	(3.8162)	(3.7144)
R^2	0.938	0.937	0.936	0.939	0.936	0.941
Observations	6298	6298	6298	6298	6298	4349
Exporter − Year − FE	Yes	Yes	Yes	Yes	Yes	Yes
Importer − Year − FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes : *The dependent variable is bilateral food product.*
Columns (1), (2), (3), (4), (5), (6) *are performed using PPML estimation.*
Standard errors are reported in parentheses and clustered by country − pair level.
*, **, *** *denote signicance respectively at the* 10% 5% *and* 1% *levels.*

Table A.11:
Food Exports, Heterogeneity STRI: EEA restrictions

	EEA Restrictions					
Model	*Cargo Handling*	*Custom Brokerage*	*Accounting*	*Banking*	*Road*	*Sea*
	(1)	(2)	(3)	(4)	(5)	(6)
RTA_{ij}	0.4201***	0.4950***	0.5379***	0.5018***	0.4158***	0.3666**
	(0.1484)	(0.1503)	(0.1525)	(0.1547)	(0.1460)	(0.1449)
Ln $dist_{ij}$	-1.9193***	-1.9417***	-1.9058***	-1.9424***	-1.9583***	-1.8378***
	(0.1232)	(0.1233)	(0.1236)	(0.1262)	(0.1187)	(0.1304)
$lang_{ij}$	0.1615	0.1501	0.1010	0.1473	0.1545	0.0505
	(0.1194)	(0.1225)	(0.1246)	(0.1182)	(0.1214)	(0.1370)
$border_{ij}$	0.7525***	0.7341***	0.7727***	0.7010***	0.7244***	0.7799***
	(0.1142)	(0.1152)	(0.1121)	(0.1153)	(0.1056)	(0.1215)
Heterogeneity score$_{ij,t} * Intra - EEA$	2.7235***	2.2666***	1.0892**	1.8766**	3.5253***	3.6350***
	(0.7001)	(0.7961)	(0.5384)	(0.7717)	(0.7976)	(0.6767)
R^2	0.940	0.937	0.935	0.937	0.943	0.946
Observations	6298	6298	6298	6298	6298	4349
Exporter − Year − FE	Yes	Yes	Yes	Yes	Yes	Yes
Importer − Year − FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes : *The dependent variable is bilateral food product.*
Columns (1), (2), (3), (4), (5), (6) *are performed using PPML estimation.*
Standard errors are reported in parentheses and clustered by country − pair level.
*, **, *** *denote signicance respectively at the* 10% 5% *and* 1% *levels.*

Table A.12:
Food Exports, Heterogeneity STRI: OECD-Emerging Countries

	OECD-Emerging Countries					
Model	*Cargo Handling*	*Custom Brokerage*	*Accounting*	*Banking*	*Road*	*Sea*
	(1)	(2)	(3)	(4)	(5)	(6)
$RTA_{ij,t}$	0.6367***	0.5876***	0.5476***	0.6001***	0.6052***	0.6779***
	(0.2004)	(0.1980)	(0.1978)	(0.1918)	(0.1977)	(0.2016)
$border_{ij}$	1.4364***	1.4220***	1.4329***	1.4159***	1.3799***	1.4589***
	(0.2605)	(0.2485)	(0.2365)	(0.2316)	(0.2417)	(0.2267)
$border_{ij}$	0.5655*	0.5723*	0.6064*	0.4728	0.5426*	0.5704*
	(0.3047)	(0.3087)	(0.3244)	(0.3197)	(0.3045)	(0.2979)
$Ln\ dist_{ij}$	-2.5765***	-2.6338***	-2.8474***	-2.5792***	-2.5548***	-2.4471***
	(0.4063)	(0.4152)	(0.4571)	(0.3839)	(0.4099)	(0.3911)
$Heterogeneity\ score_{ij,t}$	-2.6167**	-1.1089	1.5922	-2.6879*	-1.3847	-2.4576***
	(1.2687)	(1.0577)	(1.0423)	(1.4957)	(1.0388)	(0.7775)
R^2	0.958	0.958	0.958	0.958	0.958	0.963
Observations	1765	1765	1765	1765	1765	1471
$Exporter-Year-FE$	Yes	Yes	Yes	Yes	Yes	Yes
$Importer-Year-FE$	Yes	Yes	Yes	Yes	Yes	Yes

Notes : *The dependent variable is bilateral food product.*
Columns (1), (2), (3), (4), (5), (6) *are performed using PPML estimation.*
Standard errors are reported in parentheses and clustered by country − pair level.
*, **, *** *denote signicance respectively at the* 10% 5% *and* 1% *levels.*

Table A.13:
Food Exports, Heterogeneity STRI: Emerging-OECD Countries

	Emerging − OECD Countries					
Model	*Cargo Handling*	*Custom Brokerage*	*Accounting*	*Banking*	*Road*	*Sea*
	(1)	(2)	(3)	(4)	(5)	(6)
$RTA_{ij,t}$	0.1014	0.0888	-0.0170	0.0951	0.0903	0.0901
	(0.1574)	(0.1597)	(0.1697)	(0.1580)	(0.1621)	(0.1637)
$border_{ij}$	0.8693**	0.8453*	0.8306**	0.7887*	0.7890*	0.8734**
	(0.4323)	(0.4315)	(0.4226)	(0.4253)	(0.4419)	(0.4447)
$lang_{ij}$	0.4747*	0.5219**	0.4541**	0.4056*	0.4935**	0.4423**
	(0.2452)	(0.2458)	(0.2312)	(0.2205)	(0.2508)	(0.2227)
$Ln\ dist_{ij}$	-1.3945***	-1.3301***	-1.5430***	-1.3509***	-1.3348***	-1.2565***
	(0.2572)	(0.2769)	(0.2863)	(0.2933)	(0.2879)	(0.3076)
$Heterogeneity\ score_{ij,t}$	-4.2883***	-2.6552**	1.1157**	-2.4427	-1.5737	-2.3518**
	(1.4497)	(1.2419)	(0.4968)	(1.6669)	(1.1766)	(1.1015)
R^2	0.859	0.833	0.816	0.828	0.824	0.843
Observations	1775	1775	1775	1775	1775	1490
$Exporter-Year-FE$	Yes	Yes	Yes	Yes	Yes	Yes
$Importer-Year-FE$	Yes	Yes	Yes	Yes	Yes	Yes

Notes : *The dependent variable is bilateral food product.*
Columns (1), (2), (3), (4), (5), (6) *are performed using PPML estimation.*
Standard errors are reported in parentheses and clustered by country − pair level.
*, **, *** *denote signicance respectively at the* 10% 5% *and* 1% *levels.*

Table A.14:
Food Exports, Heterogeneity STRI: Major Exporter and Importer Food Countries

	Regulatory heterogeneity					
Model	*Cargo Handling*	*Custom Brokerage*	*Accounting*	*Banking*	*Road*	*Sea*
	(1)	(2)	(3)	(4)	(5)	(6)
$RTA_{ij,t}$	0.5749***	0.6860***	0.7945***	0.6782***	0.7696***	0.7490***
	(0.1939)	(0.1656)	(0.1772)	(0.1666)	(0.1742)	(0.1832)
$lang_{ij}$	0.0103	0.0026	0.0626	-0.1104	0.0315	0.0543
	(0.1786)	(0.1589)	(0.1542)	(0.1750)	(0.1687)	(0.1722)
$border_{ij}$	0.7895***	0.7773***	0.8110***	0.8688***	0.8018***	0.7742***
	(0.1497)	(0.1420)	(0.1533)	(0.1345)	(0.1522)	(0.1602)
$Ln\ dist_{ij}$	-1.7574***	-1.8023***	-1.9552***	-1.8201***	-1.7944***	-1.8536***
	(0.2471)	(0.2439)	(0.2440)	(0.2208)	(0.2638)	(0.2619)
$Heterogeneity\ score_{ij,t}$	-3.4931***	-3.7597***	-0.0574	-5.1261***	-2.0561*	-0.8819
	(1.0934)	(1.0463)	(0.6563)	(1.1192)	(1.1908)	(1.1723)
R^2	0.879	0.889	0.881	0.915	0.882	0.879
Observations	2618	2618	2618	2618	2618	1999
$Exporter-Year-FE$	Yes	Yes	Yes	Yes	Yes	Yes
$Importer-Year-FE$	Yes	Yes	Yes	Yes	Yes	Yes

Notes : *The dependent variable is bilateral food product.*
Columns (1), (2), (3), (4), (5), (6) *are performed using PPML estimation.*
Standard errors are reported in parentheses and clustered by country − pair level.
*, **, *** *denote signicance respectively at the* 10% 5% *and* 1% *levels.*

Table A.15:
Manufactured and Intermediate products

	Manufactured products						*Intermediate products (Industry level)*					
Model	*Cargo Handling*	*Custom Brokerage*	*Accounting*	*Banking*	*Road*	*Sea*	*Cargo Handling*	*Customs Brokerage*	*Accounting*	*Banking*	*Road*	*Sea*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$RTA_{ij,t}$	0.6109***	0.6858***	0.7696***	0.8105***	0.7562***	0.5865***	0.6105***	0.6911***	0.7452***	0.7754***	0.7353***	0.6362***
	(0.1306)	(0.1362)	(0.1378)	(0.1333)	(0.1169)	(0.1250)	(0.1146)	(0.1159)	(0.1193)	(0.1273)	(0.1154)	(0.1179)
$Ln\ dist_{ij}$	-1.2606***	-1.2827***	-1.4002***	-1.1766***	-1.2411***	-1.3939***	-1.5956***	-1.6380***	-1.7131***	-1.5262***	-1.6160***	-1.6782***
	(0.1443)	(0.1450)	(0.1413)	(0.1201)	(0.1363)	(0.1261)	(0.1051)	(0.0987)	(0.0958)	(0.1011)	(0.1175)	(0.0970)
$lang_{ij}$	-0.0545	-0.0556	-0.0005	-0.0332	-0.0548	-0.1526	-0.0308	-0.0301	0.0010	-0.0131	-0.0300	-0.1910
	(0.1173)	(0.1161)	(0.1335)	(0.1130)	(0.1167)	(0.1215)	(0.1328)	(0.1343)	(0.1447)	(0.1317)	(0.1360)	(0.1590)
$border_{ij}$	0.6034***	0.6027***	0.5913***	0.6225***	0.6577***	0.6151***	0.5335***	0.5324***	0.5302***	0.5514***	0.5687***	0.5482***
	(0.0952)	(0.0931)	(0.0993)	(0.0901)	(0.0996)	(0.0940)	(0.0896)	(0.0873)	(0.0900)	(0.0862)	(0.0905)	(0.0919)
$Heterogeneity\ score_{ij,t}$	-3.5873***	-3.5422***	-0.8772***	-4.6391***	-3.0942***	-3.8702***	-2.7401***	-2.0440***	-0.3947	-3.3040***	-1.5858*	-2.3587***
	(0.7171)	(0.6696)	(0.3368)	(0.7072)	(0.8198)	(0.6938)	(0.8431)	(0.7223)	(0.3180)	(0.7581)	(0.8901)	(0.8002)
R^2	0.952	0.954	0.948	0.957	0.949	0.960	0.951	0.952	0.950	0.954	0.949	0.956
Observations	6297	6297	6297	6297	6297	4349	6297	6297	6297	6297	6297	4348
$Exporter - Year - FE$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
$Importer - Year - FE$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes : *The dependent variable is bilateral food product.*
Columns (1), (2), (3), (4), (5), (6), (7), (8), (9), (10), (11), (12) *are performed using PPML estimation.*
Standard errors are reported in parentheses and clustered by country − pair level.
*, **, *** *denote signicance respectively at the* 10% 5% *and* 1% *levels.*

Table A.16:
Endogeneity Issue: OECD countries

	Regulatory heterogeneity					
Model	*Cargo Handling*	*Custom Brokerage*	*Accounting*	*Banking*	*Road*	*Sea*
	(1)	(2)	(3)	(4)	(5)	(6)
$RTA_{ij,t}$	0.5744***	0.6240***	0.6571***	0.6416***	0.6608***	0.6845***
	(0.1439)	(0.1459)	(0.1484)	(0.1510)	(0.1451)	(0.1459)
$lang_{ij}$	0.0742	0.0797	0.1092	0.0963	0.1075	0.0574
	(0.1212)	(0.1224)	(0.1234)	(0.1215)	(0.1243)	(0.1366)
$border_{ij}$	0.7264***	0.7339***	0.7284***	0.7420***	0.7298***	0.7428***
	(0.1138)	(0.1133)	(0.1132)	(0.1107)	(0.1137)	(0.1197)
$Ln\ dist_{ij}$	-1.9053***	-1.9241***	-1.9649***	-1.9158***	-1.9672***	-1.9413***
	(0.1269)	(0.1233)	(0.1207)	(0.1175)	(0.1255)	(0.1254)
$Heterogeneity\ score_{ij,t-1}$	-2.0146***	-1.3081***	-0.1018	-1.4831***	0.0142	0.0827
	(0.5828)	(0.4719)	(0.3131)	(0.5655)	(0.5602)	(0.5533)
R^2	0.937	0.938	0.936	0.938	0.936	0.940
Observations	6297	6297	6297	6297	6297	4348
$Exporter-Year-FE$	Yes	Yes	Yes	Yes	Yes	Yes
$Importer-Year-FE$	Yes	Yes	Yes	Yes	Yes	Yes

Notes : *The dependent variable is bilateral food product.*
Columns (1), (2), (3), (4), (5), (6) *are performed using PPML estimation.*
Standard errors are reported in parentheses and clustered by country − pair level.
*, **, *** *denote signicance respectively at the* 10% 5% *and* 1% *levels.*

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