No 2015-33 – December

Working Paper

CEPII

Which Import Restrictions Matter for Trade in Services?

Julien Gooris & Cristina Mitaritonna

Highlights

- This study uses the recent database of detailed import restrictions published by the World Bank to assess the impediments to trade services based on bilateral sector-level service flows from the World Trade organization.
- The diversity of the import regulations across sectors and importers create heterogeneous constraints on services flows with some threshold effects.
- Minor restrictions, in comparison to restriction-free environments, produce a trade-facilitating effect in certain sectors as regulations may address market imperfections.
- Based on the restrictions that applies in each import country and sector, we derive ad-valorem tariff equivalents.

Abstract

This study exploits rich databases of services trade and import restrictions to estimate the effects of discrete restrictiveness levels on bilateral services flows using a gravity model, and to derive tariff equivalents in three service sectors (Other Business Services, Banking and Insurance). We preserve the discrete nature of the restrictions to import, which are provided by the World Bank - WB (see Borchert et al., 2014). For each sector-country combination, we evaluate restrictiveness using four discrete levels of restrictiveness, from totally open to closed. This approach allows us track the effect of the specific import restrictions in place. We highlight their non-linear impact on services flows showing threshold effects and the trade stimulating effect of minor import restrictions on a restriction-free environment. Finally we derive tariff equivalents directly from the impact of applied restrictions.

Keywords

Services trade, Regulatory protection, Gravity model, Ad-valorem tariff equivalents.

JEL

F13, L80.

Working Paper

CEPII

CEPII (Centre d'Etudes Prospectives et d'Informations Internationales) is a French institute dedicated to producing independent, policy-oriented economic research helpful to understand the international economic environment and challenges in the areas of trade policy, competitiveness, macroeconomics, international finance and growth.

CEPII Working Paper
Contributing to research in international economics

Editorial Director:
Sébastien Jean

Production:
Laure Boivin

No ISSN: 1293-2574

CEPII
113, rue de Grenelle
75007 Paris
+33 1 53 68 55 00

www.cepii.fr
Press contact: presse@cepii.fr

RESEARCH AND EXPERTISE ON THE WORLD ECONOMY

Which import restrictions matter for trade in services ?*

Julien GOORIS† and Cristina MITARITONNA‡

1 Introduction

Services represent the largest sector in the global economy with 71% of world added value and over half of total employment. Moreover the traded share of services is expanding more rapidly than those in agriculture and manufacturing activities, despite the fact that many services require proximity between buyers and sellers which prevents many services from being internationally traded. International trade in services still lags behind goods in terms of value exchanged, in part due to important market regulations (see Francois and Hoekman, 2010 for a survey). The overall value of cross-border services exports accounts for only 21% of total international trade (World Trade Organization - WTO, 2010). Traditional export and import calculations tend to underestimate the role of services in trade. New trade data measured in value-added terms would seem to suggest a more important role of services in global trade (Marchetti and Roy, 2013). Pioneering work by the Organisation for Economic Co-operation and Development (OECD) and the WTO shows that services represented 24% of total gross trade in 2009 in the 57 economies analysed, but if measured according to the value added each time a service was exported or imported within a global production chain, their share in the overall trade is significantly higher (43% according to OECD-WTO, 2013).

In recent years, there has been a greater willingness to include services in bilateral and multilateral trade agreements. In the multilateral arena, services were not initially included in negotiations. Their inclusion in the Uruguay Round, led in January 1995 to the

*The authors acknowledge support from the PRONTO project, financed by the European Commission, DG Research, under its 7th Framework Program (contract #613504). We also acknowledge support from the World Trade Organization, in particular Antonella Liberatore, for supplying recent unpublished data on sector-level bilateral flows in services. We also thank Amélie Guillin for providing RTA data and Lionel Fontagné, Julien Gourdon, Houssein Guimbard, Sébastien Jean, Laurence Nayman, Daniel Mirza and Gianluca Orefice for their valuable advice. All the empirical work has been conducted within the CEPII.

†Microeconomix, julien.gooris@microeconomix.com.

‡CEPII, cristina.mitaritonna@cepii.fr

General Agreement on Trade in Services (GATS). GATS relates to the multilateral liberalization of 150 different services sectors, distinguishing between four modes of supply, whose relative importance differs among sectors: Mode 1 (cross-border supply), Mode 2 (consumption abroad), Mode 3 (commercial presence - FDI), and mode 4 (presence of natural persons).

As a result of the growing role of services in world trade, economists have started to pay more attention to these activities (Francois and Hoekman, 2010). Researches based on computable general equilibrium (CGE) modeling point to the large gains associated with the partial liberalization of services. These can be expected for the rich economies and also for developing countries, especially India and China (Francois et al., 2005; Decreux and Fontagné, 2011 and Christen et al., 2012). Since these estimates rely on tariff equivalents of protection for services, accurate measures of the level of protection in services are key to the assessment of the liberalization gains. However, computing tariff equivalents can be challenging, both theoretically and empirically.

One source of this challenge lies in the specific nature of services compared to goods. Proximity between producers and consumers, and the intangible characteristics intrinsic to services, imply different impediments to trade from those that apply to goods. While the later are subject to quantitative restrictions such as tariffs or quotas, impediments to trade services relate mostly to licenses for foreigners, and government regulations designed to reduce market access to foreign services and/or which discriminate in favor of domestic firms. Hence, liberalizing trade in services essentially requires a change in national regulation. Identifying the actual tariff equivalents of these regulations is not straightforward. Discriminatory barriers, which act as non-tariff barriers (NTBs) in international trade in services, are the main focus in GATS negotiations. In line with the majority of the litterature we also focus on these types of barriers.

A second problem is the scarcity of data on actual policies, and the methodological issues raised by the use of qualitative data. The computation of tariff equivalents relies on continuous restrictiveness measures (indexes) or indirect methods, from which the average applied protection is derived from residuals or imported fixed effects from gravity estimations.

In this study we use very rich databases to estimate the effects of discrete restrictiveness mesures (e.g. totally open, minor restrictions, major restrictions, virtually closed), on bilateral service flows at sector-level, and then derive tariff equivalents. Our approach allows us to enhance the existing literature in several ways. Due to our access to an unpublished WTO dataset on trade in services, for which we are indebted to the WTO, we avoid

using partially-reconstructed bilateral services flows, which we know introduce considerable bias, especially in developing countries' tariff equivalent estimations (Fontagné et al., 2011). For trade restrictions we use the qualitative and ordinal information on discriminatory restrictions, both operational and entry barriers, provided by the WB (Borchert, Gootiiz, and Mattoo, 2014) for the cross-border supply of services (Mode 1), which is in line with the trade in services data. We avoid summarizing the qualitative nature of services trade restrictions (as opposed to tariffs) into arbitrarily scaled continuous restrictiveness measures. Using a gravity model we track the effect of the specific import restrictions in place, and we highlight their non-linear impact on service flows. We identify threshold effects and the trade stimulating effect of minor restrictions on a restriction-free environment. Finally, we calculate tariff equivalents directly from the impact of applied restrictions, which is an improvement from a methodological point of view. Indeed the gravity indirect approach attributes all the model's measurement errors to trade impediments (see Deardorff and Stern, 2008). This implies that the unobserved importer-level demand factors are captured in the trade barrier estimations.

However, significant limitations remain, related to the data. First, discrepancies in terms of sectoral classification between the WTO's trade flows database and the WB restriction measures strongly constrain the matching between these two sources. Second, the measurement of trade restrictions involves different shortcomings, notably that they are time invariant and often cover only sub-sectors which are not fully representative for the measurement of restrictions applying to the overall sector (e.g. among the transportation sectors restrictions are collected only for water transport). This second limitation, in particular, is the reason why we focus only on three services sectors: Other Business services (OBS), Finance excluding insurance and Insurance. Third, all the restrictions presented are defined unilaterally at the importer level, which overlooks the bilateral nature of such impediments emanating to a large extent from the increasingly popular service Regional Trade Agreements (RTAs) (Ceglowski, 2006; Guillin, 2013b; Marchetti, 2009; Marchetti and Roy, 2013). We include this bilateral dimension, in part by controlling for whether the country pair has signed an RTA in services (information taken from Guillin, 2013b). However, most service RTAs relate to only a few service sectors and, the majority do not include binding commitments. Therefore those RTAs do not necessarely relax existing import restrictions and, instead guarantee the status quo in trade relations (Marchetti and Roy, 2013; Guillin, 2013b). The proper way to include RTAs would be to collect information on restrictions at the bilateral level, by sector, or at least consider the differences in terms of the sectoral coverage and depth of the RTAs.

The remainder of the paper is structured into four sections. Section 2 briefly reviews the

exisitng regulatory protections for service and then discusses how they are usually measured. In section 3, we present our theoretical framework and in section 4 we present the data and the empirical results, providing details on how we built our trade resticitveness indicators from the original regulatory data provided by the WB. Last section concludes with a summary of the contributions.

2 Restrictions on service cross-border supply

2.1 Impediments to trade in services

Services present a strong heterogeneity across sectors. Some activities, such as transportation and telecommunication, aim at easing spatial constraints. Others such as financing and insurance services are aimed at facilitating resources allocations and managing risk. In addition, services also include knowledge-related activities (e.g. R&D, consulting). This heterogeneity is accompanied by specific and diverse regulatory barriers. At the same time intangibility is common to all services sectors. This adds complexity to the reporting of services transactions and evaluation of services restrictions on their exchanges. International services are not tracked via customs (Dee, 2005; Deardorff and Stern, 2008). The diversity of services and their intangible nature explain the difficulties involved in identifying and assessing the impediments to the cross-border supply of services (Mode I in WTO parlance).

For trade in goods, aside from distance and cultural factors, the main obstacles are tariffs, quotas and regulatory restrictions (the last falls into the category “non-tariff measures”). Quantitative constraints such as tariffs and quotas are easily comparable across different goods, whereas regulatory restrictions are constraints specific to an industry. From the heterogeneity of services activities follows a diversity of regulatory constraints. Services trade barriers can target foreign suppliers through the imposition of discriminatory restrictions, or affect all national and foreign suppliers without differentiation. GATS is concerned mainly with discriminatory barriers, which often find legitimate justifications in limiting transaction risks and especially asymmetric information, which is exacerbated by the intangible character of services. We focus also on discriminatory barriers although a recent work by Crozet et al. (2012) shows that domestic regulations, which are *de jure* “non-discriminatory” de facto play an important role in discriminating in favor of domestic firms. Although discriminatory regulatory restrictions tend to protect incumbent service producers from competition and safeguard economic rents, domestic regulations might

discriminate against foreigners because they have less easy access to information on how to avoid or comply with local legislations than domestic firms.

For Mode 1 services trade, the regulatory constraints faced by service exporting firms fall into two broad categories: market access, and operational restrictions. The first type refers for instance to mandatory registrations for foreign companies with local authorities/institutions, the requirement of commercial presence to export to the destination country, imposition of conditions on local/domestic unavailability of the service, or an outright ban. Operational restrictions can take the form of an obligation to employ locally licensed professionals, a ban on advertising the service on offer, or a restriction on the value of the service contracted with the supplier. These examples are illustrative of the qualitative, discrete and sector-specific nature of these restrictions in services trade (Borchert et al., 2014).

The restrictiveness measures discussed above can be defined unilaterally such that all exporters serving a given importing country face the same regulatory conditions. Following the GATS framework, such policies adopt a Most-Favored Nation (MFN) approach. In addition to these regulatory settings which are constant across exporters, market access and operational restrictions may also be bilateral. In fact, trade conditions are specific to the exporter-importer pair, due mainly to RTAs in services (Ceglowski, 2006; Guillin, 2013b; Marchetti, 2009; Marchetti and Roy, 2013).

2.2 Measuring import restrictions in services

Given the diversity of possible restrictions and their sectoral specificity, quantifying the import constraints faced by service exporting firms is a delicate exercise (Christen et al., 2012; Marchetti and Roy, 2013). This difficulty has led to the emergence of a variety of measurement methods. These are either limited to a given service sector or apply to several sectors.[1] The first attempts to measure restrictiveness relied on inventory approaches. A pioneering study by PECC (1995), and the slightly later work by Hoekman (1996) summarizes trade restrictiveness quantitatively first by identifying the individual restrictions imposed by each country in a given sector by mode of supply, based on GATS commitments, and scoring them using weights to obtain frequency indexes.[2] Then they attribute an arbitrary tariff equivalent to the country demonstrating the most protectionist

[1] See Stern (2002) and Deardorff and Stern (2008) for detailed literature reviews on the quantification of services trade barriers.

[2] A value of 1 is attributed to a sector or a mode with no restrictions, 0 if no policy binds and 0.5 if there is any restriction in a sector or in a mode of supply.

policy. Other countries' tariff equivalent are calculated according to the level of their commitment relative to the benchmark. This approach has the advantage of being applicable across sectors but also has drawbacks. It mixes and aggregates different constraints in an inconsistent manner. For instance, the obligation to use locally licensed professionals to perform a service is considered even though market access is denied. These measures do not integrate a hierarchy between the different impediments to services trade. More importantly, this approach attributes judgmental (therefore arbitrary) weights to the different restrictions. Finally, as Stern (2002) points out, indexes are relative indicators, not numerical indexes that can be used to derive tariff equivalents. Nicoletti et al. (2000), Dihel and Shepherd (2007) and Fontagné and Mitaritonna (2013) tried to overcome the issue of arbitrary weigths by using principal component analysis. However, this also has an important limitation in that it attributes weights based on the contribution of each restriction to the total variance of the restriction set, which does not necessarily reflect the importance of a given factor on services flows.

Holmes and Hardin (2000) and Dee (2005) from the Australian Productivity Commission, Dihel and Shepherd (2007) and Fontagné and Mitaritonna (2013) refined the frequency approach by integrating a larger range of restrictions into the computation of indexes. More recently, the OECD (2014)[3] and Borchert et al. (2014) from the WB proposes restrictiveness measures that offer a larger country coverage (respectively 40 and 103 countries) and higher sectoral disaggregation (respectively 18 and 21 sectors). However, they lack temporal variation. Due not only to its sectoral coverage, Borchert et al. (2014)'s database presents multiple advantages. It evaluates restrictiveness measures for Mode 1, 3 and 4 of services supply, and in addition provides all the *qualitative information* used to compute restrictiveness indexes. This qualitative data are a key source of information for the developments of our paper. In this second strand of the litterature tariff equivalents were obtained relying on a two-stage method. In the first stage, qualitative data on barriers is used to build quantitative indexes (TRI indexes). In the second stage, TRI indexes are used to explain international differences in within sector price-cost margins, controlling for other firm-level variables. The use of this methodology remains limited (Dihel and Shepherd, 2007; Fontagné and Mitaritonna, 2013), mainly due to the huge volume of firm level information that the method requires.

Finally, some authors have taken an indirect approach to avoid the difficulties of consistently identifying and aggregating the regulatory protections. In this third literature strand the level of protection in services is revealed through an can be revealed through an

[3]The OECD launched these measures in 2014 and has provided regular improvements to their methodology and coverage.

econometric exercise that relies on gravity equations (Park, 2002; Fontagné et al., 2011 and Guillin, 2013a). In constrast to work demonstrating the effectiveness of a gravity equation applied to trade in goods, the litterature on application of the gravity model to services trade, pioneered by Francois (1993) remains limited. However, it increased from 2000 (Mirza and Nicoletti, 2004; Francois et al., 2005; Kimura and Lee, 2006; Walsh, 2008; Head et al., 2009; Fontagné et al., 2011 and Guillin, 2013b), due mainly to better quality data on services trade. The picture that emerges shows how the gravity equation (in panel) is as effective for explaining services trade as trade in goods.

Francois et al. (2005) rely on sector-specific gravity equations estimated on Global Trade Analysis (GTAP) data, and show that to estimate trade barriers, the standard specification is significant even for trade in services. Kimura and Lee (2006) confirm that Gross Domestic Product (GDP), distance, remoteness, adjacence, RTAs, economic freedom index, and a common language are significant and robust determinants of bilateral trade in services (imports and exports). Walsh (2008) estimates a specific gravity equation for four sectors (transport, government, other commercial services, travel). The explanatory variables are per capita GDP, population, distance, adjacency, common language and a dummy for European Union (EU) membership. Distance seems to have a strong but decreasing impact on services (Head et al., 2009), however, it should be interpreted with caution.[4]

Based on gravity models, the estimation of tariff equivalents is obtained by comparing observed flows of services relative to a benchmark (supposedly impediment-free for service imports). From the obtained residuals (Park, 2002 and Fontagné et al., 2011) or importer-country fixed-effects (only for Fontagné et al., 2011), the average applied protection equivalents for a large panel of countries can be calculated. While this method has the advantage of limited data requirements, it also has important weakness, as Deardorff and Stern (2008) point out: deviations in trade flows from what model variables predict are attributed to trade impediments. This implies that the unobserved importer-level demand factors, other than GDP and price index measures, are captured by the trade barrier estimations.

Both the direct and indirect methods presented above have a serious limitation which is that they do not allow us to track the link between the given applied policies and the trade flows. For the direct methods, the scoring process reduces multiple restrictions into one

[4] In the case of services, compared to goods, distance has a different meaning, which is due to the intangible nature of what is being traded. In the case of services distanceis also a proxy for omitted variables which are important determinants of trade in services (e.g. cultural and institutional variables). All in all distance may be capturing informational imperfections in particular.

metric and loses track of the individual constraints. Continuous scores fail to account for the discrete nature of services trade restrictions. While these scores are sufficient to test the relation between a combination of restrictions and services trade, they do not allow evaluation of particular market access or operational restrictions. This seriously limits the use of such restrictiveness measures of policy evaluation and design. This limitation applies also to indirect measures of restrictions.

All the above evaluations of import restrictions are unilateral measures, at the importer-level, but it should be borne in mind that service RTAs can add a *bilateral* source of heterogeneity to these restrictiveness measures presented above. The study by Guillin (2013b) estimates a gravity equation to sort out the effect of the RTAs in force during the period 1999-2007. She shows that only trade agreements covering services have a significant effect on trade in services, and that the deeper the agreement, the more frequently the signatory countries trade. Thus, a measures of RTA services trade restrictions must be included. Otherwise, the measure of the impact related to unilateral restrictions will be biased.

We have tried to make improvements to the method for computing restrictiveness indexes. To construct our restrictiveness indicators we use a database recently published by the WB which provides qualitative information on restrictions to trade in services across nations and sectors (Borchert et al., 2014). Our methodology is described in section 4.

3 Gravity model augmented for import restrictions

To examine the effect of import restrictions on bilateral services trade, we rely on the gravity framework developed by Anderson and van Wincoop (2004). Into this model initially formulated for trade in goods, we integrate trade frictions coming from the regulatory policies applying to services. While transportation costs and tariffs are major trade costs for goods, they are not relevant for services trade. The mostly intangible nature of services implies that the transportation costs are negligible. They take the form of telecommunication costs, which are mostly a fixed costs in the firm's expenses. However, this does not mean distance irrelevant to services since distance captures informational frictions due to the remoteness of the supplier and the buyer (Rauch and Trindade, 2002; Chaney, 2011). In addition, services are not subject to tariffs since there is no physical crossing of borders.

Market access and operational constraints faced by foreign service exporting firms have various origins (Deardorff and Stern, 2008; Borchert et al., 2014). These constrains

generate additional costs for the exporting firm arising from registration and sales authorizations and negotiations with local authorities (e.g. proving the domestic unavailability of the service) for market access regulations, compliance processes, or additional bureaucracy related to operational restrictions. These additional costs for importing the service are supposedly specific to each sector (henceforth services sector are indicated by the k subscript, and exporter and importer countries by i and j respectively). In addition to distance and dyadic country links which enter the trade cost factor Λ_{ij}^k (≥ 1), to denote regulatory restrictions we introduce the bilateral term Ψ_{ij}^k which represents the ad-valorem additional cost due to regulatory restrictions ($\Psi_{ij}^k \geq 0$ and $\Psi_{jj}^k = 0$). While we follow the monopolistic competition setting in Anderson and Van Wincoop (2003) with product differentiation by source country, we do not enforce symmetric trade impediments between countries i and j.

Starting with a producer's price p_i^k for the domestic market, we can express the cost of providing the service k by a producer from country i to a destination j in the following multiplicative form: $p_{ij}^k = \Lambda_{ij}^k(1 + \Psi_{ij}^k)p_i^k$

Following Anderson and van Wincoop (2004), we use a traditional CES-based demand structure which gives the flows of service k that cross the border from i to j:

$$X_{ij}^k = \left(\frac{p_{ij}^k}{P_j^k}\right)^{1-\sigma_k} E_j^k \tag{1}$$

where P_j^k refers to the price index of the demand function with an elasticity of substitutionσ_k between the varieties within the type of service k:

$$P_j^k = \left[\sum_i \left(p_{ij}^k\right)^{1-\sigma_k}\right]^{\frac{1}{1-\sigma_k}} \tag{2}$$

We have the value produced by country i which equals the sum of the bilateral flows from i to all destinations (including i for the internal absorption) for markets to clear:

$$Y_i^k = \sum_j X_{ij}^k \tag{3}$$

Solving for p_i in (3), we obtain: $\left(p_{ij}^k\right)^{\sigma_k - 1} = \frac{Y_W^k}{Y_i^k}\left(\Pi_i^k\right)^{1-\sigma_k}$ with :

$$\left(\Pi_i^k\right)^{1-\sigma_k} = \sum_j \left(\frac{\Lambda_{ij}^k(1+\Psi_{ij}^k)}{P_j^k}\right)^{1-\sigma_k} \frac{E_j^k}{Y_W^k} \tag{4}$$

This term transmits the effect of an increase in the level of in import restrictiveness for non-j service importers which would stimulate flows from i to j.

We substitute the previous in (1) and (2), which yields the value of the bilateral service flows in function of the regulatory frictions, dyadic factors, and the price index which can be summarized as :

$$X_{ij}^k = \left(\frac{\Lambda_{ij}^k(1+\Psi_{ij}^k)}{\Pi_i^k P_j^k}\right)^{1-\sigma_k} \frac{E_j^k Y_i^k}{Y_W^k} \tag{5}$$

and:

$$\left(P_j^k\right)^{1-\sigma_k} = \left(\frac{1}{\Pi_j^k}\right)^{1-\sigma_k} \frac{Y_j^k}{Y_W^k} + \sum_{i\neq j} \left(\frac{\Lambda_{ij}^k(1+\Psi_{ij}^k)}{\Pi_i^k}\right)^{1-\sigma_k} \frac{Y_i^k}{Y_W^k} \tag{6}$$

This captures the increase of flows from i to j if the other service providers of j happen to face higher levels of restrictions on entering j.

4 Empirical analysis

4.1 Data

We combine two key data sets for our empirical analyses: sector-level bilateral service flows from the WTO, and qualitative information on restrictions on trade in services from the WB. The sample used for the econometric estimations has a coverage that is limited by the intersection of the two data sets. We focus on three sectors (other business services -"OBS", banking and insurance) during the period 2008-2011, because the data on the import restrictions refer to this period. Below, we describe the two databases and the method used to construct our restrictiveness indicators. Additional variables required for appropriate estimation of the gravity model are also described.

4.1.1 Bilateral trade flows

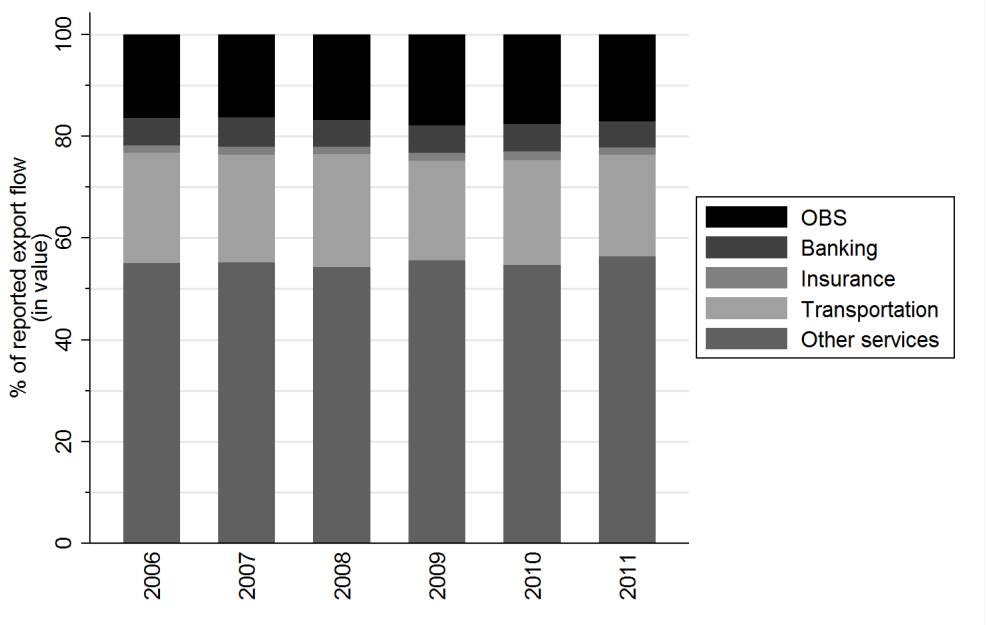
The WTO provided us confidential recent data on bilateral flows for the cross-border supply of services at sector-level. These data correspond to a focus on Mode 1 services supply adopted for the present research (as defined by the GATS). As balance of payments reporting does not offer a strict separation between Modes I and IV, some transactions recorded within the WTO bilateral flows may relate to the presence of non-resident workers in the destination country (Mode IV) rather than to cross-border supply (see Maurer et al., 2008). However, total Mode IV services trade represents about 5.1% of Mode I flows. Therefore, the inclusion of some Mode IV flows is not likely to affect our results.

For the present sample, the WTO compiled international services trade data from Eurostat, OECD and national statistical agencies. These institutions followed the Balance of Payment Manual 5 collection and reporting procedures (IMF, 1993) which improve the comparability of the flows across reporting countries and over time. The initial database reports data for 11 service sectors, however, due to the different classification used in WB database, we restrict our analyses to the four sectors of banking activities, insurance, "OBS" and transportation (respectively the Extended Balance of Payments Services categories: 260, 253, 268 and 205). The first sector covers all financial services except insurance activities which are reported in a specific sector category. "OBS" includes a large range of professional services such as legal and accounting services, technical services (including R&D) and advertising. Transportation refers to carriage of passengers, movement of goods, and the related supporting activities provided to either foreign customers by domestic companies or to domestic customers in foreign countries. The breakdown of total export value is depicted in Figure 1.

We restricted the time range to the 2006-2011 period for several reasons.[5] First, the reporting of service flows drastically improved after 2000. Between 2004 and 2006, Eurostat (the main contributor to the WTO data used in the present study) made radical improvements to sector-level reporting of service flows. Since then, with the exception of the entry of Norway, the set of reporters has remained unchanged. This ensures that the results are not affected by changes in the composition of reporting entities. In addition, the set of partners in the WTO sample did not change during 2006-2011. Finally, the data on restrictions provided by the WB are time-invariant; they evaluate the restrictiveness of import measures at just one point in time during the 2007-2010 period, without knowing exactly when information is collected for each country.

[5] Results do not change when we repeat the estimates for the period 2007-2010.

Figure 1: Service export value per sector (in %)



Source: Authors' computation based on WTO data.

The WTO covers the reporting of both exports and imports. The primary source of information is commercial banks that report international transactions in services (using the International Transactions Reporting System – ITRS, see IMF, 1993). Exports consist of the sales of service provider companies, while imports comprise the purchase of services from abroad. The main revenues of service providers from their sales, are easier to track than the piecemeal purchase of services on the import side. Thus, we decided to use only the export data because of their better reporting.[6] A reconciliation between export and import mirror flows was a possible option (Gehlhar, 1996, ten Cate, 2007 and van Leeuwen and Lejour, 2006), however, we discarded this method because of the measurement difficulties.

The resulting sample covers a total of 96 import countries where Great Britain and the US are the first importers of banking activities, insurance and "OBS". The distribution of the top-10 importer countries by sector is provided in Table 1.

[6] Based on the original sample of exports and imports, comparison of the WTO mirror flows showed that the value of bilateral imports was underestimated relative to their export counterparts.

Table 1: Top importers per sector

	OBS	Banking	Insurance	Transportation
1	USA (27.07%)	GBR (25.02%)	GBR (19.17%)	USA (18.43%)
2	GBR (12.83%)	USA (15.52%)	USA (15.66%)	GBR (10.78%)
3	DEU (10.09%)	DEU (9.59%)	ITA (8.41%)	DEU (9.13%)
4	BEL (5.08%)	BEL (5.75%)	JPN (7.52%)	CHN (8.19%)
5	NLD (5.01%)	JPN (5.56%)	DEU (7.18%)	JPN (6.71%)
6	FRA (4.44%)	ITA (5.28%)	FRA (5.75%)	NLD (4.09%)
7	CHN (3.36%)	NLD (4.81%)	CAN (4.65%)	FRA (3.92%)
8	ITA (2.81%)	FRA (4.64%)	BEL (2.86%)	ITA (3.42%)
9	JPN (2.78%)	AUS (2.83%)	AUS (2.82%)	KOR (2.91%)
10	ESP (2.16%)	CHN (2.23%)	IRL (2.77%)	BEL (2.67%)

Source: Authors' computation based on WTO data.
Note: % indicate the share of each importer relative to the total value of import flows of the sample (per sector).

4.1.2 From regulatory restrictions to trade restrictiveness indicators

Constructing trade restrictiveness indicators needs sector specific information on the market entry and operational restrictions in place. This kind of information requires significant collection efforts because of the large variety of restrictions and necessitates case-by-case analyses.

These data have been collected recently by the WB (Borchert et al., 2014) which made it available along with their own computation of trade restrictiveness indexes. We take advantage of this detailed dataset of discrete restrictions, adopting a different method to calculate restrictiveness indicators at sectoral level. This information source is remarkable in many respects.

The WB initiative started with a survey of business practices believed to be impeding imports of services in 103 countries, 21 major service sectors and service supply Modes 1, 3 and 4. In our following study we focus only on Mode 1, in line with the trade service data provided by the WTO. To be more precise, restrictions are identified for two or three key activities (depending on the sector) – referred to in what follows as sub-sectors – for each importing country-sector combination. For instance, restrictions for banking are covered by two sub-sectors: bank lending, and bank deposit.

Guided by sector experts and private sector representatives, we retained the key restrictions affecting service exporting firms based on a negative lists approach, meaning that

Table 2: Examples of binding key restrictions for the insurance sector

Restriction level	Examples of restrictions
(0) Open without restriction	Absence of restrictions (not sector specific)
(1) Virtually open	Allowed, subject to approval and registration
(2) Major / non trivial restrictions	Allowed, if buyers initiate the purchase
(3) Virtually closed	Allowed, subject to domestic unavailability
(4) Completely closed	Not allowed

Source: based on Borchert et al. (2014).

only applied measures which restrict services trade are recorded. This business level and applied methodology contrasts with most existing research in this area (e.g. Hoekman, 1996), which does not consider the enforcement dimension of restrictions. For example, those identified by Borchert et al. (2014) cover both the discriminatory as well as the main non-discriminatory restrictions which potentially have a significant impact on trade.

Within the key restrictions of country-subsector pairs, only the most binding constraint is retained. This avoids treating restrictions as additive factors. An illustrative example is that of a country that denies cross border supply of services, and in addition, imposes the requirement of locally licensed professional for a given service sector. The WB study does not double count restrictions for such a regulatory environment. Only the first is retained. However, the frequency index measures used in previous studies would count both.

Then the most binding restrictions are classified into five categories of trade impediments for all subsectors: (0) Open without restrictions, (1) Virtually open, (2) Existence of major / non trivial restrictions, (3) Virtually closed and (4) Completely closed.

This classification provides comparability across subsectors. It converts the heterogeneity of restrictions faced by firms into consistent classes of restrictions and offers a natural ordering that respects the discrete nature of the restrictions. The relation between the level and the applied restriction is direct which is convenient for policy evaluations. Table 2 presents examples of restriction levels for the Insurance sector.

While Borchert et al. (2014)'s work offers wide country coverage, this information source has several limitations. First, the restrictions are for one point in time during the 2008-2010 period. The massive collection effort required to compile this data set makes annual updates of the restrictions difficult and resource consuming. Without a temporal dimension, the variability in the restrictiveness information is limited. The second major shortcoming is the limited bilateral nature of this dataset which evaluates primarily on an

importer-level basis. For a given importing country, only the European countries have differentiated regulatory protection level depending on the exporter country (either EU member or non-EU member). This bilateral nature of restrictiveness levels becomes increasingly important as countries engage in service RTA (see Marchetti and Roy, 2013 and Guillin, 2013b).

Starting from those regulatory restrictions we want to construct sectoral level restrictiveness indicators in order to perform econometrics. This stage imposes additional constraints. First, the nomenclature for the definition of services sectors is not the same as that used for the services trade data provided by the WTO, allowing us to retain only 4 of the 21 sectors i.e. OBS, Banking, Insurance and Transportation.

Second, coverage of the sub-sectors should be representative of the entire sector. This is not the case for transportation; regulatory restrictions are collected only for maritime transportation, not for domestic air and road transportation. Therefore, we exclude the transportation sector. Another constraint is that each level of restrictiveness should be sufficiently observed to be relevant in the econometric evaluations. However, the highest level of restrictiveness – "Completely closed" is rarely observed and is associated with less than 3% of the bilateral flows in our sample. As a result, we group this restrictiveness level (4) to Level (3) keeping the name "Virtually closed", but labelling it as Level (3/4). At this stage, restrictiveness is measured based on four discrete levels at the sub-sector level, for three sectors, namely OBS, Banking and Insurance.[7]

In the final stage we need to convert sub-sector protections into a unique sector level index. One possible choice would be to associate a numerical value to each restrictiveness level, and average it at the sector level; this is the procedure adopted by the World Bank to calculate their own continous sectoral level indexes.[8]

However, we keep the discrete character of the restrictiveness levels and convert the sub-sector levels into unique protection at sectoral level following these simple rules:

- If all *sub-sectors* of the given sector present no trade impediments ("*Level (0) - Open without restrictions*"), the *sectoral* restrictiveness level is set to "*Level (0)*";
- If *sub-sectors* restrictiveness levels are not only at the "*Level (0)"* but present some minor restrictions "*Level (1) - virtually open*", the *sectoral* restrictiveness level is set to "*Level (1)*;

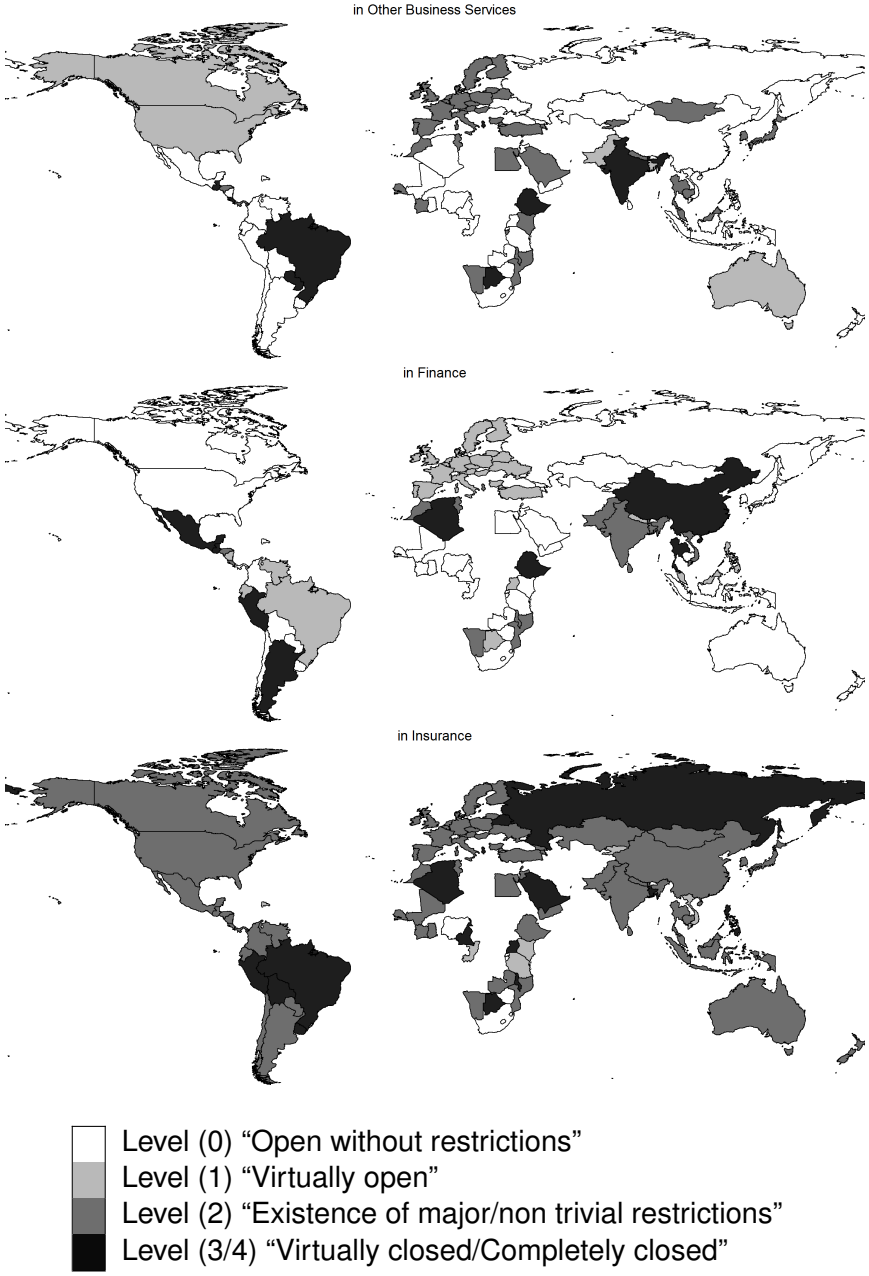
[7] Within each sector, the sub-sector restrictiveness levels are the same for almost 55% of all importer-sector combinations.

[8] This technique has a serious limitation: it removes the discrete level of the restrictiveness and therefore, assumes their linearity (same additional restrictiveness effect on trade independent of the observed level).

- If *sub-sectors* restrictiveness levels are either all at the major restriction "*Level (2)"* or if there exists at least one sub-sector at this level of restrictiveness, the *sectoral* restrictiveness level is set to "*Level (2)*";
- If *sub-sectors* restrictiveness levels are either all at the maximum level – "*Level (3/4)"* – or if there exists at least one sub-sector at this level of restrictiveness, the *sectoral* restrictiveness level is set to "*Level (3/4)*".

Borchert et al. (2014) show an important heterogeneity in the regulatory protection levels across countries across sub-sectors. The map of Figure 2, shows that our sectoral discrete levels of restrictiveness show important variations across importers.

Figure 2: Ordinal restrictiveness levels per sector



Source: Author's computation, based on Borchert et al. (2014).
Note: The countries not represented on the map are not covered by the restrictiveness database. The restriction levels for EU countries are those that apply to non-EU exporters.

Interestingly, high level restrictions are not specific to developing countries. For instance,

European countries impose strong entry and operational barriers on non-EU exporters of OBS. The insurance sector presents a distinct profile with high regulatory protection in most of the countries in the sample, relative to the other sectors.

To integrate the ordinal nature of restrictiveness levels (as opposed to continuous measures) into the econometric estimations, we use three binary variables to code the four restrictiveness levels (one dummy variable for each level of Level (1), Level (2) and Level (3/4), with Level (0) as the baseline). We adopt a simple coding method: for each importing country and sector, the binary variable of observed restriction level is set to 1, while the three others are set to 0 (the $\vec{\psi_{ij}^{k}}$represents the vector of the binary variables – *STR Level (1), STR Level (2) and STR Level (3/4)* – coding the four restrictiveness levels). For all importer countries except EU ones (at 2007), restrictions are evaluated at the importer level regardless of the exporter (MFN approach). The EU exception, for which we have both within- and extra-EU measures of restrictions, imposes the use of bilateral notations for the restrictiveness levels (with the i subscript for the exporters).

4.1.3 Other gravity variables

Our importer country level data for service restrictions proscribes the use of the importer fixed effect (developed further in Section 4.2). Therefore, we integrate importer-level key determinants into the gravity specification: the service expenditure and a proxy for the producer price index. For the importer country's expenditure, Baldwin et al. (2005) recommend the use of the corresponding sector's domestic consumption to deal with sector specific trade flows. Since these measures are not available at sector level, Baldwin et al. (2005) suggested the use of GDP values. Here, we adopt an intermediate solution by using domestic service expenditure, which is not influenced by consumption of goods. For each country-year pair, we use the data from the World Bank (2014)'s World Development Indicators (WDI) and compute service absorption as the sum of domestic value-added in total services and service imports minus exports of services (following Baldwin and Taglioni (2006), we use nominal values).

Neglecting the multilateral resistance term would provide biased estimations. For the inward multilateral resistance term, this issue should be treated using a dedicated variable to capture the import price level. Ideally, a Tornquist import price index would be used (Dutt and Traca, 2010). However, services lack the sector level disaggregated price data necessary for its construction. Therefore, we proxy for this term using the GDP deflator[9]

[9]These GDP deflators are evaluated using current exchange rate values to account for the effect of relative price changes due to variations in local currencies.

from World Bank (2014).[10]

To control for bilateral effects, we add the standard bilateral determinants: distance (in log), linguistic similarity (with the variable "common language")[11], common border (dummy variable "contiguity"),[12] and colonial link (dummy variable "colony").[13] In the case of services, distance captures transactional constrains, such as informational frictions, rather than transportation costs. The intangible nature of services suggests that marginal transportation costs are insignificant. We also consider the possibility of deviation from the unilateral character of the importer-level restrictions (MFN approach) by integrating trade agreements related to services. We construct a binary variable, "Service RTA", which has a value of 1 if the exporter and importer countries have signed a RTA covering service activities (at least in one service sector) and 0 otherwise.[14] We account further for this bilateral effect by including a dummy variable – "EU members dyad" – in our data set, indicating whether both the origin and destination countries are EU members. The stimulating effect of trade in services for this zone has been confirmed by numerous studies (Walsh, 2008, Marchetti, 2009, Fontagné et al., 2011 and Guillin, 2013b).

4.2 Econometric specifications

Despite the limited level of sectoral disaggregation (especially compared to trade in goods), the export sample presents many zero flows (between 6.7 and 32.7% of the observations depending on the sector, see Figure A.1 in the Appendix which presents the cumulative distribution of bilateral flows).[15] This characteristic raises some empirical issues which have been thoroughly addressed in the international trade literature. In this study, we suspect zero flows to occur when regulatory protections peak. An econometric specification, excluding zero flows would therefore provide biased estimates that underestimate

[10] While importer level fixed effects or Tornquist price indexes would be preferable, the use of the GDP deflator, which has been criticized in the literature, is less problematic for services. The reason is that in the structure of the economy, services accounts for 60% to 80% of GDP, and goods only for the remaining percentage. Therefore, measurement of the price evolutions using the GDP deflator is more precise for services than for goods (since it applied to most of the international trade before the use of fixed effects).

[11] This dummy variable is set to 1 if 9% of the origin and destination countries' populations have at least one common language. Otherwise the value equals 0.

[12] Set to equal1 if countries share a common border and 0 otherwise.

[13] Set to 1 if the origin and destination countries have or had colonial links and0 otherwise.

[14] For this, we thank José de Sousa (Paris-Sud University) for providing us with software routines which we used as the baseline to code service RTAs.

[15] To prevent zero flows results from missing values recorded by the statistical agencies, we obtained confirmation from the WTO that null export values do indicate null flows.

import restrictiveness. To prevent this specification error we complement the log-linear model with the method of poisson pseudo-maximum of likehood (PPML). Using level values for the dependent variable is desirable to account for zero flows and to handle heteroskedasticity (see also De Benedictis and Taglioni, 2011). the literature suggests the negative binomial as an alternative to the PPML model, in particular to deal with the frequent over-dispersion in the distribution of trade flows. We do not retain this last econometric specification, because this technique generates estimates that depend on the unit of measurement for the dependent variable, which in turn affects the estimated elasticities (Bosquet and Boulhol, 2014 and Head and Mayer, 2014). Another way to deal with zeroes is the Heckman selection model (Heckman, 1979). This two-stage model applied to trade flows first estimates the probability of trade between the two countries, and then estimates its value when it occurs. A critical assumption related to these models is exclusion restrictions (e.g. an instrument which simultaneously predicts the existence of trade but is not related to the value of strictly positive flows). This is why some researchers suggest the use of religious ties (Helpman et al., 2008 and, for an application to services see Guillin, 2013a); however, the independence between this variable and trade levels is questionable. We prefer the popular PPML specification for our estimations.

Empirical trade studies mostly adopt fixed effects to account for country-specific effects and focus on bilateral characteristics (Harrigan, 1996 and Redding and Venables, 2004). In our study, this convenient method, which reduces data requirements while providing consistent estimates of the bilateral effect, can only be applied on the exporter side. Focusing on importer-level characteristics, the effect of our key covariates capturing the restrictiveness level would be absorbed by the importer-level fixed effects. Therefore fixed effects can be used only for the exporters' production level and production price terms. We also include time-exporter country fixed effects for the reasons suggested by Baldwin and Taglioni (2006) in their generalization of Anderson and van Wincoop's multilateral trade resistance factors to the panel data approach. The absence of time varying dummies would introduce bias in the time-varying component of the multilateral trade resistance terms. The second motivation for introducing this set of dummies is to account for changes in world GDP Y_W in the production ratio Y_i/Y_W.

Our key covariates evaluate the regulatory protection at *importer-level*. For the EU only, these variables present both importer and exporter variations (which justifies the use of the ij subscripts for ψ_{ij}^k). Import restrictions related to EU country destinations differ according to whether the origin country belongs to the EU or not. This limited variability of the restrictiveness variables along the exporter dimension prevents the use of exporter (and time-exporter) fixed effects. The expenditure and production price index, which

proxies the multilateral resistance factor, cannot be substituted by importer dummies.

The estimations are performed for each sector separately, which imposes an additional assumption on service markets: the equilibria of service sectors are independent from each other. This approach has been used frquently in gravity-based studies for goods trade (see Anderson and van Wincoop, Baldwin et al., 2005, Anderson and Yotov, 2010 or Dutt and Traca, 2010). Since the variables evaluating the impediments to importing services vary essentially along the importer dimension for each sector, we adopt cluster-robust standard errors for all our estimations (at the importer-level). This prevents the standard errors from being underestimated because of intra-group correlations.

The panel estimations are performed separately for each k following the equation below (and for the PPML estimations with natural levels, instead of log):

$$ln(X_{ijt}^k) = \vec{\beta_\psi^k}\vec{\psi_{ij}^k} + \beta_1^k ln(E_{jt}) + \beta_2^k ln(P_{jt}) + \vec{\beta_\lambda^k}\vec{\lambda_{ijt}^k} + \sum_{i,t}\beta_{it}^k I_{it} + \epsilon_{ijt}^k \quad (7)$$

with I_{it} referring to the indicator function (one for each time-exporter dummy) , and ϵ_{ijt}^k represents the error term.

with $\vec{\beta_\lambda^k}$=($\beta_{\lambda 1}^k$,...,$\beta_{\lambda 5}^k$) and $\vec{\lambda_{ijt}^k} = \begin{pmatrix} ln(Distance_{ij}) \\ Common\ Language_{ij} \\ Colony_{ij} \\ Common\ Border_{ij} \\ Service\ RTA_{ijt} \\ EU\ country\ dyad_{ij} \end{pmatrix}$

4.3 Results

Following Equation 7, we start by examining the results of the gravity model and the impact of the restrictiveness levels on each sector using a simple OLS estimation. Since this truncates all zero flows, we address the potential biases in the previous estimation technique by using the PPML estimation approach. Differences in the results of the two specifications are indications of estimation bias for the OLS method. Next, we derive the average impact of a change in the restrictiveness level and comment on the different sectors. We run alternative specifications as robustness checks. Following previous research which uses continuous measures of restrictiveness, we expect that an increase

in regulatory protection will tend to reduce bilateral trade flows. For the ordinal/discrete structure of the restrictions present in our empirical model, we expect that each additional restrictiveness level significantly reduces the cross-border supply of services. However, the construction of our restrictiveness measure relaxes the assumption of a linear effect (or at best a polynomial form) in previous studies.

4.3.1 Main specifications

Before commenting on the estimates for the restrictiveness variables, we observe that the results related to the gravity variables – expenditure, distance, and country links – are in line the gravity literature, and the applications to services trade (Francois, 1993; Kimura and Lee, 2006; Walsh, 2008; Guillin, 2013b) for the OLS and PPML specifications presented in Table 3 and Table 4 respectively. For the OBS sector, estimates show two notable significant effects. Compared to the estimation baseline "No restrictions", high levels of import constraints "Virtually to completely closed", as expected, seriously impede international OBS. In addiiton we show how minor import constraints have a stimulating effect on trade in that sector. This contrasts with the trade impeding effect of regulation (see Kee et al., 2009) but is in line with Beghin et al. (2012) and Beghin et al. (2012): non-tariff measures are not necessarily protectionist, but in fact address market imperfections. These regulations mitigate negative externalities and information asymmetries which in turn, reduces the risk of an international transaction.

Table 4 reports the PPML estimations which offer more accurate results since they integrate zero flows. The trade impeding effect of the highest levels of restrictiveness, and the stimulating impact of modest policy measures are confirmed at higher significance levels.

For the banking industry, both "Major restrictions" and the highest restrictiveness level negatively impact on cross-border banking activities (using the PPML estimation, which accounts for zero flows, only "Level (3/4)" is statistically significant). However, the expectation of a significantly strong impact of the highest compared to "Major restrictions" is not confirmed. These last two levels of restrictiveness have similar impacts on international banking activities. This result challenges the assumption of a linear effect in the restrictiveness levels in previous works. In banking, the threshold for the impact of policy measures appears above the "Major restrictions" level.

In relation to the insurance industry, regulatory constraints significantly affect international flows if restrictions are at their highest level. As zero flows occur in 33% of the observa-

tions in the sector, the OLS estimation performs poorly and the effect is captured only by PPML estimations. Level (1) and level (2) restrictiveness present similar trade elasticities that show no statistical difference from the restriction-free baseline.

The estimations can be interpreted in terms of the average impact of a change in regulatory protection (from this point, only the results of the PPML estimations are considered). Studying the deviation not only as deviations from the baseline Level (0) but also from any one level of restrictiveness to another, provides additional evidence. The average impact corresponds to the ratio of estimated flow for a given restrictiveness level over the estimated flow at a reference restrictiveness level (e.g. any other level). It directly reports the result of a change in regulatory policy on service flows. The variation in trade flows related to a change in the restrictiveness level from level X to Y is given by the following expression: $\Delta X^{k}_{X \to Y} = \exp(\beta^{k}_{\psi_Y} - \beta^{k}_{\psi_X}) - 1$. For instance, if an importer decides to impose regulatory constraints on access to the cross-border supply of OBS services from Level (1) to "Level (3/4)", this would imply a 59.5% drop of international OBS flows: $\Delta X^{OBS}_{Level(1) \to Level(3/4)} = \exp(\beta^{OBS}_{\psi_{Level(3/4)}} - \beta^{OBS}_{\psi_{Level(1)}}) - 1 = exp(0.459 - (-0.444)) - 1 = -59.5\%$ (see the upper graph in Figure 3, where the reference value - Level (0) is set to 100%).

Table 3: Sectoral estimations (2006-2011) - OLS

	OBS	Banking	Insurance
STR level (1) - Virt. open	0.440*	-0.344	-0.242
	(0.193)	(0.288)	(0.483)
STR level (2) - Major restr.	0.182	-0.663***	-0.310
	(0.164)	(0.188)	(0.360)
STR level (3/4) - Virt.-compl. closed	-0.613**	-0.698	-0.495
	(0.194)	(0.369)	(0.391)
Importer serv. expend.	0.868***	0.831***	0.752***
	(0.046)	(0.091)	(0.064)
Importer deflator	-0.635	-0.577	-0.504
	(0.398)	(0.541)	(0.481)
Distance	-1.046***	-0.955***	-0.752***
	(0.095)	(0.131)	(0.093)
Common language	0.693**	0.561*	0.532*
	(0.213)	(0.246)	(0.237)
Common border	0.022	0.247	0.459
	(0.258)	(0.283)	(0.236)
Colony	0.744*	1.107***	0.964***
	(0.284)	(0.285)	(0.266)
EU members dyad	-0.010	-0.134	-0.277
	(0.281)	(0.396)	(0.292)
Service RTA	0.496	0.365	0.782**
	(0.270)	(0.290)	(0.247)
Year FE	Yes	Yes	Yes
Export country FE	Yes	Yes	Yes
Year - exp. count. FE	Yes	Yes	Yes
Cluster rob. SE	Imp. count.	Imp. count.	Imp. count.
R^2	0.80	0.79	0.73
Obs. number	6,736	5,133	4,418

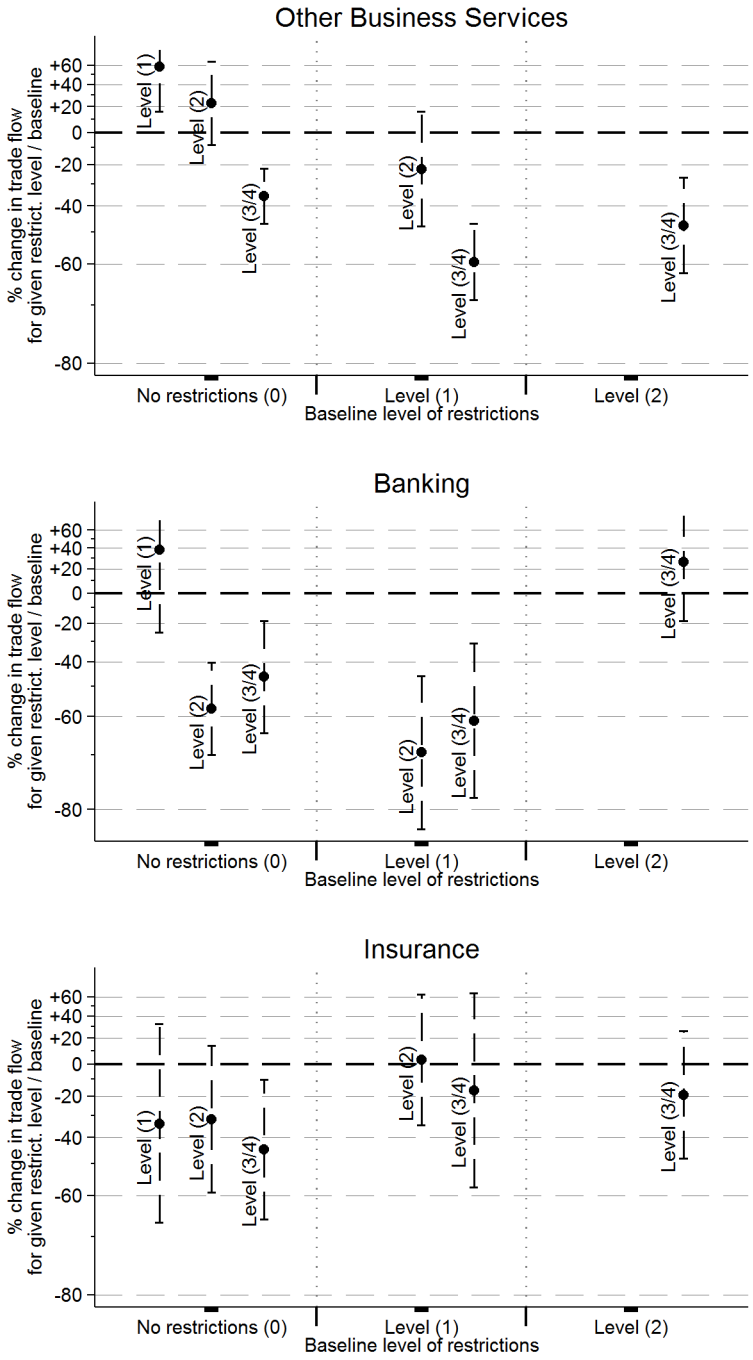
Note: Stars indicate the sign. level of the related estimates (*** p<0.01, ** p<0.05, * p< 0.1). For the OBS sector, the estimate for level (2) is not significantly different from the estimate for level (3/4). This applies also to the banking sector. Each specification includes a constant term. Results are robust when we restrict estimations at the period 2007-2010.

Table 4: Sectoral estimations (2006-2011) - PPML

	OBS	Banking	Insurance
STR level (1) - Virt. open	0.459**	0.326	-0.414
	(0.158)	(0.314)	(0.354)
STR level (2) - Major restr.	0.204	-0.858***	-0.383
	(0.148)	(0.175)	(0.261)
STR level (3/4) - Virt.-compl. closed	-0.444***	-0.623**	-0.596*
	(0.099)	(0.214)	(0.249)
Importer serv. expend.	0.753***	0.966***	0.865***
	(0.046)	(0.099)	(0.071)
Importer deflator	0.155	-0.323	-1.430
	(0.507)	(0.496)	(0.820)
Distance	-0.484***	-0.437***	-0.401***
	(0.087)	(0.102)	(0.120)
Common language	0.591***	0.798***	0.842***
	(0.113)	(0.237)	(0.190)
Common border	-0.159	-0.255	-0.046
	(0.095)	(0.307)	(0.216)
Colony	0.292*	0.322	0.110
	(0.131)	(0.235)	(0.194)
EU members dyad	0.404	1.122***	0.399
	(0.276)	(0.269)	(0.398)
Service RTA	0.053	0.141	0.567*
	(0.201)	(0.303)	(0.258)
Year FE	Yes	Yes	Yes
Export country FE	Yes	Yes	Yes
Year - exp. count. FE	Yes	Yes	Yes
Cluster rob. SE	Imp. count.	Imp. count.	Imp. count.
Ps. R^2 (McFadden)	0.87	0.90	0.85
Obs. number	7,219	6,789	6,567

Note: Stars indicate the sign. level of the related estimates (*** p<0.01, ** p<0.05, * p< 0.1). For the OBS sector, the estimate for level (2) is not significantly different from the estimate for level (3/4). This applies also to the banking sector. Each specification includes a constant term. Results are robust when we restrict estimations at the period 2007-2010.

Figure 3: Impact of stronger restrictions (based on the PPML estimations)



Note: % change of trade flow in log scale. The confidence intervals, shown as bars in the graphs, are evaluated at the 95% level. They provide information with respect to the baseline, but not relative to the other new restrictiveness levels. For ease of presentation, the upper bound of the confidence interval is cut when it is above the +80% value.

The impact of policy regulations present very different magnitudes across sectors. Moreover, not all restrictions levels show significant effects, in particular for limited changes to import regulations.

For the OBS sector, minor import regulations – Level (1) – stimulate trade flows compared to no restrictions, confirming that a minimum level of protection tends to secure cross-border transactions. When restrictions are at the highest level, this significantly impedes services trade relative not only to the no-restriction level but also to minor and major restrictions (respectively Level (1) and Level (2)). In this case OBS barriers negatively affect trade when they reach the highest level, while limited import regulation facilitates cross-border supply.

For the banking industry, we detect no significant impact of minor restrictions, neither trade promoting nor constraining. For this particular sector, major and high (Level (2) and Level (3/4)) have similar impacts on Mode 1 supply. A threshold effect appears for major restrictions.

In the insurance sector, similar to OBS, only the highest level of import regulation significantly constraints service flows. Changes from Level (1) or Level (2) restrictions to the "Virtually to completely closed" import constraints have no significant impact.

5 Robustness and endogeneity tests

To check the robustness of our results, we test alternative specifications. Four different aspects are analyzed. The first consists of adopting an alternative implementation of the variable service RTA. The second is aimed at evaluating different econometric specifications for the gravity model using the various approaches proposed in the literature. The third consists of replicating the estimations for two sub-samples based on the importer income level. Fourth, we consider the risk of endogeneity since the restrictiveness level could be influenced by the major service exporters.

In relation to our first robusteness check, the presence of a service RTA is integrated initially using a binary indicator capturing the presence of at least one RTA between importer and exporter. We try to refine this approach by considering type of service RTAs. We replace this binary variable by three distinct binary variables which capture the nature of the RTA.[16] The first indicates whether the importer and exporter countries have

[16]We thank Amelie Guillin for providing this data set on service RTAs. See her recent work (Guillin, 2013b) for more details.

a "National treatment" clause (services for destination countries are subject to the same regulatory constraints as services from the local suppliers of the importing country). The second binary variable reports the existence of a MFN clause (in that case the foreign supplier cannot be subject to a less favorable regulatory policy than the suppliers in any countries not included in the RTA). The third variable accounts for market access clauses in the RTA (the signatory countries decide to remove the discriminating policies related to market access). We run the estimation for the PPML specification with these alternative variables. As reported in the Table A.2 in the appendix, the previously observed impact of restrictiveness levels on the different sectors are confirmed and further validate our control for the bilateral effect of services RTAs. In addition, since some exporter and importer pairs signed a service RTA during the 2006-2011 period, we decide to reproduce the analyses on the sub-sample excluding the country pairs that did so since this potentially might affect restrictiveness levels. This restrictions removes 1.8% of the observations, and, as Table A.3 in the appendix shows, the estimates of trade elasticities for the restrictiveness level are not affected (in terms of magnitude or significance levels).

The second check is based on developments in the recent trade literature which suggests multiple econometric approaches to deal with expenditure levels and the multilateral resistance terms in the case that fixed effect techniques cannot be applied. To integrate the expenditure level, we use the national absorption of services for the importer countries (GDP in services plus imports of services minus exports). Some authors prefer to use the GDP of the whole importer economy (including services and goods) (see Dutt and Traca, 2010 for instance). This specification is preferable under the strong assumption that a significant level of substitution between services and goods exists (the market equilibria for goods and services are supposed then to be interdependent). We replaced importer services expenditure by GDP values and replicated the estimations (see the results in appendix Table A.4). This alternative specification mostly does not affect the key results (with the one exception of loss of significance for the impact of high restrictiveness Level (3/4) in Insurance).[17]

Third, we assess the impact of specific income-level import countries. We split the sample into two sub-groups of *importing countries*: high-income importers (83% of the sample comprising"OECD high income countries", "High income: non-OECD" and "Upper middle income countries" as defined by the OECD) and low-income importers (17%). Appendix Table A.5 shows that the results of the main specifications are confirmed. However for

[17]We also tested an additional modification to the implementation of the gravity model by replacing exporter fixed effects with value added in services and the production price index of the exporter (following Dutt and Traca, 2010). Not surprisingly, the estimation results of this approach change, with weaker control of the exporter level factors.

the low-income countries, the effects of the different restrictiveness level are not verified for the three sectors, which suggests that this minor sub-group has specific dynamics regarding import policies.

Finally we address the risk of endogeneity. To prevent leading service exporter countries possibly affecting the level of the import restrictions in destination countries (reverse causality), we estimate the impact of restrictiveness levels on a subset of flows which excludes those from top services exporters.[18] We remove the observations related to exporter countries with more than 10% of world export share (regardless of the destination country) for each service sector. This exclusion of export countries is based also on their sectoral export shares in 2006. Keeping constant the exclusion list of top exporter across time prevents the bilateral flows dynamics from affecting the restrictiveness level due to reverse causality, within the estimation period. Table A.5 shows that this test confirms the results of the "main specifications" estimations (sector-level sample sizes reduce between 13.5% and 17.3% depending on the sector) and rules out the important risk of reverse causality.[19] We observed only one minor difference from the previous estimations: major import restrictions (Level (2)) for the cross border supply of banking loose significance.

5.1 Ad-valorem tariff equivalents

5.1.1 Identification

Based on our structural model and the previous estimations (with the PPML specification), we want to quantify ad-valorem tariff equivalents for the restrictiveness levels. Using the relation between the theoretical expression (5), we first evaluate the ratio of service flows at a given restrictiveness level over benchmark flows with no import restrictions. The restriction baseline used as benchmark to evaluate the tariff equivalents corresponds to a *restriction-free* import environment (subscript *free*), i.e. Level (0). We reproduce this evaluation for the empirical expression of trade flow (7).

For the three restrictiveness levels and each k, we derive a tariff equivalent τ_{ij}^k such that $\tau_{ij}^k = \Psi_{ij}^k$. In theory, this means three equivalents per sector, given that level "*(0)*

[18] The time-invariant and unilateral evaluation of restrictions, as well as their unilateral nature, excludes the usual methods for dealing with endogeneity. In particular, we cannot implement exporter-importer country fixed effects to rely on variation across time, or use lagged values of restrictiveness levels or instrument restrictiveness levels since we have multiple discrete restrictiveness variables.

[19] We also applied more stringent conditions to test endogeneity by removing either the top 5% or the top 2% exporter countries. The estimation results follow and confirm those for the 10% level exclusion rule, with the exception of an additional loss of significance for the highest level of restrictiveness in Insurance.

No-low" is used as the baseline for each (4 levels minus 1 for the baseline): $\tau^k_{(1)}$, $\tau^k_{(2)}$ and $\tau^k_{(3/4)}$). We then identify the tariff equivalent term such that the ratio ${}^{X^k_{ijt}}/_{X^k_{ijt\ free}}$ (for given restrictions compared to the restriction-free situation) provided by Equation 5 in the theoretical model is equal to the ratio of the estimated flows ${}^{E(\hat{X}^k_{ijt})}/_{E(\hat{X}^k_{ijt\ free})}$.

On the theoretical side, we assume that the change in restrictions from restriction-*free* to another level has a negligible impact on Π^k_i and P^k_j. This assumption remains realistic to the extent that, Π^k_i and P^k_j, the weight of the origin country relative to the world production in sector k and the weight of the destination country expenditure in k over the world production, are limited. Since $\tau^k_{ij\ free} = 0$, we obtain from Equation (5):

$${}^{X^k_{ijt}}/_{X^k_{ijt\ free}} = \left(1 + \Psi^k_{ij}\right)^{1-\sigma_k}$$

On the empirical side:

$${}^{E(\hat{X}^k_{ijt})}/_{E(\hat{X}^k_{ijt\ free})} = \frac{\exp(\hat{\beta^k_\psi}\psi^k_{ij}+\hat{\alpha^k_1}ln(E_{jt})+\hat{\alpha^k_2}ln(P_{jt})+\hat{\beta^k_\lambda}\lambda^k_{ijt}+\sum_{i,t}\hat{\beta^k_{it}}I_{it})}{\exp(\hat{\beta^k_\psi}\vec{\psi^k_{ij\ free}}+\hat{\alpha^k_1}ln(E_{jt})+\hat{\alpha^k_2}ln(P_{jt})+\hat{\beta^k_\lambda}\lambda^k_{ijt}+\sum_{i,t}\hat{\beta^k_{it}}I_{it})} \text{ with } \vec{\psi^k_{ij\ free}} = \vec{0} \text{ with}$$

level "(0) No restrictions" as the estimation baseline.

This then gives : ${}^{E(\hat{X}^k_{ijt})}/_{E(\hat{X}^k_{ijt\ free})} = exp(\hat{\vec{\beta^k_\psi}}\vec{\psi^k_{ij}})$

To identify the tariff equivalent term, we set the theoretical trade ratio equal to its empirical counterpart and obtain:

$$\tau^k_{ij} = \exp(\hat{\beta^k_\psi}\psi^k_{ij}/1-\sigma_k) - 1 \tag{8}$$

5.1.2 Levels of the tariff equivalents

Using the econometric specification which integrates zero flows (PPML model), we estimate the tariff equivalent following (8). This computation requires a value for the elasticity of substitution for each sector. Since estimation of this elasticity is beyond the scope of the present research, we draw on existing works for the value of this parameter. For services, there is a large range of elasticity values in the literature. While Francois et al. (2005) suggests values from 1.26 to 1.68, Park (2002) and Fontagné et al. (2011) suggest much higher values of 5.6 (constant across service sectors). Here, we take the value of 1.95 derived by Hertel et al. (2007) (within the GTAP initiative) and used by Walsh (2008) for the computation of tariff equivalents. Compared to values observed for

trade in goods, this substitution level is consistent with the high specificity of service production which limits arbitrages between varieties, and reduces substituability (for a given service sector). However changes in σ_k do not affect the ordering of the tariff equivalent between the restrictiveness level (and consequently between countries). Each variation in σ_k produces a strictly decreasing and convex transformation of the tariff values which modifies the magnitude of the tariff equivalents.

Table 5: Tariff equivalents - Constrained baseline
Benchmark (estimation baseline for the restrictiveness dummies): Level (0) "non-restriction"

Per restrictiveness level (for all k: $\sigma_k = 1.95$)	OBS	Banking	Insurance
$\tau^k_{(0)}$ – (0) Open without restr.	*Benchmark (constrained)*		
$\tau^k_{(1)}$ – (1) Virtually open	-38.3% (trade facilitating)	Nsd from benchmark	Nsd from benchmark
$\tau^k_{(2)}$ – (2) Major/non trivial restrictions	Nsd from benchmark	146.7%	Nsd from benchmark
$\tau^k_{(3/4)}$ – (3/4) Virtually closed / completely closed	59.5%	92.6% (Nsd from tariff equiv. of (2) Major/non trivial restrictions)	87.2%

Note: this table is based on the results of the PPML specification. Nsd stands for not significantly different.

Starting with the highest level of restrictiveness Level (3/4) "Virtually closed / completely closed", we observe tariff equivalents as high as 93% for the banking sector and 87.2% for Insurance, as reported in Table 4. OBS presents a low tariff equivalent for this level of impediments. For the "Major/Non trivial restrictions" level, only the banking sector shows a significant estimate, and therefore provides an estimation of the tariff equivalent. This value is particularly high, despite being not significantly different from the estimate for Level (4) restrictions. Table 4 reports positive estimates for some effects of low levels of restrictiveness. In line with this apparently counter-intuitive finding, the negative value of 38% for the import restrictions at Level (1) for OBS suggest that Level (0) is not necessarily the restriction profile that provides the most trade facilitating environment. For some OBS (and possibly Banking, despite the non significance), this may occur at Level (1) "Virtually open". In other words, in the presence of minor regulatory constraints for market access and/or operations regulatory constraints can have ambiguous effects as

explained above (see Subsection 4.3.1).

In the case of services, minor import restrictions are mandatory registration of the cross-border provider, or respect for information and quality standards. Therefore, tariff equivalents integrate two components. The first derives from the protectionist effect of import regulations and positively contributes to τ^k. The second comes from the decrease in externalities due to regulatory protection which fosters services trade and reduces τ^k. In contrast to the first estimation of the tariff equivalent (presented in Table 5), constraining estimation of the benchmark for the tariff equivalent to Level (0) is not necessary. The benchmark for the tariff estimation can be provided by the most trade-facilitating restriction level. In the case of OBS and Banking, Level (1) rather than Level (0) becomes the benchmark.

To integrate these findings and obtain new tariff equivalents, we need simply to estimate them using the most trade facilitating restrictiveness level as a baseline dummy for the restrictions (whether Level (0) some other).[20] Table (6) reports the new results which show higher ad-valorem tariff equivalents for the OBS and Banking sectors.

For ease of comparison with other studies (Park, 2002 and Fontagné et al., 2011), we replicate Tables 5 and 6 with $\sigma_k = 5.6$, instead of 1.95. This change does not affect the ordering of tariff equivalents, but reduces their magnitude. The additional results using this new value of substitution elasticity are reported in Table A.1 (unconstrained estimation) in the Appendix (for both the constrained and unconstrained benchmarks).

Comparison with the existing previous tariff equivalent estimations shows significant differences in all sectors. For instance, Fontagné et al. (2011) find, for the OBS sector, that Brazil and Australia[21] have tariff equivalents of 46% and 66%, respectively; while we observe the highest restrictiveness level for Brazil and only minor restrictions for Australia.

There are also important differences in the banking sector. While tariff equivalents are null for Belgium and Italy using our methodology, Fontagné et al. (2011) find tariff equivalents of 0% for the former and 65% for the latter. Looking into the details of regulatory protections in banking in these two countries, we see that these two EU members have similar regulatory policies. Our method seems to directly reflect the observed level of restrictiveness, as opposed to the indirect method used by Fontagné et al. (2011).

[20] For these new estimations, we use the same value of elasticity of substitution.

[21] For reasons of space we do not report the ad-valorem equivalents at country level in the paper. However, they are avilable upon request.)

Table 6: Tariff equivalents - Unconstrained baseline
Benchmark (estimation baseline for the restrictiveness dummies): Most trade facilitating restriction level

Per restrictiveness level (for all k: $\sigma_k = 1.95$)	OBS	Banking	Insurance
$\tau^k_{(0)}$ – (0) Open without restr.	62.1%	Nsd from benchmark	*Benchmark (unconstrained)*
$\tau^k_{(1)}$ – (1) Virtually open	*Benchmark (unconstrained)*	*Benchmark (unconstrained)*	Nsd from benchmark
$\tau^k_{(2)}$ – (2) Major/non trivial restrictions	Nsd from benchmark	247.8%	Nsd from benchmark
$\tau^k_{(3/4)}$ – (3/4) Virtually closed / completely closed	158.5%	171.6% (Nsd from tariff equiv. of (2) Major/non trivial restrictions)	87.2%

Note: The results in this table are based on the PPML specification. Nsd stands for not significantly different.

6 Conclusion

This study combines very rich databases on trade in services (Mode 1) and regulatory barriers at world level. Using a gravity approach, we estimated the effects of discrete restrictiveness measures on bilateral service flows and derived tariff equivalents for three services sectors (OBS, Banking and Insurance). We contribute to the literature in several ways. We avoid using partially-reconstructed bilateral services flows thanks to the unpublished WTO dataset on trade in services kindly provided by the WTO. For trade restrictions we use the qualitative and ordinal information on discriminatory restrictions, both operational and entry barriers, provided by the WB (Borchert et al., 2014) for the cross-border supply of services (Mode 1), which is in line with the trade services data. However, we avoid summarizing the qualitative nature of services trade restrictions into a continuous restrictiveness index. We keep the discrete nature of the restrictions and considered four restrictiveness levels: Level (0) - Open without restrictions , Level (1) -

Virtually open, Level (2) - Major restrictions, and Level (3/4) - Virtually closed. This allowed us to track the effect of specific import restrictions. We highlighted their non-linear impact on service flows showing threshold effects as well as the possible trade stimulating effect of minor restrictions over a restriction-free environment (for the OBS sector only).

Our results show that the size of the impact of policy regulations differs across sectors. Also, not all restrictions levels are significant. For the OBS sector, where restrictions are at their highest Level (3/4), they significantly impede services trade relative to all the other levels. Interestingly, minor import regulations – Level (1) – stimulate trade flows compared to no restrictions, Level (0). In the banking industry, we did not detect a significant impact of minor restrictions, neither trade promoting nor constraining. For this particular sector, major and high (Level (2) and Level (3/4)) have similar impacts on Mode 1 supply. A threshold effect appears with major restrictions. For the insurance sector only the highest level of import regulation significantly constrains flows in services, similar to the OBS sector. Again changes from Level (1) or Level (2) restrictions to the "Virtually to completely closed" import constraints showed no significant impact. To summarize, similar levels of restrictions to trade in services seem to have very different impacts across services sectors.

The results seem robust to alternative specifications. Four different aspects were analyzed. The first consisted of adopting an alternative implementation of the variable services RTA. The second was evaluation of different econometric specifications for the gravity model using alternative approaches proposed in the literature to deal with expenditure levels and the multilateral resistance terms when fixed effect techniques cannot be applied. The third consisted of replicating the estimations for two sub-samples based on importer income level: high and low-income countries. The fourth was related to the risk of endogeneity since the restrictiveness level could be influenced by the major services exporters. All our predictions were confirmed. However, some differences emerged. For low-income countries, the effects of the different restrictiveness levels were not verified for the three sectors, suggesting that this minor sub-group has specific dynamics regarding import policies. A minor difference also appeared in relation to endogeneity i.e. major import restrictions (Level (2)) for the cross border supply of banking lost significance.

We have proposed a series of new tariff equivalents, based on precise estimates. Comparison with existing tariff equivalent estimations shows significant differences. For instance, the values of the ad-valorem equivalents obtained by Fontagné et al. (2011) for the banking sectors in Belgium and Italy are resepctively 0% and 65%, using an indirect method whereas our direct approach to tariff equivalents results in zero tariff equivalents

for both countries which would seem to be in line with their similar levels of regulations. This would seem to confirm the superiority of the direct method over the indirect method to compute tariff equivalents. Indeed as Deardorff and Stern (2008) point out, the gravity indirect approach attributes all the error measurements in the model specification, particularly the the unobserved importer-level demand factors, to trade impediments.

There are some significant limitations mainly related to the data. First, discrepancies in terms of sectoral classification between the WTO trade flows database and the WB restriction measures constrain matching between the two sources. Second, the measurement of trade restrictions presents some limitations, notably that they are time invariant and often cover only sub-sectors which are not fully representative for measuring restrictions in the overall sector (e.g. for transportation restrictions are collected only for water transport). For this reason we reduced our focus to the three services sectors of OBS, Banking, and Insurance. Third, all the restrictions presented are defined unilaterally at the importer level, neglecting the bilateral nature of these impediments which to a large extent comes from the increasingly popular services RTAs (Ceglowski, 2006; Guillin, 2013b; Marchetti, 2009; Marchetti and Roy, 2013). We include part of this bilateral dimension, controlling for the fact that the country pair has signed an RTA in services (information from Guillin, 2013b). However, most services RTAs cover only a few services, and most, do not include binding commitments but rather tend to impose the status quo in trade relations (Marchetti and Roy, 2013; Guillin, 2013b). A more appropriate way to include RTAs would be to collect information on restrictions at the bilateral level by sector, or at least to consider the difference in terms of sectoral coverage and detail of RTAs. Finally, another contribution to this field of research could be provided by better estimation of the elasticities of substitution across sectors and time.

References

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

Anderson, J. E. and E. van Wincoop (2004). Trade costs. *Journal of Economic Literature 42*(3), 691–751.

Anderson, J. E. and Y. V. Yotov (2010). The changing incidence of geography. *The American Economic Review 100*(5), 2157–2186.

Baldwin, R. and D. Taglioni (2006). Gravity for dummies and dummies for gravity equations. NBER Working paper 12516, National Bureau of Economic Research.

Baldwin, R. E., F. Skudelny, and D. Taglioni (2005). Trade effects of the euro: evidence from sectoral data. ECB Working paper 446, ECB.

Beghin, J., A.-C. Disdier, S. Marette, and F. Van Tongeren (2012). Welfare costs and benefits of non-tariff measures in trade: a conceptual framework and application. *World Trade Review 11*(3), 356–375.

Beghin, J. C., A.-C. Disdier, and S. Marette (2012). Trade Restrictiveness Indices in Presence of Externalities: An Application to Non-Tariff Measures. Staff General Research Papers 35578, Iowa State University, Department of Economics.

Borchert, I., B. Gootiiz, and A. Mattoo (2014). Policy barriers to international trade in services: evidence from a new database. *The World Bank Economic Review 28*(1), 162–188.

Bosquet, C. and H. Boulhol (2014). Applying the glm variance assumption to overcome the scale-dependence of the negative binomial qgpml estimator. *Econometric Reviews 33*(7), 772–784.

Ceglowski, J. (2006). Does gravity matter in a service economy? *Review of World Economics 142*(2), 307–329.

Chaney, T. (2011). The network structure of international trade. NBER Working paper 16753, National Bureau of Economic Research.

Christen, E., J. Francois, and B. Hoekman (2012). Cge modeling of market access in services. Technical report, Working Papers in Economics and Statistics.

Crozet, M., E. Milet, and D. Mirza (2012). The discriminatory effect of domestic regulations on international services trade. Working Papers 2012-02, CEPII.

De Benedictis, L. and D. Taglioni (2011). The gravity model in international trade. In *The Trade Impact of European Union Preferential Policies*, pp. 55–89. Springer.

Deardorff, A. V. and R. M. Stern (2008). Empirical analysis of barriers to international services transactions and the consequences of liberalization. *A handbook of international trade in services*, 169–220.

Decreux, Y. and L. Fontagné (2011). Economic Impact of Potential Outcome of the DDA. Working Papers 2011-23, CEPII research center.

Dee, P. (2005). A compendium of barriers to services trade. *prepared for World Bank, available at http://www. crawford. anu. edu. au/pdf/Combined_report. pdf*.

Dihel, N. and B. Shepherd (2007). Modal estimates of services barriers. Technical report, OECD Publishing.

Dutt, P. and D. Traca (2010). Corruption and bilateral trade flows: extortion or evasion? *The Review of Economics and Statistics 92*(4), 843–860.

Fontagné, L., A. Guillin, and C. Mitaritonna (2011). Estimations of tariff equivalents for the services sectors. CEPII Working Paper 24, CEPII.

Fontagné, L. and C. Mitaritonna (2013). Assessing barriers to trade in the distribution and telecom sectors in emerging countries. *World Trade Review 12*(01), 57–78.

Francois, J. and B. Hoekman (2010). Services trade and policy. *Journal of Economic Literature*, 642–692.

Francois, J., H. Van Meijl, and F. Van Tongeren (2005). Trade liberalization in the doha development round. *Economic Policy 20*(42), 349–391.

Francois, J. F. (1993). Explaining the pattern of trade in producer services. *International Economic Journal 7*(3), 23–31.

Gehlhar, M. (1996). Reconciling bilateral trade data for use in gtap. GTAP Technical papers 11, GTAP.

Guillin, A. (2013a). Assessment of tariff equivalents for services considering the zero flows. *World Trade Review 12*(03), 549–575.

Guillin, A. (2013b). Trade in services and regional trade agreements : Do negotiations have to be specific? *The World Economy 36*(11), 1406–1423.

Harrigan, J. (1996). Openness to trade in manufactures in the oecd. *Journal of international economics 40*(1), 23–39.

Head, K. and T. Mayer (2014). Gravity equations: Toolkit, cookbook, workhorse. In *Handbook of International Economics*, Volume 4. Gopinath, Helpman, and Rogoff.

Head, K., T. Mayer, and J. Ries (2009). How remote is the offshoring threat? *European Economic Review 53*(4), 429–444.

Heckman, J. J. (1979). Sample selection bias as a specification error. *Econometrica 47*, 153–161.

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

Hertel, T., D. Hummels, M. Ivanic, and R. Keeney (2007). How confident can we be of cge-based assessments of free trade agreements? *Economic Modelling 24*(4), 611–635.

Hoekman, B. (1996). Assessing the general agreement on trade in services. *The Uruguay Round and the developing countries 1*(996), 89–90.

Holmes, L. and A. Hardin (2000). Assessing barriers to service trade sector investment. In C. Findlay and T. Warren (Eds.), *Impediments to trade in services: measurement and policy implications*. London and New York: Routledge.

IMF (1993). *Balance of Payments Manual* (5th ed.), Volume International Monetary Fund. International Monetary Fund.

Kee, H., A. Nicita, and M. Olarreaga (2009). Estimating trade restrictiveness indices*. *The Economic Journal 119*(534), 172–199.

Kimura, F. and H.-H. Lee (2006). The gravity equation in international trade in services. *Review of world economics 142*(1), 92–121.

Marchetti, J. (2009). Do economic integration agreements lead to deeper integration of services markets? *International Handbook of the Economics of Integration 3*, 435–58.

Marchetti, J. A. and M. Roy (2013). The TISA initiative: An overview of market access issues. WTO Staff Working Paper 11, World Trade Organization.

Maurer, A., Y. Marcus, M. J., and B. D'Andrea (2008). Measuring trade in services. *A Handbook of International Trade in Services*, 133–168.

Mirza, D. and G. Nicoletti (2004). Is there something special about trade in services? *Research Paper* (2002/022004/02).

Nicoletti, G., S. Scarpetta, and O. Boylaud (2000). Summary indicators of product market regulation with an extension to employment protection legislation. OECD Economics Department Working Papers 226, OECD Publishing.

OECD (2014). Services Trade Restrictiveness Index. http://www.oecd.org/tad/services-trade/services-trade-restrictiveness-index.htm.

OECD-WTO (2013). Trade in value added (tiva). *OECD Database*.

Park, S.-C. (2002). Measuring tariff equivalents in cross-border trade in services. Trade Working Papers 353, East Asian Bureau of Economic Research.

PECC (1995). Survey of impediments to trade and investment in the APEC region. Technical report, Pacific Economic Cooperation Council - APEC Secretariat, Singapore.

Rauch, J. and V. Trindade (2002). Ethnic chinese networks in international trade. *Review of Economics and Statistics 84*(1), 116–130.

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

Stern, R. (2002). Quantifying barriers to trade in services. In B. Hoekman, A. Mattoo, and P. English (Eds.), *Development, Trade and the WTO: A Handbook*. Washington D.C.: The World Bank.

ten Cate, A. (2007). Modelling the reporting discrepancies in bilateral data. CPB Memorandum 179, CPB Netherlands Bureau for Economic Policy Analysis.

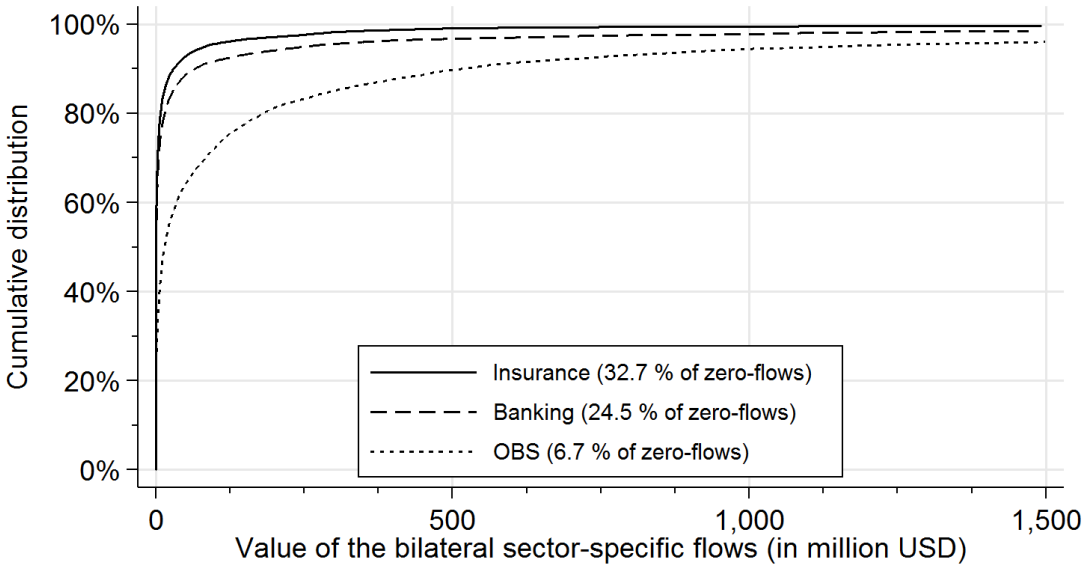
van Leeuwen, N. and A. Lejour (2006, August). Bilateral Services Trade Data and the GTAP database. CPB Memorandum 160, CPB Netherlands Bureau for Economic Policy Analysis.

Walsh, K. (2008). Trade in services: Does gravity hold?. *Journal of World Trade 42*(2), 315 – 334.

World Bank (2014). World Development Indicators. Available at http://data.worldbank.org /indicator.

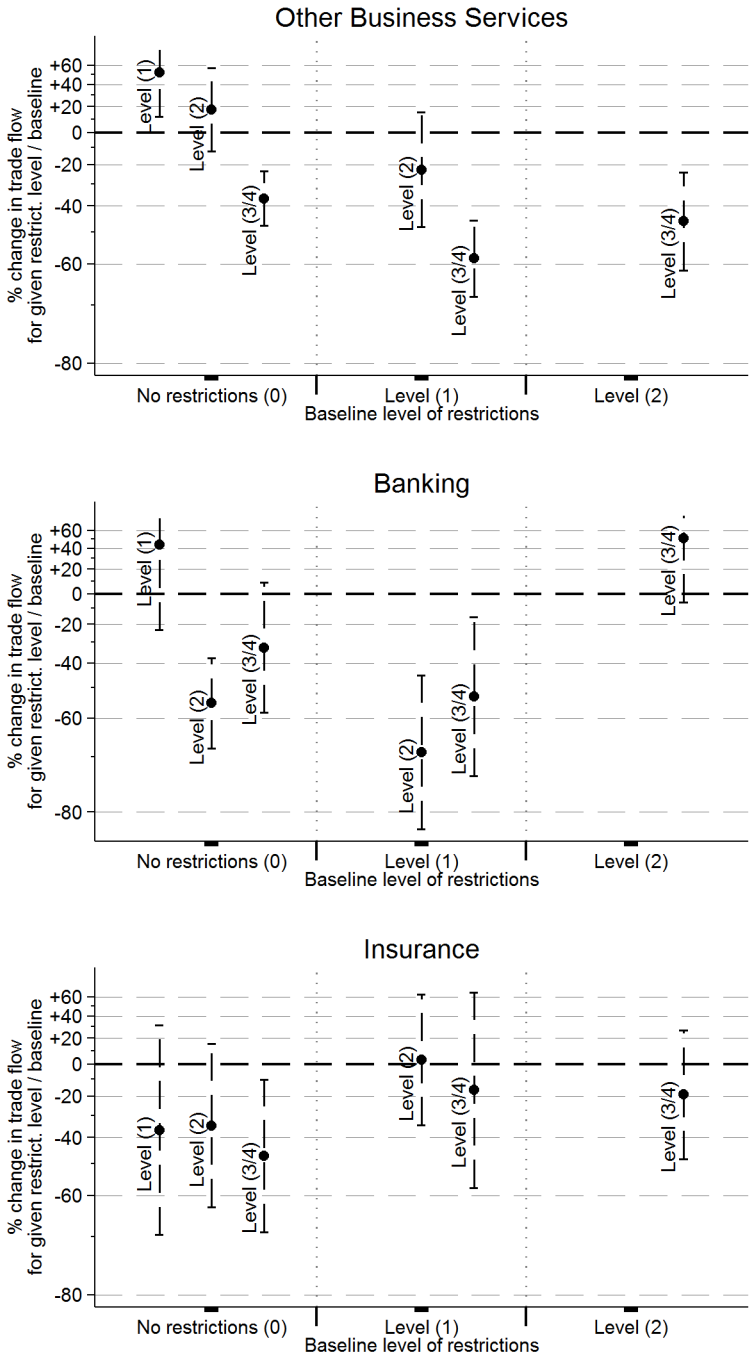
7 Appendix

Figure A.1: Cumulative distribution of the value of bilateral flows (at the sector-level)



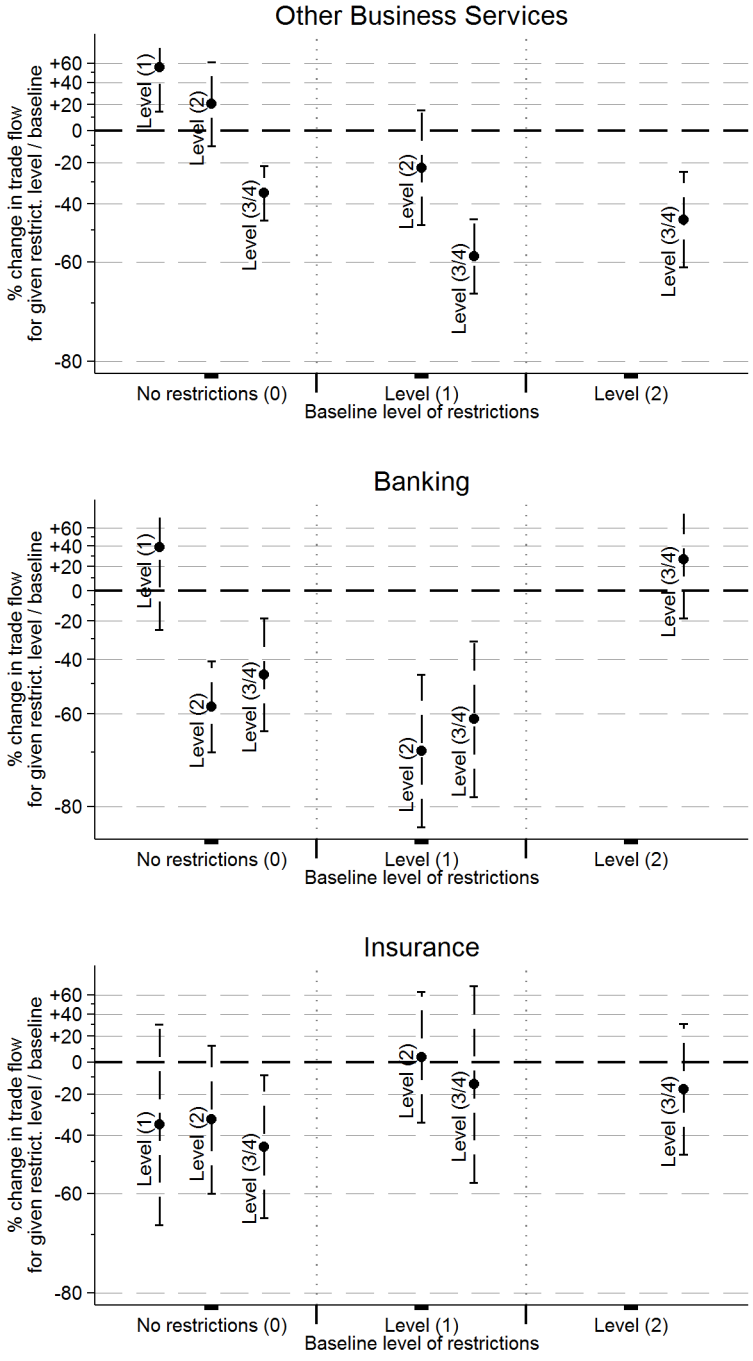
Source: Authors' computation based on WTO data.

Figure A.2: Impact of stronger restrictions controlling for MFN, National treatment and market access clauses (based on the PPML estimations)



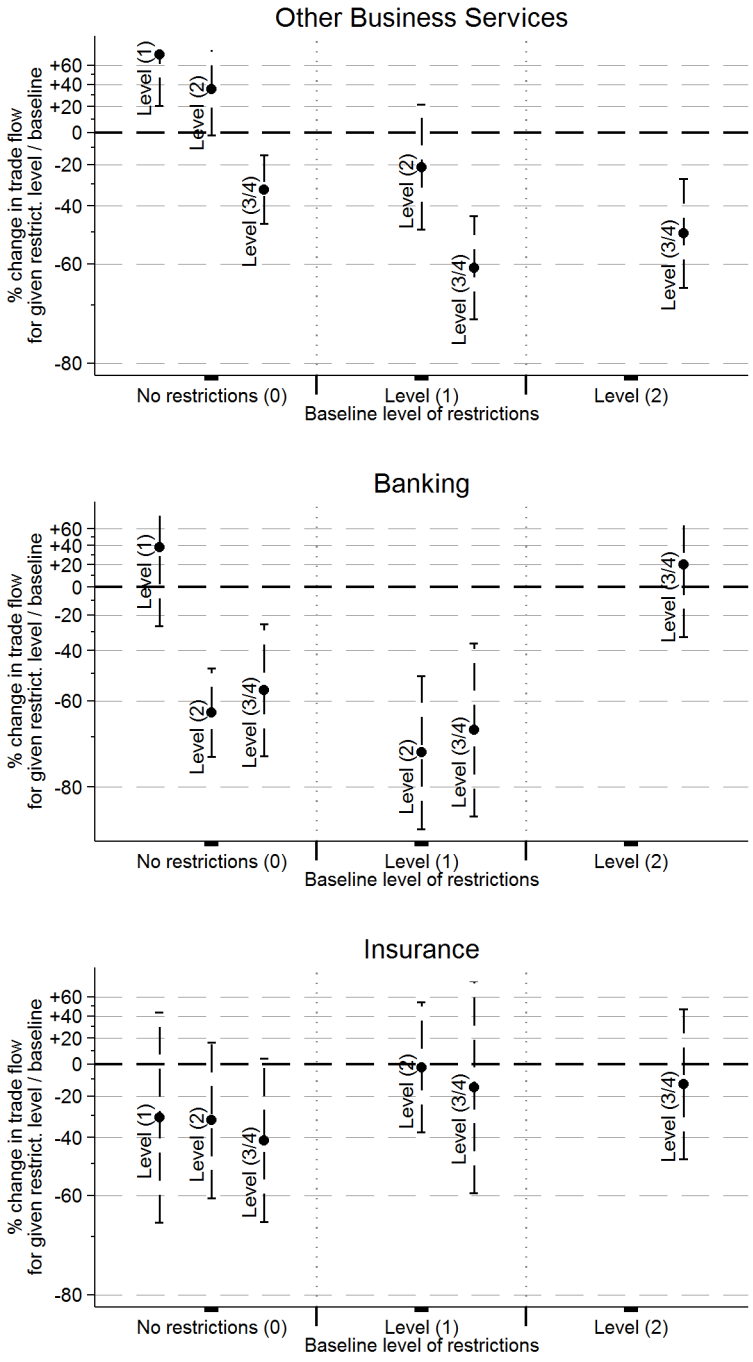
Note: % change of trade flow in log scale. The confidence intervals, shown as bars in the graphs, are evaluated at the 95% level. They provide significance information with respect to the baseline, but not relative to the other new restrictiveness levels. For the ease of presentation, the upper bound of confidence interval are cut when above the +80% value.

Figure A.3: Impact of stronger restrictions with a sub-sample excluding exporter-importer pair with changes in service RTA (based on the PPML estimations)



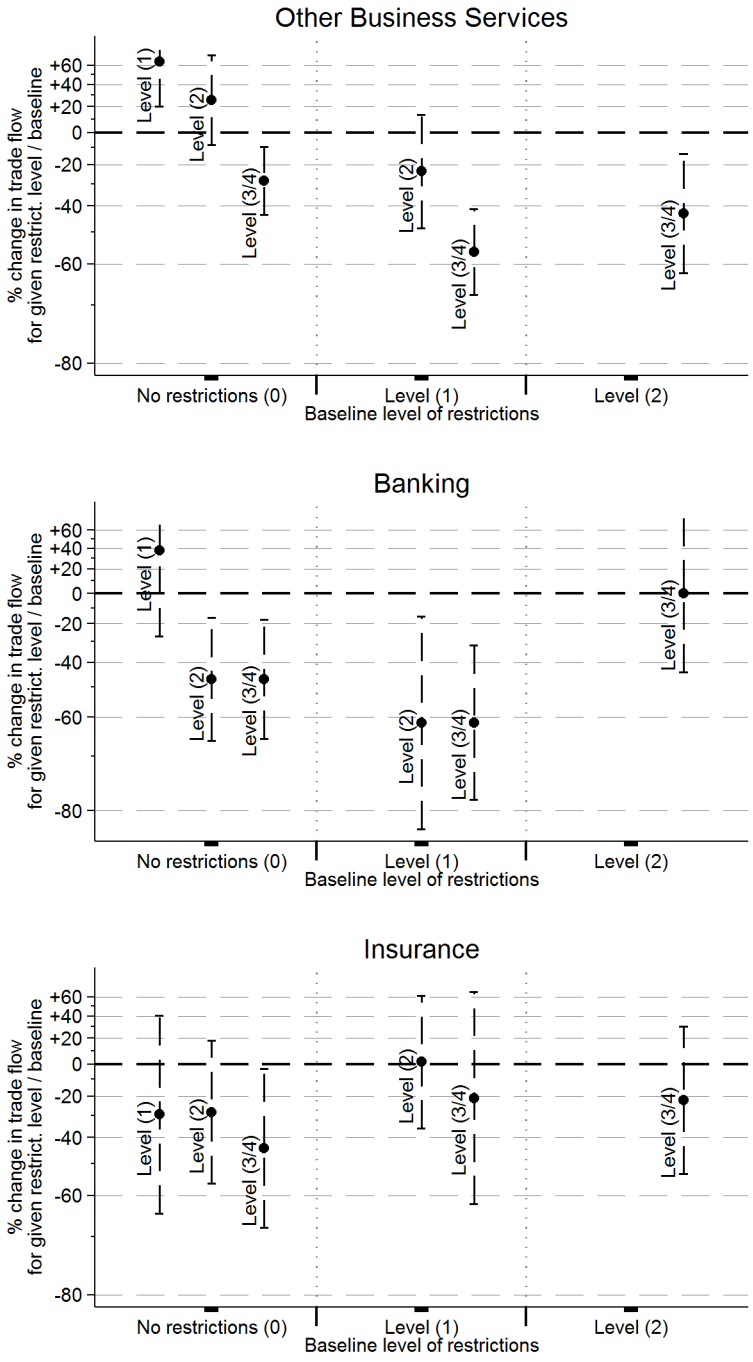
Note: % change of trade flow in log scale. The confidence intervals, shown as bars in the graphs, are evaluated at the 95% level. They provide significance information with respect to the baseline, but not relative to the other new restrictiveness levels. For ease of presentation, the upper bound of the confidence interval is cut when it is above the +80% value.

Figure A.4: Impact of stronger restrictions with GDP instead of service expenditures (based on the PPML estimations)



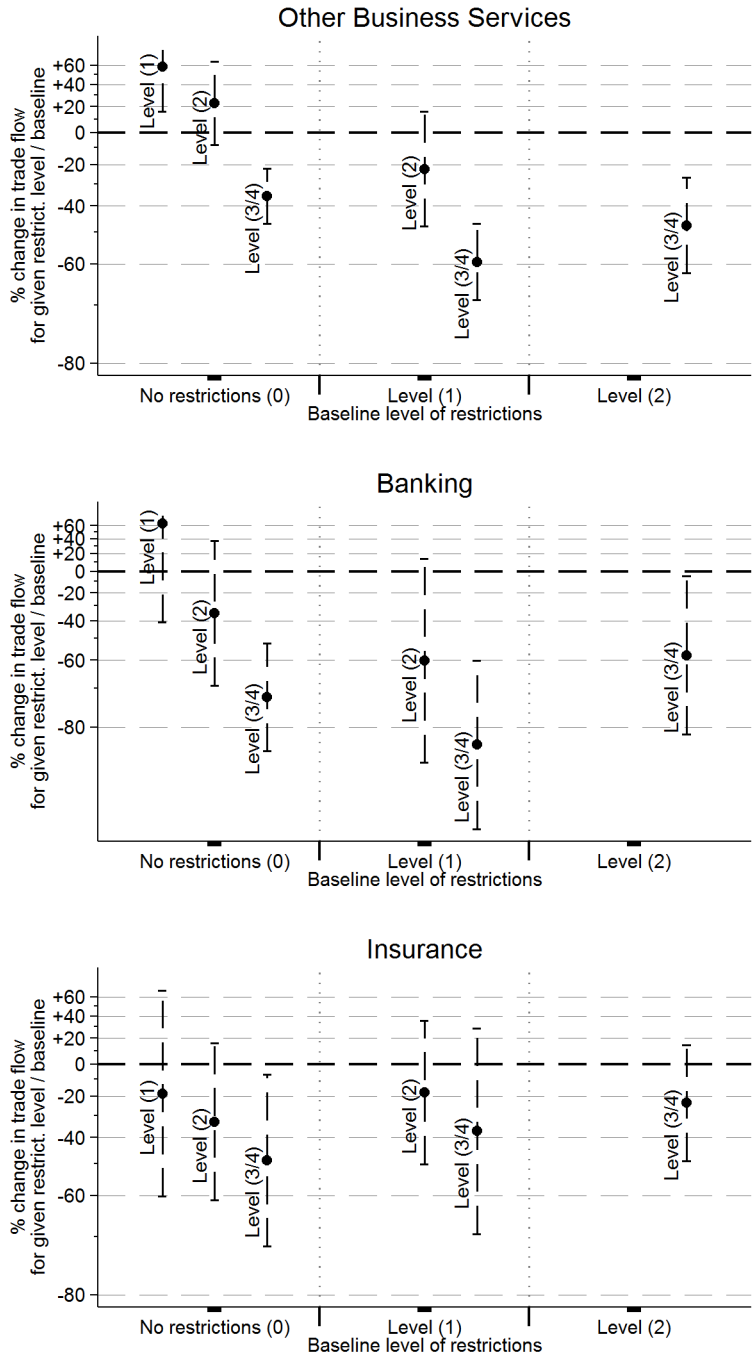
Note: % change of trade flow in log scale. The confidence intervals, shown as bars in the graphs, are evaluated at the 95% level. They provide significance information with respect to the baseline but not relative to the other new restrictiveness levels. For ease of presentation, the upper bound of the confidence interval is cut when it is above the +80% value.

Figure A.5: Impact of stronger restrictions for high-income importers (based on the PPML estimations)



Note: % change of trade flow in log scale. The confidence intervals, shown as bars in the graphs, are evaluated at the 95% level. They provide significance information with respect to the baseline but not relative to the other new restrictiveness levels. For ease of presentation, the upper bound of the confidence interval is cut when it is above the +80% value.

Figure A.6: Impact of stronger restrictions - endogeneity test without top exporters (based on the PPML estimations)



Note: ratios are in % of trade at the baseline restrictiveness (with a log scale). The confidence intervals, shown as bars in the graphs, are evaluated at the 95% level. They provide significance information with respect to the baseline, but not relative to the other new restrictiveness levels. For ease of presentation, the upper bound of the confidence interval is cut when it goes above the 80% value.

Table A.1: Tariff equivalents with alternative elasticity of substitution

Constrained baseline : Benchmark for the computation of the tariff equivalent computation is forced to Level (0) "*No-restrictions*".

Per restrictiveness level (for all k: $\sigma_k = 5.6$)	OBS	Banking	Insurance
$\tau^k_{(0)}$ – (0) Open without restr.	*Benchmark (constrained)*		
$\tau^k_{(1)}$ – (1) Virtually open	-9.0% (trade facilitating)	Not signif. different from benchmark	Not signif. different from benchmark
$\tau^k_{(2)}$ – (2) Major/non trivial restrictions	Not signif. different from benchmark	21.5%	Not signif. different from benchmark
$\tau^k_{(3/4)}$ – (3/4) Virtually closed / completely closed	10.4%	14.8% (Not sign. diff. from tariff equiv. of (2) Major/non trivial restrictions)	13.7%

Unconstrained baseline : Benchmark for the computation of the tariff equivalent is the most trade facilitating restrictiveness level.

Per restrictiveness level (for all k: $\sigma_k = 5.6$)	OBS	Banking	Insurance
$\tau^k_{(0)}$ – (0) Open without restr.	9.9%	Not signif. different from benchmark	*Benchmark (unconstrained)*
$\tau^k_{(1)}$ – (1) Virtually open	*Benchmark (unconstrained)*	*Benchmark (unconstrained)*	Not signif. different from benchmark
$\tau^k_{(2)}$ – (2) Major/non trivial restrictions	Not signif. different from benchmark	29.9%	Not signif. different from benchmark
$\tau^k_{(3/4)}$ – (3/4) Virtually closed / completely closed	15.11%	22.7%	13.7%

Note: the results of this table derive from the PPML specification.