Global Trade Analysis Project
https://www.gtap.agecon.purdue.edu/

This paper is from the
GTAP Annual Conference on Global Economic Analysis
https://www.gtap.agecon.purdue.edu/events/conferences/default.asp

Estimations of Tariff Equivalents for the Services Sectors

Lionel Fontagné* Amélie Guillin† Cristina Mitaritonna‡

June 1, 2010

Abstract

Methodological issues arising with the estimation of tariff equivalents of barriers to services trade are of high policy relevance. These equivalents are extensively used to compute welfare gains and resource reallocation associated with the partial liberalization of the sector and any measurement error will strongly affect the estimated gains. Using the most recent release of the GTAP (2004), we rely on the so-called *quantity based methods* to derive tariff equivalents from a gravity equation estimated at the sectoral level, based on the importer fixed effects coefficients, for nine services sectors and a large set of countries.

Beyond providing these tariff equivalents, the objective of the paper is threefold. Firstly, we estimate trade equations in cross section and improve on the methodology of Park (2002) to compute ad valorem equivalents of barriers to services trade. Secondly we ask whether relying on a cross section rather than on panel data leads to differences in estimated equivalents. Lastly, we confront estimations performed with reconstructed data and actual data. We conclude that while utilizing reconstructed data (such as GTAP) affects the results, the equivalents obtained characterize properly the magnitude of protection in services in the various countries, though with larger deviations for developing economies.

JEL classification: F13.

*Paris School of Economics (University of Paris I) and CEPII (lionel.fontagne@univ-paris1.fr).
†Paris School of Economics (University of Paris I) (amelie.guillin@univ-paris1.fr).
‡CEPII (cristina.mitaritonna@cepii.fr).

1 Introduction

Services are the largest sector in the global economy, representing 70% of world added value and over half of total employment. However their share in total trade still falls behind, even if it has been expanding rapidly since the 1980s. They account for 20% of total international trade (Bensidoun & Ünal Kensenci, 2007), and thanks to the technological progress their importance is expected to acquire a growing weight in the future.

Over the last few years there has also been an increasing willingness to include services in bilateral as well as multilateral agreements. Concerning the multilateral arena, services became a subject of negotiation relatively late. Their inclusion in the Uruguay Round, led to the General Agreement on Trade in Services (GATS) on January 1995.

The GATS deals with the multilateral liberalization of 150 different services sectors,[1] distinguishing between four modes of supply, whose relative importance differs from one sector to another:

- Mode 1 or Cross-border supply (e.g. financial operation).
- Mode 2 or Consumption abroad (tourism).
- Mode 3 or Commercial presence (Foreign Direct Investment).
- Mode 4 or Presence of natural person (temporary workers migrations).

As a result of the growing role of services into the world trade, economists have started to pay more attention to this field. In particular simulations relying on Computable General Equilibrium (CGE) modeling point to large gains associated with the partial liberalization of services. Sizable gains are expected not only for rich economies, but also also for developing countries, especially India and China (Francois et al., 2003; Decreux & Fontagne, 2006).

Since these estimates rely on tariff equivalents of protection in services, accurately measuring the level of protection in services is key to the quality of assessment of gains to

[1]The 150 sectors are aggregated into macro-categories: business services, communication, construction and engineering, distribution,education, finance, environmental services, tourism, health and other social services, transport and recreational services

liberalization. However, computing tariff equivalents is quite challenging, both from a theoretical and empirical point of view.

The first problem lies in the specific nature of services, compared to goods. Proximity between the producer and the consumer is often needed and due to the intangible characteristic, intrinsic to services, impediments on services trade are different than those in goods. They comprise limitations such as quotas, licenses, interdictions of some activities to foreigners and government regulations made with the intent to reduce the market access of foreign access and/or discriminate in favor of domestic firms. Hence, liberalizing trade in services for a country means essentially changing its own regulations. From a technical as well as political economy perspective, reconsidering such regulations is much more ambitious than simply cutting a tariff.

The second problem is methodological. Computing tariff equivalents consists in revealing protection by comparing actual trade in services to a benchmark. The distribution of residuals of a gravity equation estimated at the sectoral level can be mobilized. Alternatively the average protection applied by each importer can be computed from importer fixed effects coefficients. The data used may be a cross section or a panel; but more importantly, given the scarcity of information, the data is either reconstructed when the sample is comprehensive, or actual data for a limited number of countries.

This paper has two contributions. First, it highlights the potential problems arising when estimating tariff equivalents for trade in services with a gravity equation and provides evidence on the magnitude of the related estimation bias. Second, it provides tariffs equivalents for nine services sectors and 82 countries that can be used for estimating the welfare effects of the liberalization in services trade.

The rest of the paper is organized in five more sections. Section 2 presents the theoretical and empirical issues related to the gravity approach and briefly reviews the existing literature on gravity model applied to services. Then we detail the data used in Section 3. The empirical approach adopted is explained in Section 4. Section 5 presents the results. Section 6 concludes.

2 Quantifying trade barriers in services

There have already been several attempts in quantifying trade barriers in services. In a semina paper Hoekman (1996) uses a methodology based on a *frequency index*, and assigning a numerical value to the level of restrictions imposed by each country in a given sector, by mode of supply. [2] The country's GATS commitment schedule is used as the main source to derive information on the barriers that a country imposes. An arbitrary tariff equivalent is then attributed to the most protectionist country. Other countries' tariff equivalent are calculated according to their level of commitment relative to the benchmark. Altogether, as pointed out by Stern (2000), Hoekman indices are relative indicators and not real indices to be used as tariff equivalents.

Mattoo et al. (2001) build openness indices for telecommunications and financial services to analyze the effects on growth of the services liberalization. The first index is based on three elements: the sector market structure (competitive or not), FDI (allowed or not) and the presence of an independent regulator. The values of this first index range from 1 (less open) to 9. The other index proposed by Mattoo et al. (the so-called 'financial index') ranges between 1 and 8 and combines information on the market structure, on capital controls (actually the Dailami index) as well as on the level of foreign equity. Not surprisingly, these two indices do not give the same classification by country. Indeed, financial indices ordering shows that the most developed countries are the most liberalized ones. However, for the telecommunications indices, some developing countries have an index at 9, like El Salvador or Ghana, indicating the liberalization in financial services did not occur in developed countries only. Concerns regarding the reliability and data availability with this method as well as Hoekman's one are summarized in (Chen & Schembri, 2002).

Similarly, a recent survey conducted by the World bank compiles the actual restrictiveness of policies in the service sector for 32 development and transition economies, plus 24 OECD countries. The degree of restrictiveness (ranging from 0 – open – to 100 – closed) is compared to Doha offers and Uruguay round commitments. A synthetic index is calculated by country and sector for the three levels of restrictiveness, but not ad valorem equivalent is proposed (Mattoo & Gootiiz, 2009).

[2] A weight 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.

A second strand of literature on barriers on trade in services relies on a two-stage method. The first stage consists in a more qualitative assessment of commitments taken by importers under the GATS, or on the contrary surveys addressing barriers faced by exporters of services on their destination markets. In a second stage, the corresponding information is used as an explanation of international differences in price-cost margins within sectors. The Australian Productivity Commission (APC) pioneered such estimation of tariff equivalents with the Trade Restrictiveness Indices (TRI).[3] Relying on a weighting methodology, Dihel & Shepherd (2007) apply the same methodology as the APC. The overhang is their modal TRI for every APC services sectors adding the insurance sector. They observe that the non-OECD trade restrictiveness indexes are higher than the OECD indexes Besides, countries in transition are increasingly liberalized. For example, for distribution services, the TRI is cost-increasing for the mode 1 but rent-creating for the mode 4. The method has been recently extended by Fontagne & Mitaritonna (2010).

Lastly, the level of protection in services can be *revealed* by an econometric exercise relying on a gravity equation. Since Tinbergen (1962), the gravity equation has been extensively used in the empirics of international trade, due to its remarkably good prediction for bilateral trade flows in goods. Initially criticized for the lack of its theoretical foundations, nowadays the gravity equation has been derived from various formal trade models under a wide range of modeling assumptions.[4]

Essentially a gravity equation is an expenditure equation with a market clearing condition imposed. Two price terms, labeled as multilateral resistance terms since Anderson & van Wincoop (2003), appear into the equation. Such terms are quite complex, and not directly

[3] A set of qualitative data on barriers are taken to build a quantitative indexes which are used in econometric models explaining economic performance in order to obtain tariff equivalents: controlling for firm-level variables, price-cost margins are regressed on these TRI. Notice that these indices are different from the Anderson-type TRI and MTRI based on different methodologies, despite the similarity in the acronym.

[4] For various instances of the theoretical foundation of the gravity equation see, e.g., Anderson (1979),Helpman & Krugman (1985),Bergstrand (1990), Deardorff (1998), Feenstra (2002), Feenstra (2004), Anderson & van Wincoop (2003),Helpman et al. (2007), Melitz & Ottaviano (2008). The development of the theoretical models has been very useful also to explain why despite the goodness of the fits, results concerning the estimations of the bilateral trade costs variables can be severely biased. Baldwin & Taglioni (2006) provide for a minimalist derivation of the gravity equation furnishing estimates of the size of the biases commonly done in the literature, taking the currency union as an example.

observable as they include lacking data, for instance the number of the varieties consumed or the producer price of each variety. The problem with this is that the omitted terms are correlated with the trade cost term, as they are themselves function of the bilateral trade costs. Because of this correlation, the estimates of the trade costs determinants are biased. The main value added by Anderson & van Wincoop (2003) is the derivation of a practical way of using the full expenditure system to estimate key parameters on cross-section data, moreover they show that including country specific fixed effects yields the same results. Using panel data, however the problem is more severe. If one presumes that omitted terms vary over time, including time-invariant nation dummies only removes part of the cross-section bias but not the time series dimension. To this end one of the best solution is to include time-varying country dummies. The alternative of time-varying pair dummy is rarely useful, since most gravity models are aimed at identify bilateral trade barriers which would be impossible to estimate as already captured by pair fixed effects.

Contrasting with the degree of achievement of the gravity equation applied to trade in goods, the existing literature on the application of the gravity model to services trade is still limited, even if it has increased during the last decade. This is mainly due to a an improved quality of data, even if the availability of information in services trade still lacks behind that of trade in goods.

Francois (2001), further developed in Francois et al. (2003), can be considered as the seminal study showing that standard gravity equation is significant even for trade in services. The author uses sector-specific gravity equations to estimate services barriers with GTAP data. Trade is explained by the GDP per capita, the population and a dummy for European countries. From an elasticity of substitution at 4.67, the tariff equivalents come from the actual to predicted trade ratio. With this method, India is the least opened country while Sub-Saharan Africa and Netherlands have 0% trade cost equivalents for the four categories of services.

Park (2002) is another often quoted paper. Its estimates of tariff equivalents have been used largely by applied modelers addressing the liberalization in services. He bases the gravity equation on Deardorff (1998) and considers common explanatory variables used in gravity equation as GDPs, distance or language. We will elaborate on Park's work in further detail later. Notice however that this paper departs from Anderson & van Wincoop (2003)

regarding the way prices are tackled. Applying the estimation of tariff barriers on seven different sectors, Park finds results very different from Hoekman (1996).

Besides, Kimura & Lee (2006) apply a gravity equation to international trade in services. They find that GDP, distance, remoteness, adjacency, to belong at the same Regional Trade Agreement (RTA), economic freedom index and common language are significant and robust determinants of bilateral services trade (imports as well as exports). Note that their gravity equation has a greater power of explanation in services trade than in goods trade.

Walsh (2006) estimates a specific gravity equation for four sectors (transport, government, other commercial services and travel). The explanatory variables are the GDP per capita, the population, the distance, the adjacency, the common language and a dummy for the European Union membership. All of the variables are statistically significant and have a positive impact on the value of bilateral trade, except the distance. In order to address the biases potentially due to the OLS method, Walsh applies the Hausman and Taylor model (HTM thereafter) to the services trade. [5] Using a similar method as Park but with an elasticity of substitution of 1.95, Walsh finds average tariff equivalents ranging between 0.00% (for Japan, Norway and Belgium) and 124.8 percent (for Indonesia).

All in all, there are potentially numerous methodological issues arising with the gravity method. The distribution of residuals of the estimated equation is sensitive to problems of specification and omitted variables what affects the estimation of tariff equivalents. Hence one may prefer relying on a strategy based on country fixed effects. An assumption must be made on the elasticity on substitution to transform the parameter estimate in an ad valorem equivalent and the value of the equivalents is highly sensitive to this assumption. Moreover, since sectoral and bilateral data on trade in services is scarce, many papers rely on reconstructed data, based on econometrics which is a priori questionable.

In order to highlight the various problems associated with the gravity method, we estimate in this paper tariff equivalents in service sectors, focusing on *cross border trade* in services (Mode 1). We rely on the so-called *quantity based methods*. Initially we estimate trade equations in services in cross section. We use the most recent version of GTAP database

[5]Note that for each sector, Walsh adds specific variables. For example, government efficiency for the government sector, temperatures for travel, and economic freedom for commercial services.

provided by the Netherlands Bureau of Economic Analysis (CPB thereafter) for 2004. Using the same source data (but for a more recent cross section) as Park (2002), we prefer a methodology based on country fixed effects. We provide estimates of trade barriers for a larger set of countries (82 instead of 51) and sectors. The robustness of these estimations is systematically questioned by addressing the methodological issues referred to above.

The next section will start by discussing data issues.

3 Data

We make use of a relative small set of data sources. The main source of data used in the first stage of this paper remains the GTAP database (release 7.4) which provides bilateral trade in services for fourteen services sectors for the year 2004: Construction (cns), Communication(cmn), Trade (trd), Finance (ofi), Other services (osg),[6] Business (obs), Air transport (atp), Water transport (wtp), Other transport (otp), Insurance (irs), Recreational services (ros) and Dwellings, Water (wtr) and Energy (ely).[7] The purpose of this first stage is to address the problems raised by the estimated in Park. We aggregate the three transport sectors in one sector, Transport (hence trn), in order to reproduce Park (2002),[8] even if we will provide estimations for the tariff equivalents also for the Maritime sector (wtp).

The number of countries varies according to the different versions of the GTAP database. The release 7.4 includes 82 countries,[9] which allows us to have an exhaustive representation of both developed and developing countries. Unfortunately not all of them are single countries, some are regions made up of Least Developed Countries and Developing Countries.[10] We decided to drop them both as importers and exporters, due to the problem of using control variables for non single countries. When deleting a region as exporter we pay attention to keep a single country as importer if we still have at leat 70% of its bilateral trade in the

[6] Osg is composed by education, health, defense and public administration.

[7] See https://www.gtap.agecon.purdue.edu/

[8] Park considers only seven services sectors: cmn, cns, obs , trn, trd, ofi, osg.

[9] Park relies, for his estimation concerning 1997, on the version 5 which has 52 countries. The presence in Park's work of tariff equivalents for Bostwana, Uganda, Mozambique, Tanzania, Malawi and the Zambia is puzzling, since the producer price indexes for these countries are not available in the IMF Finances for the year 1997.

[10] This is particularly the case for African countries. We underline the fact that also Israel is not documented individually in GTAP.

remaining data.

The IMF provides data on GDP and on Producer Price Indexes (or Wholesale Price Indexes for some countries) for the year 2004. Concerning the population data, we draw it from the World Bank (WDI). For the distances,and all the remaining control variables we use the distance database from the CEPII.[11] For some countries, namely Bostwana, Malawi, Morocco, Mozambique, Tanzania, Uganda, Zambia and Zimbabwe, we do not have available data on Producer Price Indexes, accordingly we cannot estimate tariff equivalents for them whenever Prices are used as regressors in the gravity estimation.

The reliability of the data is of course fundamental in our analysis, van Leeuwen & Lejour (2008) address the quality of data in the GTAP and OECD databases. They compute reliability indices for the 1999-2003 period. Reliability is not uniform across sectors[12] and countries. Considering a sample of 29 countries, they find that less than half of these countries have good indices. Beyond reliability, the issue of how the data was collected or constructed is key to the exercise as we will show below.

In the second part of this paper we proceed to the estimation of a gravity equation *in panel*. for this we need bilateral trade flows over time. In this case our regression analysis uses OECD data for the period 2002-2006, instead of GTAP data, mainly because it offers the best country coverage and annual frequency. There are somewhat more observations for Total services (code 200) than for the other three disaggregated categories considered:[13] Transport (code 205), Communication (code 245) and Construction (code 249).[14] An additional advantage to using such kind of data will appear during this exercise.

We employ the exports reported by OECD countries versus all their trade partners. Countries of interest such as India and China enter as partners in the OECD data through their trade with reporting countries. OECD import data are also utilized to complete the dataset. In this way emerging economies also appear as exporters, but only versus OECD members. Trade between two no reporters are still unavailable. However in this way we

[11] The database is freely available on the CEPII Web site http://www.cepii.fr .

[12] It is harder to obtain good data in recreational sector than in travel sector.

[13] We decided to consider only the sectors for which the mirror data was covering at least 90% of the value of the declaration of the origin country.

[14] The codes correspond to the nomenclature employed by the Extended Balance of Payments Services.

cover more than 89% of total export services.[15]

4 Methodology

There are two distinctions to be made: we can use cross section or panel data, and this data can either be actual data or reconstructed data. In the latter case, a wider range of countries is available, but an econometric model is mobilized to achieve this goal. We start with the traditional cross-sectional approach, using the GTAP data set that relies on reconstructed data. We extend the gravity equation proposed by Park (2002) in order to introduce omitted variables. We tackle the misspecification of this equation concerning prices. We depart from the use of residuals and prefer a fixed effect methodology.

In a second step, the exercise is replicated with (actual) panel data from the OECD. We also confront panel and cross section estimates using the same (actual) data source. We identify the discrepancies associated with the use of reconstructed data, such as GTAP, while cross section and panel estimations are comparable.

The last step involves the calculation of the tariff equivalents either, as usual, from the estimated residuals, or alternatively form the importer fixed effect coefficients.

4.1 Gravity equations estimated in cross-section with reconstructed data

We firstly estimate a gravity equation in a cross-section relying on reconstructed data. There are two issues here: we rely on a very specific set of data as regards trade in services, namely the GTAP data set of trade in services, while a cross-section estimate is performed. We firstly replicate Park (2002) using the last release of the data, then we add useful controls, and last we adopt a better suited econometric specification. Ad valorem equivalents of the latter approach are ultimately proposed.

The econometric model is the following:

$$ln(x_{ij}) = c + \alpha_1 ln(y_i) + \alpha_2 ln(y_j) + \alpha_3 ln(P_j) + \alpha_4 ln(P_i) + \alpha_5 ln(dist_{ij}) + \sum \alpha_{ij} D_{ij} + \varepsilon_{ij} \quad (1)$$

[15] We use the Balance of Payments data to calculate the coverage of our data in the different sectors considered at a multilateral level.

where x_{ij} is the export of services under Mode 1 from country i to country j, y_i is the GDP for the exporter, y_j is the GDP for the importer, P_j is the overall Production Price Index for the importer and P_i is the overall Production Price Index for the exporter,[16] *dist* is the distance between the two countries and D a vector of dummies which in the original work includes common language, border and dummies considering the fact that partner countries belong both to Asia or Latin America.[17]

In particular using equation 1 we test three different specifications of **Model 1**:

- **Model 1.1**: Firstly we try to replicate, as close as possible, Park's specification, considering the same group of countries and sectors, as well as the same regressors. The main difference remains the base year for which the regression is performed, that is 1997 for Park and 2004 in our case.
- **Model 1.2**: Some variables of interest are indeed omitted in the previous specification and we add some more regressors, notably dummies if partner countries belong or not to some Regional Trade Agreements (RTA) such as NAFTA, ASEAN or ANZCERTA or if they are both EU member states (EUROPE). Moreover we consider additional variables such as the common ethnic language and colony.
- **Model 1.3**: Basically the estimation is the same as in Model 1.2, but we use a larger sample of countries (82 against 51).

In Park (2002), the purpose of estimations with model 1 is ultimately to rely on the residuals of this equation to derive tariff equivalents. Accordingly, the precision of the estimates of tariff equivalents is subject to the quality of the estimation and the associated residuals. This raises two issues. Firstly the prices considered in the regressions are not theoretically founded.[18] Secondly unobserved characteristics may be correlated with the residuals leading to biased estimates.

Against this background we prefer relying on a different strategy based on country fixed effects (**Model 2**). Working in a cross sectional dimension fixed effect yields consistent estimations. Being interested in measuring the 'average protection' for the importer, proxied

[16] Data on sectoral PPI is not available.

[17] Actually the original work also includes the dummy Sub Saharan that we drop because of the lack of data concerning the group of countries belonging to the region.

[18] The latter is however not observable as said in section 2.

by the importer fixed effect, it is important at least to isolate the GDP importer effect, so that the coefficient on the importer fixed effect contains information on protection only. We chose to constrain the coefficient for the importer GDP to 0.8.[19] **Model 2** that we estimate is:

$$ln(x_{ij}) = c + 0.8ln(y_j) + \alpha_1 ln(dist_{ij}) + \sum{}_i \gamma_i I_i + \sum{}_j \gamma_j I_j + \sum \alpha_{ij} D_{ij} + \varepsilon_{ij} \qquad (2)$$

where I is a country specific dummy, for the importer and the exporter, which controls for unobserved characteristics of a country (not only the price index but any additional country characteristics that affect its propensity to import(export), as the share of services in the structure of the economy). We do not control for unobserved characteristics of pairs of countries, this is why we include again bilateral variables such as distance and dummies D_{ij} for common language and RTAs. Using fixed effects, the econometric model has a very high explanatory power: the R^2 ranges from 0.93 to 0.99. In this case the error term is just a noise, but it might still contain some information on bilateral protection.

In line with Model 1, also for this specification we propose three alternatives of Model 2:

- **Model 2.1**: we consider the same regressors as in Model 1.1, obviously *replacing importer and exporter variables by country fixed effects* with the exception of the importer's GDP.
- **Model 2.2**: we add some more regressors, as in Model 1.2.
- **Model 2.3**: we use a bigger sample of countries (82 against 51).

In fact while normally GDP_i and GDP_j are used as control variables, the theoretical models suggest to use the production for the exporter and the expenditure function for the importer (which is quite close to the concept of consumption). This is why we finally carried a set of estimations - **Model 1 bis**, **Model 2 bis** - replacing each time the exporting country GDP and the importing country GDP with the total production and the total consumption in services, respectively, as represented in GTAP 7 data.[20] Another advantage in using these alternative variables is that in this way we take into account the fact that services have a

[19] Feenstra (2002) suggests to constrain this coefficient to unity but it is well accepted in the literature that the openness of countries is not constant: smaller countries are more opened than larger ones.

[20] Of course for Model 2 we do need only to use the production variable, instead of the GDP_j, constrained to 0.8.

different weight across the countries considered. However there are still a few limitations. First of all, consumption and production already contain the bilateral trade, which is the dependent variable. We try to reduce this bias, considering total services production and total services consumption instead of sectoral variables. Secondly, in order to get protection measures, we should use regressors that are not relied on protection, which is not actually the case for the production; a country which does not produce anything in one sector, protects less this sector (and *vice-versa*). Last but not least the base year for GTAP I-0 data is not the same for all the countries considered in the regression, and sometimes some of them are quite old,[21] reflecting different country characteristics from the actual economic situation.

All in all we find that the best estimation is given by the importer and exporter fixed effect econometric model. As the estimation of tariff equivalents are substantially invariant across the different specifications of model 2, we will present results only for Model 2.3 in Table 14, in Appendix 8.3.

4.2 Gravity equations estimated using actual data

There are obvious limitations to relying on deviations from a cross sectional equation to compute ad valorem equivalents of protection in services. It is even more the case if the data used is reconstructed. Alternatively, a panel data approach can be contemplated, relying on actual data. We accordingly fit the gravity model to 2002-2006 OECD data to check the accuracy of our previous results. Adding the time dimension, the model estimated becomes **Model 3**:

$$ln(x_{ijt}) = c + 0.8ln(y_{jt}) + \alpha_1 ln(dist_{ij}) + \sum_{it} \gamma_{it} I_{it} + \sum_{j} \gamma_j I_j + \sum_{t} \gamma_t I_t + \sum \alpha_{ij} D_{ij} + \varepsilon_{ijt} \quad (3)$$

The specification is very closed to model **??**. However as we work now with panel data, we include in Model 3 country-and-time fixed effects, which account for multilateral resistance terms varying over time.[22] For the importer fixed effect, we only include country dummy, given the limited time variation considered (2002-2006).[23] Here again, as we use the importer fixed effect to measure the average protection applied by the importer, we isolate

[21] See Table 15.

[22] These resistance terms are truly theoretically funded.

[23] We assume that during such a short period the importer average protection remains unchanged.

the variable GDP importer, constraining it to 0.8.

To control for the time invariant bilateral determinants of trade we add the usual regressors: bilateral distance and dummies, D_{ij}, for common border, common language or countries ever in a colonial relationship or countries belonging to a FTA.[24] Finally we include a full set of year dummies, I_t, to allow for time varying means of the error terms.

4.3 Derivation of tariff equivalents

The next step involves the calculations of the tariff equivalents.

There are two alternative ways to compute the average protection applied by each importer: either from the estimated residuals, or alternatively form the importer fixed effect coefficients. Both methodologies present pro and cons. In the former case it is important to keep in mind that residuals contain mixed information other than protection and that their magnitude and goodness largely depend on the fit of the equation performed. For the latter it is worth underlying that the importer fixed effect coefficient also capture something larger than the protection itself. We could say that it represents the propensity to import, or in other words the accessibility of a given market. On the top of this methodological choice, comes the decision on the decision to be used: reconstructed data for a larger set of countries, or original bilateral and sectoral data.

More formally, as in Park (2002) if we adopt the first (residuals) methodology trade barriers of country j can be measured by the following equation :

$$ln(1+t_j)^{-\sigma} = ln\frac{X_j^{real}}{X_j^{predicted}} - ln\frac{X_{benchmark}^{real}}{X_{benchmark}^{predicted}} \tag{4}$$

where X is the country j's simple average imports, real and predicted, over all its trade partners, normalized relative to the free trade benchmark in the sector. The benchmark being the country with the highest positive difference between the actual and predicted average import values.

Using the second (fixed effect) methodology Equation 4 becomes:

[24] Here we consider as RTA only NAFTA, Europe and ANZCERTA.

$$ln(1+t_j)^{-\sigma} = Fe\gamma_j - Fe\gamma_{benchmark} \tag{5}$$

where now the benchmark is the country with the highest importer fixed effect coefficient.

From equation 4 or 5 we get the estimation of $ln(1+t_j)^{-\sigma}$. To obtain the tariff equivalent we need to make another crucial assumption on the elasticity of substitution. We can then calculate the tariff equivalent as follows:

$$t_j = exp(1+t_j)^{\frac{-1}{\sigma}} - 1 \tag{6}$$

As in Park (2002), we use the value of 5.6 for the elasticity of substitution in each sector, to be more comparable but also because in the literature a rigorous measure for σ in the services sectors does not exist. Moreover using different ad-hoc measures for the elasticity of substitution, would only modify the magnitude of the equivalent ad valorem without changing the ranking among countries, which at the end is the most reliable information.

5 Estimation results

5.1 Beyond Park's specification: regression results on (cross section) reconstructed data

Table 1 presents the basic results for the exact replication of Park's methodology, namely Model 1.1. We accordingly consider the 7 sectors present in Park. On the whole, our model performs relatively well with a R^2 comprised between 0.65 and 0.90, to a lesser extent than that of Park (2002). The standard explanatory variables exhibit signs in line with the gravity literature. Trade in services rises with the size of the exporters and importers (proxied here by GDP) and decreases with the distance ($ldist$). On average, sharing a common language appears to affect positively trade, whereas belonging to the same zone such as ASEAN ($bilsa$) or Latin America ($bilac$) does not favor trade between countries. Although rather counter-intuitive, this result illustrates the fact that trade in services mainly concerns developed country pairs or at least one developed partner. Noticeably, there is the well-documented exception of the business services sector (obs) in Asia, which shows a positive impact of free-trade agreement on trade.

The significance of two explanatory variables, namely distance and common language, strongly decrease when we amend Model 1.1. In particular for distance, once other control variables are included (Model 1.2), or when nation fixed effects replace importer and exporter specific determinants (see Model 2.1, Model 2.2 and Model 2.3), the coefficient becomes insignificant, except for the construction sector (cns). Those results seem to suggest that unlike trade in goods, trade in services is less impacted by geographical distance between countries. But we should refrain to raise such conclusion without checking the robustness of this finding.[25]

However, as explained above, we prefer relying on a fixed effect approach, such as **Model 2.3**. Results presented in Table 2 for 9 sectors and for 2004 point to the significant and negative impact of distance in most cases. While the fit of the equation is good, most controls related to other gravity-like variables or regional agreements are generally not significant, a result that would not be obtained for trade in goods.

[25]Results are provided in Appendix 7, in the following tables: Table 8 for Model 1.2, Table 9 for Model 1.3; Table 10 for Model 2.1; Table 11 for Model 2.2 and Table 12 for Model 2.3.

Table 1: Comparison with Park's coefficients (Model 1.1)

	cns	trd	trn	cmn	ofi	obs	osg
$lgdp04_i$	0.854***	0.790***	0.728***	0.669***	0.898***	0.896***	0.774***
	(0.816)***	(0.930)***	(0.960)***	(0.859)**	(0.926)***	(0.908)***	(0.879)***
$lgdp04_j$	0.779***	0.813***	0.787***	0.774***	0.730***	0.709***	0.816***
	(0.785)***	(0.920)***	(0.983)***	(0.909)**	(0.890)***	(0.850)***	(0.918)***
$lppi04_i$	-1.951***	-2.138***	-0.912***	-1.771***	-1.664***	-1.686***	-0.646***
	(-0.354)	(-0.640)***	(0.114)	(-0.952)***	(-0.737)***	(-0.615)***	(-0.834)***
$lppi04_j$	-1.431***	-0.929***	-0.567***	-1.061***	-0.521***	-1.548***	-0.255***
	(-0.168)	(-0.599)***	(-0.367)***	(-0.550)***	(0.013)	(-0.308)**	(-0.057)
ldist	-0.842***	-0.159***	-0.050***	-0.206***	-0.179***	-0.389***	-0.258***
	(-0.849)***	(-0.372)***	(-0.085)***	(-0.281)***	(-0.270)***	(-0.563)***	(-0.180)***
comlang-off	-0.584***	0.455***	0.325***	0.245**	0.787***	0.157	0.236***
	(0.438)***	(0.257)***	(0.103)***	(0.90)	(0.293)***	(0.531)***	(0.242)***
border	-0.605***	-0.286**	-0.294***	-0.361**	-0.493***	-0.410***	0.376**
	(-)	(-)	(-)	(-)	(-)	(-)	(-)
bil-sa	-0.403	0.839***	0.167	-1.290***	-0.064	1.078***	-0.412**
	(-1.388)***	(-0.372)**	(0.044)	(-0.862)***	(-0.627)***	(-0.730)***	(-0.386)***
bil-lac	-1.483***	-0.829***	-0.332***	0.239	-0.656***	-1.671***	-0.699***
	(-3.946)***	(-1.932)***	(-0.561)***	(-1.425)***	(-1.307)***	(-3.377)***	(-1.139)***
bil-ssa	-	-	-	-	-	-	-
	(-1.249)***	(-1.091)***	(-0.629)***	(-0.607)***	(-0.839)***	(-1.545)***	(-0.719)***
Constant	-6.550***	-10.335***	-15.455***	-7.955***	-15.668***	-6.875***	-19.211***
	(-16.60)***	(-21.246)***	(-29.485)***	(-20.261)***	(-24.112)***	(-17.826)***	(-23.720)***
Observations	2750	2750	2750	2750	2750	2750	2622
	(2599)	(2599)	(2599)	(2548)	(2599)	(2599)	(2599)
R-squared	0.65	0.74	0.80	0.69	0.72	0.74	0.77
	(0.644)	(0.781)	(0.909)	(0.792)	(0.829)	(0.730)	(0.880)

In brackets there are Park's results and above our results.

Note: *** and ** points to the significance of the coefficients at 1% and 5%. See Table 7.1 in Appendix 7 for detailed results including standard errors. Correspondence of sectoral acronyms: cns: construction – trd: trade – trn: transport – cmn: communications – ofi: finance – obs: business– osg: other services

Table 2: Estimator importer and exporter FE, Model 2.3

Dependent Variable	Bilateral Services Trade for a given sector in 2004								
Sector	cmn	cns	ofi	obs	trn	trd	osg	isr	wtp
$lgdp04_j$	0.800	0.800	0.800	0.800	0.800	0.800	0.800	0.800	0.800
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
ldist	-0.009	-0.103	-0.067	-0.021	-0.028	-0.031	-0.030	-0.011	0.000
	(1.05)	(4.00)**	(4.69)**	(1.98)*	(3.19)**	(2.64)**	(2.81)**	(1.20)	(0.02)
comlang-off	-0.030	-0.049	0.095	-0.000	-0.019	0.018	-0.036	0.031	-0.011
	(0.92)	(0.51)	(1.77)	(0.00)	(0.57)	(0.40)	(0.90)	(0.92)	(0.14)
border	-0.021	0.038	0.008	-0.045	-0.031	0.010	0.042	-0.019	0.003
	(0.76)	(0.46)	(0.17)	(1.36)	(1.10)	(0.27)	(1.26)	(0.67)	(0.05)
bil-sa	0.239	-0.347	0.489	0.213	-0.073	0.052	-0.000	-0.013	0.003
	(3.45)**	(1.72)	(4.33)**	(2.60)**	(1.05)	(0.56)	(0.00)	(0.18)	(0.02)
bil-lac	-0.008	0.856	-0.212	0.061	-0.077	-0.112	0.109	-0.090	0.133
	(0.19)	(6.86)**	(3.04)**	(1.22)	(1.80)	(1.93)	(2.13)*	(2.06)*	(1.36)
comlang-ethno	0.025	0.155	-0.057	0.043	-0.013	0.057	-0.025	-0.019	-0.013
	(0.81)	(1.73)	(1.13)	(1.19)	(0.42)	(1.36)	(0.67)	(0.60)	(0.18)
colony	0.016	0.063	-0.159	-0.001	0.034	-0.020	-0.011	-0.025	0.039
	(0.51)	(0.69)	(3.13)**	(0.02)	(1.08)	(0.48)	(0.30)	(0.77)	(0.55)
europe	0.014	0.291	0.035	0.005	-0.054	-0.035	-0.001	-0.030	-0.030
	(0.66)	(4.51)**	(0.98)	(0.19)	(2.43)*	(1.18)	(0.04)	(1.33)	(0.60)
alena	0.008	-0.531	-0.068	-0.277	-0.081	0.075	-0.048	0.038	0.403
	(0.06)	(1.49)	(0.34)	(1.93)	(0.67)	(0.45)	(0.33)	(0.31)	(1.45)
anzcerta	-0.042	-0.179	-0.138	0.005	0.067	0.148	0.102	0.006	0.513
	(0.21)	(0.30)	(0.41)	(0.02)	(0.33)	(0.53)	(0.42)	(0.03)	(1.09)
Constant	-2.883	-5.071	-1.925	-0.922	-0.494	-2.536	0.049	-3.507	-5.246
	(28.95)**	(17.44)**	(11.87)**	(7.84)**	(4.97)**	(18.86)**	(0.41)	(34.52)**	(23.09)**
Importer Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exporter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4094	4094	4158	4094	4094	4158	4158	4158	4094
R-squared	0.99	0.93	0.97	0.99	0.99	0.98	0.98	0.99	0.94

Robust t-statistics in parentheses.
*significant at 5%; ** significant at 1%.

5.2 Regression results from estimations on actual data

As said we also performed panel data estimations for the period 2002-2006, using OECD data. Table 3 reports the results for Total services (200) and 3 three other subcategories for which the data is available: Transport (205), Communication (245) and Construction (249). The comparison with previous studies performing panel data regressions is not straightforward. Firstly samples retained vary across studies in terms of country, time and sectors covered. Secondly, to the best of our knowledge, only one existing study estimates trade equations in services including time-varying importer and exporter fixed effects (Head & Ries, 2007).

Table 3: Panel estimation with FE (Model 3) using panel OECD data

Dependent Variable	Bilateral Services Trade (2002-2006)			
Sector	ALL	Trn	Cmn	Cns
$lgdp04_{jt}$	0.800	0.800	0.800	0.800
	(.)	(.)	(.)	(.)
ldist	-0.99	-0.97	-1.17	-1.12
	(0.02)***	(0.02)***	(0.04)***	(0.07)***
comlang-off	0.48	0.254	0.15	-0.597
	(0.04)***	(0.05)***	(0.09)	(0.18)***
border	0.43	0.25	0.18	-0.31
	(0.06)***	(0.07)***	(0.12)	(0.18)*
colony	1.16	0.74	-0.71	0.34
	(0.04)***	(0.06)***	(0.09)***	(0.17)*
alena	-0.29	-0.56	0	0
	(0.27)	(0.23)**	(0)	(0)
europe	0.325	0.26	-0.14	0.14
	(0.04)***	(0.06)***	(0.13)	(0.217)
anzcerta	0.59	0.64	0.73	-0.477
	(0.11)***	(0.16)***	(0.22)***	(0.66)
Constant	22.42	19.27	18.73	17.48
	(0.23)***	(0.27)***	(1.05)***	(0.77)***
Importer Fixed Effects	Yes	Yes	Yes	Yes
Exporter-Year Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	16249	7984	3087	2363
R-squared	0.82	0.73	0.79	0.72

Robust t-statistics in parentheses.
*significant at 10%;**significant at 5%; *** significant at 1%.
Note: Correspondence of sectoral acronyms: cns: construction – trn: transport – cmn: communications

The general picture that emerges from Table 3 is that the gravity equation, even using the more sophisticated FE specifications, explains services trade just as well as trade in goods. In particular we find strong distance effects as in Head et al. (2007). This result contrasts with to those obtained with the fixed effects specifications in cross section, namely Model 2.1, Model 2.2 and Model 2.3, whereby most controls related to gravity-like variables

or regional agreements other than distance are generally not significant. Still the distance variable might have a different 'meaning' in the services sector. In the case of services distance is also a proxy for omitted variables which are important determinants for trade in services (e.g. cultural and institutional variables).

We must accordingly sort out differences due to the methodology (cross section versus panel data estimations) from differences in the data source used. Our cross section GTAP database is a reconstructed database, based on OECD data, where the gaps for missing data were filled and the data reconciled.[26]. To shed some light on this latter point we replicate equation 3 on 2004 data with country FE. In this way deviations between results obtained with model 2.3 and the new estimations would be directly imputable to differences in the data sources. Results in Appendix (column '2004' in Tables 11, 12, 13) confirm that using an estimated dataset such as GTAP, affects the results obtained.

6 Tariff equivalents

The ultimate objective of our paper remains the estimation of tariff equivalents. In this section we try to assess the reliability of the average protection obtained using the GTAP data with the fixed effect methodology, compared to the full set of the estimations from previous sections. The main idea is that the GTAP data remains the largest available data source to obtain a widespread set of protection measures in services, both in terms of sectors and countries. We report in the appendix 8.3 the equivalents ad valorem by importing country for the 9 services sectors using the Model 2.3. We will in a further stage examine whether alternative strategies lead to different results or not.

Before commenting upon the results is worth noting that benchmark countries that we obtain are essentially developed countries and that they stay the same across different specifications, with a few exceptions (Table 4).

We now turn our attention to the level of protection in the different categories of services, as estimated from cross section regressions using the GTAP dataset for the year 2004. Figure 1 allows for a confrontation between the results estimated using the methodology proposed

[26]The method is explained in van Leeuwen & Lejour (2008)

Table 4: Benchmark countries, cross section regressions residual approach on reconstructed data

Sector	Model 1.1	Model 1.2	Model 1.3	Model 2.1	Model 2.2	Model 2.3
cmn	HKG	PHL	PHL	HKG	HKG	HKG
cns	HKG	PHL	KAZ	HKG	HKG	HKG
ofi	BEL	BEL	BEL	BEL	BEL	BEL
obs	MYS	MYS	MYS	AUT	AUT	AUT
trn	ARG	ARG	ARG	SGP	SGP	SGP
trd	IRL	IRL	IRL	IRL	IRL	IRL
osg	HKG	HKG	HKG	HKG	HKG	HKG
isr	MEX	MEX	MEX	MEX	MEX	MEX
wtp	GRC	GRC	GRC	GRC	GRC	GRC

by Park (2002) (plotted in the y axis) and the ones with fixed effects (x axis), at the sectoral level, for a common sample of countries. In both cases we use the same 2004 GTAP database. Notice that Park (2002) also imposes a constraint over the importing countries to get the tariff equivalent, assuming that the total residuals should be zero. The issue here is that to obtain the average protection for a given importer one sums over all the countries exporting to that market, which can largely differ from one importer to another. Imposing such a constraint over the residuals means to eliminate, erroneously, the export composition effect. In Figure 1, we prefer relying on the fixed effect strategy, which controls for the export composition effect.

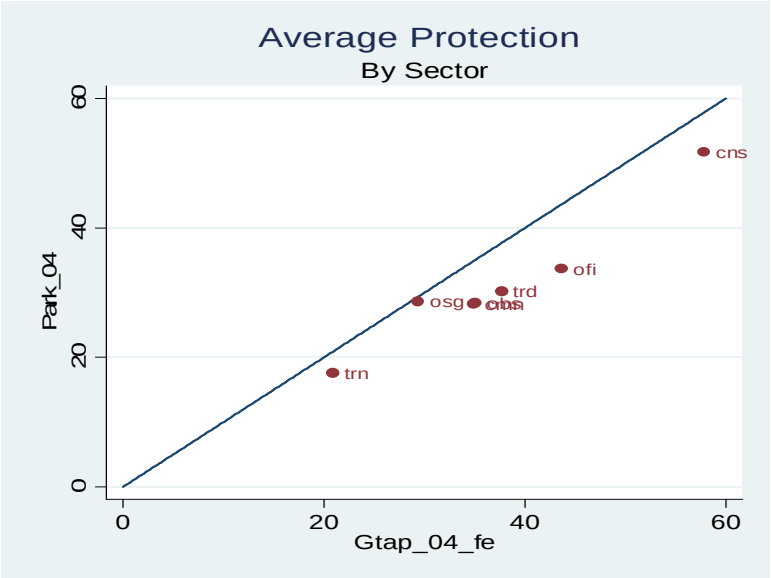
First of all we can notice that tariff equivalents based on Model 2.3 are systematically *higher*, except for the other service sector (osg), for which the figures are comparable in magnitude. This illustrates that the misspecification of the model can cause a systematic bias, underestimating the actual trade barriers.

Two similarities are evident: the most liberalized sector remains Transport (trn) with an average protection of 21%, while the most protected one is Construction, with an average tariff of 58%. The fact that barriers in Construction are particularly high is somewhat expected, as correctly underlined by Park, in general foreign firms ''are not permitted to bid for procurement contracts'.

Figure 2 plots on the bisector the normalized values of the protection using the two methods, by country and for each of the seven GTAP sectors.[27] We can see than that the

[27]In order to compare the two methodologies across sector and countries, we standardized the distribution

Figure 1: Equivalent ad Valorem as estimated using GTAP data.



difference between the two methodologies are evident in three sectors, namely construction (cns), other business services (obs) and trade (trd), and are particularly important for developing countries.

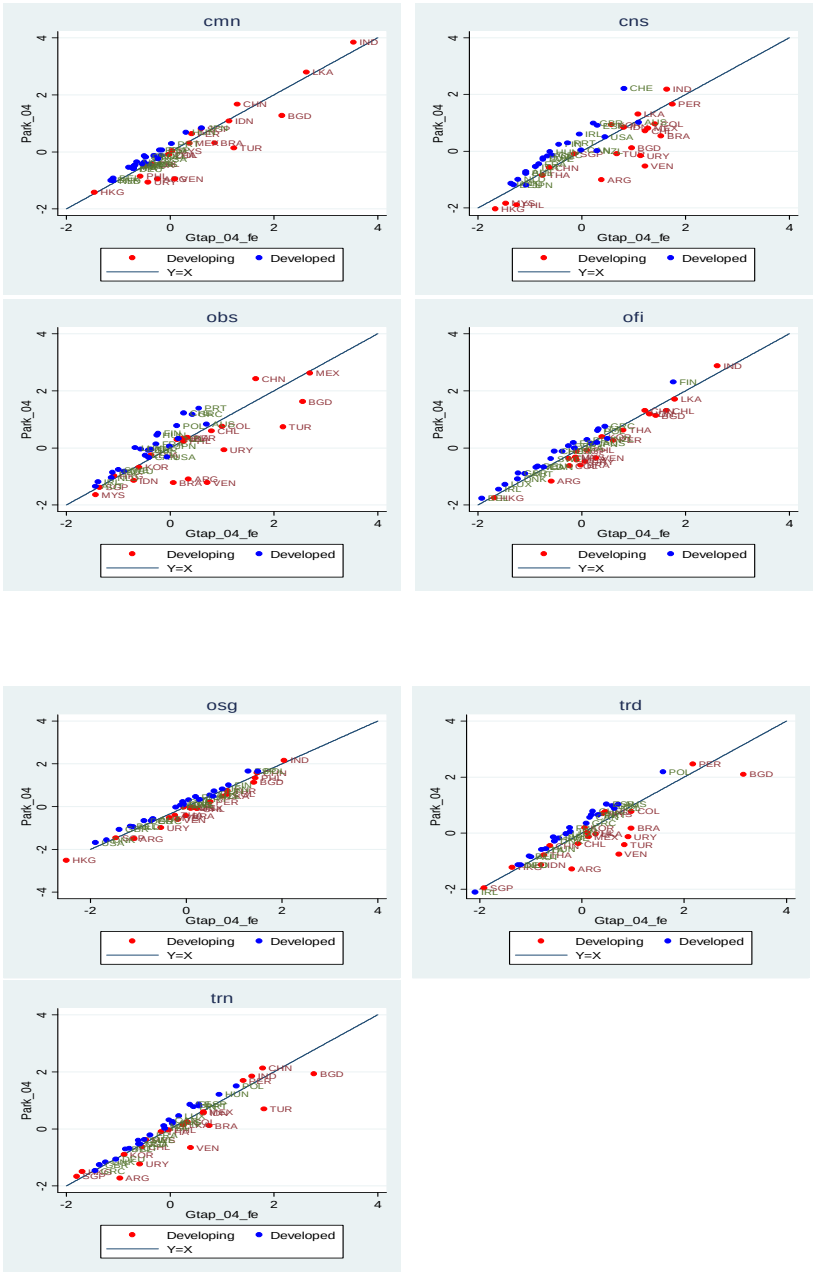
The confrontation with the tariff equivalent obtained using the OECD data demand for a greater awareness about the sources of differences. In fact, as we use the model predictions to derive tariff equivalents, we need to isolate the differences stemming from the data itself (actual or reconstructed data) or from the methodology (cross section versus panel data).

To disentangle the two channels, we first compare the results obtained with the (reconstructed) GTAP dataset to those obtained using (actual) panel OECD data (see Figure 3). We then compare, for the same data source (OECD), the results obtained applying the cross section versus panel estimations (see Figure 4).

Even if the comparison is focused only on two sectors, communication (cmm) and transport (trn), we can see from Figure 4 that the discrepancies due to the methodology are minimum. At the same time, the tariff barriers estimated performing panel estimations

of the estimated protections. That is, we subtracted the population mean from each country's tariff equivalent and then we divided the difference by the standard deviation.

Figure 2: Equivalent ad Valorem as estimated using GTAP data. By sector and countries.



with the OECD data are quite different from the ones obtained in cross section using the GTAP data (see Figure 3). This confirms that the main issue remains the utilization of reconstructed data, as already underlined.

Figure 3: Equivalent ad Valorem. GTAP data versus OECD panel data.

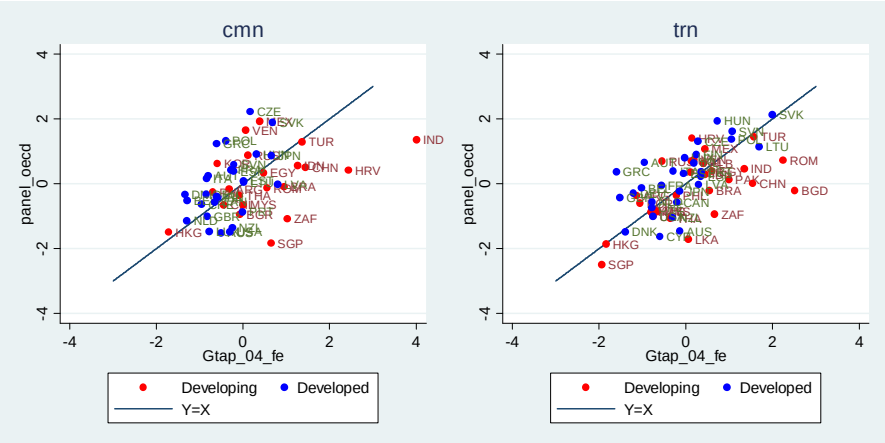
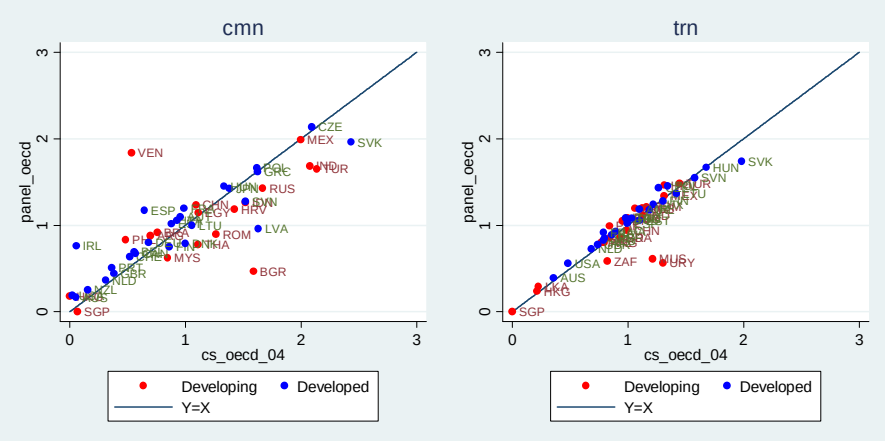


Figure 4: Equivalent ad Valorem. OECD data, panel versus cross sections.



7 Conclusion

This research aimed at providing tariff equivalents for trade barriers in services based on quantity based methods.

We firstly improved on the model proposed by Park (2002) and used a more recent version of the GTAP dataset of trade in services. We obtained tariffs equivalents for 9 services sectors and 82 countries. Some similarities and differences in the level of protection between countries are worth underlining. The least protected countries are globally developed economies. The most liberalized sector remains Transport (trn) with an average protection of 21%, while the most protected one is Construction, with an average tariff of 58%.

A second contribution of this paper is to highlight that the misspecification of the gravity model used can cause a systematic bias, underestimating the actual trade barriers. In fact compared to Park's estimates, our tariff equivalents are higher, except for the Transport and Business services for which the figures are comparable in magnitude. Relying panel data from the OECD for the period 2002-2006, the results obtained were quite dissimilar from the ones obtained in cross section using the GTAP dataset. We showed that those differences were due to data (reconstructed versus actual) not to the methodology (cross section versus panel). This is a warning that using "reconstructed data' to estimate tariff equivalents may bias the results. Still, the hierarchy of countries within sectors in terms of protection obtained with the reconstructed data set is rather reliable and most divergences fall on developing economies. We can accordingly be rather confident in the accurateness of the tariff equivalents of protection in services trade proposed here.

Still, these results call for the confrontation with alternative methods of estimating barriers to trade, notably the price impact approaches.

References

Anderson, J. E. (1979). A theoretical foundation for the gravity equation. *American Economic Review*, 69(1), 106–16.

Anderson, J. E. & van Wincoop, E. (2003). Gravity with Gravitas: A Solution to the Border Puzzle. *American Economic Review*, 93(1), 170–192.

Baldwin, R. & Taglioni, D. (2006). *Gravity for dumies and Dummies for Gravity*. Working Paper 12516, NBER.

Bensidoun, I. & Ünal Kensenci, D. (2007). *Mondialisation des services : de la mesure à l'analyse*. CEPII Working Paper 2007-14, CEPII research center.

Bergstrand, J. H. (1990). The heckscher-ohlin-samuelson model, the linder hypothesis and the determinants of bilateral intra-industry trade. *Economic Journal*, 100(403), 1216–29.

Chen, Z. & Schembri, L. (2002). *Measuring the Barriers to Trade in Services: Literature and Methodologies*. Trade policy research, Minister of Public Works and Government Services Canada.

Deardorff, A. V. (1998). Determinants of Bilateral Trade: Does Gravity Work in a Neoclassical World? In *The Regionalization of the World Economy*. J.A. Frankel.

Decreux, Y. & Fontagne, L. (2006). *A Quantitative Assessment of the Outcome of the Doha Development Agenda*. Working Papers 2006-10, CEPII research center.

Dihel, N. & Shepherd, B. (2007). *Modal Estimates of Services Barriers*. OECD Trade Policy Working Papers 51, OECD Trade Directorate.

Feenstra, R. (2002). Border Effects and the Gravity Equation: Consistent Methods for Estimation. *Scottish Journal of Political Economy*, 49(5), 491–506.

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

Fontagne, L. & Mitaritonna, C. (2010). *Assessing barriers to trade in the distribution and telecom sectors in emerging countries*. Cepii working paper, CEPII.

Francois, J., van Meijl, H., & van Tongeren, F. (2003). *Economic Benefits of the Doha Round for the Netherlands.* Project report, Agricultural Economics Research Institute, The Hague.

Head, K. Mayer, T. & Ries, J. (2007). *How Remote is the Offshoring Threat?* Working Paper 18, CEPII.

Helpman, E. & Krugman, P. (1985). *Market Structure and Foreign Trade.* Cambridge University Press.

Helpman, E., Melitz, M., & Rubinstein, Y. (2007). *Estimating Trade Flows: Trading Partners and Trading Volumes.* NBER Working Papers 12927, National Bureau of Economic Research, Inc.

Hoekman, B. (1996). Assessing the General Agreement on Trade in Services. In *The Uruguay Round and the Developing Countries.* Cambridge University Press.

Kimura, F. & Lee, H.-H. (2006). The Gravity Equation in International Trade in Services. *Review of World Economics*, 142(1), 92–121.

Mattoo, A. & Gootiiz, B. (2009). Services in Doha. What's on the table? *World bank Policy Research Paper*, 4903.

Mattoo, A., Rathindran, R., & Subramanian, A. (2001). *Measuring services trade liberalization and its impact on economic growth: an illustration.* Policy Research Working Paper Series 2655, The World Bank.

Melitz, M. J. & Ottaviano, G. I. P. (2008). Market size, trade, and productivity. *Review of Economic Studies*, 75(1), 295–316.

Park, S.-C. (2002). *Measuring Tariff Equivalents in Cross-Border Trade in Services.* Trade Working Papers 353, East Asian Bureau of Economic Research.

Stern, R. M. (2000). *Quantifying Barriers to Trade in Services.* Working Papers 470, Research Seminar in International Economics, University of Michigan.

van Leeuwen, N. & Lejour, A. (2008). *The quality of bilateral services trade data.* Cpb memoranda, CPB Netherlands Bureau for Economic Policy Analysis.

Walsh, K. (2006). *Trade in Services: Does Gravity Hold? A Gravity Model Approach to Estimating Barriers to Services Trade.* The Institute for International Integration Studies Discussion Paper Series 183, IIIS.

8 Appendix

8.1 Cross section estimations using GTAP data

Table 5: Estimator OLS, Model 1.1

Dependent Variable	Bilateral Services Trade for a given sector in 2004						
Sector	cmn	cns	ofi	obs	trn	trd	osg
$lgdp04_i$	0.669	0.854	0.917	0.896	0.728	0.790	0.742
	(53.39)**	(45.06)**	(55.40)**	(67.34)**	(72.04)**	(55.66)**	(58.81)**
$lgdp04_j$	0.774	0.779	0.813	0.709	0.787	0.813	0.824
	(42.24)**	(32.35)**	(39.85)**	(39.58)**	(62.14)**	(46.36)**	(55.61)**
ldist	-0.206	-0.842	-0.443	-0.389	-0.050	-0.159	-0.148
	(8.84)**	(24.43)**	(13.45)**	(15.24)**	(2.82)**	(6.29)**	(7.22)**
comlang-off	0.245	-0.584	0.709	0.157	0.325	0.455	0.317
	(2.55)*	(5.10)**	(5.70)**	(1.48)	(5.42)**	(4.30)**	(3.87)**
border	-0.361	-0.605	-0.679	-0.410	-0.294	-0.286	-0.293
	(2.52)*	(3.21)**	(4.01)**	(2.81)**	(2.85)**	(1.96)*	(2.75)**
bil-sa	-1.290	-0.403	-1.051	1.078	0.167	0.839	-0.539
	(4.14)**	(1.01)	(4.86)**	(4.04)**	(0.94)	(3.00)**	(2.73)**
bil-lac	0.239	-1.483	-1.327	-1.671	-0.332	-0.829	-0.417
	(1.85)	(9.02)**	(6.58)**	(8.96)**	(3.12)**	(5.35)**	(3.80)**
$lppi04_i$	-1.771	-1.951	-1.456	-1.686	-0.912	-2.138	-0.743
	(20.67)**	(13.59)**	(13.83)**	(19.00)**	(11.40)**	(17.35)**	(10.10)**
$lppi04_j$	-1.061	-1.431	-0.284	-1.548	-0.567	-0.929	-0.122
	(13.92)**	(15.53)**	(2.85)**	(17.89)**	(9.14)**	(11.13)**	(1.86)
Constant	-7.955	-6.550	-19.276	-6.875	-15.455	-10.335	-20.718
	(9.12)**	(5.12)**	(17.74)**	(7.24)**	(21.44)**	(9.94)**	(26.89)**
Observations	2750	2750	2750	2750	2750	2750	2750
R-squared	0.69	0.65	0.69	0.74	0.80	0.74	0.75

Robust t-statistics in parentheses.
*significant at 5%; ** significant at 1%.

Table 6: Estimator OLS, Model 1.2

Dependent Variable	Bilateral Services Trade for a given sector in 2004						
Sector	cmn	cns	ofi	obs	trn	trd	osg
$lgdp04_i$	0.938	1.108	1.354	1.217	0.915	1.057	0.888
	(50.16)**	(35.75)**	(65.94)**	(61.40)**	(67.00)**	(50.94)**	(51.43)**
$lpib04_j$	1.179	0.922	1.194	0.888	0.981	0.954	0.992
	(51.86)**	(26.90)**	(53.72)**	(38.26)**	(61.10)**	(39.17)**	(51.56)**
ldist	0.059	-0.690	-0.227	-0.208	0.016	-0.057	-0.063
	(2.04)*	(14.13)**	(6.88)**	(6.77)**	(0.69)	(1.67)	(2.25)*
comlang-off	-0.370	-0.111	0.328	-0.445	-0.231	0.123	-0.495
	(2.86)**	(0.54)	(2.18)*	(2.79)**	(2.26)*	(0.83)	(3.19)**
border	0.065	-0.295	-0.221	-0.083	-0.116	-0.045	-0.152
	(0.63)	(1.73)	(1.63)	(0.70)	(1.36)	(0.32)	(1.53)
bil-sa	0.130	0.399	0.472	2.077	0.851	1.573	0.084
	(0.48)	(1.03)	(3.44)**	(9.35)**	(7.11)**	(6.40)**	(0.54)
bil-lac	0.633	-1.246	-0.963	-1.466	-0.152	-0.695	-0.259
	(5.36)**	(7.71)**	(5.42)**	(8.39)**	(1.65)	(4.72)**	(2.44)*
$lppi04_i$	-1.094	-1.283	-0.377	-0.832	-0.482	-1.455	-0.387
	(12.15)**	(8.45)**	(3.58)**	(8.74)**	(6.66)**	(12.36)**	(5.27)**
$lppi04_j$	-0.129	-1.143	0.525	-1.160	-0.163	-0.647	0.253
	(1.80)	(11.22)**	(5.94)**	(13.60)**	(2.54)*	(7.76)**	(3.67)**
comlang-ethno	0.486	-0.614	0.234	0.590	0.463	0.308	0.777
	(4.08)**	(3.06)**	(1.76)	(3.83)**	(4.95)**	(2.38)*	(5.52)**
colony	0.072	0.108	-0.168	-0.001	0.136	-0.146	0.170
	(0.67)	(0.64)	(1.06)	(0.01)	(1.43)	(1.08)	(1.35)
$lpop_i$	-0.401	-0.358	-0.635	-0.469	-0.277	-0.387	-0.223
	(17.09)**	(10.80)**	(27.42)**	(20.35)**	(18.90)**	(16.42)**	(13.19)**
$lpop_j$	-0.514	-0.164	-0.475	-0.225	-0.250	-0.173	-0.224
	(26.25)**	(5.30)**	(24.33)**	(10.28)**	(17.26)**	(7.94)**	(13.23)**
europe	0.138	0.112	-0.229	0.116	-0.272	-0.102	-0.090
	(1.99)*	(0.86)	(2.27)*	(1.55)	(4.04)**	(1.18)	(1.16)
alena	0.383	-1.827	-0.045	-1.764	-0.056	-1.076	0.197
	(2.65)**	(5.01)**	(0.11)	(3.74)**	(0.49)	(4.95)**	(0.52)
anzcerta	-0.567	-2.526	-2.165	-2.314	-0.840	-1.253	-0.677
	(4.44)**	(8.45)**	(16.29)**	(18.01)**	(6.99)**	(9.69)**	(3.95)**
Constant	-20.122	-13.961	-32.717	-15.731	-21.014	-16.986	-25.613
	(21.99)**	(9.67)**	(32.30)**	(15.78)**	(28.80)**	(15.95)**	(31.17)**
Observations	2750	2750	2750	2750	2750	2750	2750
R-squared	0.79	0.68	0.79	0.78	0.84	0.77	0.78

Robust t-statistics in parentheses.
*significant at 5%; ** significant at 1%.

Table 7: Estimator OLS, Model 1.3

Dependent Variable	Bilateral Services Trade for a given sector in 2004						
Sector	cmn	cns	ofi	obs	trn	trd	osg
$lpib04_i$	0.943	1.109	1.346	1.211	0.915	1.059	0.888
	(60.74)**	(41.67)**	(79.99)**	(70.50)**	(80.98)**	(63.82)**	(61.12)**
$lpib04_j$	1.210	1.013	1.210	1.096	1.060	1.109	0.975
	(75.07)**	(40.35)**	(72.94)**	(60.56)**	(92.42)**	(66.23)**	(70.47)**
ldist	0.063	-0.668	-0.132	-0.255	0.038	0.036	-0.068
	(2.85)**	(18.28)**	(5.19)**	(10.90)**	(2.21)*	(1.53)	(3.21)**
comlang-off	-0.361	-0.118	0.333	-0.464	-0.146	0.092	-0.439
	(3.56)**	(0.72)	(2.54)*	(3.23)**	(1.73)	(0.75)	(3.40)**
border	0.059	-0.189	-0.105	-0.183	-0.103	0.052	-0.207
	(0.66)	(1.25)	(0.99)	(1.92)	(1.54)	(0.48)	(2.58)**
bil-sa	0.188	0.560	0.629	2.286	0.972	1.913	0.046
	(0.70)	(1.48)	(4.81)**	(10.44)**	(7.96)**	(8.03)**	(0.30)
bil-lac	0.556	-1.243	-0.844	-1.594	-0.114	-0.395	-0.265
	(4.85)**	(8.70)**	(5.60)**	(10.25)**	(1.41)	(2.98)**	(2.80)**
$lppi04_i$	-1.075	-1.318	-0.425	-0.863	-0.509	-1.461	-0.373
	(14.67)**	(10.32)**	(5.00)**	(10.74)**	(8.44)**	(15.32)**	(5.97)**
$lppi04_j$	-0.032	-0.791	0.515	-0.603	-0.069	-0.414	0.145
	(0.51)	(8.84)**	(6.90)**	(7.70)**	(1.20)	(5.92)**	(2.34)*
comlang-ethno	0.457	-0.621	0.251	0.640	0.423	0.319	0.766
	(5.02)**	(4.05)**	(2.27)*	(4.61)**	(5.41)**	(2.98)**	(6.61)**
colony	0.058	0.214	-0.225	-0.084	0.193	-0.084	0.098
	(0.65)	(1.48)	(1.72)	(0.70)	(2.49)*	(0.69)	(0.96)
$lpop_i$	-0.405	-0.347	-0.628	-0.464	-0.278	-0.397	-0.217
	(21.13)**	(12.15)**	(33.42)**	(23.46)**	(22.89)**	(21.07)**	(15.26)**
$lpop_j$	-0.462	-0.184	-0.436	-0.269	-0.263	-0.241	-0.183
	(27.75)**	(6.85)**	(24.83)**	(13.43)**	(20.99)**	(13.20)**	(12.22)**
europe	0.100	0.191	-0.098	-0.055	-0.314	-0.033	-0.088
	(1.79)	(1.86)	(1.19)	(0.91)	(6.08)**	(0.54)	(1.47)
alena	0.343	-1.934	0.009	-1.982	-0.111	-1.124	0.211
	(2.22)*	(5.37)**	(0.02)	(4.40)**	(1.07)	(4.76)**	(0.56)
anzcerta	-0.413	-2.373	-1.943	-2.237	-0.799	-1.091	-0.661
	(4.75)**	(9.46)**	(13.47)**	(20.65)**	(5.06)**	(10.23)**	(3.83)**
Constant	-22.533	-18.030	-34.375	-22.604	-23.460	-21.798	-25.482
	(33.32)**	(16.16)**	(45.89)**	(29.46)**	(42.88)**	(28.41)**	(41.10)**
Observations	4094	4094	4158	4094	4094	4158	4158
R-squared	0.82	0.68	0.81	0.80	0.87	0.81	0.80

Robust t-statistics in parentheses.
*significant at 5%; ** significant at 1%.

Table 8: Estimator importer and exporter FE, Model 2.1

Dependent Variable	Bilateral Services Trade for a given sector in 2004								
Sector	cmn	cns	ofi	obs	trn	trd	osg	isr	wtp
$lgdp04_j$	0.800	0.800	0.800	0.800	0.800	0.800	0.800	0.800	0.800
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
ldist	-0.012	-0.142	-0.091	-0.012	-0.008	-0.037	-0.019	-0.003	0.005
	(1.36)	(5.68)**	(6.27)**	(1.25)	(0.92)	(3.04)**	(2.14)*	(0.40)	(0.26)
comlang-off	-0.010	0.033	0.012	0.029	-0.011	0.035	-0.026	-0.006	-0.019
	(0.42)	(0.51)	(0.32)	(1.16)	(0.48)	(1.14)	(1.12)	(0.27)	(0.36)
border	-0.038	0.002	-0.061	-0.040	-0.011	-0.023	0.013	-0.044	0.014
	(1.19)	(0.03)	(1.16)	(1.13)	(0.34)	(0.51)	(0.41)	(1.50)	(0.19)
bil-sa	0.286	-0.367	0.559	0.217	-0.046	0.006	0.014	0.005	-0.002
	(4.21)**	(1.91)	(5.00)**	(2.91)**	(0.66)	(0.06)	(0.21)	(0.08)	(0.01)
bil-lac	0.011	0.897	-0.205	0.052	-0.041	-0.039	0.134	-0.044	0.115
	(0.23)	(6.97)**	(2.75)**	(1.05)	(0.88)	(0.63)	(2.92)**	(1.06)	(1.09)
Constant	-2.853	-4.707	-1.751	-0.985	-0.728	-2.516	-0.083	-3.580	-5.401
	(28.70)**	(16.73)**	(10.72)**	(9.04)**	(7.16)**	(18.55)**	(0.83)	(39.30)**	(23.39)**
Importer Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exporter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2750	2750	2750	2750	2750	2750	2750	2750	2750
R-squared	0.99	0.93	0.97	0.99	0.99	0.98	0.98	0.99	0.93

Robust t-statistics in parentheses.
*significant at 5%; ** significant at 1%.

Table 9: Estimator importer and exporter FE, Model 2.2

Dependent Variable	Bilateral Services Trade for a given sector in 2004								
Sector	cmn	cns	ofi	obs	trn	trd	osg	isr	wtp
$lgdp04_j$	0.800	0.800	0.800	0.800	0.800	0.800	0.800	0.800	0.800
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
ldist	-0.009	-0.082	-0.093	-0.007	-0.020	-0.037	-0.008	-0.007	0.006
	(0.86)	(2.77)**	(5.36)**	(0.61)	(1.89)	(2.57)*	(0.72)	(0.71)	(0.26)
comlang-off	-0.030	-0.055	0.095	-0.004	0.000	-0.047	-0.036	0.019	-0.026
	(0.78)	(0.52)	(1.52)	(0.09)	(0.01)	(0.91)	(0.94)	(0.53)	(0.29)
border	-0.040	0.035	-0.043	-0.026	-0.015	-0.031	0.017	-0.048	-0.007
	(1.21)	(0.38)	(0.80)	(0.73)	(0.45)	(0.70)	(0.51)	(1.60)	(0.09)
bil-sa	0.290	-0.305	0.545	0.221	-0.056	0.010	0.026	0.002	0.007
	(4.25)**	(1.58)	(4.86)**	(2.95)**	(0.81)	(0.11)	(0.38)	(0.03)	(0.04)
bil-lac	0.015	0.970	-0.238	0.046	-0.048	-0.045	0.150	-0.040	0.145
	(0.31)	(7.34)**	(3.10)**	(0.90)	(1.01)	(0.70)	(3.18)**	(0.92)	(1.34)
comlang-ethno	0.023	0.092	-0.061	0.040	-0.025	0.103	0.011	-0.035	-0.008
	(0.63)	(0.90)	(1.02)	(1.02)	(0.67)	(2.10)*	(0.30)	(1.07)	(0.09)
colony	0.010	0.137	-0.143	-0.004	0.019	-0.025	0.017	0.018	0.047
	(0.29)	(1.37)	(2.45)*	(0.10)	(0.51)	(0.51)	(0.48)	(0.57)	(0.57)
europe	0.012	0.310	0.001	0.029	-0.057	-0.028	0.054	-0.015	-0.022
	(0.45)	(4.07)**	(0.03)	(0.96)	(2.05)*	(0.76)	(1.97)*	(0.61)	(0.35)
alena	0.016	-0.440	-0.094	-0.304	-0.046	0.146	0.018	0.066	0.509
	(0.14)	(1.31)	(0.48)	(2.33)*	(0.37)	(0.90)	(0.15)	(0.60)	(1.84)
anzcerta	-0.035	-0.046	-0.155	0.048	0.114	0.208	0.108	0.044	0.553
	(0.18)	(0.08)	(0.47)	(0.22)	(0.56)	(0.77)	(0.54)	(0.24)	(1.20)
Constant	-2.891	-5.239	-1.695	-1.023	-0.609	-2.574	-0.190	-3.539	-5.450
	(25.09)**	(16.13)**	(8.96)**	(8.10)**	(5.17)**	(16.38)**	(1.63)	(33.52)**	(20.38)**
Importer Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exporter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2750	2750	2750	2750	2750	2750	2750	2750	2750
R-squared	0.99	0.93	0.97	0.99	0.99	0.98	0.98	0.99	0.93

Robust t-statistics in parentheses.
*significant at 5%; ** significant at 1%.

8.2 Cross section estimations using OECD data

Table 10: Cross section estimations with Importer and Exporter FE: OECD data for different years

Dependent Variable	Bilateral Services Trade, Total services from 2002 to 2006				
Sector	All-2002	All-2003	All-2004	All-2005	All-2006
$lgdp04_j$	0.8	0.8	0.8	0.8	0.8
	(.)	(.)	(.)	(.)	(.)
ldist	-1.042***	-0.975***	-0.995***	-0.995***	-1.003***
	(0.0438)	(0.0417)	(0.0463)	(0.0460)	(0.0432)
comlang-off	0.546***	0.591***	0.415***	0.466***	0.453***
	(0.0898)	(0.0871)	(0.0788)	(0.0755)	(0.0778)
border	0.390**	0.364**	0.508***	0.410***	0.409***
	(0.160)	(0.156)	(0.146)	(0.144)	(0.135)
colony	1.272***	1.177***	1.172***	1.094***	1.140***
	(0.111)	(0.115)	(0.0975)	(0.0945)	(0.0967)
alena	-0.415	-0.257	-0.359	-0.146	-0.301
	(0.673)	(0.599)	(0.613)	(0.645)	(0.598)
europe	0.413***	0.341***	0.206	0.232*	0.169
	(0.115)	(0.108)	(0.132)	(0.134)	(0.129)
anzcerta	0.434**	0.795***	0.475**	0.599**	0.593***
	(0.215)	(0.260)	(0.227)	(0.240)	(0.229)
Constant	21.93***	21.09***	21.35***	21.37***	21.42***
	(0.465)	(0.439)	(0.466)	(0.460)	(0.439)
Importer FE	Yes	Yes	Yes	Yes	Yes
Exporter FE	Yes	Yes	Yes	Yes	Yes
Observations	2593	2876	3293	3643	3844
R-squared	0.835	0.820	0.826	0.826	0.821

Robust t-statistics in parentheses.
*significant at 10%;**significant at 5%; *** significant at 1%.

Table 11: Cross section estimations with Importer and Exporter FE

Dependent Variable	Bilateral Services Trade, Transport services from 2002 to 2006				
Sector	Trn-2002	Trn-2003	Trn-2004	Trn-2005	Trn-2006
$lgdp04_j$	0.8	0.8	0.8	0.8	0.8
	(.)	(.)	(.)	(.)	(.)
ldist	-0.924***	-0.872***	-1.002***	-0.991***	-0.971***
	(0.0519)	(0.0522)	(0.0652)	(0.0598)	(0.0592)
comlang-off	0.232**	0.313***	0.211*	0.246**	0.268**
	(0.111)	(0.108)	(0.127)	(0.123)	(0.117)
border	0.279*	0.385**	0.172	0.215	0.290*
	(0.145)	(0.151)	(0.192)	(0.182)	(0.170)
colony	0.799***	0.570***	0.758***	0.809***	0.762***
	(0.115)	(0.128)	(0.157)	(0.147)	(0.138)
alena	-0.441	-0.338	-0.556	-0.573	-0.737
	(0.469)	(0.466)	(0.566)	(0.560)	(0.480)
europe	0.264*	0.224	0.403**	0.386**	0.276
	(0.140)	(0.136)	(0.172)	(0.164)	(0.168)
anzcerta	0.620**	0.845**	0.573	0.633*	0.547*
	(0.277)	(0.341)	(0.485)	(0.328)	(0.299)
Constant	18.67***	17.93***	19.75***	19.66***	19.31***
	(0.536)	(0.532)	(0.650)	(0.596)	(0.586)
Importer FE	Yes	Yes	Yes	Yes	Yes
Exporter FE	Yes	Yes	Yes	Yes	Yes
Observations	1477	1447	1634	1755	1671
R-squared	0.748	0.738	0.709	0.742	0.736

Robust t-statistics in parentheses.
*significant at 10%;**significant at 5%; *** significant at 1%.

Table 12: Cross section estimations with Importer and Exporter FE

Dependent Variable	Bilateral Services Trade, Communication services from 2002 to 2006				
Sector	Cmn-2002	Cmn-2003	Cmn-2004	Cmn-2005	Cmn-2006
$lgdp04_j$	0.8	0.8	0.8	0.8	0.8
	(.)	(.)	(.)	(.)	(.)
ldist	-0.926***	-0.865***	-1.248***	-1.245***	-1.112***
	(0.0807)	(0.104)	(0.108)	(0.116)	(0.105)
comlang-off	0.201	-0.00220	-0.0528	0.421*	0.231
	(0.215)	(0.221)	(0.254)	(0.223)	(0.225)
border	0.646***	0.614**	0.101	-0.101	-0.0630
	(0.220)	(0.294)	(0.324)	(0.282)	(0.274)
colony	0.504**	0.660***	0.853***	0.805***	0.699***
	(0.236)	(0.255)	(0.209)	(0.196)	(0.219)
alena	0	0	0	0	0
	(0)	(0)	(0)	(0)	(0)
europe	0.318	0.671*	-0.449	-0.337	0.359
	(0.263)	(0.347)	(0.359)	(0.382)	(0.371)
anzcerta	0.235	0.610	0.894*	1.088**	0.929**
	(0.426)	(0.482)	(0.519)	(0.453)	(0.406)
Constant	16.27***	15.44***	18.08***	18.04***	17.03***
	(1.092)	(1.186)	(1.016)	(0.988)	(0.899)
Importer FE	Yes	Yes	Yes	Yes	Yes
Exporter FE	Yes	Yes	Yes	Yes	Yes
Observations	509	458	618	734	768
R-squared	0.779	0.778	0.792	0.811	0.827

Robust t-statistics in parentheses.
*significant at 10%;**significant at 5%; *** significant at 1%.

Table 13: Cross section estimations with Importer and Exporter FE

Dependent Variable	Bilateral Services Trade, Construction services from 2002 to 2006				
Sector	Cns-2002	Cns-2003	Cns-2004	Cns-2005	Cns-2006
$lgdp04_j$	0.8	0.8	0.8	0.8	0.8
	(.)	(.)	(.)	(.)	(.)
ldist	-0.929***	-0.837***	-1.051***	-1.162***	-0.956***
	(0.147)	(0.176)	(0.185)	(0.190)	(0.206)
comlang-off	0.0933	-0.831*	-0.721	-0.558	-0.383
	(0.389)	(0.454)	(0.439)	(0.430)	(0.392)
border	0.450	0.878*	0.346	0.129	-0.188
	(0.297)	(0.463)	(0.448)	(0.422)	(0.398)
colony	0.315	1.093**	0.188	0.0438	0.212
	(0.365)	(0.442)	(0.404)	(0.417)	(0.365)
alena	0	0	0	0	0
	(0)	(0)	(0)	(0)	(0)
europe	-0.243	0.372	0.652	0.605	1.317**
	(0.483)	(0.577)	(0.574)	(0.598)	(0.604)
anzcerta	0	0	-0.557	-0.663	-0.553
	(0)	(0)	(0.792)	(1.469)	(1.459)
Constant	15.36***	14.26***	16.68***	17.63***	15.36***
	(1.451)	(1.716)	(1.732)	(1.751)	(1.915)
Importer FE	Yes	Yes	Yes	Yes	Yes
Exporter FE	Yes	Yes	Yes	Yes	Yes
Observations	460	387	459	529	528
R-squared	0.680	0.753	0.749	0.764	0.746

Robust t-statistics in parentheses.
*significant at 10%;**significant at 5%; *** significant at 1%.

8.3 Ad-valorem equivalents by country from cross section estimations using GTAP data

Table 14: Equivalent Ad Valorem derived from Model 2.3
(Percent)

Country	cmn	cns	ofi	isr	obs	osg	trd	trn	wtp
ALB	35.3	96.0	73.4	24.9	86.5	23.0	46.8	28.0	66.8
ARG	29.1	71.2	30.3	30.4	43.6	16.6	34.1	9.6	53.7
AUS	25.2	95.9	50.3	44.9	52.1	35.2	50.5	21.5	48.0
AUT	18.9	20.4	18.8	16.1	0.0	21.2	19.7	11.8	52.4
BEL	8.7	20.5	0.0	21.6	8.1	15.7	19.1	10.9	43.9
BGD	86.4	91.3	76.0	50.9	97.3	46.0	94.8	53.2	130.2
BGR	34.3	47.7	38.2	50.4	40.9	40.3	55.4	24.5	64.4
BRA	55.5	111.1	43.3	53.2	36.6	29.3	55.1	29.6	40.3
CAN	22.1	57.5	27.0	16.8	25.0	28.7	40.4	20.7	52.5
CHE	15.8	86.2	31.7	46.8	41.5	28.5	41.6	13.8	55.7
CHL	26.4	100.5	80.8	48.3	54.5	32.0	36.4	14.7	23.5
CHN	65.9	36.1	71.3	40.7	75.3	46.8	26.4	41.6	90.5
COL	34.4	106.9	38.3	32.4	59.4	39.4	55.2	24.7	84.3
CYP	38.4	95.5	73.5	27.5	65.8	28.2	43.6	16.0	67.7
CZE	39.2	26.2	27.9	44.3	22.4	33.0	39.7	26.5	66.0
DEU	18.0	12.1	24.4	39.3	13.5	19.1	15.2	8.8	30.4
DNK	7.7	10.3	15.6	14.0	21.2	9.9	28.0	6.5	17.1
ECU	36.7	118.0	72.5	62.3	118.0	43.3	26.9	37.4	86.5
EGY	45.7	85.2	55.0	19.9	16.0	8.8	53.4	30.4	18.0
ESP	31.2	68.3	37.9	41.2	23.4	44.6	46.4	27.3	61.5
EST	36.0	27.6	49.9	76.1	35.2	15.3	48.2	22.6	42.3
FIN	23.6	42.5	83.8	66.5	29.4	39.8	41.1	26.1	32.5
FRA	30.0	29.0	40.1	61.7	28.4	31.7	33.4	16.4	32.5
GBR	18.5	65.7	15.8	36.0	24.7	13.0	27.6	5.0	30.3
GRC	23.0	38.2	53.7	39.9	45.5	20.9	39.2	4.1	0.0
HKG	0.0	0.0	5.4	6.1	8.6	0.0	13.1	1.2	14.6
HRV	86.6	98.5	80.3	92.8	23.4	50.1	56.3	24.9	94.6

Country	cmn	cns	ofi	isr	obs	osg	trd	trn	wtp
HUN	42.2	36.6	35.2	46.8	28.8	36.3	25.0	31.9	56.1
IDN	62.0	86.1	73.3	38.1	17.9	30.5	23.4	28.4	44.2
IND	119.4	114.9	103.0	47.1	38.3	53.5	46.0	39.2	48.3
IRL	23.1	56.3	7.3	4.5	1.1	30.0	0.0	25.3	48.5
IRN			94.7	48.4	-	34.4	75.1	-	-
ITA	18.2	26.9	51.0	39.9	26.1	26.8	23.4	19.7	34.6
JPN	49.4	20.7	47.9	45.1	34.8	38.3	33.6	21.4	38.1
KAZ	43.6	-	66.9	53.1	35.2	43.7	65.1	36.5	145.7
KGZ	31.3	36.8	58.1	39.3	43.5	61.1	111.1	55.9	78.0
KOR	23.5	77.9	52.5	67.2	20.5	28.9	38.7	10.6	18.7
LKA	97.7	95.5	84.3	29.7	41.0	38.3	42.6	23.9	38.7
LTU	36.2	56.4	75.5	65.7	59.7	42.4	62.4	43.3	39.0
LUX	19.5	32.0	10.0	33.8	18.6	28.1	32.1	22.8	58.7
LVA	52.5	42.1	38.8	32.7	45.9	24.1	53.6	26.7	24.9
MEX	43.7	102.3	41.5	0.0	100.7	31.0	40.0	28.4	100.8
MUS	49.3	78.1	47.3	27.2	19.3	28.7	37.8	13.6	93.4
MYS	35.9	6.9	40.9	41.2	0.1	25.3	45.1	15.4	36.5
NLD	8.7	15.1	23.6	34.2	7.4	16.3	16.1	13.9	58.5
NZL	30.6	68.0	55.0	47.1	39.0	36.0	49.2	19.5	36.4
PAK	76.7	133.1	69.7	78.3	93.3	37.9	67.4	35.0	104.8
PER	44.8	118.6	57.4	37.6	43.1	35.2	76.9	37.3	83.2
PHL	21.2	14.2	46.0	39.5	41.3	46.3	39.6	20.6	39.2
POL	27.4	34.8	50.6	27.6	38.2	46.9	66.4	35.7	50.3
PRT	35.5	48.4	45.9	55.4	48.5	32.7	43.5	27.4	69.1
PRY	88.9	99.5	49.3	18.3	82.1	25.9	58.8	25.4	91.9
ROM	47.3	68.3	55.5	68.0	47.8	52.5	74.2	49.9	44.2
RUS	38.1	35.6	55.9	37.2	30.7	33.4	34.7	16.6	111.4
SGP	49.3	53.0	41.5	5.4	1.9	12.2	3.2	0.0	11.9
SVK	50.0	32.3	43.5	62.6	29.5	47.7	36.0	47.0	77.5
SVN	31.4	39.0	55.2	73.5	41.0	42.8	44.5	36.0	45.4
SWE	18.2	32.0	30.2	40.6	10.8	28.7	29.6	15.1	36.5
THA	34.1	31.5	61.8	14.4	26.0	26.6	24.3	18.9	42.5
TUN	72.3	51.0	49.6	42.3	59.6	24.2	52.1	33.5	61.5

Country	cmn	cns	ofi	isr	obs	osg	trd	trn	wtp
TUR	64.3	81.4	38.0	63.2	88.1	39.5	52.7	41.9	55.9
URY	24.7	97.4	45.1	33.6	60.3	23.2	54.0	14.1	28.3
USA	29.4	73.4	40.5	43.7	33.6	7.1	48.3	14.1	75.5
VEN	37.1	100.4	49.8	50.5	52.5	27.3	50.8	25.5	44.1
ZAF	57.2	108.1	88.4	36.2	73.2	40.5	54.7	31.1	61.3

8.4 Reliability

Table 15: Original I-0 data

Country	Year of original matrix	Split
Albania	2000	transport*
Argentina	2000	none
Australia	1997	transport**
Austria	1983	none
Bangladesh	1994	transport**
Belgium	1995	none
Bulgaria	1996	none
Bostwana	1994	transport, finance, insurance*
Canada	1990	no available
China	1997	none
Croatia	1995	none
Cyprus	1986	none
Czech Republic	1996	none
Denmark	1992	none
Estonia	1997	none
Finland	1995	none
France	1992	none
Germany	1995	none
Greece	1995	none
Hungary	1991	transport, business**
Hong Kong	1988	no available
India	1994	transport, business*
Indonesia	1995	transport**
Ireland	1990	none
Italy	1992	none
Japan	2000	no available
Korea	2000	none
Latvia	1997	none
Lithuania	1997	none

Continued on next page

Country	Year of original matrix	Split
Luxembourg	1995	none
Madagascar	1999	no available
Malaysia	1995	transport**
Malawi	1994	transport, finance, insurance*
Malta	1996	none
Morocco	1990	no available
Mozambique	1995	all*
Netherlands	2001	none
New Zealand	1996	none
Peru	1989	no available
Philippines	1989	transport**
Poland	1997	none
Portugal	1993	none
Russian Federation	1997	transport, finance, insurance**
Romania	1997	none
Singapore	1996	transport**
Slovakia	1997	none
Slovenia	1997	none
South Africa	1995	transport, finance, insurance*
Spain	1994	none
Sri Lanka	1989	no available
Sweden	1985	none
Switzerland	1990	transport**
Taiwan	1999	transport**
Tanzania	1992	all*
Thailand	1995	transport**
Tunisia	1995	none
Turkey	1995	none
Uganda	1992	finance**
United Kingdom	1990	other services, recreational services, business*
Uruguay	1983	none

Continued on next page

Country	Year of original matrix	Split
Venezuela	1986	no available
Zambia	1995	all*
Zimbabwe	1991	all*

Source: Note: Gtap documentations provide all the information.

*: the different weights are notified.

**: no information on the weights.

8.5 RTAs

Table 16: Regional Trade Agreements

Region	Year	Members
NAFTA	1994	Canada, Mexico, United States
Europe	1957 on	Belgium, France, Germany, Italy, Luxembourg, Netherlands, Denmark, Ireland, United Kingdom, Greece, Portugal, Spain, Austria, Finland, Sweden, Bulgaria, Czech Republic, Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia, Romania, Bulgaria
ASEAN (bil-sa)	1967	Indonesia, Malaysia, Philippines, Singapour, Thailand, Brunei(1984), Vietnam(1995), Laos(1997), Myanmar(1997), Cambodia(1999)
ANZCERTA	1983	Australia, New Zealand