

Does Gravity Apply to Intangibles? Measuring Openness in Services*

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Abstract: We work with a panel dataset on trade and FDI across a number of detailed service sectors for 178 countries, based on combined data from the OECD, IMF, EUROSTAT, and the U.S. Bureau of Economic Analysis. To estimate degrees of service sector openness, we develop a two-stage estimator suitable for available balance-of-payments based services trade data, which lacks bilateral detail. The result is a set of comparable, detailed trade and FDI restriction indices that spans time, sector, and country dimensions. For a smaller set of countries – the OECD -- we then examine the relationship of these indexes to regulatory indicators. Our estimates of service sector openness and related trade cost equivalents are invariant to domestic regulatory structure in the OECD.

JEL codes: F13

Keywords: trade in services; trade barriers; tariff equivalents

* The views expressed are personal and should not be attributed to the World Bank.

1. Introduction

The negotiations for an agreement on trade in services and the establishment of the GATS in 1995 has led to a rising interest on trade in services and also on the question of how to measure barriers to trade in services. Given the intrinsic problem of attaching at-the-border-barriers to trade in intangibles, it is hardly surprising that relatively little progress has been made up to date despite various serious and very applied efforts to measure restrictions in services trade (for instance Hoekman 1996, Hoekman and Primo Braga 1997, Brown and Stern 2001, Deardorff and Stern 2006, Dihel and Sheperd 2007). A major complication, despite a certain lack of conceptual clarification about the nature and form of barriers to trade in services is the rather poor data situation.

The empirical literature on international trade in services and trade policy is limited, reflecting this weakness of the available data on both flows and policies. Because services are generally intangible, barriers to trade do not take the form of import tariffs. Instead, trade barriers take the form of prohibitions, quotas, government regulations (standards, licenses, procurement), price-based instruments and discriminatory access to distribution networks. Quotas may limit the quantity or value of imports of specific products for a given time period, or restrict the number or market share of foreign providers of services. Such discriminatory measures are often complemented by nondiscriminatory measures applying equally to foreign and domestic providers. These may consist of limitations on the number of firms allowed to contest a market, or on the nature of their operations. Frequently, this involves either a monopoly (telecommunications) or an oligopolistic market structure (insurance, air transport). As discussed by Sapir (1993) considerations relating to consumer protection, high fixed (sunk) costs (increasing returns to scale), prudential supervision and regulatory oversight often induce governments to require establishment by foreign providers or to reserve activities for government-owned or controlled entities even if cross border trade is technically feasible.

As is well known, services have unique characteristics that affect their tradability. Typical characteristics include: (i) intangibility – so that international transactions in services are often difficult to monitor, measure and tax; (ii) nonstorability – so that production and consumption often must occur at the same place and time; (iii)

differentiation – services are often tailored to the needs of customers; and (iv) joint production, with customers having to participate in the production process. As the conventional definition of trade – where a product crosses the frontier – would miss out on a whole range of international transactions, the WTO defines trade to span four modes of supply:

- *Mode 1 – Cross-border:* services supplied from the territory of one country into the territory of another.
- *Mode 2 – Consumption abroad:* services supplied in the territory of a nation to the consumers of another.
- *Mode 3 – Commercial presence:* services supplied through any type of business or professional establishment of one country in the territory of another (i.e., FDI).
- *Mode 4 – Presence of natural persons:* services supplied by nationals of a country in the territory of another.

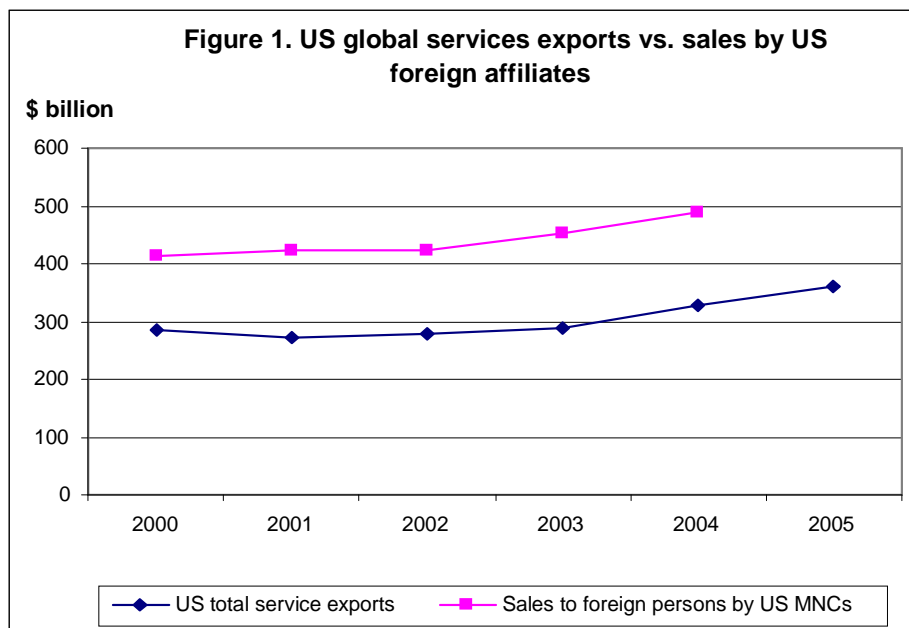
In practice, FDI remains a major channel for foreign providers to supply services and reduce these cost effects. In fact, the available statistics reveal that for the US, FATS has grown more rapidly than cross border trade in services since the mid 1990s. The global stock of FDI stood at some \$10 trillion in 2004, of which about 60 percent was in service industries, up from only 25% in 1970.¹ This is the result of changes in policy towards FDI and large scale privatization of service sector firms in many countries during the late 1980s and the 1990s. These developments have also led to a marked shift in the composition of global FDI flows. UNCTAD (2005) reports that in 1970 finance and trade (distribution) accounted for 65% of the total stock; this dropped to 45% in 2003. Conversely, the share of telecoms, energy, and business services has risen from 17% to 44%. There are also significant differences in FDI inflows into developed and developing countries. Thus, business services accounted for 40% of the total inward FDI stock in developing countries in 2003, compared to only 20% in the OECD.² It may well be that increased use of services outsourcing will result in cross-border trade in services coming to dominate FATS at some point in the future, but this is not the case today. In the case of the US, which collects and publishes detailed data on both cross-border trade in services as reported in the BOP and sales by affiliates of US services firms in host countries, the overall value of FATS (some \$500 billion in 2004) dominates cross-border services trade

¹ See <http://www.unctad.org/Templates/Page.asp?intItemID=1923&lang=1>.

² Non-equity FDI is not captured in the forgoing statistics (e.g. franchising, management contracts, or leasing).

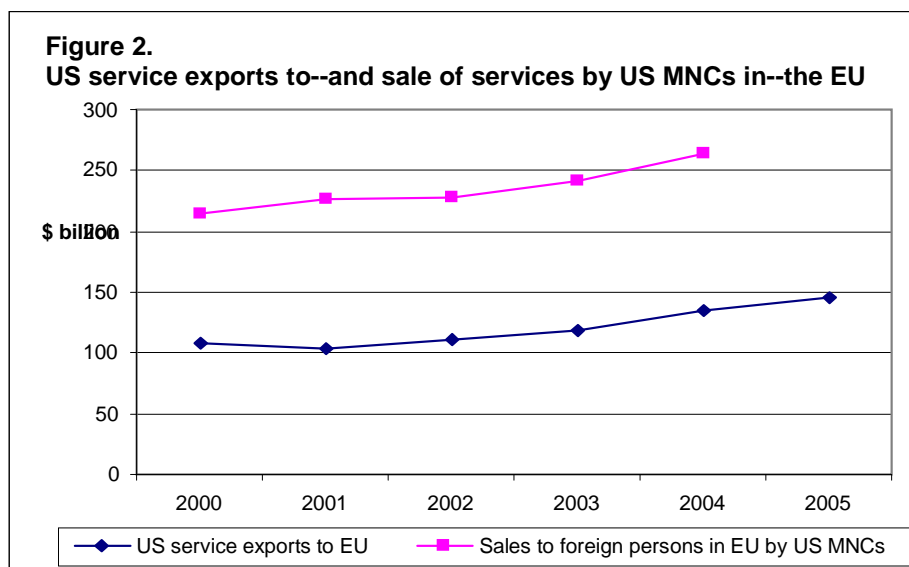
(close to \$350 billion in 2004), illustrating that although services have become more tradable in recent years, geographic proximity remains crucial for the provision of many services. If extrapolated to global trade flows, the US data suggest that globally total FATS may exceed \$1.5 trillion.³

Our interest in this paper concerns the magnitude of prevailing barriers of such trade – both cross-border and through FDI. The ratio between FATS and cross-border trade in services for sales to the EU is significantly greater in the bilateral relationship with the US than it is for overall US exports of services (compare Figures 1 and 2). About 40 percent of all US cross-border service exports go to the EU-25, while some 35 percent of all EU service exports go to the US. These ratios are much higher than for goods trade: 21 percent of US exports of goods go to the EU, whereas the US accounts for 24 percent of EU exports. Shares in EU-US FDI flows and stocks are similarly higher than merchandise trade shares: some 40 to 45 percent of total annual outward and inward FDI flows for the EU-25 go to (come from) the US.



Source: US Department of Commerce, Survey of Current Business.

³ The stock of outward FDI by the US in 2003 was some \$1.8 trillion, of which \$1.3 trillion was in services (UNCTAD 2005). Given FATS of \$477 billion in 2003, this gives a sales/stock ratio of 0.35. Assuming some \$5 trillion global FDI in services, this generates a FATS guesstimate of \$1.6 trillion.



Source: US Department of Commerce, Survey of Current Business.

These data suggest that the EU may be more open to FDI from the US than the rest of the world, and thus illustrate the potential impacts of policy. However, very little is actually known about the relative magnitudes of barriers to trade and investment in services across countries and time.

Similar to the measurement of non-tariff-barriers (NTBs) in merchandise trade, the measurement of barriers to trade in services is intrinsically difficult and further complicated by the fact that services can be traded through four modes. In addition, the qualitative differences between individual service sectors are far greater than between individual goods producing industries. In the literature, two different approaches have been taken to assess the size and impact of policy barriers to trade.⁴ The first involves collection of information on applied policies, converting these into coverage/frequency indicators and using the resulting indices as regressors to explain observed measures of prices or costs (often the price-cost margin is the focus of estimation). A drawback of the frequency measures is that they do not give information on the economic severeness of the barrier. The second approach is to rely on indirect methods such as calculation of price-cost margins by sector across countries or gravity regressions to estimate what trade

⁴ See Dee (2006) and Deardorff and Stern (2006) for detailed surveys of existing work along these lines, as well as Hoekman (2006).

flows “should be” and back out an estimate of the tariff equivalent of policies from the difference between estimated and observed flows. A well-known problem with indirect approaches is that it is not possible to attribute price-cost margins or differences in trade volumes to specific policies – other factors such as the business cycle and natural barriers to trade/contestability will also play a role. It remains common to both approaches that the measures obtained can be interpreted as relative degrees of protection. To obtain absolute measures (in the spirit of tariff or tax equivalents) one would need to know elasticities of demand, etc.

Most of the literature has pursued the first approach. This is not so much because of problems of interpretation of results but because comprehensive, disaggregated bilateral data on trade in services –cross-border and via FDI—is lacking. Bilateral trade data do exist for a limited number of OECD countries, but in general are simply unavailable. This restricts researchers and analysts to overall (i.e. trade with world) data.

In this paper we develop a gravity-based approach to estimating barriers to services trade using the available data on trade and investment in services. By following a relatively restrictive formal set-up based on CES demand equations, we are able to develop an estimator suitable to working with overall trade. Such an estimating framework is actually consistent with the general approach taken in the numerical literature, which relies on the same functional forms for both national and firm-level product differentiation-based models of international trade.

2. Data and Trends

Data on services trade come from the OECD, supplemented with published IMF balance of payments statistics.⁵ These data are based on balance of payment statistics and correspond mainly to what is known as GATS mode 1 – cross border trade - and mode 2 – expenditures (receipts) associated with temporary movement of consumers to other countries for tourism and business travel. The IMF data cover 178 countries for 10 years (1994-2004). Other country-level data (GDP, population, etc.) are from the World Bank World Development Indicators database. These data sources reveal that service imports roughly tripled over the decade from 1994 to 2004. For the 178 countries in our sample, imports of services averaged US\$6,522 million in 1994 (with a maximum of US\$198,300 million for the US). The median was considerably below the average, at US\$556 million. By 2004, the average value of service imports has increased to US\$16909 million, and the maximum nearly doubled to US\$340,900 million (again the United States). Likewise the median rose to US\$1,491 million. Despite the tripling in absolute value, the relative importance of service trade as captured by the balance of payments has remained relatively constant. Service imports as a percentage of GDP rose slightly from 11 percent in 1994 to 12 percent of GDP in 2004 (Table 1). This masks declines in the services share in developing countries. The rising importance of service imports in the aggregate stems mainly from increases within the most developed countries (from 8 percent to 12.7 percent), and here this can be attributed to the strongly rising importance of other service imports (whose ratio to GDP rose from 3.3 percent to 6.7 percent for this country group).

Within the service sector categories that are distinguished in the balance of payments, there has been a structural shift away from travel (tourism) and transport services towards more producer oriented services (see Figures 3 and 4). While the overall structure has been relatively stable over the past decade, some notable differences between countries at different stages of development can be observed. Travel was the most important service import for high income countries in 1994, while by 2004 other

⁵ Data sources are „Statistics on International Trade in Services: Detailed tables by Service Vol 2006 release 01“ taken from SourceOECD and „Balance of Payments Statistics“ from the IMF. The data are based on the fifth edition of the IMF's Balance of Payments Manual and the Extended Balance of Payments

business services had become the most important category of imported services. Further, imports of financial, insurance, computer, communication services and royalties and license fees have seen strong increases in this country group. These still represent only a small fraction of total service imports. However they show a very strong dynamic. Thus, in general, producer related services gained considerable importance in the most developed countries. For the less developed countries, transport services are traditionally the most important single service import category. Between 1994 and 2004 this share has declined somewhat due to growing imports of construction services, as well as computer services.

Table 1: Service Imports in per cent of GDP.

	Total Services	
	1994	2004
all countries	11.0	12.0
high income	8.0	12.7
upper middle income	11.4	12.8
middle income	10.3	11.6
lower middle income	13.6	11.4
low income	11.7	11.2
	Other services	
	1994	2004
all countries	4.6	5.1
high income	3.3	6.7
upper middle income	4.5	5.3
middle income	4.2	4.6
lower middle income	6.5	4.9
low income	4.4	3.8

Source: IMF BOP Statistic

Figure 5 illustrates that the strong increase of producer related service imports, especially financial services, is relatively restricted to a few countries. This can be read from the greater number of outliers in 2004 compared to 1994. Still, financial service imports have generally become much more important, here the median has doubled in size, despite remaining at a rather small absolute level.

Services Classification (EBOPS) which is consistent with the balance of payments classification but is more detailed.

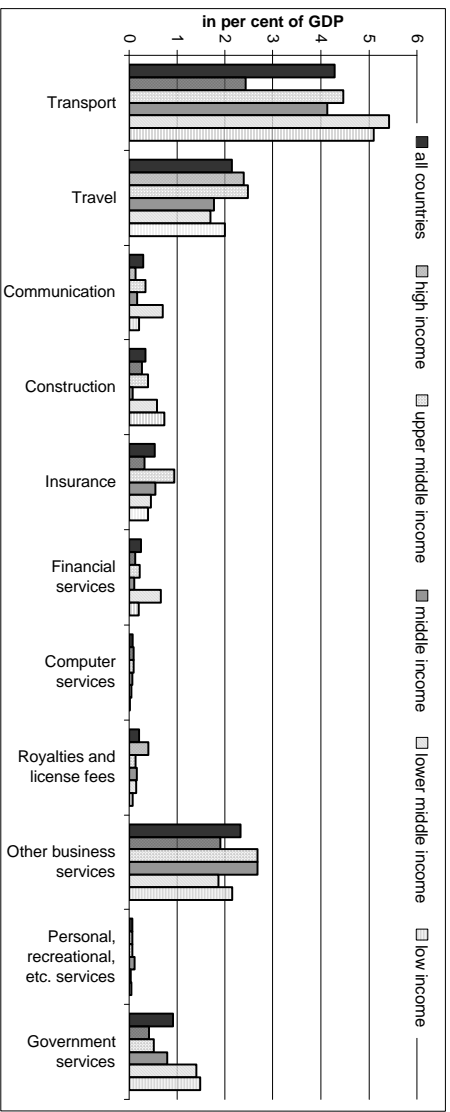


Figure 3: Service imports as percent of GDP by income groups, 1994

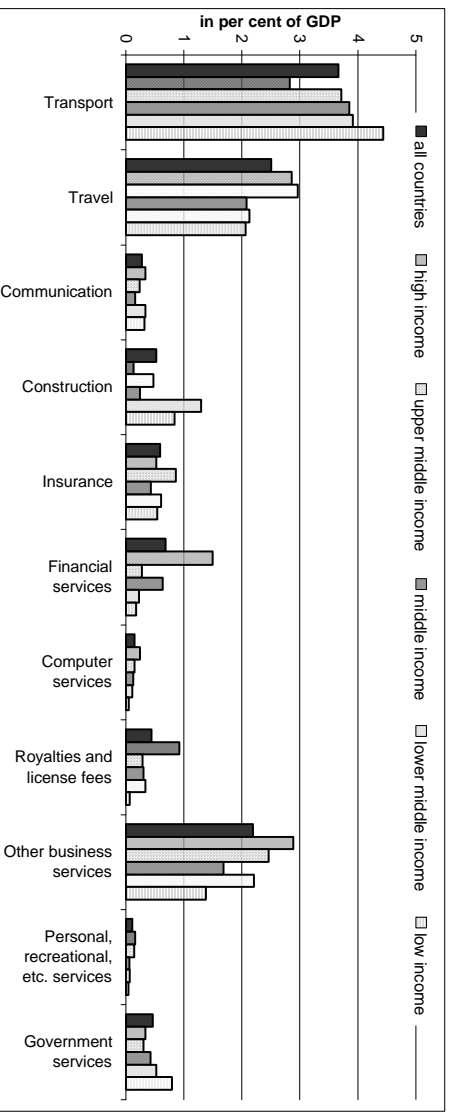
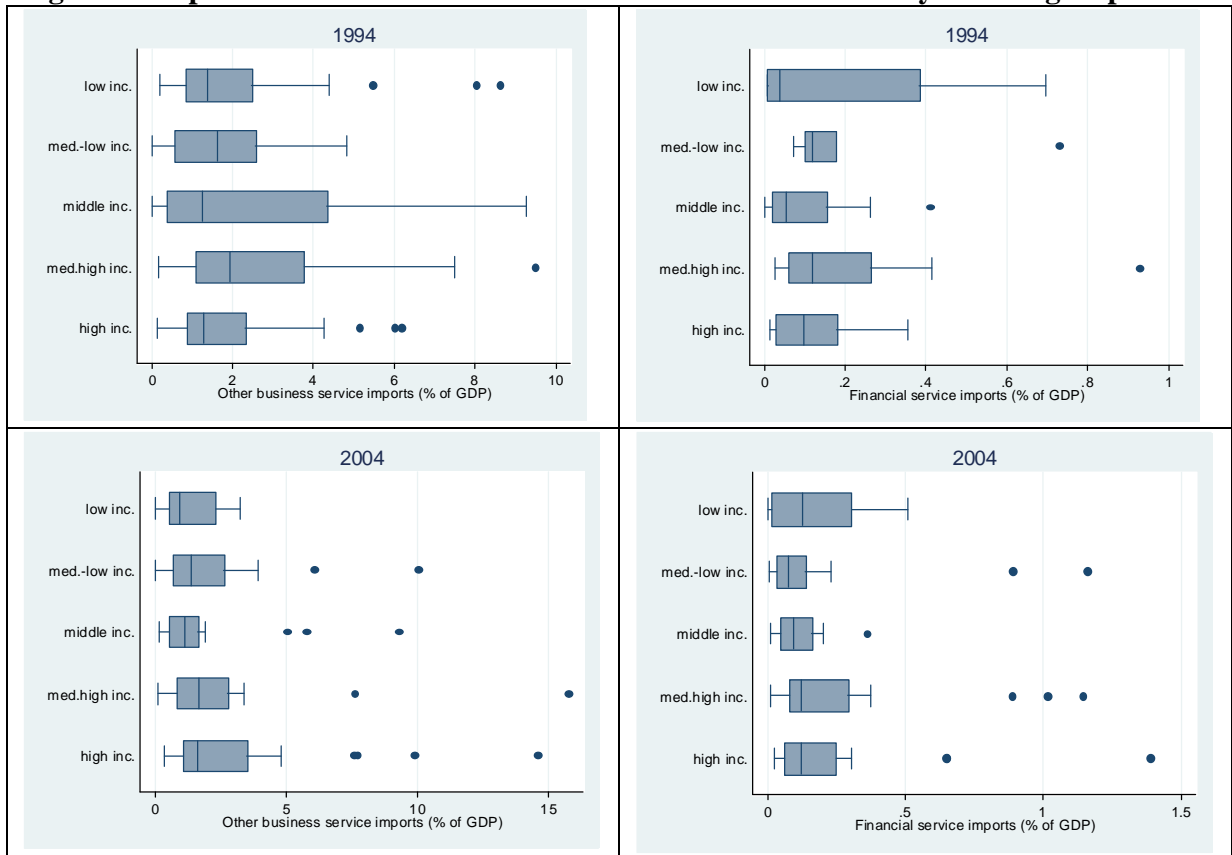


Figure 4: Service imports as percent of GDP by income group, 2004

Figure 5: Imports of other business services and financial services by income groups



Note: The median is given by the bar in the middle of the box, the upper and lower bound of the box signifies the 25- and 75-percentile. Observations which are outside the 75-percentile plus 1.5 times the inner quartile range, as well as observations below the 25-percentile minus 1.5 times the inner quartile range are classified as outliers and drawn as dots.

3. Estimating Framework

Our estimating framework is based on a CES-based variation of the gravity model. In particular, we represent the composition of total import demand for services in sector j as following from a representative CES aggregator for composite service imports M_j

$$(1) \quad M_j = \left[\sum_i \alpha_{ij} m_{ij}^{\rho_{j1}} \right]^{1/\rho_{j1}} \quad 1 > \rho_{j1} > 0$$

In equation (1), the terms α_{ij} are the CES weights applied to imports indexed by source. The (Allen) substitution elasticity across imports will be $\sigma_{j1}=1/(1-\rho_{j1})$. Because we will be doing econometrics with trade data reflecting actual prices and actual industry firm structure (i.e. with variety given by actual values in the cross-section), this specification is more general than it at first appears. In particular, the CES weights can follow from both an Armington view of the world, and also a variety-based view of the world with firm-level differentiation. This means the estimation strategy we develop in this section is consistent with the underlying theoretical structure of monopolistic competition-based and Armington-based computational models of trade. Both can be represented as in equation (1), though with a different interpretation of the CES weights. (For example, see the derivations in Francois and Roland-Holst 1997). From first order conditions for maximization of composite M subject to expenditure E_{Mj} we can derive the following:

$$(2) \quad P_{Mj} = \left[\sum_i \alpha_{ij}^{\sigma_{j1}} \omega_{ij}^{1-\sigma_{j1}} \right]^{1/(1-\sigma_{j1})}$$

where ω_{ij} are the border prices for services from different markets indexed over i . We will normalize world prices (before any costs related to distance or policy) to unity. This means we can specify border price as then being inclusive of any distance-related cost factors γ_j

$$(3,4) \quad \omega_{ij} = \gamma_{ij}$$

$$P_{Mj} = \left[\sum_i \alpha_{ij}^{\sigma_{j1}} \gamma_{ij}^{1-\sigma_{j1}} \right]^{1/(1-\sigma_{j1})}$$

As a final step to moving into the border we will assume there are also policy variables that raise the cost of delivering services cross-border, apart from any “natural” costs that follow from physical constraints or cultural differences as embodied by cost factors γ_j . We assume these policy-linked costs are imposed at the border against all imports, effectively raising the price of delivered services by the multiplier τ_j .

Next, we introduce a second CES aggregator specified over imported services and domestic services. Our second, upper-nest CES function is as follows:

$$(5) \quad Q_j = A \left[\beta_{mj} M_j^{\rho_{j2}} + \beta_{dj} D_j^{\rho_{j2}} \right]^{1/\rho_{j2}} \quad 1 > \rho_{j2} > 0$$

If the substitution elasticities are the same (i.e. $\rho_{j1} = \rho_{j2}$), we could also represent this by a single CES function that nests domestic and imported services. For expositional purposes though, it is easier to introduce the role of trade costs in the import demand function if we adopt a nested CES approach. From our first order conditions for maximizing Q_j at a given level of expenditure E_j , the value of total import V_j demand can be shown, after some manipulation to equal:

$$(6) \quad V_j = Q_j \left(\frac{\beta_{mj}}{\tau_j} \right)^{\sigma_{j2}} P_{Mj}^{1-\sigma_{j2}} P_{Qj}^{\sigma_{j2}}$$

where P_{Qj} is the composite price index for Q . Normalizing quantities (selecting A) so that $P_{Q,j} = 1$ in the baseline data, and making substitutions, we then have the following:

$$(7) \quad V_j = Q_j \left(\frac{\beta_{mj}}{\tau_j} \right)^{\sigma_{j2}} \left[\sum_i \alpha_{ij}^{\sigma_{j1}} \gamma_{ij}^{1-\sigma_{j1}} \right]^{-(1-\sigma_{j2})/(1-\sigma_{j1})}$$

Taking logs, we arrive at our basic estimating equation:

$$(8) \quad \ln(V_j) = \ln(Q_j) + \sigma_{j2} \ln(\beta_{mj}) + (1 - \sigma_{j2}) / (1 - \sigma_{j1}) \ln \left(\sum_i \alpha_{ij}^{\sigma_{j1}} \gamma_{ij}^{1-\sigma_{j1}} \right) - \sigma_{j2} \tau_j$$

The first term on the right hand side is total demand for services, the second is the total import expenditure weight, the third is a measure of economic distance from sources of service supply, and the fourth measures the impact of policy-based trade costs on service imports. Conceptually, we control for the first and second terms by income and population (for demand linked to level of development and size of given national economies). On the assumption that level of development and size –reflecting economic structure - are correlated with country specific tastes and preferences as well as technologies employed to provide services, these variables also implicitly control for differences in preferences and technologies. To measure the costs of economic distance, the third term, we use geographic distance (from CEPII 2004) weighted by trading partner GDP. We will proxy for policy variables in the fourth term in the regressions using indicators of product market regulations. Thus, what is left unexplained is the general openness of a country or the impact of barriers to trade in services. We will focus on the fourth term in the regressions that follow for trade in services.

This approach thus offers a proper way of modelling trade flows in services using the gravity approach. We further develop here a generalized estimator for trade-with-world data in accordance with terminology set out by Andersen and Van Wincoop (2004). Thus, despite the fact that we rely here on trade with the world flows rather than on bilateral data, we can still include a measure of multilateral openness by using the centrality index. Working with a panel of countries over time where we further pool data across different service sectors, we can also avoid the old critique against gravity modelling in the cross-section, where by definition all estimated barriers sum up to zero. The pooling across sectors technically lifts the restriction that all residuals for one sector sum up to zero already in the cross-section.

So far we have focused on pure cross-border trade. We can extend this analysis to services FDI if we are willing to assume that FDI stock in services are a legitimate measure of affiliate sales in the service sector. In particular, given the nature of service transactions (requiring interaction between buyer and seller) trade is going to involve some degree of local affiliate sales. (Hill 1977, Francois 1990.) Formally, assume that for our discussion above of sales of services we can represent foreign sales of services m_{ij}

as the CES production function in equation (9), where $z=1/(1-\zeta)$ is the Allen-elasticity of substitution between affiliate sale F and cross border sales T .

$$(9) \quad m_{ij} = f_{ij}(F_{ij}, T_{ij}) = A \left(a_F (F_{ij})^\zeta + a_T (T_{ij})^\zeta \right)^{1/\zeta}, \quad 0 \leq \zeta \leq 1$$

From the first order conditions for cost-minimization we will have the following:

$$(10,11) \quad \begin{aligned} F_{ij} &= m_{ij} A^{-1} \left(\frac{a_F}{P_{Fij}} \right)^z P_{ij}^z = m_{ij} A^{-(1+z)} \left(\frac{a_F}{P_F} \right)^z \left(a_F^z P_{Fij}^{1-z} + a_T^z P_{Tij}^{1-z} \right)^{z/(1-z)} \\ T_{ij} &= m_{ij} A^{-1} \left(\frac{a_T}{P_{Tij}} \right)^z P_{ij}^z = m_{ij} A^{-(1+z)} \left(\frac{a_T}{P_T} \right)^z \left(a_F^z P_{Fij}^{1-z} + a_T^z P_{Tij}^{1-z} \right)^{z/(1-z)} \end{aligned}$$

$$(12) \quad P_{i,j} = A^{-1} \left(a_F^z P_{Fij}^{1-z} + a_T^z P_{Tij}^{1-z} \right)^{1/(1-z)}$$

In general, increased openness to services trade and FDI implies higher cross-border trade and higher FDI stocks. From equations (10-12), it is also straightforward to link demand for cross-border and local service sales as a function of changes in the price of cross-border and local affiliate inputs.

$$(13,14) \quad \begin{aligned} \frac{dF}{dP_{Tij}} &= (\varepsilon + z) \left(P_{ij}^{\varepsilon+2z-1} a_{Tij} P_{Tij}^{-z} \left(\frac{a_F}{P_{Fij}} \right)^z A^{z-2} P_{Tij}^{-1} \right) \\ \frac{dF}{dP_{Fij}} &= - \left(P_{ij}^{\varepsilon+z} \left(\frac{a_{Fij}}{P_{Fij}} \right)^z \left(-\varepsilon a_{Fij}^z P_{Fij}^{1-z} + \sigma a_{Tij}^z P_{Tij}^{1-z} \right) A^{z-2} P_{Tij}^{-1} \right) \end{aligned}$$

In equations (13) and (14), $\varepsilon < 0$ is the elasticity of demand for m_{ij} . This is approximated by σ_2 . If we have variations in the degree of openness for T relative to F , the impact depends on the elasticity of substitution between F and T , and the underlying elasticity of demand for composite services m . If the elasticity of substitution is relatively low - in particular if $z < |\sigma_2|$ - then they actually serve as gross compliments,

and openness in one implies greater activity in the other. Alternatively, as long as $z > |\sigma_2|$, they will serve as gross substitutes.

We can summarize the implications of local service sector openness and related FDI openness as follows:

- General liberalization of services trade and affiliate sales implies increased trade and FDI flows coincident with increase in m and M .
- Greater trade (affiliate sales) openness implies greater levels of trade (FDI stocks).
- Variations in relative openness to trade and affiliate sales imply a shift in the relative importance of trade affiliate sales (FDI).
- Greater openness to trade (affiliate sales) implies an ambiguous impact on affiliate sales (trade) depending on the degree of substitution z and the demand elasticity (approximated by σ_2)

4. Basic Results for Cross Border Trade

We estimate equation (8) separately with data on cross-border trade flows and data on FDI. For cross-border trade we have a pooled sample of 178 countries over 10 years (1994-2004) from the IMF's BOP statistic. Our estimation of protection in the service sector involves a two-step procedure. In the first stage we regress service imports on the usual gravity variables: GDP per capita, population, and distance. We focus on individual categories within the service sector. Given available data sources, we have data for trade with the world and do not have detailed bilateral trade flows broken down by individual service sectors.⁶ In order to be able to follow the gravity approach, we have constructed a measure of GDP-weighted distance to a hypothetical centre of the world. This index of "centrality" is used as our distance variable in the first stage. (We are using robust regressions with convergence criteria such that the maximum change in weights drops below 0.01.) In the second stage we regress the residuals from the first stage on individual country dummies. This staged approach allows us to follow different strategies for pooling sectors to estimate trade restriction. The second stage gives us an indication

of how protected individual markets are, and we use the resulting coefficients to estimate tariff equivalents or trade costs as a percentage of delivered prices. These tariff equivalents can be seen as relative protection benchmarked against Hong Kong and Singapore (which we consider to be the closest we have in our sample to free trade countries).⁷ Table 2 reports the regression output from the first stage for the full sample of 178 countries, spanning the whole income range from Ethiopia to Switzerland.

The first stage results, estimated by iterative robust regression, are given in Table 2. In general the pattern of the coefficients fits expectations. All coefficients are highly significant and of the expected sign. Only transport service imports increase with increasing distance from the hypothetical world centre, which is to be expected. The negative coefficients on the dummies for producer services in the third specification indicate that imports in these services categories are on average relatively lower than imports in other business services, which is the benchmark sector here. On the other hand, most other service categories (i.e. travel, transport, construction and government services) show on average higher imports than other business services controlling for stage of development, country size and distance (as reflected by the positive coefficients for the sector dummies in the last regression). The table further gives the adjusted R^2 from the corresponding OLS regressions for the first and second stage. For total services and transport services, these are equally high, while the clustering of different service sectors in one equation results in a considerably lower R^2 in the second stage.

The second stage results are shown in Appendix Table A2 for each of the 178 individual countries. Table 3 reports averaged individual country-specific coefficients by income groups. Average “protection” in the service sector seems to be at around 20% of delivered service prices (assuming a substitution elasticity of 3.6).⁸ Protection is considerably higher in the transport sector and lower in non-producer related service categories (which is dominated by travel services). When looking at the differences

⁶ Both, the IMF and the OECD do not report the dual breakdown by sectors and partners. This is available from Eurostat for cross-border trade only and for a reduced sample of EU members plus USA, JPN and TUR. We do some robustness checks using this dataset in section 6.

⁷ For the subset of OECD countries, we did some robustness checks, using different countries as benchmark countries. The results were in general not sensitive to the choice of benchmark country, as long as the benchmark was one of the low-protection countries.

⁸ This assumed elasticity value is not totally arbitrary. This is the default value used in the GTAP model, a widely-used multi-region CGE model.

between individual per capita income groups towards the end of the observation period, it is interesting to note that the highest income countries exhibit the lowest average rate of protection. This is especially pronounced for transport services, other business services and non-producer related services.

Table 2: 1st Stage Regression Results, Cross-Border Trade

	TOTAL SERVICES		ONLY TRANSPORT		PRODUCER SERVICES		OTHER BUSINESS SERVICES		OTHER NON-TRADE SERVICES	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
lnPop	0.77	127.82	0.74	118.14	0.79	110.29	0.78	54.98	0.76	127.42
lnGDPpc	0.94	117.99	0.84	100.80	1.10	118.02	1.04	55.00	0.89	113.88
lnWDIST	-0.11	-2.21	0.21	4.03	-0.07	-1.22	-0.12	-0.99	-0.15	-3.09
transport									3.73	93.89
travel									3.25	81.54
construction									0.82	18.18
communication					-2.27	-52.34				
insurance					-1.51	-36.92				
finance					-2.56	-55.00				
computer					-2.99	-60.86				
licenses and royalties					-2.37	-53.20				
government									1.28	31.90
cons	-0.55	-1.15	-3.56	-7.19	-3.95	-7.32	-3.04	-2.67	-4.58	-9.82
Observations	1558		1553		6884		1525		6097	
F ₁ (Pr>F)	9828.64	0.00	7573.91	0.00	3714.86	0.00	1973.31	0	5626.11	0
R ² from corresponding OLS	0.89		0.91		0.79		0.74		0.80	
2d stage:										
Observations	1557		1552		6884		1525		6097	
F ₁ (Pr>F)	166.74	0	120.00	0	22.12	0	99.02	0	13.14	0
R ² from corresponding OLS	0.90		0.81		0.30		0.81		0.19	

Note: Iterative robust regressions; benchmark sector is other business services.

Table 3: Trade costs in Cross-Border Trade as a Percent of Delivered Service Prices (demand elasticity of 3.6)

Group averages by p.c. income

	TOTAL SERVICES	ONLY TRANSPORT	PRODUCER SERVICES	OTHER BUSINESS SERVICES	OTHER NON-TRADE SERVICES
high inc.	20.70	32.45	24.88	22.53	12.15
med.-high inc.	24.50	38.33	25.00	25.65	12.83
middle inc.	22.09	36.34	23.71	24.19	13.95
med.-low inc.	17.97	33.30	24.44	32.12	12.24
low inc.	21.31	35.23	25.47	28.59	14.57
Total	21.34	35.15	24.75	26.34	13.15

5. Effect of regulatory measures

The estimates reported above reflect overall implicit protection in the service sector. These do not follow from import tariffs, but rather from a mix of less transparent variations in tax and regulatory policies. This makes it difficult to define trade barriers in services, since there is no equivalent to at-the-border-tariffs like in merchandise trade. We focus in this section on the contribution of regulatory measures within a country to our estimated barriers to services trade. Heterogeneity in regulatory measures on the one hand, but also certain measures themselves on the other hand may act as implicit trade barriers. We can control for different regulatory regimes in two ways given our estimating framework. We can either include regulatory indices in the first stage, and thereby control for these effects before estimating our implicit rates of protection. Alternatively we can regress the residuals from the first stage regression on a set of regulatory indices. We will present the results from pursuing the first alternative here.⁹ Since we are using data for product market regulation (PMR) compiled by the OECD, we have to restrict the analysis in this section to OECD members. Thus, what follows focuses on a set of 29 countries, with per capita incomes spanning the range between those of Mexico and Switzerland. We chose Denmark as the benchmark country. (The results are however robust to using Luxembourg or Korea instead).

Table 4 reports the first stage results, using the high level PMR-indicators from the OECD.¹⁰ We are here controlling very broadly for three different types of regulatory obstacles: barriers to entrepreneurship, state control and barriers to trade. It is interesting to note that barriers to trade (tariffs, discriminatory procedures, etc.) do not show an impact on service imports, in particular not in producer related services. Rather we see that barriers to entrepreneurship have a dampening effect on imports of services as such. However, the results differ between individual service sectors. The negative effect of barriers to entrepreneurship is especially relevant for imports of producer services and imports in the more narrowly defined sub-category of other business services. On the

⁹ We have also regressed the residuals on the first stage on indices for product market regulation, however, the resulting estimations had a low explanatory power. Since in addition PMR-indicators turned out to have an impact only on few countries and in certain service categories, we did not pursue this possibility further, since it is likely to give misleading results for the sample as a whole.

¹⁰ See Nicoletti (2001) for an early summary and analysis of these types of data, and Kox and Lejour for a recent analysis using such indices as a determinant of bilateral services trade flows for the EU.

other hand, these barriers do not matter for imports of transport services. As is to be expected however, here barriers to trade exhibit a negative impact. Finally, state control did not show a significant effect, except for imports of other business services, where a weak positive effect is observed.

Table 4
1st Stage Regressions controlling for product market regulation

	TOTAL SERVICES		ONLY TRANSPORT		PRODUCER SERVICES		BUSINESS SERVICES		OTHER NON-TRADE SERVICES	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
lnPop	0.79	59.83	0.76	48.22	0.79	58.87	0.75	26.73	0.82	62.44
lnGDPpc	0.90	26.82	1.02	25.51	0.91	25.49	1.00	13.91	0.82	24.36
lnWDIST	-0.53	-5.16	-0.18	-1.44	-0.78	-7.40	-1.26	-5.71	-0.33	-3.01
barriers to entrepreneurship	-0.18	-3.93	-0.02	-0.42	-0.34	-6.94	-0.30	-3.04	-0.15	-3.14
state control	0.04	1.23	0.00	0.07	-0.02	-0.50	0.13	1.90	0.05	1.63
barriers to trade	-0.08	-1.88	-0.13	-2.52	0.03	0.72	-0.07	-0.72	-0.20	-4.56
transport									2.43	40.70
travel									2.60	43.62
communication					-2.22	-35.07				
insurance					-2.30	-36.69				
finance					-2.28	-35.74				
computer					-2.49	-37.67				
licenses and royalties					-1.63	-25.52				
personal and cultural									-0.39	-6.43
government									-0.30	-5.02
cons	3.78	3.65	-1.92	-1.55	4.61	4.35	7.71	3.47	-1.09	-1.00
Observations	282		282		1544		282		1322	
F, (Pr>F)	765.51	0.00	561.92	0.00	602.32		163.75	0.00	1035.14	0.00
R ² from corresponding OLS	0.53		0.92		0.76		0.79		0.76	
2d stage:										
Observations	282		282		1544		282		1322	
F, (Pr>F)	820.15	0.00	71.76	0.00	18.95	0.00	60.73	0.00	11.03	0.00
R ² from corresponding OLS	0.95		0.68		0.26		0.81		0.17	

Note: Iterative robust regressions; benchmark sector is other business services.

Table 5 reports the second stage results when the above indices of product market regulation are included in the first stage as controls. Appendix table A3 reports the same results, without controlling for product market regulation in the first stage for comparison purposes. These estimates are in line with those obtained from the larger, world wide sample before. In general, implicit protection in the service sector is considerably lower for the subset of OECD members as compared to the results for almost all countries in the previous section. The USA turns out to be the country with the highest implicit protection rates.¹¹ Again, implicit protection rates are on average higher in transport services and lower in producer related services and other non-trade services. However, business services show relatively high rates of protection for this subset of countries.

Comparing Table 5 to Appendix Table A3 clearly shows that controlling for regulatory measures in the first stage does not change much. In other words, in general

¹¹ This explains why the results were not robust to using the USA as the benchmark country of “free trade”.

regulatory measures behind the border do not seem to influence the openness of the service sector strongly. There are some differences between individual service sectors, but even more pronounced are the differences between individual countries. A few countries emerge, where regulatory measures do show an impact on openness to trade in services: Switzerland, France, the UK, Hungary, Iceland, Poland, Portugal, Slovakia, Turkey and the USA. Further, regulatory measures show a greater impact in producer related services, raising implicit protection rates for five countries (Switzerland, UK, Hungary, Slovakia and the USA) and lowering trade costs in two cases (France and Turkey). On the other hand, within business services – which are one component of producer related services – trade costs are lowered in six countries when controlling for product market regulation indices.

These differentiated results make it clear that the impact of regulatory measures behind the border on trade in services will not be uniform and will depend critically on the type of measure as well as the service activity which is considered. Thus, more detailed research is needed here, investigating at a more disaggregated level the impact of very specific regulatory measures for individual countries. For the analysis here, we used the three high level indicators – barriers to entrepreneurship, barriers to trade and state control.

Table 5**Trade costs as a percent of delivered service prices (demand elasticity of 3.6)**

OECD only; Controlling for product market regulation in the 1st stage

	TOTAL SERVICES	ONLY TRANSPORT	PRODUCER SERVICES	BUSINESS SERVICES	OTHER NON- TRADE SERVICES
Australia	8.32	14.64	α	11.27	3.68
Austria	α	22.53	α	α	8.14
Canada	11.31	18.93	4.07	15.99	9.93
Switzerland	14.73	19.04	13.03	36.44	18.94
Czech Republic	5.11	22.61	6.30	α	4.63
Germany	2.79	16.37	5.27	6.73	α
Spain	12.55	14.38	5.48	8.41	16.90
Finland	17.22	22.70	12.38	17.03	21.35
France	11.24	14.74	13.60	11.22	7.24
United Kingdom	8.68	12.91	11.84	20.38	5.46
Greece	α	α	17.94	28.60	α
Hungary	8.09	21.55	5.46	4.17	13.27
Iceland	16.19	19.11	30.20	28.18	12.14
Italy	9.29	17.35	8.84	4.59	9.83
Japan	14.38	22.08	12.36	6.82	18.40
Korea, Rep.	α	α	12.84	α	7.66
Luxembourg	α	23.92	α	α	α
Mexico	13.21	34.65	20.58	30.79	13.69
Netherlands	α	2.13	α	α	α
Norway	11.48	9.11	20.43	23.36	12.27
Poland	12.46	15.00	5.11	12.63	11.70
Portugal	18.59	20.05	17.31	25.80	12.96
Slovak Republic	11.81	11.95	11.38	α	11.42
Sweden	7.05	20.82	6.86	α	17.88
Turkey	13.82	13.48	13.48	18.62	13.41
USA	21.34	24.69	22.59	28.68	13.82

Note: Iterative robust regression, a "α" indicates that the estimate was not significantly greater than zero at the .1 level (one-tailed test).

6. Protection against inward FDI

We then apply the same procedure to FDI data obtained from the OECD. Since we could not obtain FDI data by service sectors for the sample as a whole, the analysis is here restricted again to the group of OECD members. Table 6 reports the first stage results and Table 7 gives an index of protection which we calculated from the coefficients of the second stage regression output. We use here an index of protection, since tariff equivalents are not meaningful in the case of FDI. The index ranges between 0 (lowest protection) and 100 (maximum protection in the sample). More evidently we see here the

relative nature of our protection estimates. We decided to define the range of the index over all sector combinations and countries. As a result, the lowest degree of protection is observed for the USA when looking at all sectors without transport services. On the other end of the range, Finland shows the highest protection in business services for the sample of OECD members.

Again, the coefficients in the gravity equation show the expected sign in the first stage regressions (Table 6). It is interesting to note that unlike for cross-border trade, distance plays a differentiated role for FDI. The coefficient has the traditional negative sign in the case of other business services, however it is not significant for producer services and positive for non-producer services. Thus, when pooling across all sectors, we see a positive coefficient on average. This empirical observation can be interpreted in the sense that over large distances, FDI is rather increasing. Together with the negative coefficient in the model for cross border trade from Section 4, we can conclude that the two can act as substitutes when economic distance increases. The effect of regulatory measures shows some interesting features. Barriers to entrepreneurship clearly have an overall negative impact on inward FDI. One exception is here other business services. In contrast, state control shows a surprising positive correlation with inward FDI, again apart from other business services. Finally, barriers to trade have no effect on FDI stocks. The highest FDI stocks are observed in financial services, insurances services and trade and repair, which is the only sector here where by definition international trade can only take place through foreign establishment.

Turning now to Table 7, Japan, Iceland, and Korea emerge as the most highly protected countries for inward FDI, followed by countries like France, Germany, Australia, Norway and the Slovak Republic. France shows a high protection in non-producer related services, while Germany is characterized by a high protection in transportation services and non-producer related services. Austria shows the highest degree of protection in transportation services.

Table 6: 1st Stage Regression Results, FDI.

	ALL SERVICES	ONLY TRANSPORT	PRODUCER SERVICES	OTHER BUSINESS SERVICES	OTHER NON- TRADE SERVICES
lnPop	0.9479 43.67	0.9038 11.4	0.9292 38.4	1.145 14.37	1.0295 21.13
lnGDPpc	0.656 10.35	1.5316 6.69	0.6586 9.18	0.2993 1.12	0.6301 4.69
lnWDIST	0.396 1.94	1.6882 1.1	0.0596 0.25	-6.4202 -3.93	1.5284 3.82
barriers to entrepreneurship	-0.919 -10.52	-1.7929 -5.16	-0.8412 -8.50	0.7442 2.15	-1.1909 -6.47
state control	0.1161 2.00	0.6503 3.14	0.066 1.00	-0.4734 -1.95	0.3304 2.74
barriers to trade	-0.0624 -0.58	0.03 0.09	-0.0139 -0.11	-0.0469 -0.11	-0.2835 -1.30
transport	-1.4351 -9.28				-0.2753 -1.9
travel	-1.0748 -7.6				
communication	-0.0489 -0.33		-0.0318 -0.21		
construction	-1.1285 -8.23		-1.1081 -8.03		
insurance	1.13 4.59		1.1241 4.54		
finance	1.7445 13.15		1.7865 13.37		
computer	-1.6686 -11		-1.6658 -10.92		
trade and repair	1.5317 11.37		1.5518 11.44		
cons	-3.9593 -1.98	-25.0821 -1.82	-1.0859 -0.47	56.6395 3.75	-14.7327 -3.74
R ²	0.759	0.746	0.752	0.663	0.711
adjusted R ²	0.756	0.730	0.748	0.645	0.703
F-Value	263.4781	46.5734	232.7729	37.9751	85.0544
Observations	1186	102	936	123	250

Note: Iterative robust regressions; benchmark sector is other business services, t-values reported below the coefficient.

Transportation services in general show on average a rather high degree of protection, so do non-producer related services. Relative protection in producer related services is comparably low.¹² Very large differences are seen in other business services

¹² The sectors with on average highest protection rates within the group of producer related services are communication services and computer and information services. Given the time period we look at (1994-

(and similar so in financial services, results not reported here): Here most countries are totally open for FDI, while a few –Finland , Turkey, Germany, Great Britain and Austria - show relatively high protection rates.

Table 7: Index of Protection for FDI

	ALL SERVICES	ONLY TRANSPORT	PRODUCER SERVICES	OTHER BUSINESS SERVICES	OTHER NON- TRADE SERVICES
Australia					16.73
Austria	9.71	52.86	6.81	12.77	23.27
Canada		17.81			6.00
Switzerland	\$			\$	
Czech Republic		12.73		\$	11.22
Germany	15.85	45.95	10.87	29.09	40.53
Spain					
Finland	1.57	9.30		100.00	6.55
France				\$	23.74
United Kingdom	1.63	46.43	1.31	20.60	4.94
Greece	3.06	8.51	8.87		
Hungary		16.43		\$	12.32
Ireland					
Iceland	18.08	30.09	17.58		22.04
Italy	5.49		2.40		
Japan	64.53		62.88		79.10
Korea, Rep.	18.40	31.75	18.97		14.28
Luxembourg	\$		\$		
Mexico		\$			
Netherlands	\$		\$	\$	
Norway	4.75	18.57	1.71		51.47
New Zealand					
Poland					
Portugal		49.34			9.61
Slovak Republic	5.89	43.81			41.78
Sweden					
Turkey	2.99			73.65	20.26
USA	2.48	19.21	0.99		12.01

Note: Index calculated from 2nd stage coefficients; 100...highest protection, 0...lowest protection, \$ indicates a positive deviation from predicted trade flows, missing values were not significant at the 5% confidence level.

2004) this is not surprising, since most countries started to privatize and then liberalize their

6. Robustness

We assessed the appropriateness of using trade-with-world data in a gravity model setup using bilateral trade in service data by service sectors provided from Eurostat. Thus, we ran our 2-stage estimation procedure for a reduced sample of 25 countries (all reporter countries which had data for the entire period 1994-2004) using on the one hand service trade flows with the world (as in our estimations above) but this time taken from Eurostat and on the other hand bilateral flows from Eurostat with all reported partners. In the first stage we took exactly the same control variables (i.e. population, GDP per capita and distance) whereby these refer to the reporter and to our index of remoteness in the trade-with-world case while we have reporter and partner gravity variables and bilateral distance in the bilateral case. The second stage is in both cases a regression of the obtained residuals on reporter fixed effects. The results, reported in Appendix Tables A4 and A5 are reassuring: the relative degree of protection as represented by an index which we calculated from the second stage regression coefficients on the country fixed effects show high protection for the same countries in cross-border trade in services. Thus, we are confident that our trade-with-world approach to the gravity model gives us reliable estimates of implicit protection rates in services trade while allowing us to base our analysis on a wide sample on the one hand and on FDI data on the other hand, for which bilateral stock data by service categories are practically not available from any country in the world.

7. Conclusions

The empirical literature quantifying policy barriers to trade in services remains quite limited. Although recently progress has been made for the OECD countries, and despite important efforts to compile policy measures for subsets of countries—see Hoekman (2006)—for the majority of countries we have neither comprehensive information on prevailing services policies and the extent of barriers to trade and investment, nor can we infer what the barriers are by using indirect methods such as gravity regressions that use bilateral trade data. The limited empirical research reflects the weakness of the available

communication sectors in this period or towards the end of the period.

data. In this paper we have develop techniques, based on gravity models used in the merchandise trade literature, to estimate trade and FDI barriers in services using data on total trade and FDI stocks. These yield openness indexes, which give a map of relative degrees of protection among different countries and sectors. With the imposition of import demand elasticities, we are also able to convert these to trade cost or tariff equivalents. The results point to substantial variations in the openness of service sectors across countries, and substantial room for liberalization—be it unilateral, or under GATS-based or regional initiatives. Our estimates suggest that barriers to trade in services are higher than remaining barriers on average for trade in goods.

Another interesting finding is that openness appears robust to regulatory regime. cross-border barriers are broadly separable from domestic regulation according to our estimation results. This underlines that we still need to sort out conceptually the linkages between modes, regulation, discriminatory barriers, and gains from openness in services trade. Often, these are mixed up in the discussion, not least due to the difficulty of adequately measuring trade flows, regulations and barriers. Thus, there is ample field for further theoretical as well as applied empirical research.

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Table A1: Grouping of countries

ISO code	Name	Income group	
		1994	2004
AGO	Angola	1	2
ALB	Albania	2	3
ARG	Argentina	5	4
ARM	Armenia	2	2
ATG	Antigua and Barbuda	4	5
AUS	Australia	5	5
AUT	Austria	5	5
AZE	Azerbaijan	2	2
BDI	Burundi	1	1
BEN	Benin	1	1
BFA	Burkina Faso	1	1
BGD	Bangladesh	1	1
BGR	Bulgaria	3	3
BHR	Bahrain	5	5
BHS	Bahamas, The	5	
BIH	Bosnia and Herzegovina	2	3
BLR	Belarus	3	3
BLZ	Belize	4	4
BOL	Bolivia	2	2
BRA	Brazil	4	3
BRB	Barbados	4	4
BWA	Botswana	4	4
CAF	Central African Republic	1	1
CAN	Canada	5	5
CHE	Switzerland	5	5
CHL	Chile	4	4
CHN	China	2	3
CIV	Cote d'Ivoire	2	2
CMR	Cameroon	2	2
COG	Congo, Rep.	2	2
COL	Colombia	3	3
COM	Comoros	2	2
CPV	Cape Verde	3	3
CRI	Costa Rica	4	4
CYP	Cyprus	5	5
CZE	Czech Republic	4	5
DEU	Germany	5	5
DJI	Djibouti	2	2
DMA	Dominica	4	4
DNK	Denmark	5	5
DOM	Dominican Republic	3	3
ECU	Ecuador	3	3
EGY	Egypt, Arab Rep.	2	2
ERI	Eritrea	1	1
ESP	Spain	5	5
EST	Estonia	4	4
ETH	Ethiopia	1	1
FIN	Finland	5	5
FJI	Fiji	3	3
FRA	France	5	5
GAB	Gabon	4	4
GBR	United Kingdom	5	5
GEO	Georgia	2	2
GHA	Ghana	1	1
GIN	Guinea	2	1
GMB	Gambia, The	1	1
GNB	Guinea-Bissau	1	1
GRC	Greece	5	5
GRD	Grenada	4	4
GTM	Guatemala	3	3
GUY	Guyana	2	2
HKG	Hong Kong, China	5	5
HND	Honduras	2	2
HRV	Croatia	4	4
HTI	Haiti	2	1
HUN	Hungary	4	4
IDN	Indonesia	2	2
IND	India	2	2
IRL	Ireland	5	5
ISL	Iceland	5	5
ISR	Israel	5	5
ITA	Italy	5	5
JAM	Jamaica	3	3
JOR	Jordan	3	3
JPN	Japan	5	5
KAZ	Kazakhstan	3	3
KEN	Kenya	1	1
KGZ	Kyrgyz Republic	2	1
KHM	Cambodia	1	1
KIR	Kiribati	2	2

ISO code	Name	Income group	
		1994	2004
KNA	St. Kitts and Nevis	4	4
KOR	Korea, Rep.	5	5
KWT	Kuwait		5
LBN	Lebanon	4	4
LBY	Libya	4	4
LCA	St. Lucia	4	4
LKA	Sri Lanka	2	2
LSO	Lesotho	2	2
LTU	Lithuania	3	4
LUX	Luxembourg	5	5
LVA	Latvia	3	4
MAC	Macao, China	5	
MAR	Morocco	3	3
MDA	Moldova	2	2
MDG	Madagascar	1	1
MDV	Maldives	3	3
MEX	Mexico	4	4
MLI	Mali	1	1
MLT	Malta	4	5
MNG	Mongolia	1	2
MOZ	Mozambique	1	1
MRT	Mauritania	2	1
MUS	Mauritius	4	4
MWI	Malawi	1	1
MYS	Malaysia	4	4
NAM	Namibia	3	3
NER	Niger	1	1
NGA	Nigeria	1	2
NIC	Nicaragua	2	2
NLD	Netherlands	5	5
NOR	Norway	5	5
NPL	Nepal	1	1
NZL	New Zealand	5	5
OMN	Oman	4	4
PAK	Pakistan	2	2
PAN	Panama	4	4
PER	Peru	3	3
PHL	Philippines	3	2
PNG	Papua New Guinea	3	2
POL	Poland	4	4
PRT	Portugal	5	5
PRY	Paraguay	3	2
ROM	Romania	3	3
RUS	Russian Federation	4	4
RWA	Rwanda	1	1
SAU	Saudi Arabia	5	4
SDN	Sudan	1	2
SEN	Senegal	2	2
SGP	Singapore	5	5
SLB	Solomon Islands	2	2
SLE	Sierra Leone	1	1
SLV	El Salvador	3	3
STP	Sao Tome and Principe	2	1
SUR	Suriname	3	3
SVK	Slovak Republic	4	4
SVN	Slovenia	4	5
SWE	Sweden	5	5
SWZ	Swaziland	3	3
SYC	Seychelles	4	4
SYR	Syrian Arab Republic	2	2
TGO	Togo	1	1
THA	Thailand	4	3
TJK	Tajikistan	1	1
TKM	Turkmenistan	2	2
TON	Tonga	3	3
TTO	Trinidad and Tobago	4	4
TUN	Tunisia	3	3
TUR	Turkey	3	4
TZA	Tanzania	1	1
UGA	Uganda	1	1
UKR	Ukraine	3	3
URY	Uruguay	4	4
USA	United States	5	5
VCT	St. Vincent and the Grenadines	3	3
VEN	Venezuela, RB	4	4
VUT	Vanuatu	3	3
WSM	Samoa	3	3
YEM	Yemen, Rep.	1	2
ZAF	South Africa	4	4
ZMB	Zambia	2	1
ZWE	Zimbabwe	2	1

Note: 1...low income - 5... high income

TABLE A2
Trade costs as a percent of delivered service prices (demand elasticity of 3.6)

	TOTAL SERVICES	ONLY TRANSPORT	PRODUCER SERVICES	OTHER BUSINESS SERVICES	OTHER NON- TRADE SERVICES
Angola	□	27.46	□	□	□
Albania	35.58	42.92	21.63	47.68	11.27
Argentina	31.99	47.25	32.81	48.92	13.88
Armenia	24.78	30.69	30.21	57.71	10.09
Antigua and Barbuda	18.54	32.75	9.50	3.56	8.34
Australia	26.93	38.40	26.78	36.79	5.48
Austria	7.04	38.53	12.34	□	3.79
Azerbaijan	16.48	38.44	20.96	□	9.59
Burundi	32.14	45.85	30.77	59.53	15.76
Benin	24.45	30.64	29.12	24.92	19.14
Burkina Faso	30.95	39.16	44.74	59.24	16.18
Bangladesh	30.56	34.56	45.00	47.41	18.76
Bulgaria	14.46	24.81	15.94	8.36	7.40
Bahrain	28.32	30.37	38.58	38.72	7.19
Bahamas, The	16.95	37.61	22.81	6.83	□
Bosnia and Herzegovina	33.29	41.07	11.18	□	17.95
Belarus	32.67	52.15	43.27	34.61	30.76
Belize	27.11	41.66	29.70	25.00	10.94
Bolivia	30.82	39.76	29.06	45.92	18.77
Brazil	30.91	45.32	25.51	25.02	12.03
Barbados	19.26	34.10	16.44	29.98	11.29
Botswana	26.34	37.80	33.61	24.77	20.90
Central African Republic	18.46	34.19	□	20.95	□
Canada	20.18	36.14	10.41	17.19	13.56
Switzerland	27.75	35.53	33.77	37.95	22.00
Chile	23.26	32.08	18.22	21.47	10.71
China	19.83	32.74	19.63	9.68	15.29
Cote d'Ivoire	10.45	25.50	7.91	□	□
Cameroon	26.92	40.61	33.41	16.14	11.42
Congo, Rep.	□	36.43	□	□	7.77
Colombia	30.62	41.10	25.03	38.90	21.81
Comoros	15.07	32.40	29.71	27.95	□
Cape Verde	19.83	32.78	26.49	33.92	8.33
Costa Rica	26.68	38.12	28.20	27.54	19.04
Cyprus	17.29	20.17	25.67	40.74	7.21
Czech Republic	17.69	44.10	14.56	□	3.28
Germany	13.58	31.80	18.51	10.09	□
Djibouti	19.19	29.83	□	□	□
Dominica	25.59	38.71	23.60	15.30	10.22
Denmark	15.63	18.52	13.86	4.67	□
Dominican Republic	25.06	28.61	26.62	57.82	13.54
Ecuador	26.46	38.09	26.38	18.56	7.61
Egypt, Arab Rep.	13.03	30.65	17.41	□	□
Eritrea	31.17	60.15	40.37	□	34.95
Spain	23.60	33.30	18.24	13.64	15.42
Estonia	17.59	25.40	23.70	14.77	□
Ethiopia	19.63	29.13	19.95	7.57	10.48
Finland	26.89	38.37	22.92	17.48	21.83
Fiji	12.61	30.22	□	□	□
France	23.53	32.10	28.17	17.31	4.96
Gabon	13.83	33.62	□	□	11.81
United Kingdom	15.45	28.27	16.34	19.07	□
Georgia	25.86	40.46	32.21	54.32	4.76
Ghana	17.06	31.05	7.76	6.06	□
Guinea	20.26	36.50	26.76	12.70	27.08
Gambia, The	16.41	31.86	18.73	44.61	□
Guinea-Bissau	25.49	39.32	23.94	10.18	14.99
Greece	□	23.48	30.26	31.56	□
Grenada	25.24	36.45	21.13	9.76	14.82
Guatemala	33.48	41.00	39.57	30.42	22.05
Guyana	9.69	33.36	□	8.04	□
Honduras	22.37	30.55	23.07	23.51	7.24
Croatia	21.55	41.64	18.67	7.92	4.03
Haiti	25.69	25.67	23.83	38.71	3.43
Hungary	17.62	43.69	9.40	□	10.96
Indonesia	4.65	27.69	6.67	□	□
India	18.03	27.63	6.25	□	13.89
Ireland	□	33.42	□	□	23.34
Iceland	27.75	34.95	47.85	29.57	15.15
Israel	17.61	26.09	19.08	7.68	6.19
Italy	21.12	35.42	23.75	9.06	4.60
Jamaica	9.71	22.30	6.70	□	10.39
Jordan	3.38	16.37	□	4.71	□
Japan	29.43	39.22	34.06	26.28	16.47
Kazakhstan	10.46	41.06	23.15	□	13.41
Kenya	26.41	39.53	21.62	34.13	8.19
Kyrgyz Republic	22.17	33.69	7.45	7.93	18.93
Cambodia	21.79	30.96	12.63	26.78	11.96
Kiribati	9.13	22.64	□	□	□
St. Kitts and Nevis	24.54	36.71	20.46	10.04	8.77
Korea, Rep.	17.40	28.17	32.11	6.73	10.80
Kuwait	10.82	25.93	54.42	63.06	□

	TOTAL SERVICES	ONLY TRANSPORT	PRODUCER SERVICES	OTHER BUSINESS SERVICES	OTHER NON- TRADE SERVICES
Lebanon	□	41.03	□	□	29.12
Libya	43.56	46.84	50.76	49.25	17.11
St. Lucia	22.02	36.89	17.87	9.34	4.41
Sri Lanka	15.89	23.97	11.66	8.64	9.30
Lesotho	34.43	42.04	49.20	80.94	15.71
Lithuania	29.95	38.68	39.93	37.90	15.83
Luxembourg	□	34.46	□	□	□
Latvia	26.04	39.44	26.88	30.20	14.41
Macao, China	19.59	50.78	19.99	□	14.30
Morocco	24.74	37.79	28.24	23.05	3.33
Moldova	17.40	33.80	23.25	16.52	6.98
Madagascar	14.27	33.24	27.15	24.63	□
Maldives	21.11	33.23	31.33	37.48	7.53
Mexico	30.14	55.38	24.99	46.16	16.53
Mali	10.55	17.99	22.79	6.51	□
Malta	16.89	24.54	23.60	21.29	□
Mongolia	13.50	26.27	18.29	7.26	□
Mozambique	11.97	34.85	9.01	□	□
Mauritania	12.58	22.27	9.12	□	□
Mauritius	14.39	30.56	15.85	□	3.09
Malawi	19.07	30.76	46.52	19.84	□
Malaysia	□	14.66	□	□	□
Namibia	17.68	45.01	19.44	7.42	10.92
Niger	25.17	32.77	37.08	46.24	10.44
Nigeria	2.40	34.73	□	□	□
Nicaragua	26.40	35.08	24.96	13.33	10.32
Netherlands	6.76	21.26	8.02	□	□
Norway	20.37	25.67	29.37	20.20	13.12
Nepal	31.72	49.84	20.98	18.72	18.07
New Zealand	23.35	37.03	24.22	20.36	13.79
Oman	23.40	34.67	18.13	8.15	9.86
Pakistan	25.87	30.62	33.68	34.31	9.84
Panama	20.04	26.15	17.46	30.17	5.14
Peru	30.78	41.76	24.20	24.24	16.00
Philippines	12.68	28.06	7.08	□	5.20
Papua New Guinea	4.10	35.63	□	□	12.42
Poland	27.08	42.87	16.11	19.50	17.19
Portugal	27.26	39.14	24.81	26.02	8.36
Paraguay	29.32	36.46	42.81	63.35	11.82
Romania	28.22	39.92	25.00	18.72	18.96
Russian Federation	15.60	42.84	19.91	9.00	□
Rwanda	18.48	37.09	38.48	32.45	16.99
Saudi Arabia	6.20	41.04	19.12	□	20.08
Sudan	42.56	47.60	64.17	65.24	26.45
Senegal	20.23	28.60	18.47	18.08	16.80
Solomon Islands	11.26	63.64	□	□	24.16
Sierra Leone	21.74	46.67	21.13	20.45	3.85
El Salvador	29.11	38.15	20.69	29.06	25.05
Sao Tome and Principe	20.12	36.06	□	33.08	5.02
Suriname	16.67	29.28	20.00	□	□
Slovak Republic	20.93	41.63	10.75	□	9.85
Slovenia	29.54	43.63	29.84	25.57	15.52
Sweden	18.20	36.59	16.78	5.43	15.62
Swaziland	15.71	49.74	16.28	□	16.95
Seychelles	18.59	33.85	25.48	7.71	3.62
Syrian Arab Republic	15.85	26.59	39.29	34.09	□
Togo	21.22	27.87	16.08	32.49	24.75
Thailand	1.42	14.66	□	□	□
Tajikistan	24.90	27.66	28.98	42.15	4.92
Turkmenistan	4.07	27.12	11.63	□	□
Tonga	□	□	□	□	□
Trinidad and Tobago	41.83	49.69	50.96	43.61	21.25
Tunisia	26.31	33.74	37.44	33.28	8.26
Turkey	26.73	41.05	25.73	29.53	14.14
Tanzania	14.54	39.43	22.51	25.53	□
Uganda	15.65	33.60	□	□	7.80
Ukraine	14.74	45.98	□	□	6.48
Uruguay	36.15	44.75	41.13	45.31	15.72
United States	30.60	38.61	33.78	35.67	23.50
St. Vincent and the Grenadines	23.45	38.00	20.35	5.87	8.60
Venezuela, RB	29.47	38.70	27.57	25.60	10.64
Vanuatu	24.15	36.25	14.14	10.04	11.08
Samoa	28.18	39.81	24.56	9.19	23.67
Yemen, Rep.	16.78	31.33	5.23	2.86	□
South Africa	26.66	36.94	25.42	40.13	9.45
Zambia	20.66	26.76	47.47	40.57	□
Zimbabwe	□	□	21.27	□	□

Note: Iterative robust regression, a"□" indicates that the estimate was not significantly greater than zero at the .1 level (one-tailed test).

TABLE A4

Protection Indices in Cross-Border Trade, based on trade-with-world data.

	Total Trade	All Trade (pooling all sectors)	Producer Services	Non- Producer Services
AUT	\$			
BGR	\$			
CYP				
CZE	\$			0.0
DEU		10.9		39.3
ESP	\$	12.7		17.5
EST	\$			
FIN	32.4	41.9		65.3
FRA		16.7	13.8	21.1
GBR	\$	\$	\$	
HUN	\$			-1.5
ITA		36.7	39.1	38.2
JPN	60.0	100.0	76.6	91.9
LTU	1.9	41.8	27.7	58.1
LVA		15.1		34.1
MLT				
NLD	\$	\$		\$
NOR		25.1	25.1	36.1
POL		43.3	24.0	49.5
PRT		32.3	32.9	36.2
ROM	29.0	35.2	19.0	64.5
SVK				11.4
SVN	5.7	59.9	55.0	58.3
TUR	\$			

Note: Index calculated from 2nd stage coefficients; 100...highest protection, 0...lowest protection, \$ indicates a positive deviation from predicted trade flows, missing values were not significant at the 5% confidence level.

TABLE A5
Protection Indices in Corss-Border Trade, based on bilateral data.

	Total Trade	All Trade (pooling all sectors)	Producer Services	Non- Producer Services
AUT	\$	31.4		
BGR	\$			\$
CYP	\$			\$
CZE		68.8		7.9
DEU	\$	6.5		\$
ESP	\$	17.9		\$
EST	\$	21.1		
FIN	91.4	81.5		50.3
FRA		31.1		
GBR	\$	\$		\$
HUN	11.2	43.8		0.0
ITA		81.8		6.7
JPN	30.4	90.1		35.5
LTU		55.5		6.1
LVA	\$			\$
MLT	\$	\$		\$
NLD	\$			\$
NOR	26.2	99.9		39.3
POL	18.0	100.0		35.2
PRT	22.0	46.1		3.7
ROM		23.2		
SVK	16.8	50.2		6.5
SVN		75.1		16.7
TUR	\$	33.4		\$

Note: Index calculated from 2nd stage coefficients; 100...highest protection, 0...lowest protection, \$ indicates a positive deviation from predicted trade flows, missing values were not significant at the 5% confidence level.