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Does Gravity Apply to Intangibles? Trade and FDI 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 BEA. 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 indexes 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.

1. Introduction

The empirical literature on international trade in services and trade policy is limited, reflecting the 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, and government regulation. 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 that are allowed to establish. 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.

Two different approaches have been taken to assess the magnitude and impact of policy barriers to trade.¹ 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). 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 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. Most of the literature has therefore pursued the first approach, although more use has been made of gravity regressions as data on bilateral trade in services has become available for OECD countries.

One of the limits to the empirical analysis of services trade is the lack of comprehensive bilateral trade data. These data do exist for a limited number of OECD countries, but in general are simply unavailable. This leaves us with overall (i.e. trade with world) data. In this paper we develop a gravity-based approach to estimating barriers to services trade. 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.

¹ See Dee (2006) and Deardorff and Stern (2006) for detailed surveys of existing work along these lines.

2. Data and Trends: JULIA we need better source data discussion

Data on services trade come from the OECD supplemented with published IMF balance of payments statistics. 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 – movement of consumers. These data cover 178 countries for 10 years (1994-2004). Other country data (GDP, country population, etc) are from the World Bank’s World Development Indicators database. From these data, service imports have more than doubled over the decade from 1994 to 2004. For the 178 countries in our sample, imports of services averaged at USD 6770 in 1994 (with a maximum of USD 133100 for the USA). The median was considerably below the average, at USD 575. By 2004, the average value of service imports has increased to USD 13557, and the maximum has also doubled to USD 296200 (again the USA). Likewise the median rose to USD 1059. Despite the doubling in absolute values, the importance of service imports has remained relatively constant. Service imports as a per cent of GDP have been at 8.8% in 1994 and have shown even a weak relative decrease over the past decade, coming down to 7.9% of GDP in 2004 (see Table 1).

Table 1: Service Imports in per cent of GDP.

	1994	2004
all countries	8.8	7.9
high income	6.9	11.6
upper middle income	10.6	8.3
middle income	9.0	7.3
lower middle income	8.7	6.7
low income	9.8	5.9

Source: IMF BOP

Within the service sector, there has been a structural shift away from travel and transport services towards more producer oriented services. The most important service categories are traditionally transport, travel and other business services (see Figure 1). 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 service

were the most important service imports for high income countries in 1994, while by 2004 other business services have 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.

Figure 2 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 shifted from around 0.1% of GDP to roughly 1% of GDP.

Figure 1a: Service imports as percent of GDP by income groups

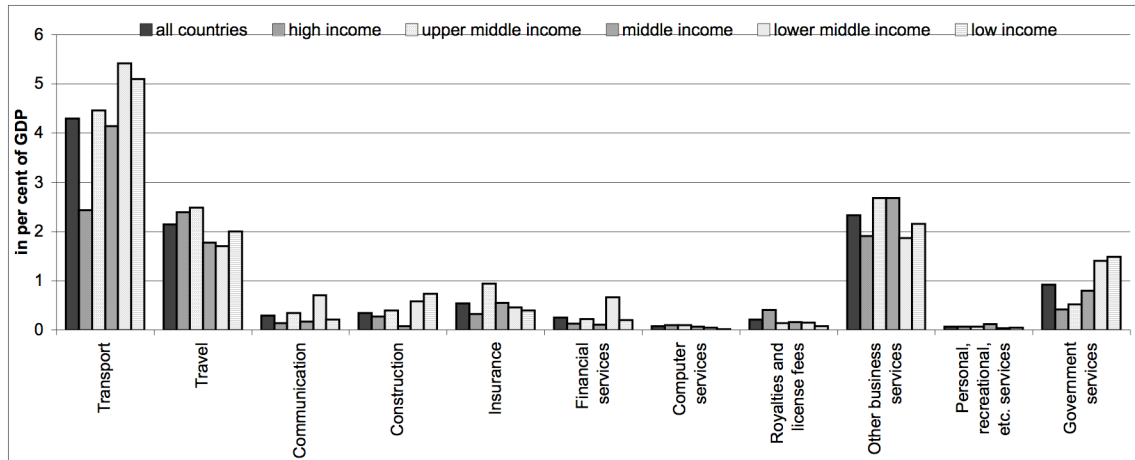


Figure 1b: Service exports as percent of GDP by income group

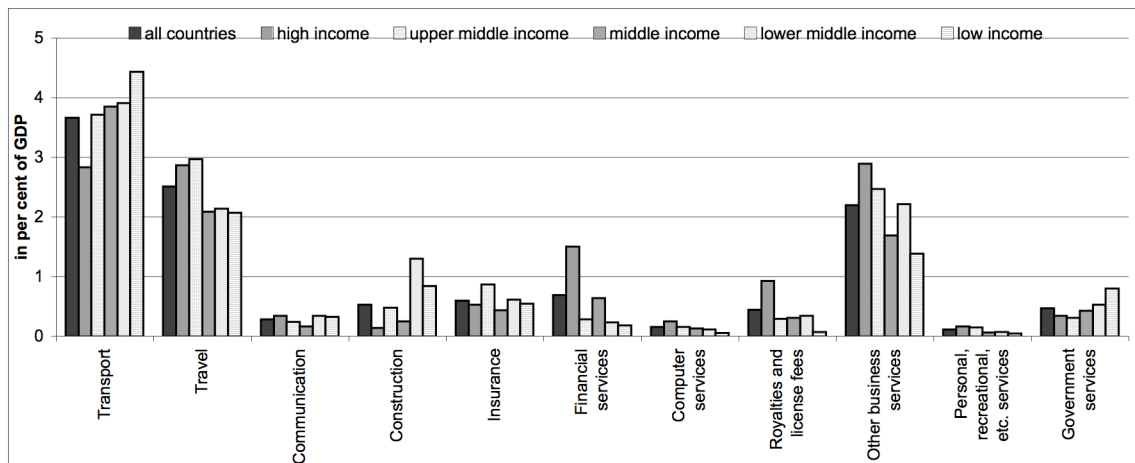
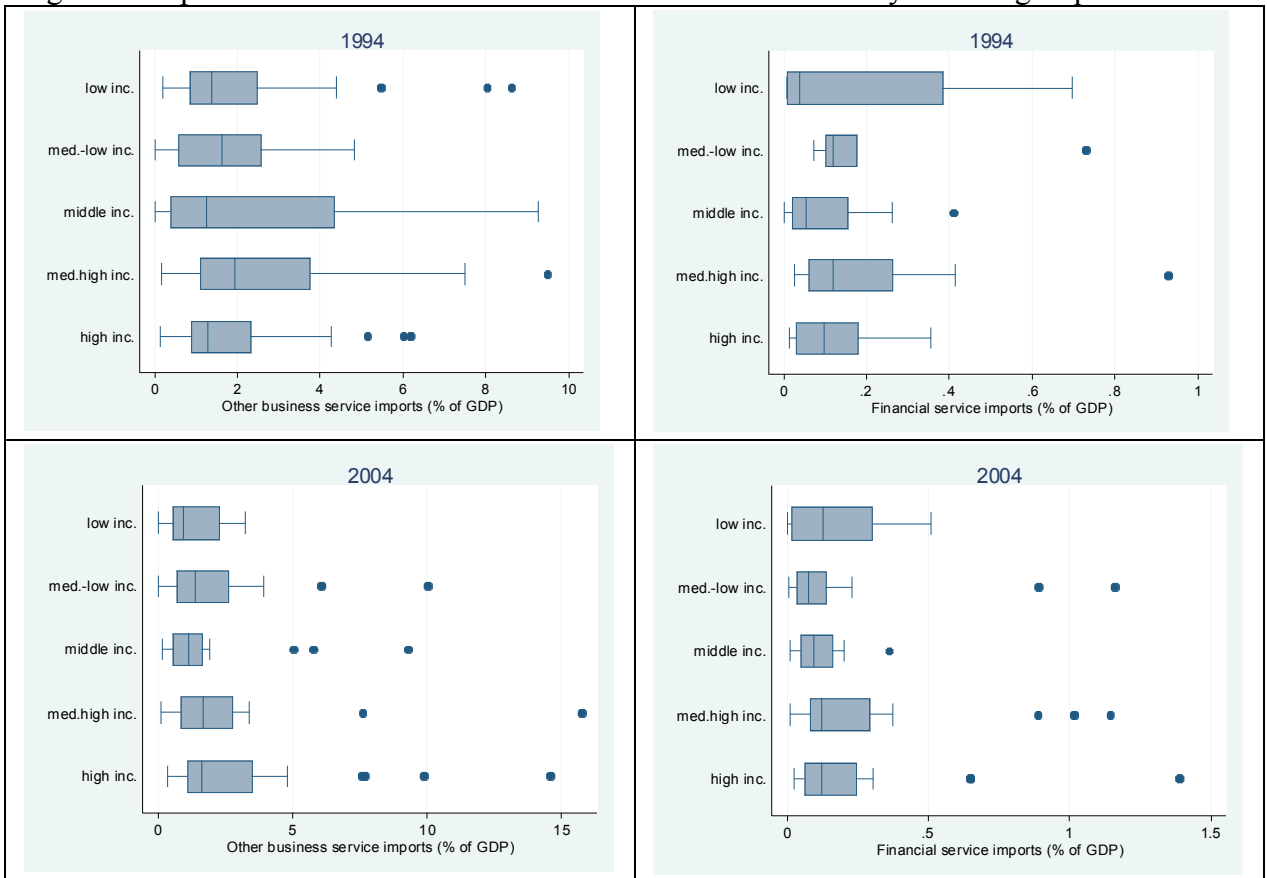


Figure 2: Imports of other business services and financial services by income groups



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 innerquartile range, as well as observations below the 25-percentile minus 1.5 times the innerquartile range are classified as outliers and drawn as dots.

3. Estimating Framework: JOE needs to extend this to FDI and joint production to motivate FDI regressions

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

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

In equation (1), the terms $\alpha_{i,j}$ are the CES weights applied to imports indexed by source. The (Allen) substitution elasticity across imports will be $\sigma_{j,1} = 1/(1-\rho_{j,1})$. 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 $E_{M,j}$ we can derive the following:

$$(2) \quad P_{M,j} = \left[\sum_i \alpha_{i,j}^{\sigma_{j,1}} \omega_{i,j}^{1-\sigma_{j,1}} \right]^{1/(1-\sigma_{j,1})}$$

where $\omega_{i,j}$ 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

$$(3,4) \quad \begin{aligned} \omega_{i,j} &= \gamma_{i,j} \\ P_{M,j} &= \left[\sum_i \alpha_{i,j}^{\sigma_{j,1}} \gamma_{i,j}^{1-\sigma_{j,1}} \right]^{1/(1-\sigma_{j,1})} \end{aligned}$$

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 or cultural differences and 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:

$$(5) \quad Q_j = A \left[\beta_{m,i} M_i^{\rho_{j,2}} + \beta_{d,i} D_i^{\rho_{j,2}} \right]^{1/\rho_{j,2}} \quad 1 > \rho_{j,2} > 0$$

If the substitution elasticities are the same (i.e. $\rho_{j,1} = \rho_{j,2}$), 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 equation (6).

$$(6) \quad V_j = Q_j \left(\frac{\beta_{m,j}}{\tau_j} \right)^{\sigma_{j,2}} P_{m,j}^{1-\sigma_{j,2}} P_{Q,j}^{\sigma_{j,2}}$$

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

$$(7) \quad V_j = Q_j \left(\frac{\beta_{m,j}}{\tau_j} \right)^{\sigma_{j,2}} \left[\sum_i \alpha_{i,j}^{\sigma_{j,1}} \gamma_{i,j}^{1-\sigma_{j,1}} \right]^{(-\sigma_{j,2})/(1-\sigma_{j,1})}$$

Taking logs, we arrive at our basic estimating equation:

$$(8) \quad \ln(V_j) = \ln(Q_j) + \sigma_{j,2} \ln(\beta_{m,j}) - \sigma_{j,2} / (1 - \sigma_{j,1}) \ln \left(\sum_i \alpha_{i,j}^{\sigma_{j,1}} \gamma_{i,j}^{1-\sigma_{j,1}} \right) - \sigma_{j,2} \tau_j$$

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). To measure the costs of economic distance, the third term, we use geographic distance (from CEPII 2004) weighted by trading partner GDP. We will focus on the fourth term in the regressions that follow.

4. Basic Results: JOE/JULIA need to add FDI regressions

We employ the estimating equation (8) with a pooled sample of 178 countries over 10 years (1994-2004). This 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. Thus, 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 a 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 to follow different strategies for pooling sectors to estimate trade restriction. This second stage gives us an indication of how protected individual markets are, and we use the resulting coefficients to calculate ETE’s or trade costs in per cent of delivered prices. These ETE’s 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).² 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.

² 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.

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) are on average more important 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).³ 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 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.

³ This assumed elasticity value is not totally arbitrary. It is actually the default value used in the GTAP model, a widely-sued multi-region CGE model.

Table 2: 1st Stage Regression Results

	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	
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	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	0
R ² from corresponding OLS reg	0.90		0.81		0.30		0.81		0.19		

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

Table 3: Trade costs as a percent of delivered service prices (demand elasticity of 3.6)
(Group averages by p.c. income)

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: JULIA we need more discussion of the data

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 thus control for these effects already 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.⁴ Since we are using data for regulatory indicators from the OECD, we have to restrict the analysis in this part to OECD members. Thus we now have a set of 27 countries, with per capita GDP spanning from Mexico to 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. 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 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 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

⁴ 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.

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 ₁ (Pr>F)	765.51	0.00	561.92	0.00	602.32	0.00	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 ₁ (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 reg	0.95		0.68		0.26		0.81		0.17	

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

comparison. 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.⁵ Again, implicit protection rates are on average higher in transport services and lower in producer related services and other non-trade services. However, also business services show relatively high rates of protection for this subset of countries.

Comparing Table 4 to Appendix Table 3 clearly shows that controlling for regulatory measures in the first stage does not change much. In other words, in general regulatory measures behind the border do not seem to influence the openness of the service sector strongly. There are however some difference between individual service sector, but even more pronounced are the differences between individual countries. A few countries emerge, where regulatory measures do show an impact on trade protection in services, these are Switzerland, France, the UK, Hungary, Island, 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,

⁵ This explains why the results were not robust to using the USA as the benchmark country of „free trade“.

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.

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	§	11.27	3.68
Austria	§	22.53	§	§	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	§	4.63
Germany	2.79	16.37	5.27	6.73	§
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	§	§	17.94	28.60	§
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.	§	§	12.84	§	7.66
Luxembourg	§	23.92	§	§	§
Mexico	13.21	34.65	20.58	30.79	13.69
Netherlands	§	2.13	§	§	§
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	§	11.42
Sweden	7.05	20.82	6.86	§	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"§" indicates that the estimate was not significantly greater than zero at the .1 level (one-tailed test).

These differentiated results make it clear that the impact of regulatory measures behind the border on trade in services will not be uniform and 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. In ongoing research, we will look more deeply into individual sub-indices of these aggregated indicators.

6. Summary

The empirical literature quantifying policy barriers to trade in services limited. (See Hoekman 2006). This reflects the weakness of the available. 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. These yield openness indexes. 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 variation to openness in the sector, and substantial room for liberalization under GATS-based or regional in initiatives.

References

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
LIB	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 Grenadin	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 A3

Trade costs as a percent of delivered service prices (demand elasticity of 3.6)
 OECD only; Not controlling for product market regulation in the 1st stage

	TOTAL SERVICES	ALL SERVICES	EXCLUDING TRANSPORT	ONLY TRANSPORT	PRODUCER SERVICES	BUSINESS SERVICES	OTHER NON- TRADE SERVICES
Australia	4.36	\$	\$	14.75	\$	10.91	\$
Austria	\$	3.83	\$	22.92	\$	\$	9.47
Canada	5.59	\$	\$	19.03	\$	13.99	7.32
Switzerland	17.28	20.51	17.44	21.74	18.78	43.55	23.22
Czech Republic	2.62	4.80	\$	22.54	6.74	\$	4.77
Germany	\$	\$	\$	15.86	6.01	6.82	\$
Spain	9.17	9.79	4.93	14.07	7.40	9.19	15.84
Finland	15.85	16.77	12.39	22.54	14.62	19.12	20.19
France	10.34	12.64	7.81	15.97	17.64	14.73	9.07
United Kingdom	\$	2.52	\$	10.94	5.25	17.05	\$
Greece	\$	10.22	6.33	\$	19.05	28.80	\$
Hungary	1.83	4.05	\$	20.23	\$	\$	9.18
Iceland	19.63	22.37	19.66	18.50	34.86	36.48	14.82
Italy	6.30	9.69	4.12	18.16	11.84	3.70	9.42
Japan	12.28	16.03	10.88	23.54	14.62	9.14	19.63
Korea, Rep.	\$	9.97	9.03	\$	14.75	\$	8.49
Luxembourg	\$	\$	\$	19.75	\$	\$	\$
Mexico	10.96	18.28	12.24	35.80	22.09	34.60	15.58
Netherlands	\$	\$	\$	1.72	\$	\$	\$
Norway	9.49	16.44	13.64	9.59	20.64	23.10	11.37
Poland	11.99	10.81	6.00	18.85	7.55	16.91	16.10
Portugal	14.00	12.47	7.66	18.35	16.84	24.45	8.82
Slovak Republic	6.08	6.57	\$	14.74	6.43	\$	8.33
Sweden	5.73	10.21	4.17	21.32	7.00	2.15	18.39
Turkey	8.98	14.67	11.80	12.65	17.32	22.94	12.92
USA	16.35	17.14	12.90	24.98	18.65	27.63	12.10

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