The Gravity Equation in International Trade in Services

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Abstract: The main purpose of this paper is to assess the impact of various factors on bilateral services trade, relative to that on bilateral goods trade. To accomplish this purpose, using the standard gravity model, we ran regressions on bilateral services trade and goods trade between 10 OECD member countries and other economies (including OECD member and nonmember countries) for the years 1999 and 2000. One main and interesting result is that services trade is better predicted by gravity equations than goods trade. Another interesting result is that there is a complementary relationship between goods exports and services imports. JEL no. F10, F20, L51, F80
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1 Introduction

There are some important characteristics of services that clearly distinguish international trade in services from trade in goods.[1] However, for the purpose of analysis of trade flows and their effects on the allocation of resources and the welfare of national residents, there is no reason to separate trade in goods from trade in services (Lee and Lloyd 2002). Hence, in principle, any theory of international trade should cover both goods and services. Hitherto, however, most empirical studies and analyses of international trade have been confined to trade in goods. There are several reasons. In practice,

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[1] For example, production and consumption of a service must appear simultaneously, and services have an intangible nature.

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the two trade flows have been separated because the Standard International Trade Classification (SITC) applies only to goods and there has been no readily comparable classification of trade in services. There were also no internationally comparable data on services trade until the OECD Secretariat released in 2002 a new publication presenting data on total trade in services, broken down by partner country, for 26 OECD member countries for the years 1999 and 2000.

Grünfeld and Moxnes (2003), Kimura (2003), and Mirza and Nicoletti (2004) have been the first studies which use the new OECD data set on bilateral trade in services to assess the determinants of bilateral trade in services. They all use the gravity framework to estimate the determinants of bilateral services trade. Grünfeld and Moxnes (2003) estimate not only the determinants of international trade in services but also the determinants of foreign affiliate sales in services (proxied by the outward FDI stock), noting that approximately 40 percent of all services trade relates to the activities of foreign subsidiaries (Karsenty 2000). In pursuit of finding possible areas of FTA negotiation between Japan and Korea, Kimura (2003) also uses the OECD data set and estimates the standard gravity equation so as to evaluate the overall services trade flows of Japan and Korea. Instead of using the standard gravity model, Mirza and Nicoletti (2004) develop a theoretical model that incorporates the unique feature of services trade that the traded service must use interactively inputs from both the exporting and importing countries. They then test their extended gravity framework drawn from their model.

One of the main questions for services trade is how it is different from (and similar to) goods trade, but these studies do not explicitly compare the determinants of services trade with the determinants of goods trade. For the sake of comparison, this paper estimates the gravity standard equation for bilateral services trade and goods trade separately, assuming that the specifications are the same, and using the OECD publication for the same set of sample countries. One main and interesting result is that services trade is better predicted by gravity equations than goods trade. Another interesting result is that there is a complementary relationship between goods exports and services imports.

Section 2 presents the gravity model of international trade to be estimated for both services trade and goods trade. Empirical results are presented in Section 3. Finally, Section 4 discusses the implications of the major findings of the paper.

2 The Gravity Model

2.1 The Standard Gravity Equation

Since Tinbergen (1962) and Pöyhönen (1963) it has been well known that the simple gravity equation, in which the volume of trade between two countries is proportional to the product of their masses (GDPs) and inversely related to the distance between them, is empirically highly successful. Recently, with a renewed interest among economists in geography, it has again become widely used in the literature.

One of the criticisms of the gravity equation is that it has no theoretical foundation. In fact, there are several theoretical foundations for the gravity equation. See, for example, Anderson (1979) and Bergstrand (1985, 1989). Using the Armington (1969) assumption that consumers regard goods as being differentiated by location of production, Anderson's and Bergstrand's models have the feature that the value of bilateral trade (imports or exports) is a function of income and transport costs.

Subsequently, it has been recognized that the gravity equation can be derived from different models, including Ricardian, Heckscher–Ohlin, and the monopolistic competition models. Specifically, Helpman and Krugman (1985) have shown that the gravity equation can be derived from the monopolistic competition model with increasing returns to scale. Deardorff (1998) has shown that a gravity equation can also be derived from a Heckscher–Ohlin model without assuming product differentiation. On the other hand, Eaton and Kortum (2002) have developed a Ricardian model of trade in homogenous goods which generates a gravity-type relationship. Thus, the gravity equation is at the heart of any model of trade. Harrigan (2002) provides a comprehensive review of the theoretical models of the gravity equation.

One thing to note is that bilateral trade depends not only on country size and distance, but also on relative distance (Deardorff 1998; Anderson and van Wincoop 2001). That is, trade will be greater between country pairs that are far from the rest of the world than between country pairs that are close to the rest of the world. Thus, the standard gravity equation drawn from theory can take the following form:

$$T_{ij} = G_i^{\beta 1} \cdot G_j^{\beta 2} \cdot D_{ij}^{\beta 3} \cdot R_j^{\beta 4} \cdot R_{ij}^{\beta 5} \cdot E_{ij}\,, \tag{1}$$

where T_{ij} = bilateral trade flows (exports or imports) between country i and country j, G_i = economic mass of country i, G_j = economic mass of

country j, D_{ij} = geographical distance between the capitals of country i and country j, R_i = relative distance of country i, R_j = relative distance of country j, $_{ij}$ = error term.

In order to estimate the standard gravity equation, we use, as the dependent variable, the bilateral service exports and imports drawn from the recently published OECD statistics on international trade in services (OECD 2002). This publication gives data on service exports and imports, broken down by partner country, for 26 OECD member countries, for the years 1999 and 2000. Thus, for the panel data set, the basic gravity equation for our regression analysis takes the following form:

$$\begin{aligned} TRADE_{ijt} = {} & \beta_1 GDP_{it} + \beta_2 GDP_{jt} + \beta_3 DISTANCE_{ij} \\ & + \beta_4 REMOTENESS_{it} + \beta_5 REMOTENESS_{jt} \\ & + \gamma_i + \gamma_j + \gamma_{ij} + \delta_t + \varepsilon_{ijt}\,, \end{aligned} \tag{2}$$

where $TRADE_{ijt}$ = log of bilateral trade flows (exports or imports) between country i and country j in time t,
GDP_{it} = log of GDP of country i in time t,[2]
GDP_{jt} = log of GDP of country j in time t,
$DISTANCE_{ij}$ = log of geographical distance between the capitals of country i and country j,[3]
$REMOTENESS_{it}$ = log of relative distance of country i in time t,
= log $[1/\Sigma_{it}(GDP_{it}/GDP_{wt})/DISTANCE_{ij}]$, where GDP_{wt} = world GDP in time t,
$REMOTENESS_{jt}$ = log of relative distance of country j in time t,
= log $[1/\Sigma_{jt}(GDP_{jt}/GDP_{wt})/DISTANCE_{ij}]$, where GDP_{wt} = world GDP in time t, γ_i = home country (i) fixed effects, γ_j = partner country (j) fixed effects, γ_{ij} = country pair fixed effects, δ_t = time fixed effects, ε_{ijt} = random disturbance term.

We will use this standard-type gravity equation to assess the differences (and similarities) between trade in services and trade in goods. That is, as the dependent variable we will use the bilateral trade in services and

[2] Data on *GDP*s are drawn from the World Bank's *World Bank Development Indicators* (WDI) database (http://www.worldbank.org/data).

[3] *DISTANCE* is measured as the great circle distance between the capitals of home countries and partner countries drawn from Vulcansoft Distance Calculator (http://www.vulcansoft.com/city97.html).

that in goods, respectively. One may claim that we need a different gravity equation framework for services trade because there are some important characteristics of services that clearly distinguish trade in services from trade in goods, but we have decided to put the standard gravity equation to the test for the following two reasons. First, as noted in the introduction of this paper, for the purpose of analysis of trade flows there is no reason in general to separate trade in goods from trade in services. Hence, in principle, any theory of international trade like the traditional Ricardian, Heckscher–Ohlin theory and the new trade theory emphasizing economies of scale and imperfect competition should cover both goods and services. Without doubt, the gravity model is not an exception.

Second, as stressed at the outset, there have been no direct attempts to compare the difference (and similarity) between services trade and goods trade, and hence the main concern is to assess the impact of various factors on bilateral services trade, relative to that on bilateral goods trade. Thus, by assuming that the specifications are the same, we can examine how the impact on trade for some of the variables differs. As a matter of fact, one may expect that the absolute and relative distance variables would have a greater impact on services trade than on goods trade as physical proximity between producer and consumer is very important for services trade, a point made by many researchers. One may also expect that *GPD* would have a greater impact on services trade than on goods trade because the share of service sector becomes bigger as the economy grows.

2.2 More on the Dependent Variable

As noted above, we use, as the dependent variable, the bilateral service exports and imports drawn from the recently published OECD statistics on international trade in services (OECD 2002). The OECD data on service exports and imports are broken down by partner country, for 26 OECD member countries, at varying levels of detail, for the years 1999 and 2000. It is worth noting that the data are on balance-of-payments basis, and thus cover mode 1 (cross-border supply) and mode 2 (consumption abroad) transactions, while they reflect only a small part of mode 3 (commercial presence) and mode 4 (presence of natural persons) transactions.[4,5]

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[4] See Table 1 in UN et al. (2002).

[5] This is another reason why we use the same specification for services trade while assuming that the parameters can be different across the two equations. That is, technology and

Among the 26 countries, we choose 10 countries which report data for a large number of partner countries, consistent for the two years.[6] We also delete some observations due to the availability of some explanatory variables for the partner countries.

As a result, the set of "home countries" includes 10 OECD member countries, while the set of "partner countries" is constituted by 47 OECD member and nonmember countries. Home countries, however, do not have among themselves the same sample of partner countries. In each year, we have a stacked matrix with 10 home countries, for which there are between 27 and 47 partner countries. This is why the total number of observations for each year is 397, which is smaller than 470 ($= 10 \times 47$). The Appendix presents the list of home countries and partner countries.

For the purpose of comparison, we also use, as the dependent variable, exports and imports of goods in place of exports and imports of services, covering the same set of country groups. The data on goods trade are taken from OECD (2003).

2.3 More on the Explanatory Variables

As discussed above, our gravity equation includes the *GDP*s (*PCGDP*s, *POPULATION*s), the geographic distance (*DISTANCE*), and the relative distance (*REMOTENESS*). We also augment the basic specification (equation 2) by including the following variables:

ADJACENCY

Like most other empirical studies of the gravity model, we include a dummy variable for the country pairs which share a land border.[7]

Regional Trade Arrangement (*RTA*)

One of the primary uses of gravity equations has been to evaluate the regional trade arrangements. We include a dummy variable which takes the value 1 if the two countries *i* and *j* are members of the same regional trade

production factors such as capital, labor, and natural resources are likely to have similar impacts in the case of mode 1 and mode 2 services transactions.

[6] Member countries were requested to submit data at the most detailed level possible of trading partners, but some member countries report data only for a small number of partner countries.

[7] Data for the land boundaries are from *The World Factbook, 2003*, Washington, D.C.: Central Intelligence Agency, 2003. This is available from http://www.bartleby.com/151/a37.html.

arrangement. In our sample, all OECD member countries except Japan are members of regional arrangements.

Economic Freedom of the World (*EFW*)

Grünfeld and Moxnes (2003) include in their regression the Trade Restrictiveness Index (TRI) developed by the Australian Productivity Commission in collaboration with the Australian National University. The TRI measures market regulations and protection for services in 34 different countries. One problem with the TRI is that it is measured for only six industries which represent a small portion of the total services sector. Another problem with the TRI is that it is not a tariff equivalent.

For these reasons, we use a different measure of restrictiveness which affects the whole economy (and hence both the services trade and goods trade). Since 1996, the Fraser Institute of Canada has published an Economic Freedom of the World (*EFW*) Index, which measures the degree of economic freedom present in five major areas: (1) size of government, (2) legal structure and security of property rights, (3) access to sound money, (4) freedom to trade internationally, (5) regulation of credit, labor, and business.[8] The publication of the index has inspired scholars to examine more closely the effect of economic freedom on economic growth, income equality, and quality of life, but there have been only few attempts to use the index in the gravity type model to examine the effect of economic freedom on international trade.

We include the *EFW* index in the right-hand side of the gravity equation to find out how the economic freedom of one country facilitates international trade in services and in goods (i.e., to find out how the economic restrictiveness of one country impedes trade in services and in goods).[9]

It should be noted that in general the higher the degree of economic freedom of one country, the higher the per capita income of the country. Therefore, without an adequate adjustment (control) of collinearity between the economic freedom index and per capita income one may suspect that any positive relationship between the economic freedom index and international trade is due to the positive relationship between per capita income and international trade. Therefore, in an alternative regression, we also use

[8] The *EFW* index is available from http://www.freetheworld.com/release.html.

[9] An increase in the economic freedom index of a country can be viewed as a general reduction of "regulatory barriers", which in turn increases competition.

an income adjusted Economic Freedom of the World (*EFWRESID*) index defined as the residual from a regression of the *EFW* index on the log of per capita income (*PCGDP*) and a constant.

LANGUAGE

The existence of a common language and a common culture, in addition to proximity, is also likely to lower search and transaction costs and hence boost bilateral trade. In order to incorporate such a linguistic tie, we include a dummy variable for the countries which use the same language.[10]

2.4 More on Empirical Specification

First, our empirical analysis is conducted using a panel data set during the period 1999–2000. Estimates are made with a year dummy included in the regression. Country dummies are not included, because this would create a multicollinearity problem. Country-pair dummies are not included, because our data cover only two years, and because some of our key explanatory variables are time-invariant. Thus, we assume that the three types of fixed effects, except the time fixed effects, are constrained to equal the constant. That is, we assume that $\alpha = \gamma_i + \gamma_j + \gamma_{ij}$, and thus our gravity equation is as follows:

$$\begin{aligned} TRADE_{ijt} = {} & \beta_1 GDP_{it} + \beta_2 GDP_{jt} + \beta_3 DISTANCE_{ij} \\ & + \beta_4 REMOTENESS_{it} + \beta_5 REMOTENESS_{jt} \\ & + \beta_6 ADJACENCY_{ij} + \beta_7 RTA_{ij} + \beta_8 EFW_{it} \\ & + \beta_9 EFW_{jt} + \beta_{10} LANGUAGE_{ij} + \alpha + \delta_t + \varepsilon_{ijt} , \end{aligned} \tag{3}$$

where $ADJACENCY_{ij}$ = dummy for the country pairs which share a land border,
RTA_{ij} = dummy for the countries which are the members of the same *RTA*,
EFW_{it} = Economic Freedom of the World Index for country i in time t,
EFW_{jt} = Economic Freedom of the World Index for country j in time t,

[10] Data for the usage of *LANGUAGE* are from *The World Factbook, 2003*, Washington, D.C.: Central Intelligence Agency, 2003. This is available from http://www.bartleby.com/151/a37.html.

$LANGUAGE_{ij}$ = dummy for the country pairs which use the same language,
α = constant,
δ_t = time dummy,
ε_{ijt} = random disturbance term.

In sum, we hypothesize that the coefficients of all explanatory variables, except the one for *DISTANCE* (β_3), are positive. Many authors also include *PCGDP* in a gravity equation like (3). The idea behind this appears to be that higher income countries trade more in general, because higher income countries may have superior transportation infrastructure and lower tariffs. However, there is a problem with including *PCGDP* along with *GDP* in the right-hand side of the equation, because *GDP* is the product of *PCGDP* and *POPULATION* and hence *GDP* and *PCGDP* are correlated with each other.

Therefore, in a different equation, we include *PCGDP* and *POPULATION* in place of *GDP*. There is also an advantage in estimating a separate equation which includes *PCGDP* and *POPULATION*. That is, it has been pointed out that there is a built-in accounting relationship between trade and *GDP* because exports and imports are part of *GDP*, and this inflates the R^2 of the regressions. This has led some studies to use *POPULATION* as an instrumental variable for *GDP*.

Note also that, because the OECD (2002) publication is the first release of the data on bilateral services trade and because the collection of services trade data is not as straightforward as that of goods trade data, one may claim that services trade data are not as reliable as goods trade data and this poor reliability in services trade data results in less precise estimates of the regression analysis. Therefore, in an attempt to reduce the noise of the data, we also consider a different specification which uses the two-year average of the data to run the ordinary least squares regression. In this way, we can avoid any undue noise effect that might result from using the single year data.

3 Estimation Results

3.1 Results

Tables 1 and 2 show the estimated gravity equation for the exports and imports of services, respectively.[11] Let us start with the results for export

[11] One may be tempted to estimate either one of the export or import equations. In fact, the coefficients should be equal if there is the same set of home and partner countries, but

of services presented in Table 1. The estimation results from the regression of the time fixed effects model are reported in columns (1)–(3), and those estimated by the ordinary least squares regression with the two-year average data are reported in columns (4)–(6). Let us first consider the results from estimating the fixed effects model. Column (2) is different from column (1) in that in place of the original *EFW* index, column (2) includes *EFWRESID*, the residuals from a regression of the *EFW* index on log of GDP per capita (*PCGDP*), the constant and a time dummy. Column (3) reports the results of the regression in which *GDP* is replaced by *POPULATION* and *PCGDP*.

All variables enter with the expected signs, which are statistically significant in most (if not all) equations. The estimated coefficients for *GDP*s are highly significant. When we compare the sizes of the coefficients, the home country *GDP* coefficient is larger than the partner country *GDP* coefficient. This is similar to the finding of Grünfeld and Moxnes (2003), who claim that there is a clear home market effect in service exports, but we do not come to such a conclusion until we consider the results for the service imports equation.

POPULATION and *PCGDP* of both the home and partner countries have positive coefficients which are highly significant. It is worth noting that the coefficients for *PCGDP* in both the exporting and importing countries are similar in size and highly significant. Thus rich countries not only export more services but also import more services. This is in contrast with Grünfeld and Moxnes (2003), who found no significant coefficient for the *PCGDP* in the importing country.

The distance variable has an estimated coefficient whose sign is negative and highly significant. The estimated coefficients for the relative distance variables for both the home and partner countries have also expected positive signs and are statistically significant. Thus, even in the case of services trade, without controlling for relative distance the gravity models are misspecified and may produce biased results.[12]

The coefficient for the land border dummy, *ADJACENCY*, is positive and significant at the 10 percent level in column (1). But the significance

in the present study we have differences in the numbers of home and partner countries. Therefore, it is necessary to estimate both equations so as to obtain more robust results.

[12] For example, when we estimate column (1) excluding the relative distance variables, the size of the exporting country *GDP* coefficient becomes greater, while that of the importing country *GDP* coefficient becomes smaller. The coefficients for *DISTANCE*, *ADJACENCY*, *RTA* and *EFW* for both countries become smaller, while the coefficient for *LANGUAGE* becomes greater, and the coefficient for *ADJACENCY* becomes insignificant.

Table 1: *The Determinants of Service Exports*

	Time fixed effects model			OLS with two-year average		
	(1)	(2)	(3)	(4)	(5)	(6)
GDP_i	0.811***	0.821***		0.810***	0.817***	
	(0.030)	(0.031)		(0.040)	(0.042)	
GDP_j	0.697***	0.760***		0.690***	0.757***	
	(0.023)	(0.024)		(0.031)	(0.033)	
$POPULATION_i$			0.820***			0.807***
			(0.035)			(0.049)
$POPULATION_j$			0.704***			0.700***
			(0.024)			(0.033)
$PCGDP_i$			0.695***			0.840**
			(0.242)			(0.347)
$PCGDP_j$			0.665***			0.637***
			(0.043)			(0.060)
DISTANCE	−0.691***	−0.626***	−0.693***	−0.691***	−0.627***	−0.691***
	(0.043)	(0.044)	(0.043)	(0.058)	(0.060)	(0.058)
$REMOTENESS_i$	0.081*	0.096*	0.088*	0.069	0.082	0.066
	(0.049)	(0.051)	(0.051)	(0.066)	(0.070)	(0.070)
$REMOTENESS_j$	0.287***	0.076	0.271***	0.288***	0.065	0.259***
	(0.062)	(0.064)	(0.065)	(0.084)	(0.088)	(0.089)
ADJACENCY	0.246*	0.227	0.242	0.260	0.240	0.257
	(0.149)	(0.156)	(0.149)	(0.202)	(0.212)	(0.202)
RTA	0.248**	0.565***	0.259**	0.221	0.542***	0.239
	(0.106)	(0.106)	(0.107)	(0.144)	(0.144)	(0.145)
EFW_i	0.590***		0.590***	0.304***		0.308***
	(0.074)		(0.074)	(0.051)		(0.052)
EFW_j	0.375***		0.407***	0.195***		0.221***
	(0.028)		(0.045)	(0.019)		(0.032)
$EFWRESID_i$		0.585***			0.302***	
		(0.077)			(0.053)	
$EFWRESID_j$		0.450***			0.244***	
		(0.047)			(0.033)	
LANGUAGE	0.421***	0.403***	0.396***	0.396***	0.365**	0.367**
	(0.110)	(0.117)	(0.113)	(0.149)	(0.160)	(0.154)
YEAR99	−0.406***	−0.038	−0.411***			
	(0.067)	(0.061)	(0.070)			
CONSTANT	−39.216***	−32.907***	−38.162***	−39.464***	−32.811***	−39.608***
	(1.158)	(1.114)	(2.304)	(1.591)	(1.524)	(3.310)
Number of observations	794	794	794	397	397	397
Adjusted R^2	0.814	0.796	0.814	0.825	0.807	0.825

Note: For columns (1), (2), and (3), estimates are made with time fixed effects model. For columns (4), (5), and (6), estimates are made by ordinary least squares regression with two-year averages of the data. All variables are in logarithms, except the economic freedom indices (such as *EFW* and *EFWRES*) and the binary variables (such as *ADJACENCY*, *RTA*, and *LANGUAGE*). Standard errors are shown in parentheses. ***, **, and * denote 1, 5, and 10 percent level of significance, respectively, for a two-tailed test.

Table 2: *The Determinants of Service Imports*

	Time fixed effects model			OLS with two-year average		
	(1)	(2)	(3)	(4)	(5)	(6)
GDP_i	0.759***	0.799***		0.792***	0.794***	
	(0.030)	(0.039)		(0.040)	(0.042)	
GDP_j	0.708***	0.780***		0.705***	0.781***	
	(0.023)	(0.024)		(0.031)	(0.033)	
$POPULATION_i$			0.790***			0.778***
			(0.035)			(0.048)
$POPULATION_j$			0.726***			0.727***
			(0.024)			(0.033)
$PCGDP_i$			0.855**			0.961***
			(0.242)			(0.346)
$PCGDP_j$			0.610***			0.588***
			(0.043)			(0.060)
DISTANCE	−0.666***	−0.604***	−0.666***	−0.665***	−0.605***	−0.664***
	(0.043)	(0.044)	(0.043)	(0.058)	(0.059)	(0.058)
$REMOTENESS_i$	0.161***	0.170***	0.156***	0.149**	0.156**	0.136*
	(0.049)	(0.051)	(0.051)	(0.066)	(0.069)	(0.070)
$REMOTENESS_j$	0.175***	−0.065	0.119*	0.173**	−0.075	0.106
	(0.062)	(0.064)	(0.065)	(0.084)	(0.087)	(0.088)
ADJACENCY	0.140	0.118	0.135	0.145	0.123	0.141
	(0.149)	(0.155)	(0.149)	(0.202)	(0.210)	(0.201)
RTA	0.310***	0.638***	0.348***	0.284**	0.611***	0.326**
	(0.106)	(0.105)	(0.107)	(0.144)	(0.143)	(0.144)
EFW_i	0.220***		0.232***	0.113**		0.123**
	(0.074)		(0.074)	(0.051)		(0.052)
EFW_j	0.409***		0.501***	0.209***		0.266***
	(0.028)		(0.045)	(0.019)		(0.032)
$EFWRESID_i$		0.222***			0.115**	
		(0.076)			(0.053)	
$EFWRESID_j$		0.543***			0.289***	
		(0.047)			(0.033)	
LANGUAGE	0.417***	0.367***	0.366***	0.407***	0.341**	0.348**
	(0.110)	(0.117)	(0.113)	(0.149)	(0.159)	(0.153)
YEAR99	−0.256***	−0.037	−0.295***			
	(0.067)	(0.060)	(0.070)			
CONSTANT	−36.352***	−32.445***	−36.550***	−36.430***	−32.472***	−37.610***
	(1.162)	(1.109)	(2.304)	(1.593)	(1.509)	(3.295)
Number of observations	794	794	794	397	397	397
Adjusted R^2	0.816	0.801	0.817	0.828	0.813	0.829

Note: For columns (1), (2), and (3), estimates are made with time fixed effects model. For columns (4), (5), and (6), estimates are made by ordinary least squares regression with two-year averages of the data. All variables are in logarithms, except the economic freedom indices (such as *EFW* and *EFWRES*) and the binary variables (such as *ADJACENCY*, *RTA*, and *LANGUAGE*). Standard errors are shown in parentheses. ***, **, and * denote 1, 5, and 10 percent level of significance, respectively, for a two-tailed test.

disappears in columns (2) and (3). Thus it appears that the existence of the land border has only a minor impact on the flows of traded services.

The coefficient for common membership in a *RTA* is positive and significant at least at the five percent level in the three columns. Thus, we have reason to claim that the *RTA*s have a significant impact on service exports of OECD member countries. This is in contrast with Grünfeld and Moxnes (2003), who found no significant coefficient for the common *RTA* membership. One reason may be due to the fact that services trade and goods trade are complements in many ways. For instance, an increase in goods trade due to a *RTA* could lead to an increase in transports to ship those goods and in retail to sell those goods abroad.[13]

The economic freedom index variables for both the home and partner countries have positive coefficients which are significant at the 1 percent level. Even when we replace the original *EFW* indices with the income-adjusted indices in column (2), they continue to have positive coefficients, significant at the 1 percent level. Thus we have strong evidence that economic freedom has a strong positive impact upon the flows of trade services (i.e., both exports and imports) whichever measure of economic freedom is used. The strong positive relationship between economic freedom and services trade implies that the countries with a greater degree of economic freedom not only export more services but also import more services. In other words, the countries with greater economic restrictiveness not only import less services but also export less services. It should be noted that the coefficients for the economic freedom indices are larger for the home countries (i.e., the exporting countries) than for the partner countries (i.e., the importing countries). Thus, economic freedom has greater impact on service exports than on service imports.

The common *LANGUAGE* dummy variable has a positive coefficient, significant at the 1 percent level, in all equations. More precisely, service exports are about 50 percent larger between countries using the same language, ceteris paribus.[14]

Columns (4)–(6) in Table 1 report the results estimated by ordinary least squares regression using the two-year averages of the data. In general, the results are very similar to the ones estimated with the time fixed effects

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[13] We are grateful to acknowledge that this is a point made by the referee of this journal.
[14] $100 \times [\exp(0.421) - 1.0] = 52.3$ percent; $100 \times [\exp(0.403) - 1.0] = 49.6$ percent; $100 \times [\exp(0.396) - 1.0] = 48.6$ percent.

model, but some differences are noticeable. First, the coefficients for the relative distance variables are no longer statistically significant, except the one for the partner country, in columns (4) and (6). The coefficients for the dummy variable for the common land border are no longer significant in any of the three columns, even though they still have expected signs. The dummy variable for the membership of the same regional trade arrangement has an insignificant coefficient in columns (4) and (6), while it continues to have a significant coefficient in column (5).

Table 2 reports the results for service imports. Let us first consider the results based on our fixed effects model in columns (1)–(3). The estimated coefficients for all variables have expected signs and are statistically significant. One exception is the dummy variable for the common land border, whose coefficient is not significant in either of the two equations. There are several points to make. First, the elasticity of the home country *GDP* (i.e., importing country) is greater than for the partner country (i.e., the exporting country *GDP*). That is, we find opposite evidence of home market effect in the import equations. Thus, considering the results for both exports and imports of services, we come to conclude that the home market effect is not evident for services trade in our sample. Second, the sizes of the coefficients for economic freedom indices are larger for the exporting countries (i.e., partner countries) than for the importing countries (i.e., OECD member countries). Thus, economic freedom has greater impact on service exports than on service imports. This is also a result that we found for the service export equations. Third, the sizes of the coefficients for geographical distance and the language dummy are similar in both export and import equations.

Columns (4)–(6) in Table 2 report the results estimated by ordinary least squares regressions using the two-year averages of the data. The results are roughly the same as the ones estimated with the time fixed effects model.

3.2 A Comparison with Trade in Goods

As discussed in the introduction, one of the main purposes of this paper is to compare the similarities (and differences) between bilateral services trade and goods trade in terms of their determinants. In order to accomplish this purpose, we also estimate our gravity equation with exports of goods and imports of goods as dependent variables in place of service exports and service imports, respectively, using the same group of countries. Tables 3 and 4 report the results for the exports of goods and imports of goods, respectively. As expected, there are both similarities and differences.

Table 3: *The Determinants of Goods Exports*

	Time fixed effects model			OLS with two-year average		
	(1)	(2)	(3)	(4)	(5)	(6)
GDP_i	0.950***	0.949***		0.947***	0.946***	
	(0.039)	(0.039)		(0.055)	(0.055)	
GDP_j	0.696***	0.758***		0.695***	0.761***	
	(0.030)	(0.030)		(0.043)	(0.043)	
$POPULATION_i$			0.930***			0.922***
			(0.046)			(0.066)
$POPULATION_j$			0.734***			0.737***
			(0.032)			(0.045)
$PCGDP_i$			1.184***			1.258***
			(0.315)			(0.470)
$PCGDP_j$			0.494***			0.469***
			(0.056)			(0.081)
DISTANCE	−0.510***	−0.484***	−0.507***	−0.514***	−0.491***	−0.512***
	(0.056)	(0.055)	(0.056)	(0.079)	(0.077)	(0.079)
$REMOTENESS_i$	−0.059	−0.058	−0.076***	0.057	−0.057	−0.081
	(0.064)	(0.064)	(0.067)	(0.091)	(0.090)	(0.095)
$REMOTENESS_j$	0.306***	0.115	0.189**	0.310***	0.109	0.180
	(0.082)	(0.080)	(0.085)	(0.115)	(0.113)	(0.120)
ADJACENCY	0.562***	0.542***	0.552***	0.561**	0.540**	0.552**
	(0.196)	(0.194)	(0.194)	(0.276)	(0.274)	(0.273)
RTA	0.278**	0.478***	0.357**	0.265	0.462**	0.345*
	(0.139)	(0.132)	(0.139)	(0.197)	(0.186)	(0.196)
EFW_i	−0.066		−0.038	−0.029		−0.010
	(0.097)		(0.097)	(0.070)		(0.070)
EFW_j	0.296**		0.488***	0.153***		0.264***
	(0.037)		(0.059)	(0.027)		(0.043)
$EFWRESID_i$		−0.050			−0.019	
		(0.096)			(0.069)	
$EFWRESID_j$		0.507***			0.274***	
		(0.059)			(0.043)	
LANGUAGE	0.051	−0.058	−0.048	0.041	−0.088	0.073
	(0.145)	(0.146)	(0.147)	(0.204)	(0.207)	(0.208)
YEAR99	−0.164*	−0.102	−0.252***			
	(0.088)	(0.076)	(0.091)			
CONSTANT	−29.720***	−28.368***	−31.032***	−30.102***	−28.766***	−32.236***
	(1.523)	(1.389)	(2.998)	(2.179)	(1.966)	(4.476)
Number of observations	794	794	794	397	397	397
Adjusted R^2	0.695	0.699	0.702	0.695	0.701	0.702

Note: For columns (1), (2), and (3), estimates are made with time fixed effects model. For columns (4), (5), and (6), estimates are made by ordinary least squares regression with two-year averages of the data. All variables are in logarithms, except the economic freedom indices (such as *EFW* and *EFWRES*) and the binary variables (such as *ADJACENCY*, *RTA*, and *LANGUAGE*). Standard errors are shown in parentheses. ***, **, and * denote 1, 5, and 10 percent level of significance, respectively, for a two-tailed test.

Table 4: *The Determinants of Goods Imports*

	Time fixed effects model			OLS with two-year average		
	(1)	(2)	(3)	(4)	(5)	(6)
GDP_i	0.821***	0.826***		0.822***	0.825***	
	(0.042)	(0.041)		(0.059)	(0.058)	
GDP_j	0.668***	0.726***		0.668***	0.729***	
	(0.033)	(0.032)		(0.046)	(0.046)	
$POPULATION_i$			0.778***			0.769***
			(0.049)			(0.070)
$POPULATION_j$			0.715***			0.718***
			(0.033)			(0.048)
$PCGDP_i$			1.335***			1.477***
			(0.335)			(0.502)
$PCGDP_j$			0.409***			0.386***
			(0.060)			(0.086)
DISTANCE	−0.450***	−0.442***	−0.442***	−0.453***	−0.449***	−0.446***
	(0.060)	(0.058)	(0.059)	(0.085)	(0.082)	(0.084)
$REMOTENESS_i$	−0.040	−0.037	−0.076	−0.046	−0.045	−0.094
	(0.069)	(0.067)	(0.071)	(0.098)	(0.096)	(0.101)
$REMOTENESS_j$	0.159*	−0.013	0.005	0.162	−0.018	−0.004
	(0.087)	(0.085)	(0.091)	(0.124)	(0.120)	(0.128)
ADJACENCY	0.757***	0.734***	0.747***	0.757**	0.733**	0.750**
	(0.209)	(0.206)	(0.206)	(0.297)	(0.292)	(0.292)
RTA	0.247*	0.390***	0.351**	0.234	0.372*	0.337
	(0.149)	(0.140)	(0.148)	(0.212)	(0.198)	(0.210)
EFW_i	0.293***		0.334***	0.156**		0.185**
	(0.104)		(0.103)	(0.075)		(0.075)
EFW_j	0.250***		0.493***	0.128***		0.264***
	(0.040)		(0.062)	(0.029)		(0.046)
$EFWRESID_i$		0.306***			0.166**	
		(0.102)			(0.074)	
$EFWRESID_j$		0.505***			0.271***	
		(0.062)			(0.046)	
LANGUAGE	0.191	0.047	0.078	0.186	0.021	0.059
	(0.155)	(0.155)	(0.156)	(0.220)	(0.221)	(0.222)
YEAR99	−0.310***	−0.109	−0.436***			
	(0.094)	(0.080)	(0.096)			
CONSTANT	−27.124***	−23.410**	−30.580***	−27.693***	−23.780***	−32.604***
	(1.629)	(1.472)	(3.185)	(2.343)	(2.095)	(4.780)
Number of observations	794	794	794	397	397	397
Adjusted R^2	0.640	0.651	0.652	0.637	0.650	0.650

Note: For columns (1), (2), and (3), estimates are made with time fixed effects model. For columns (4), (5), and (6), estimates are made by ordinary least squares regression with two-year averages of the data. All variables are in logarithms, except the economic freedom indices (such as *EFW* and *EFWRES*) and the binary variables (such as *ADJACENCY*, *RTA*, and *LANGUAGE*). Standard errors are shown in parentheses. ***, **, and * denote 1, 5, and 10 percent level of significance, respectively, for a two-tailed test.

It should be stressed that the focus of this paper is on the study of bilateral services trade, while the analysis on goods exports is used as a comparative tool. Therefore, instead of going over all details of the results for the goods trade, we present in Table 5 a summary of estimated coefficients of the key variables for both services trade and goods trade and the range of R^2, drawn from Tables 1–4.

Table 5: *Summary of Estimated Coefficients for Different Types of Transactions*

	Exports			Imports		
	Service (1)		Goods (2)	Service (3)		Goods (4)
GDP_i	0.811***	$<^{***}$	0.950***	0.759***		0.821***
GDP_j	0.697***		0.696***	0.708***		0.668***
$POPULATION_i$	0.820***	$<^{**}$	0.930***	0.790***		0.778***
$POPULATION_j$	0.704***		0.734***	0.726***		0.715***
$PCGDP_i$	0.695***	$<^{*}$	1.184***	0.855**		1.335***
$PCGDP_j$	0.665***	$>^{***}$	0.494***	0.610***	$>^{***}$	0.409***
DISTANCE	−0.691***	$>^{***}$	−0.510***	−0.666***	$>^{***}$	−0.450***
$REMOTENESS_i$	0.081*	$>^{**}$	−0.059	0.161***	$>^{***}$	−0.040
$REMOTENESS_j$	0.287***		0.306***	0.175***		0.159*
ADJACENCY	0.246*	$<^{*}$	0.562***	0.140	$<^{***}$	0.757***
RTA	0.248**		0.278**	0.310***		0.247*
EFW_i	0.590***	$>^{***}$	−0.066	0.220***		0.293***
EFW_j	0.375***		0.296**	0.409***	$>^{***}$	0.250***
LANGUAGE	0.421***	$>^{***}$	0.051	0.417***		0.191
Range of Adjusted R^2	0.796 ∼ 0.825		0.695 ∼ 0.702	0.801 ∼ 0.829		0.637 ∼ 0.652

Note: All estimates are drawn from column (1) of Tables 1–4, except for the estimates of $POPULATION_i$, $POPULATION_j$, $PCGDP_i$, $PCGDP_j$, which are drawn from column (3) of Tables 1–4. ***, **, and * denote 1, 5, and 10 percent level of significance, respectively, for a two-tailed test. $>^{***}$, $>^{**}$, $>^{*}$ ($<^{***}$, $<^{**}$, $<^{*}$) denote that the equality of the coefficients can be rejected by a Chi^2 test at the 1, 5, and 10 percent level of significance, respectively. Range of Adjusted R^2 is the minimum and maximum values of Adjusted R^2 obtained for the six different regression equations for each type of transaction.

There are a number of noticeable points. Most of all, the values of adjusted R^2 obtained for the exports of services are 0.796 ∼ 0.825, which are greater than the values of 0.695 ∼ 0.702 for the exports of goods. This finding is also apparent in the import equations: the values of adjusted R^2 for service imports are 0.801 ∼ 0.829, while those for goods exports

are 0.637 ∼ 0.652. Thus, we have evidence to claim that the gravity model performs better with international trade in services than with trade in goods.

There are also several differences between services trade and goods trade, with respect to the elasticities of the explanatory variables.[15] When we compare the results for the exports of services (column 1) with the results for the exports of goods (column 2), we observe that *GDP*, *POPULATION* and *PCGDP* of home country have a greater impact on the exports of goods than on the exports of services, but this pattern is not so evident in the import equations. We also do not find a consistent pattern of these variables for the partner countries.

Geographical distance is consistently more important for services trade (exports and imports) than for goods trade, at the 1 percent level of significance. One may conjecture that this finding is in line with the common perception that physical proximity between producer and consumer is very important for services trade and hence distance should have a greater dampening effect on services trade than on goods trade. However, it is worth noting that the services data that we are dealing with in this study are not such services as haircuts, but "tradable services" like transport, tourism, etc.[16] This result may indicate that the cost of transport for tradable services is also "in general" higher than that for goods, but it should be stressed that some services like communication, financial intermediation and business services are expected to involve lower transport costs. Therefore, there is a need for further investigation using the disaggregate services trade data to find out how and why different services behave differently with respect to distance.

Distance is correlated not only with transport costs but also with communication costs, cultural differences, etc. Common border and common language are also correlated with communication costs and cultural differences. Therefore one may expect that such variables as common land border and common language would also have a greater impact on services trade than on goods trade, but the results are mixed. The size of coefficient for the common land border is smaller in services trade than in goods trade, and is insignificant in the equation for service imports (column 3). On the other hand, the common language dummy is significant only in the case of service exports.

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[15] In order to assess whether the coefficients are significantly equal, we ran Chi^2 tests. In Table 5, $>^{***}$, $>^{**}$, $>^{*}$ ($<^{***}$, $<^{**}$, $<^{*}$) denote that the equality of the coefficients can be rejected by a Chi^2 test at the 1, 5, and 10 percent level of significance, respectively.

[16] We are grateful to acknowledge that we owe this discussion to Daniel Mirza.

The relative distance of partner countries has a significant impact on both services trade and goods trade, while that of home countries does not have such an impact on goods exports. Thus, trade in services as well as trade in goods will be greater between country pairs that are far from the rest of the world than between country pairs that are close to the rest of the world.

Also shown in Table 5 is that membership in the same regional trade arrangement has a significant impact on both services trade and goods trade, and we cannot reject the equality of the coefficients for the common regional trade arrangement in both equations. As noted above, this finding is at odds with Grünfeld and Moxnes (2003), who find no relationship between common RTA membership and service exports and suggest that this may reflect that many regional trade arrangements do not emphasize the liberalization of services trade. In fact, in the case of exports, the coefficient for the common *RTA* dummy is greater in service imports than in goods imports. Thus, the results suggest that even though many of the regional trade arrangements to date fail to include services explicitly, they certainly facilitate services trade at least as much as they facilitate goods trade.

Finally, economic freedom of partner countries has greater impact on services trade (exports and imports) than on goods trade. Economic freedom of home countries also has a highly significant impact on service exports but not on the exports of goods.[17] This implies that as countries move toward economic liberalization, services trade will grow faster than goods trade, and hence services trade will play an even more important role in the global economy.[18]

3.3 More on the Comparison between Services Trade and Goods Trade

Grünfeld and Moxnes (2003) also investigate whether service exports and foreign affiliate sales are complements or substitutes. Following Graham

[17] An exception is in import equations where the size of the coefficient for the economic freedom variable of home country is slightly smaller than that of partner country, but the size difference is not so large and our Chi^2 test cannot reject the equality of the coefficients.

[18] OECD service exports in 2002 accounted for 21.9 percent of total exports of goods, and service imports accounted for 20.5 percent of total goods and service imports. The relatively minor role for services in international trade is in contrast to the contribution of services in the domestic economies of members, where the proportion of total value-added contributed by services is around 70 percent.

(1996), they obtain the residuals of service exports and foreign affiliate sales from the regression of their models, and regress the residual of foreign affiliate sales on the residual of service exports.[19] The presumption is that the gravity equations have removed the influence of common factors, and hence the residual correlation may show other causal relationships between exports and foreign affiliate sales. Thus, they test whether the unexplained variation in foreign affiliate sales is accompanied by an unexplained variation in service exports. They find a positive sign for the coefficient of the residual of service exports and thus the relationship is complementary.

We follow this approach to investigate the relationship between services trade and goods trade. We first obtain the residuals of service exports, service imports, goods exports, and goods imports from regressing the benchmark equations of the fixed effects model (column (1) in Tables 1–4). We then regress the residual of service exports against the residuals of service imports, goods exports, and goods imports. For the purpose of comparison, we also regress the residual of goods exports against the residuals of service exports, service imports, and goods imports. The novelty here is that by incorporating the residuals of different types and directions of trade flows in the same regression equation, we look at the relationship of service exports not only with goods exports, but also with service imports and goods imports. The results are presented in Table 6.

For the purpose of robustness check, we repeat the same procedure using the residuals from estimating the other regression models. The results are very similar. For the sake of brevity, we only present the results with the residuals from ordinary least squares regressions with two-year average data (column (4) in Tables 1–4).

Let us first consider the results for service exports. As shown in columns (1) and (2) unexplained variation in service exports is very closely associated with unexplained variation in service imports. This implies that service exports and service imports are complements. However, service exports are not accompanied by unexplained variations either in goods exports or goods imports.

When we consider the results for goods exports, the story is a bit different. That is, unexplained variation in goods exports is accompanied not only by

[19] There are some other studies of this kind. For example, Di Mauro (2000) uses the Graham (1996) approach to look at the relationship between goods exports and foreign direct investment.

Table 6: *Service Exports vs. Goods Exports—Complementarity Test*

	Service exports residual		Goods exports residual	
	Residual from time fixed effects model (1)	Residual from OLS with two-year average (2)	Residual from time fixed effects model (3)	Residual from OLS with two-year average (4)
Service exports residual			0.006 (0.052)	−0.024 (0.078)
Service imports residual	0.663*** (0.028)	0.689*** (0.040)	0.220*** (0.053)	0.262*** (0.081)
Goods exports residual	0.003 (0.025)	−0.010 (0.033)		
Goods imports residual	0.026 (0.023)	0.024 (0.031)	0.471*** (0.029)	0.466*** (0.041)
Number of observations	794	397	794	397
Adjusted R^2	0.462	0.485	0.344	0.347

Note: Standard errors are shown in parentheses. ***, **, and * denote 1, 5, and 10 percent level of significance, respectively, for a two-tailed test.

unexplained variation in goods imports, but also by unexplained variation in service imports. This implies that if a home country *i* exports more goods than the normal value (i.e., the predicted value) to a partner country *j*, it not only imports more goods than the normal value from country *j* but also imports more services than normal from country *j*.

This result provides an interesting insight into the nature of the relation between services trade and goods trade. That is, this result may reflect the existence of trade in factor services which helps increase the exports of goods. A good example is transport service, which is by far one of the most important traded services. Other possible factors would be financial services (e.g., using services of foreign banks), consultancy services (e.g., obtaining advice from foreign consultants), and licensing fees (e.g., using foreign technology).

It should be stressed here, however, that our interpretation should be treated with caution, because we have examined the complementarity rela-

tionship only at the aggregate level. The OECD data set does not provide information on the type of services traded among country pairs, covering only aggregate values of bilateral trade in services. However, because the idiosyncratic nature of each traded service should have different policy implications, future research at sectoral level is necessary, subject to the availability of the data.

3.4 Robustness of the Results

One may worry about not accounting for the country fixed effects in the regression results reported above, but as noted above, including country dummies for both home and partner countries would incur a multicollinearity problem. Therefore, we express the variables that entered for both home and partner countries as the sum of the two values, and re-estimate the gravity equation including the home country dummies. Thus, our gravity equation becomes as follows:

$$\begin{aligned} TRADE_{ijt} = {} & \beta_1 TGDP_{ijt} + \beta_2 DISTANCE_{ij} \\ & + \beta_3 REMOTENESS_{ijt} + \beta_4 ADJACENCY_{ij} \\ & + \beta_5 RTA_{ij} + \beta_6 EFW_{ijt} + \beta_7 LANGUAGE_{ij} \\ & + \alpha + \gamma_i + \delta_t + \varepsilon_{ijt}\,, \end{aligned} \tag{4}$$

where $TGDP_{ijt} = GDP_{it} + GDP_{jt}$,
$TREMOTENESS_{ijt} = REMOTENESS_{it} + REMOTENESS_{jt}$,
$TEFW_{ijt} = EFW_{it} + EFW_{jt}$,
$\alpha =$ constant,
$\gamma_i =$ home country (i) fixed effects,
$\delta_t =$ time fixed effects,
$\varepsilon_{ijt} =$ random disturbance term.

An advantage of this approach is that we can take account of the home country fixed effects, and a disadvantage is that we cannot estimate separately the coefficients for the home country and the partner country. We apply this approach to see whether our previous results are robust to the different specifications. The estimated results are reported in the Appendix Tables A1–A4. As can be seen in the tables, adding the home country fixed effects does not change the qualitative results that we found above.[20]

[20] We also ran random effect regressions and found similar results. The results are available upon request.

4 Concluding Remarks

The main purpose of this paper has been to analyze the determinants of bilateral services trade as compared to those of bilateral goods trade. Using the standard gravity model, we ran regressions on bilateral services trade and goods trade from 10 OECD member countries to other OECD member and nonmember countries covering the years 1999 and 2000.

We summarize some of the key findings. First of all, the values of adjusted R^2 obtained for services trade (exports and imports) are greater than those for goods trade. This result implies that the gravity equation performs better with international trade in services than with trade in goods.

Also, there are some differences between services trade and goods trade with regard to the elasticities of the explanatory variables. Geographical distance is consistently more important for services trade (exports and imports) than for goods trade. This result may indicate that the cost of transport for tradable services is "in general" higher than that for goods. However, there is a need for further investigation using the disaggregate services trade data to find out why geographical distance is more important for the flows of traded services than for goods trade.

We found that the common land border dummy variable exerts a significant positive impact on bilateral goods trade, whereas the effect on bilateral services trade is much weaker. We also found that common membership in the same regional trade arrangement has a significant impact on both services trade and goods trade. The results suggest that even though many of the regional trade arrangements to date fail to include services explicitly, they facilitate services trade at least as much as goods trade.

Another interesting result concerns the impact of economic freedom on services trade. In our application, both goods trade and services trade are positively affected by economic freedom, but the effect is much stronger for services trade. This implies that as countries move toward economic liberalization, services trade will grow faster than goods trade and, hence, services trade will play an even more important role in the global economy.

Lastly, we have shown that while unexplained variation in service exports is not accompanied by unexplained variation in goods trade (either in goods exports or in goods imports), unexplained variation in goods exports is accompanied by unexplained variation in service imports. This result may reflect the existence of trade in factor services which helps increase the exports of goods.

Appendix

Home countries (10 countries)
Australia (26), Austria (26), Belgium-Luxembourg (45), Canada (44), France (42), Germany (47), Japan (27), the Netherlands (45), the United Kingdom (46), the United States (30).
Note: Home countries do not have among themselves the same sample of partner countries. Shown in parentheses is the number of partner countries

Partner countries (47 countries at the maximum)
Argentina, Australia, Austria, Belgium-Luxembourg, Brazil, Bulgaria, Canada, Chile, China, Colombia, Denmark, Egypt, Finland, France, Germany, Greece, Hong Kong, Hungary, Iceland, India, Indonesia, Iran, Ireland, Israel, Italy, Japan, Korea, Malaysia, Mexico, the Netherlands, New Zealand, Nigeria, Norway, Pakistan, the Philippines, Poland, Portugal, Russia, Singapore, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, the United Kingdom, the United States.

Table A1: *The Determinants of Service Exports—Estimation with Home Country Fixed Effects*

	Time fixed effects model			OLS with two-year average		
	(1)	(2)	(3)	(4)	(5)	(6)
GDP	0.701*** (0.022)	0.762*** (0.024)		0.695*** (0.030)	0.759*** (0.032)	
POPULATION			0.706*** (0.023)			0.704*** (0.032)
PCGDP			0.676*** (0.042)			0.647** (0.058)
DISTANCE	−0.641*** (0.042)	−0.576*** (0.044)	−0.642*** (0.042)	−0.641*** (0.058)	−0.578*** (0.060)	−0.643*** (0.058)
REMOTENESS	0.219*** (0.061)	0.013 (0.063)	0.205*** (0.064)	0.218*** (0.083)	0.001 (0.087)	0.192** (0.087)
ADJACENCY	0.244* (0.145)	0.227 (0.156)	0.242* (0.145)	0.250 (0.197)	0.232 (0.207)	0.246 (0.197)
RTA	0.219** (0.103)	0.528*** (0.103)	0.228** (0.104)	0.190 (0.140)	0.503*** (0.140)	0.206 (0.141)
EFW	0.365*** (0.027)		0.389*** (0.043)	0.190*** (0.019)		0.214*** (0.031)
EFWRESID		0.431*** (0.045)			0.237*** (0.032)	
LANGUAGE	0.497*** (0.108)	0.489*** (0.116)	0.482*** (0.110)	0.482*** (0.147)	0.457*** (0.159)	0.452*** (0.150)
YEAR99	−0.296*** (0.059)	−0.041 (0.059)	−0.314*** (0.064)			
CONSTANT	−35.088*** (1.677)	−29.797*** (1.710)	−34.905*** (1.697)	−35.068*** (2.245)	−29.801*** (2.295)	−34.810*** (2.261)
Number of observations	794	794	794	397	397	397
Adjusted R^2	0.827	0.809	0.827	0.836	0.818	0.836

Note: For columns (1), (2), and (3), estimates are made with time and home country fixed effects model. For columns (4), (5), and (6), estimates are made with home country fixed effects model using the two-year averages of the data. The coefficients for the home country dummies are not shown, for brevity. All variables are in logarithms, except the economic freedom indices (such as *EFW* and *EFWRES*) and the binary variables (such as *ADJACENCY*, *RTA*, and *LANGUAGE*). Standard errors are shown in parentheses. ***, **, and * denote 1, 5, and 10 percent level of significance, respectively, for a two-tailed test.

Table A2: *The Determinants of Service Imports—Estimation with Home Country Fixed Effects*

	Time fixed effects model			OLS with two-year average		
	(1)	(2)	(3)	(4)	(5)	(6)
GDP	0.708***	0.778***		0.706***	0.779***	
	(0.023)	(0.024)		(0.030)	(0.032)	
POPULATION			0.724***			0.726***
			(0.023)			(0.032)
PCGDP			0.626***			0.602***
			(0.042)			(0.058)
DISTANCE	−0.624***	−0.562***	−0.625***	−0.624***	−0.565***	−0.627***
	(0.043)	(0.044)	(0.042)	(0.058)	(0.059)	(0.057)
REMOTENESS	0.127***	−0.103	0.082	0.125	0.114**	0.070
	(0.062)	(0.063)	(0.064)	(0.083)	(0.086)	(0.087)
ADJACENCY	0.126	0.106	0.120	0.129	0.108	0.122
	(0.146)	(0.152)	(0.145)	(0.197)	(0.206)	(0.196)
RTA	0.331***	0.652***	0.362***	0.303**	0.622***	0.338**
	(0.103)	(0.103)	(0.104)	(0.140)	(0.139)	(0.140)
EFW	0.397***		0.475***	0.204***		0.255***
	(0.027)		(0.044)	(0.019)		(0.031)
EFWRESID		0.517***			0.278***	
		(0.045)			(0.032)	
LANGUAGE	0.535***	0.493***	0.486***	0.527***	0.468***	0.462***
	(0.109)	(0.116)	(0.111)	(0.147)	(0.157)	(0.150)
YEAR99	−0.327***	−0.050	−0.385***			
	(0.060)	(0.059)	(0.065)			
CONSTANT	−35.044***	−29.291***	−34.446***	−35.335***	−29.711***	−34.778***
	(1.688)	(1.710)	(1.703)	(2.247)	(2.278)	(2.253)
Number of observations	794	794	794	397	397	397
Adjusted R^2	0.828	0.813	0.829	0.839	0.824	0.840

Note: For columns (1), (2), and (3), estimates are made with time and home country fixed effects model. For columns (4), (5), and (6), estimates are made with home country fixed effects model using the two-year averages of the data. The coefficients for the home country dummies are not shown, for brevity. All variables are in logarithms, except the economic freedom indices (such as *EFW* and *EFWRES*) and the binary variables (such as *ADJACENCY*, *RTA*, and *LANGUAGE*). Standard errors are shown in parentheses. ***, **, and * denote 1, 5, and 10 percent level of significance, respectively, for a two-tailed test.

Table A3: *The Determinants of Goods Exports—Estimation with Home Country Fixed Effects*

	Time fixed effects model			OLS with two-year average		
	(1)	(2)	(3)	(4)	(5)	(6)
GDP	0.692***	0.749***		0.692***	0.753***	
	(0.028)	(0.028)		(0.039)	(0.039)	
POPULATION			0.727***			0.732***
			(0.029)			(0.040)
PCGDP			0.508***			0.480***
			(0.051)			(0.073)
DISTANCE	−0.498***	−0.475***	−0.501***	−0.502***	−0.484***	−0.508***
	(0.052)	(0.051)	(0.052)	(0.074)	(0.072)	(0.073)
REMOTENESS	0.287***	0.113	0.187**	0.290***	0.106	0.178
	(0.076)	(0.074)	(0.078)	(0.107)	(0.105)	(0.111)
ADJACENCY	0.534***	0.515***	0.521***	0.532**	0.511**	0.516**
	(0.179)	(0.178)	(0.177)	(0.253)	(0.250)	(0.249)
RTA	0.286**	0.472***	0.356***	0.270	0.454***	0.342*
	(0.127)	(0.120)	(0.126)	(0.180)	(0.170)	(0.179)
EFW	0.276***		0.453***	0.144***		0.249***
	(0.034)		(0.053)	(0.024)		(0.039)
EFWRESID		0.469***			0.258***	
		(0.053)			(0.039)	
LANGUAGE	0.164	0.057	0.054	0.155	0.025	0.023
	(0.134)	(0.135)	(0.135)	(0.190)	(0.192)	(0.191)
YEAR99	−0.277***	−0.085	−0.407***			
	(0.073)	(0.069)	(0.079)			
CONSTANT	−27.766***	−23.779***	−26.415***	−27.932***	−24.031***	−26.797***
	(2.071)	(1.998)	(2.072)	(2.889)	(2.774)	(2.870)
Number of observations	794	794	794	397	397	397
Adjusted R^2	0.750	0.753	0.755	0.748	0.753	0.755

Note: For columns (1), (2), and (3), estimates are made with time and home country fixed effects model. For columns (4), (5), and (6), estimates are made with home country fixed effects model using the two-year averages of the data. The coefficients for the home country dummies are not shown, for brevity. All variables are in logarithms, except the economic freedom indices (such as *EFW* and *EFWRES*) and the binary variables (such as *ADJACENCY*, *RTA*, and *LANGUAGE*). Standard errors are shown in parentheses. ***, **, and * denote 1, 5, and 10 percent level of significance, respectively, for a two-tailed test.

Table A4: *The Determinants of Goods Imports—Estimation with Home Country Fixed Effects*

	Time fixed effects model			OLS with two-year average		
	(1)	(2)	(3)	(4)	(5)	(6)
TGDP	0.662***	0.716***		0.661***	0.720***	
	(0.031)	(0.031)		(0.045)	(0.044)	
POPULATION			0.710***			0.714***
			(0.032)			(0.046)
PCGDP			0.412***			0.386***
			(0.058)			(0.084)
DISTANCE	−0.457***	−0.453***	−0.461***	−0.460***	−0.461***	−0.468***
	(0.059)	(0.058)	(0.058)	(0.085)	(0.082)	(0.083)
TREMOTENESS	0.163*	0.004	0.028	0.164	−0.002	0.019
	(0.086)	(0.083)	(0.088)	(0.122)	(0.119)	(0.126)
ADJACENCY	0.740***	0.721***	0.723***	0.737**	0.715**	0.717**
	(0.203)	(0.200)	(0.200)	(0.289)	(0.284)	(0.284)
RTA	0.258*	0.390***	0.354**	0.246	0.371*	0.339
	(0.144)	(0.135)	(0.143)	(0.206)	(0.192)	(0.204)
TEFW	0.236***		0.475***	0.122***		0.258***
	(0.038)		(0.060)	(0.028)		(0.045)
EFWRESID		0.480***			0.260***	
		(0.060)			(0.044)	
LANGUAGE	0.255*	0.107	0.107	0.255	0.084	0.084
	(0.152)	(0.152)	(0.153)	(0.217)	(0.217)	(0.218)
YEAR99	−0.265***	−0.102	−0.441***			
	(0.083)	(0.077)	(0.089)			
CONSTANT	−23.274***	−19.891**	−21.443***	−23.480***	−20.243***	−22.002***
	(2.354)	(2.249)	(2.344)	(3.305)	(3.145)	(3.269)
Number of observations	794	794	794	397	397	397
Adjusted R^2	0.666	0.677	0.677	0.661	0.673	0.673

Note: For columns (1), (2), and (3), estimates are made with time and home country fixed effects model. For columns (4), (5), and (6), estimates are made with home country fixed effects model using the two-year averages of the data. The coefficients for the home country dummies are not shown, for brevity. All variables are in logarithms, except the economic freedom indices (such as *EFW* and *EFWRES*) and the binary variables (such as *ADJACENCY*, *RTA*, and *LANGUAGE*). Standard errors are shown in parentheses. ***, **, and * denote 1, 5, and 10 percent level of significance, respectively, for a two-tailed test.

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