BUSINESS SERVICES – A SOURCE OF COMPARATIVE ADVANTAGE

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Abstract

Business services provide essential inputs to production and trade in both goods and services, and a broad and competitive supplier base in such services may be a source of comparative advantage in downstream sectors. This paper explores the role of business services for competitiveness in downstream industries. It starts by analysing the determinants of trade in business services using a gravity approach. Second, trade costs in business services are estimated from gravity residuals. Third, the relationship between trade costs in business services and performance in downstream industries are explored. The performance indicators included are the Grubel-Lloyd index of intra-industry trade, an index of marginal intra-industry trade and weight-to value ratio of exports. The downstream industries analysed are electronics, motor vehicles, chemicals and textiles. The paper finds that contrary to popular perceptions, trade in business services are highly sensitive to distance, but the marginal impact of distance is smaller for large countries and countries with a high GDP per capita. Also contrary to popular perceptions, trade costs in business services including computer services are not significantly lower than for services on average. Trade costs in business services are negatively related to all the performance indicators in downstream industries. The business services share of total costs is positively related to the value to weight ratio in manufacturing industries, suggesting that the higher value added end of the product spectrum is more business services intensive. The paper concludes with a discussion of policy measures that can be taken to bring down trade costs in business services.

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1. Introduction

Business services entail a broad variety of services that have in common that they are provided to organisations rather than to individuals. Furthermore, business services are often an essential and integrated part of the client organisation's production process. Due to advances in communication technology, the business services sector has become increasingly international and a growing literature has emerged that analyses the scale and scope of international trade in business services. Hitherto the focus has mainly been on the driving forces and the employment consequences of offshoring business services, while little is known about barriers to trade in business services and how these affect the performance of downstream industries.

This paper contributes to filling this gap. Its objective is three-fold. First, it provides some perspective on the extent of trade in business services and the costs involved, demonstrating that cross-border trade is still muted and subject to significant costs. Politically determined trade barriers may be an important contribution to trade costs, but business services are also much less tradable than what seems to be popular perceptions. For instance a study from the Birmingham city region in the UK found that about 60% of the clients of computer, marketing and design firms were situated in the local region and about 30% in the rest of the UK, leaving only 10% for international clients. For consultancy and accountancy almost 80% of clients were found in the local region, while 15% were in the rest of UK (Daniels and Bryson, 2002). Studies from the US also suggest that many business services are provided locally, but computer services were among the sectors most traded within the US (Jensen and Kletzer, 2005).

A possible explanation for the proximity of business services companies and their clients is that business services complement and support services produced inside the client firm. Thus, external and internal services are interwoven at all stages of manufacturing production from design, R&D, market research and testing at the pre-production stage; via process design, quality control, procurement, maintenance and many more during production; to marketing packaging, and after sales services (Bryson et al., 2004). In many cases frequent face-to-face interactions between internal and external services providers is required.

Second, the paper explores how trade costs in business services affect performance in downstream industries along several dimensions, including exports, intra-industry trade and the value-to-weight ratio. As is well known, an important source of productivity growth is deepening division of labour. The proliferation of a widening spectrum of specialized business services reflects deepening specialization. Furthermore, demand for external business services stems from the need to increase flexibility, reduce risk and solve problems related to developing or adopting technology, entering into new markets and complying with new regulation in familiar markets or with existing regulation in new markets. Most organisations do not have in-house capacity, nor would it be economical or practical to acquire the capacity to solve problems of the nature described here.

When entering new markets, local knowledge is important. Multinational companies tend to source business services in the host countries in order to get access to local expertise on culture, legal systems and other relevant features of the business environment, while they also encourage their regular services suppliers to follow them into new markets (Bryson *et al.* 2004). Business services and trade and investment in business services thus appear to be an important element of internationalization of downstream industries.

The rest of the paper is organised as follows. Section two starts by relating the paper to previous research; section three outlines the analytical framework and section four presents the data and provides some descriptive statistics. Results from gravity regressions, including estimates of trade costs in business services are presented in section five. Empirical results on the impact of trade costs on performance of

downstream sectors are presented in section six. Finally, policy implications are briefly discussed in section seven which concludes.

2. Relations to previous research

The contribution of this study to the literature is an empirical one. Previous empirical studies on the relationship between trade in business services and performance in downstream industries include firm-level analysis as well as sector studies. Among the former is an in depth study of Ireland on the nature of and driving forces for trade in business services (Grimes, 2006). Strong complementarities between manufacturing and business services are found and a functional relationship between the internationalisation of both activities is emphasised. Thus, international production networks require a number of supporting supply chain management services. In addition, manufacturing subsidiaries require a number of supporting sales and marketing services both from the home and the host country. Finally, moving up the value chain in manufacturing typically goes together with higher services content embedded in the manufactured product.[2]

The study also draws on insights from a body of research using stylized general equilibrium modelling to explore the interrelationship between goods and services. Markusen (1999) demonstrated that trade in intermediate inputs generates gains from specialization both due to international division of labour and due to lower costs of intermediate inputs. Markusen et al. (2005) discussed possible complementarities between foreign expertise and local services providers arguing that foreign experts could open bottlenecks and unleash potential industrial capacity in importing countries. Robert-Nicoud (2008) shows how offshoring of services could help strengthen competitiveness in downstream industries and support agglomeration of manufacturing in rich countries for a wider range of trade costs than what would be the case without offshoring. Nordås (2010) explores the impact of trade in business services when they are complements and substitutes respectively to intermediate goods (e.g. parts and components). She also explores the cases when a country *produces* business services more effectively than its trading partner versus when a country *uses* business services more effectively in downstream industries. In all cases it is found that the impact of services trade liberalisation on trade is non-linear and that the marginal effect of going the last mile is larger than taking the first steps towards open markets in business services.

There is also a small body of empirical studies on the interrelationship between business services and competiveness in downstream sectors. Francois and Woerz (2009) find that increased business services openness has a strong positive effect on the competitiveness of downstream industries, and that the intensity of business services in downstream production is correlated with GDP per capita in a U-shaped relation, first declining and then rising with GDP per capita for a number of labour-intensive and natural resource-intensive industries. This study extends the Francois and Woerz analysis by looking at additional aspects of performance in downstream sectors, focusing on the impact on moving up the value chain and engaging in intra-industry trade in downstream industries. Further, it is argued that actual trade flows may not be the most important indicator of the relationship between business services and performance in downstream industries. Some countries may have a comparative advantage in business services, while others have not. What is important is that business services face international competition – either at home or abroad, or both.

[2] Other studies that have found strong interdependence between manufacturing and business services activities are Francois (1990), Diaz Fuentes (1998) and Guerrieri and Meliciani (2005).

3. Analytical framework

This section sets out the analytical framework for the empirical investigation to follow in section five. As noted the contribution of this paper to the literature is empirical and the models applied should be well known and therefore not discussed in detail.

The gravity model and trade costs

The gravity model has been widely applied both for explaining trade patterns and for estimating relative trade costs. This paper follows Egger (2008) who shows that the gravity equation should be specified as follows:

$$\ln(n_{it}\, p_{it}\, x_{ijt}) = \beta_1 \ln(D_{ij}) + \beta_2 \ln(D_{ij}) * \ln(n_{it}) + \beta_3 \ln(D_{ij}) * \ln(p_{it}) + \beta_4 \ln(D_{ij}) * \ln(n_{jt}) + \beta_5 \ln(D_{ij}) * \ln(p_{jt}) + \gamma_{it} + \chi_{jt} + \varepsilon_{ijt} \quad (1)$$

The left hand side represents exports from country *i* to country *j*, which in turn is broken down on export volume per representative firm (x_{ijt}), the price of the product (p_{it}) and the number of varieties (n_{it}). The right hand side captures relative trade costs and market size where D_{ij} represents the distance between country *i* and *j*, whereas γ_{it} and χ_{jt} represent exporter*time and importer*time fixed effects respectively. The last term is an error term. What distinguishes Egger's specification is the interaction terms between distance and the measures of prices and market size. These are based on the observation that the marginal impact of distance depends on price levels and market size of trading partners; a result that is apparent when differentiating the gravity equation. The terms $\ln n_{it}$ and $\ln p_{it}$ and the corresponding terms for the importer, are captured by the country*time fixed effects.

In the empirical estimate of the model presented below GDP is used as a proxy for market size or the number of varieties, while GDP per capita is used as a proxy for the price level.[3] Egger's suggested methodology is applied to trade in business services (EBOPS 268) and computer and information services (EBOPS 262), and for comparison the regressions are also run for total services.

Several estimation techniques have been applied to the gravity equation. Early research used standard ordinary least squares (OLS). However, there are at least two problems with this technique that have been revealed in more recent literature. First, heteroskedasticity is a serious problem; second, a relatively large share of all possible bilateral trade flows is zero. Using OLS on log-linearized data omits the zero trade observations and results in inefficient parameter estimates due to heteroskedasticity. An alternative technique, pseudo Poisson maximum likelihood (PPML), solves both problems (Santos Silva and Tenereyro 2006; 2009).[4] Both techniques are explored in the empirical estimations presented below.

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3 . Egger approximates the number of varieties by GDP per capita and uses import and export deflators from IMF Financial Statistics as a proxy for prices. However, it is argued here that under the usual Dixit-Stiglitz monopolistic competition assumptions, the number of varieties in a market is determined by the size of the market, and the appropriate proxy should be GDP. Import price deflators do not exist for services, but it is assumed that the price level of services is strongly related to the wage level in the country in question, which in turn is strongly related to GDP per capita, which is therefore our chosen proxy for the price level. The sources of data are the following: GDP and GDP per capita are taken from the World Development Indicators while bilateral distance (geographical and cultural) is from CEPII.

[4] PPML does not allow for the possibility that the decision to enter a new market is different from the decision to expand trade flows. A Heckman two stage regression would adjust for possible selection bias in the data.

The gravity model can be used not only for analysing the relationship between trade costs and trade flows. It can also be used for estimating relative trade costs. Several studies have approximated relative trade costs by first estimating the gravity model, and using the resulting parameters to predict trade flows for each country pair and finally using the difference between predicted and actual trade flows as a proxy for trade costs. The methodology for estimating relative trade costs used here is as follows:

$$tc_{ijt} = \frac{aex_{ijr} - \min aex_{ijt}}{\max aex_{ijt} - \min aex_{ijt}} \qquad (2)$$

where aex_{ijt} is defined as predicted bilateral exports divided by actual bilateral exports. These ratios are normalized to a scale between zero and unity using min-max. The country pair with the smallest ratio of predicted to actual trade flows (e.g. they trade much more than predicted) are assigned a relative trade cost of zero, whereas the country pair with the highest ratio is assigned a relative trade cost index of unity. This measure is used for assessing the possible relationship between trade costs in business services and performance in down-stream manufacturing sectors.

Intra-industry trade

A large proportion of trade among countries at a similar level of development is intra-industry. Countries produce different varieties of the same product categories and exchange the different varieties providing consumers or downstream firms with a broader variety of products to choose from. The driving forces behind such trade are economies of scale in production and consumers' love of variety (Krugman, 1979). With the proliferation of international production networks, vertical intra-industry trade has expanded also among countries at different levels of income, trading parts and components rather than different varieties of final goods or services. Whether intra-industry trade is horizontal or vertical, a range of business services is needed to make such trade economical. For instance combining international supply chains with just-in-time organization of production obviously requires effective and reliable transport and logistics services, but also technical testing, legal advice, ICT support and many other business services. Furthermore, services providers with expertise in regulation and other features of the export destination country are needed.

The most commonly used measure of intra-industry trade is the Grubel-Lloyd index which is calculated as follows:

$$GL_{ijkt} = 1 - \frac{\left| x_{ijkt} - m_{ijkt} \right|}{x_{ijkt} + m_{ijkt}} \qquad (3)$$

If a country only exports or only imports good *k* from a particular trading partner, the GL is zero, while if trade is balanced in the sector the GL is unity. In this paper the GL is calculated both for each country pair and for total trade at a Harmonized System (HS) 2-digit level. It should be borne in mind that the value of the index strongly depends on the level of aggregation it is calculated on. At the extreme the GL index is unity by necessity if calculated on total trade in a country with balanced trade. A dynamic version of the GL index, coined the marginal intra-industry trade index has been suggested by Brülhart (1994).

This possibility was explored, but the lamda was not statistically significant, so we conclude that selection bias does not appear to be a serious problem in our data.

$$MIIT_{ijkt} = 1 - \frac{\left|\Delta x_{ijk} - \Delta m_{ijk}\right|}{\left|\Delta x_{ijk}\right| + \left|\Delta m_{ijk}\right|} \quad (4)$$

Δ symbolizes the change in exports or imports from period t-1 to period t. The MIIT index thus reflects to what extent new or lost trade is of the inter-industry or the intra-industry type. It varies between 0 and 1 like the GL. If exports and imports change at the same rate, the index takes the value of unity, reflecting intra-industry trade. If only exports or imports change, the index takes the value of 0 and changes are of the extra-industry type. It is our hypothesis that intra-industry trade is more affected by high trade costs in business services than is trade on average.

The relation between intra-industry trade in downstream industries and trade costs in business services are explored using the following regression equation:

$$GL_{ijt} = a + \alpha_1 \left|\ln GDPcap_{it} - \ln GDPcap_{jt}\right| + \alpha_2 \ln d_{ij} + \alpha_3 tc_{ijt} + \gamma_i + \chi_j + \varphi_t + \varepsilon_{ijt} \quad (5)$$

I control for the absolute value of differences in GDP per capita, since the theory of intra-industry trade predicts that love of variety and economies of scale are the major driving forces and that this is more likely to be an important determinant of trade among countries at a similar level of income. Distance is also likely to be important not only for trade, but also for the extent of intra-industry trade. This is particularly the case for vertical intra-industry trade since lead time variability increases with distance, and certainty about timely delivery is particularly important in vertical supply chains (Nordås et al., 2006). In order to capture country-specific explanatory variables and time trends, country and year fixed effects are also included in the analysis. The same right-hand side variables are applied to the MIIT index.

Business services and value added

Moving up the value added chain essentially implies adding more processing to raw materials. Adding R&D, design, engineering and customization based on market research distinguishes a differentiated product that fetches a relatively high price from a homogenous "commoditized" product. One measure of to what extent a country has moved up the value added chain and become competitive in high-value added products is the value to weight ratio of exports. Data on both weight and value of imports is available for the European Union, the United States and a few other countries. Here the value to weight ratio for exports to the Euro-zone is used as an indicator of competitiveness in high value added products. To what extent this is correlated with high trade costs in business services is then explored empirically.

4. Descriptive statistics

This section presents a descriptive analysis of intra-industry trade and the value to weight ratios in five industrial sectors: pharmaceuticals (HS 30), plastics and rubber (HS 39), clothing (HS 61 and 62), electrical machinery (HS 85) and motor vehicles (HS 87).

Intra-industry trade

Starting with intra-industry trade, Table 1 reports the mean and standard deviation for the GL and the MIIT indices in the six HS categories. The average conceals large variations both within and between sectors.

Table 1. Indicators of intra-industry trade, selected sectors, 2000-2008

HS category	30		39		61		62		85		87	
	Aggr	Bilat	Aggr	Bilat	Aggr	Bilat	Aggr	Bilat	Aggr	Bilat	Aggr	Bilat
Grubel-Lloyd (GL)												
Mean	0.31	0.09	0.43	0.16	0.36	0.13	0.36	0.13	0.41	0.16	0.31	0.12
Standard deviation	0.30	0.21	0.32	0.27	0.32	0.24	0.31	0.25	0.37	0.27	0.33	0.24
Marginal intra-industry (MIIT)												
Mean	0.28	0.08	0.38	0.12	0.24	0.09	0.25	0.10	0.32	0.11	0.26	0.09
Standard deviation	0.32	0.20	0.34	0.25	0.32	0.22	0.31	0.22	0.35	0.24	0.31	0.21

Note: Aggr. denotes intra-industry trade calculated from a country's total exports and imports; Bilat. Represents intra-industry trade calculated for each country pair.

The intra-industry trade index is higher for a country's total trade with the rest of the world within a sector than the average of bilateral trade within the same sector. The difference reflects that firms are located at different stages in international supply chains in different countries. For instance, country A may import parts and components of electronic machinery (HS 85) from country B whose industry is located upstream in the supply chain. These parts and components are processed into modules in country A and exported to country C, which hosts firms downstream in the supply chain. This triangle gives country A a high overall GL index in this sector, but a low (or even zero) bilateral GL index both with country B and C.

It is also worth noticing that the standard deviation relative to the mean is high in all product categories, suggesting large variation in the extent to which the countries in the sample participate in intra-industry trade. Perhaps surprisingly, the marginal intra-industry index is relatively low, suggesting that sectoral trade deficits or surpluses tend to grow over time and countries are becoming increasingly specialized.[5] I also find a statistically significant positive correlation between the GL and the MIIT indices, suggesting that changes in trade flows are more likely to be of the intra-industry type the higher the intra-industry index.

As noted there is a large variation in the data and a number of countries have a GL index close to unity. In pharmaceuticals (HS 30) five countries, all members of the European Union (Austria, Belgium, Hungary, Italy and the Netherlands), had an overall GL index above 0.99 in one or more years between 2000 and 2008. There are also some country pairs with significant trade in pharmaceuticals and close to balanced trade. The US, for instance, has close to balanced trade in this sector with Canada, China, France, Japan and Spain; Spain's trade with Italy, Netherlands the UK and USA is close to balanced, whereas Germany features a close to unity GL index with the UK, Denmark and Norway. The countries in which intra-industry trade explains all the changes in trade in this sector are Austria, Belgium, Bulgaria, China, Finland, France, Slovenia and Uruguay. At the opposite end of the spectrum, countries that engage in one-way trade are mainly developing countries, many of them in Africa, and most of them are importers in this sector.

In plastics and rubber (HS 39) Austria, Canada, Finland, Hungary, Indonesia, Italy, Malaysia, Peru and Sweden had a GL index above 0.99 in at least one year in the period analysed. Bosnia Herzegovina, Brazil, China, the Czech Republic, Lithuania, Sweden and Turkey observed an MIIT index larger than 0.99. Countries that engage in one-way trade and only import plastics and rubber are mainly small, developing countries, and many of them in Africa. Among the countries with the lowest GL index (below 0.01), only Peru is an exporter in this sector.

[5] The MIIT index is similar for longer time lags, e.g. five years.

Clothing (HS 61) shows quite a different trade pattern. The highest GL index is found in the Czech Republic, Belgium, Costa Rica, Singapore, Albania, Botswana, the Slovak Republic and Poland (GL > 0.99). Among these Singapore and the Slovak Republic also had among the highest MIIT indices (above 0.99) together with Malaysia and Switzerland. The lowest intra-industry index is observed in developing countries also in this sector, but several of the one-way traders are exporters. These include Bangladesh, India, Indonesia, Iran, Pakistan and Syria all with a GL-index below 0.01 for at least one year in the period analysed. All of these also had a low MIIT index. Since intermediate inputs in this sector is mainly categorized under different HS codes, one-way trade suggests comparative advantage combined with lack of segmented consumer markets rather than absence of international supply chains.

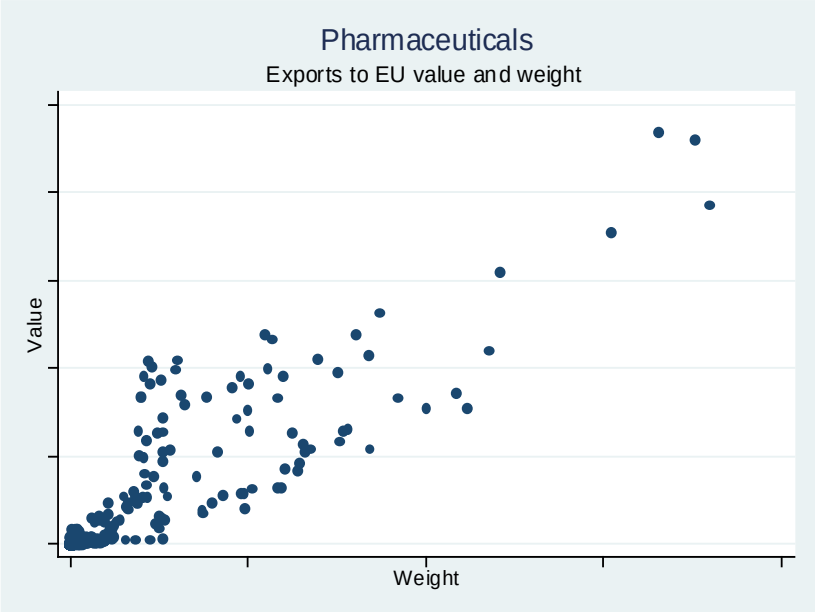
In electronics (HS 85), the countries with a GL index above 0.99 are China, the Czech Republic, Denmark, France, Hungary, Luxembourg, Mexico, the Netherlands, the Philippines, Switzerland and Thailand. With the exception of Luxembourg these countries also have a high score on the MIIT index, albeit somewhat lower than the GL index (ranking from 0.59 (Thailand) to 0.97 (China)). At the opposite end are developing countries, which are mainly importers with low scores on both GL and MIIT. Balanced trade in the motor vehicle industry (HS 87) is less common and only Austria, Belgium, Canada, Hungary and the Philippines experienced a score on the GL index of more than 0.99 in this sector, whereas only Belgium, Spain and Taiwan scored more than 0.99 on the MIIT index. Annex table A1 presents further details depicting the GL index for the five sectors for 110 countries' total trade in 2007. Finally Annex table A2 presents the results for the MIIT index for 2006-2007.

Value to weight ratio

Differences in the value to weight ratio indicates differences in value added among countries within the same sector. Export value is plotted against export volume (in tons) in Chart 1, where panels A-E depict each of the sectors studied.[6]

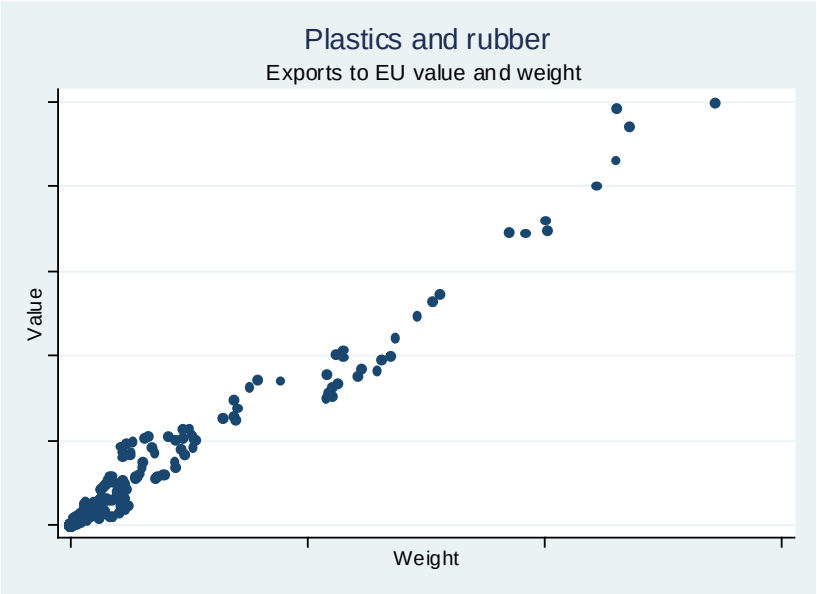
Chart 1. Export value and volume to EU 2000-20007, selected sectors

Panel A

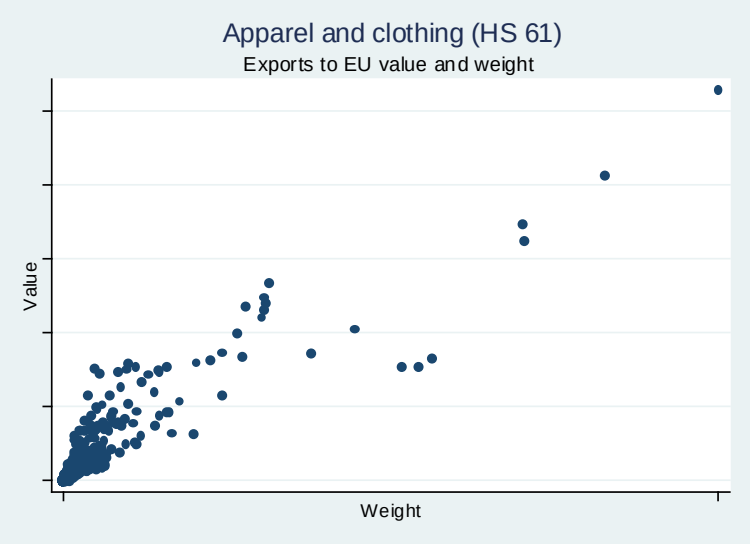


6 . HS 62 is not included because of lack of data on export volumes.

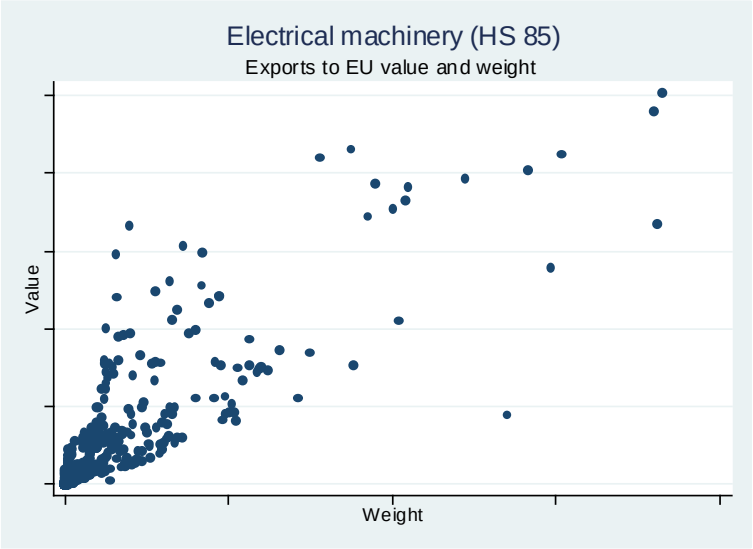
Panel B



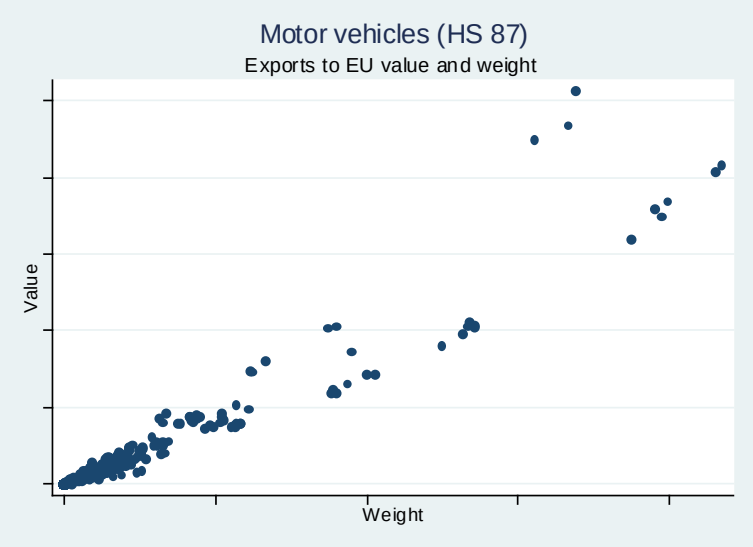
Panel C



Panel D



Panel E



If the products within a given sector had been homogenous, all observations would have fallen on a straight line. The plastics and rubber sector comes close to this whereas the largest variation is found in electrical machinery, with the other sectors falling between these two extremes. Further detail on period averages for the period 2000-2008 are reported in Annex table A.3, which shows that the sector with the highest average value to weight ratio is pharmaceuticals. In the next section the role of services for the variation in the value to weight ratio will be explored.

5. Determinants of trade in business services – the role of market size and geography

The gravity model as presented in equation (1) above is estimated for computer services (EBOPS 262), other business services (EBOPS 268) and total services (EBOPS 200), fist using standard OLS estimates and second, using the Poisson Pseudo Maximum Likelihood (PPML) estimator. Table 2, panels A-C present the results.

Table 2. Gravity regression results

Panel A. Computer services

Variable	OLS	OLS	OLS	PPML	PPML
ln distance	-3.818***	-3.326***	-2.990***	-6.900 ***	-7.086***
	(0.079)	(0.328)	(0.354)	(0.146)	(0.410)
ln distance* ln GDP exp	0.052***	0.068***	0.043**	0.091***	0.114***
	(0.002)	(0.013)	(0.014)	(0.003)	(0.016)
ln distance* ln GDP imp	0.060***	0.021*	0.069***	0.101***	0.074***
	(0.002)	(0.012)	(0.014)	(0.003)	(0.013)
ln distance* ln GDP per capita exp	0.036***	-0.023	-0.073***	0.067***	0.065***
	(0.002)	(0.017)	(0.026)	(0.007)	(0.026)
ln distance* ln GDP per capita imp	0.015***	0.042***	0.024***	0.037***	0.054***
	(0.002)	(0.016)	(0.002)	(0.004)	(0.020)
Contig	0.253***	0.351***	0.368***	0.129	0.818***
	(0.080)	(0.064)	(0.072)	(0.098)	(0.089)
comlang_off	0.901***	0.362***	0.762***	0.838***	-0.440***
	(0.054)	(0.056)	(0.075)	(0.070)	(0.100)
N	4781	4781	4781	14337	14377
adjusted R2	0.382	0.687	0.579	0.761	0.910
Coutry fixed effects	No	Yes	No	No	Yes
Year fixed effects	No	Yes	No	No	Yes
Coutry*year fixed effects	No	No	Yes	No	No

Panel B. other business services

Other business services					
Variable	OLS	OLS	OLS	PPML	PPML
ln distance	-5.237***	-4.034***	-7.749***	-6.269***	-7.07***
	(0.047)	(0.213)	(0.286)	(0.075)	(0.254)
ln distance* ln GDP exp	0.077***	0.019***	0.067***	0.095***	0.080***
	(0.001)	(0.008)	(0.010)	(0.002)	(0.009)
ln distance* ln GDP imp	0.080***	0.072***	0.085***	0.090***	0.151***
	(0.001)	(0.008)	(0.010)	(0.002)	(0.009)
ln distance* ln GDP per capita exp	0.034***	0.050***	0.134***	0.038***	0.044***
	(0.001)	(0.010)	(0.015)	(0.002)	(0.015)
ln distance* ln GDP per capita imp	0.018***	0.014	0.127***	0.030***	-0.034***
	(0.001)	(0.010)	(0.015)	(0.003)	(0.014)
Contig	0.377***	0.440***	0.316***	-0.061	0.652***
	(0.057)	(0.048)	(0.061)	(0.088)	(0.065)
comlang_off	1.267***	0.414***	0.514***	1.054***	0.205**
	(0.043)	(0.042)	(0.053)	(0.089)	(0.058)
N	10422	10422	14960	17735	17735
adjusted R2	0.583	0.779	0.832	0.820	0.931
Coutry fixed effects	No	Yes	No	No	Yes
Year fixed effects	No	Yes	No	No	Yes
Coutry*year fixed effects	No	No	Yes	No	No

Panel C. Total services

Variable	OLS	OLS	OLS	PPML	PPML
ln distance	-5.334***	-4.567***	-5.849***	-5.852***	-4.678***
	(0.023)	(0.129)	(0.128)	(0.042)	(0.161)
ln distance* ln gdp exp	0.079***	0.034***	0.045**	0.089***	0.053***
	(0.001)	(0.005)	(0.005)	(0.001)	(0.005)
ln distance* ln gdp imp	0.082***	0.059***	0.086***	0.087***	0.039***
	(0.001)	(0.005)	(0.001)	(0.001)	(0.006)
ln distance* ln gdp per capita exp	0.034***	0.059***	0.148***	0.027***	0.063***
	(0.001)	(0.006)	(0.009)	(0.001)	(0.008)
ln distance* ln gdp per capita imp	0.028***	0.053***	0.032***	0.023***	0.090***
	(0.001)	(0.006)	(0.001)	(0.002)	(0.009)
Contig	0.997***	0.692***	0.880***	0.181***	0.319***
	(0.004)	(0.033)	(0.037)	(0.044)	(0.038)
comlang_off	1.346***	0.781***	1.158***	0.723***	0.401***
	(0.026)	(0.025)	(0.025)	(0.034)	(0.032)
N	30247	30247	30247	41976	41976
adjusted R2	0.685	0.811	0.754	0.864	0.929
Coutry fixed effects	No	Yes	No	No	Yes
Year fixed effects	No	Yes	No	No	Yes
Coutry*year fixed effects	No	No	Yes	No	No

Note: Standard errors in parentheses. ***, **, and * represent significance levels of 1, 5 and 10% respectively.

First, it is worth noticing that the number of observations is more than twice as high for the PPML regressions than for the OLS regressions for computer services; about a quarter higher for other business services and about a fifth higher for total services. This reflects the fact that a significant number of all possible bilateral trade flows are zero, with the highest number in computer services.[7]

Contrary to popular perceptions, distance is highly relevant for cross-border trade both for computer services and other business services. Interestingly computer services are less sensitive to distance than services on average when only positive trade flows are considered (the OLS regressions), but more sensitive when also zero flows are taken into account (the PPML regressions). A possible explanation is that computer services are more sensitive to distance on the extensive margin. According to Chaney (2008), the extensive margin is more sensitive to changes in trade costs the lower the elasticity of substitution between differentiated products, suggesting that the computer services are highly differentiated.

The OLS and PPML regressions give similar parameter estimates as far as sign and statistical significance are concerned, whereas the PPML regressions appear to give the best fit. I therefore refer to the parameters in the PPML regressions with fixed effects in the discussion of the results. These regressions are also used for the baseline estimates of relative trade costs.

The regression results suggest that the marginal impact of distance is smaller for large countries and countries with high income per capita. Thus, GDP and GDP per capita in both the importing and exporting country reduce the marginal impact of distance on bilateral trade. Countries with a common border tend to trade about a third more with each other than countries without a common border for total services. For computer services, however, contiguous countries tend to trade more than twice as much with each other, all else equal and for other business services neighbours trade about twice as much with each other than with other countries all else equal. Furthermore countries that share a common official language tend to trade about 50% more services with each other and a quarter more in other business services, while for computer services the sign of the parameter on common language is not robust to model specification. The large market share of two countries, India and Ireland, could explain this lack of robustness.

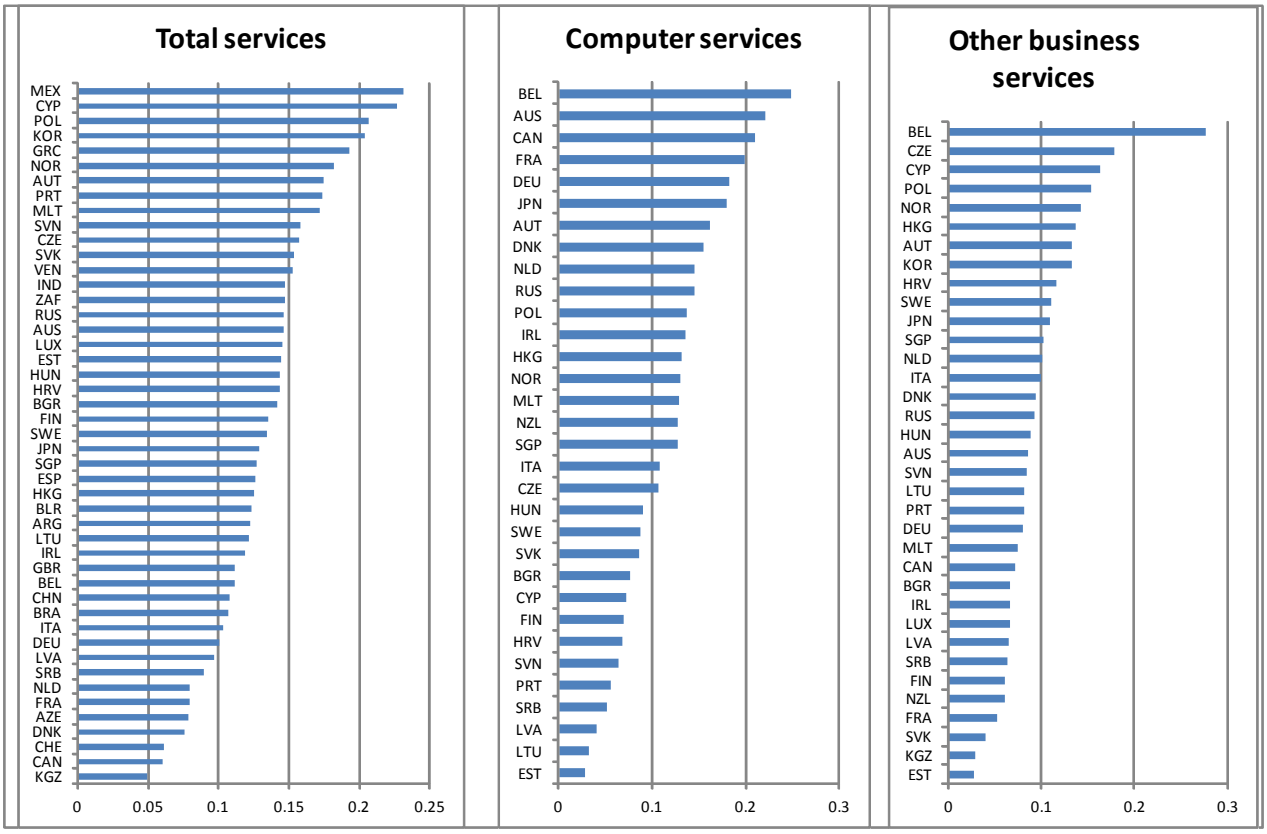
To illustrate the results on distance, comparative statics is conducted for the country that came closest to the median GDP, the Netherlands. Consider two countries, A and B that are both similar in size and GDP per capita as the Netherlands. The marginal impact of distance for their exports to the Netherlands would be -0.56 for total services, -0.72 for computer services and -0.69 for other business services. This implies that if country A is 10% further away than country B, the Netherlands would import 5.6% less services, 7.2% less computer services and 6.9% less other business services from it compared to country B. For countries that are twice as large and 25% richer than the Netherlands, the marginal impact of distance on exports to the Netherlands would be -0.51 for total services, -0.66 for computer services and -0.59 for other business services. Finally for countries that are half as large and half as rich as the Netherlands, the marginal impact of distance would be -0.65 for total services, -0.81 for computer services and -0.76 for other business services. The disadvantage of remoteness is in other words larger the smaller and poorer the country. The regression results also illustrate that among all possible countries e.g. a French importer could source from, he will buy more from the immediate neighbours and among those, the French-speaking ones would be the most attractive. When moving further afield he is again likely to prefer French-speaking sources.

[7] It is, however possible that the data coverage may vary between sectors as well.

The gravity model and trade costs in business services

The regression results presented in Table 2 are used for estimating bilateral services trade costs for each sector and for total services trade as indicated by equation (2) above. The min-max normalisation returns values between zero and unity and the mean is 0.12 for total services, 0.11 for computer services and 0.10 for other business services. These figures suggest that the distribution is skewed towards the left and the median is smaller than the mean (about 0.06 for all sectors). The average across partner countries for a selection of countries is presented in Chart 2.

Chart 2. Estimated trade cost index



Since the estimated costs are normalized, the absolute levels of trade costs are not comparable between sectors. What is measured is the relative trade costs over and above what is captured by geographic, cultural and market size variables. These are assumed to be largely policy determined.[8] The country that has the lowest estimated total services trade costs is somewhat surprisingly Kyrgyzstan. The other countries with low services trade costs are less surprising including Canada, Switzerland, Denmark and – another surprise – Azerbaijan. At the other end of the spectrum are Mexico, Cyprus, Poland, Korea and Greece. It should be noted that transport and travel services account for almost half of total services trade and that the cost of cross-border supply of these services have a heavy weight in total services trade costs. These costs are likely to be correlated with distance and other country characteristics such as being landlocked, which is captured in the country dummies.

8 . It could be argued that time invariant fixed effects also capture politically determined trade costs, since e.g. trade restricting domestic regulation may not change much over the relatively short period analysed. If so, the regression without fixed effects should be used as the basis of estimating bilateral trade costs. This will be done as a robustness check.

The three Baltic countries have the lowest estimated trade costs in computer services followed by other Eastern and Central European countries. These are found to be quite liberal as far as services trade regulation are concerned in a number of studies and the results should not be surprising. These estimated trade costs are next used for analysing the relation between services trade costs and performance in down-stream industries.

6. Trade costs in business services and performance in downstream industries

Intra-industry trade

This section presents the results of correlating indices of intra-industry trade in downstream manufacturing industries with estimated trade costs in services. Services trade costs are estimated using the gravity model depicted by equation (1) above and normalized to values between zero and one using min-max (equation (2)). Horizontal intra-industry trade is more likely among countries at a similar level of income and we control for that by including the absolute value of the difference in GDP per capita for each country pair. It is noted that the number of observations are much higher in the regressions which includes bilateral total services trade costs, reflecting better data coverage which is also clear from Table 2 above. Table 3 panel A to F presents the regression results for the six HS categories analysed.

Table 3. Services trade costs and intra-industry trade.

OLS regressions with country and year fixed effects.

Panel A. Pharmaceuticals (HS 30)

	Grubel Lloyd index			Marginal intra-industry trade index		
	total services	computer services	other business services	total services	computer services	other business services
ln distance	-0.104***	-0.117***	-0.097***	-0.063***	-0.069***	-0.056***
	(0.002)	(0.005)	(0.004)	(0.002)	(0.006)	(0.004)
ln difference GDP per capita	-0.050***	-0.046***	-0.048***	-0.023***	-0.014***	-0.024***
	(0.001)	(0.004)	(0.003)	(0.002)	(0.005)	(0.003)
trade costs index services	-0.015	-0.193***	-0.012	-0.032**	-0.101***	-0.026
	(0.013)	(0.032)	(0.023)	(0.015)	(0.037)	(0.025)
N	25422	4311	9005	22900	3965	8096
adj. R square	0.364	0.394	0.3345	0.160	0.133	0.120

Panel B. Plastics and rubber (HS 39)

	Grubel Lloyd index			Marginal intra industry trade index		
	total services	computer services	other business services	total services	computer services	other business services
ln distance	-0.099*** (0.002)	-0.091*** (0.006)	-0.091*** (0.004)	-0.077*** (0.003)	-0.058*** (0.008)	-0.055*** (0.005)
ln difference GDP per capita	-0.026*** (0.002)	-0.019*** (0.004)	-0.024*** (0.003)	-0.012*** (0.002)	-0.018*** (0.005)	-0.014*** (0.003)
trade costs index services	-0.142*** (0.015)	-0.147*** (0.032)	-0.079*** (0.025)	-0.103*** (0.017)	-0.052 (0.043)	-0.075** (0.031)
N	26860	4329	9251	24950	3985	8412
adj. R square	0.413	0.421	0.360	0.177	0.117	0.094

Panel C. Articles of apparel and clothing accessories, knitted or crocheted (HS 61)

	Grubel Lloyd index			Marginal intra industry trade index		
	total services	computer services	other business services	total services	computer services	other business services
ln distance	-0.093*** (0.002)	-0.089*** (0.006)	-0.093*** (0.004)	-0.058*** (0.003)	-0.041*** (0.006)	-0.052*** (0.004)
ln difference GDP per capita	-0.010*** (0.002)	-0.009*** (0.004)	-0.008*** (0.003)	-0.003* (0.002)	0.000 (0.004)	-0.001 (0.003)
trade costs index services	-0.080*** (0.016)	-0.003 (0.034)	-0.045* (0.025)	-0.042*** (0.017)	-0.020 (0.037)	-0.043* (0.026)
N	25348	4315	9099	22932	3959	8187
adj. R square	0.275	0.317	0.28	0.100	0.080	0.082

Panel D. Articles of apparel and clothing accessories, not knitted or crocheted (HS 62)

	Grubel Lloyd index			Marginal intra industry trade index		
	total services	computer services	other business services	total services	computer services	other business services
ln distance	-0.094*** (0.003)	-0.088*** (0.006)	-0.097*** (0.004)	-0.054*** (0.003)	-0.043*** (0.007)	-0.049*** (0.004)
ln difference GDP per capita	-0.015*** (0.002)	-0.007 (0.004)	-0.017*** (0.003)	-0.006*** (0.002)	-0.002 (0.005)	-0.005 (0.003)
trade costs index services	-0.092*** (0.016)	-0.003 (0.034)	-0.076** (0.025)	-0.026 (0.016)	-0.004 (0.037)	-0.072** (0.025)
N	26860	4329	9251	23321	3967	8258
adj. R sqare	0.256	0.293	0.241	0.087	0.059	0.072

Panel E. Electrical machinery and parts thereof (HS 85)

	Grubel Lloyd index			Marginal intra industry trade index		
	total services	computer services	other business services	total services	computer services	other business services
ln distance	-0.093*** (0.002)	-0.085*** (0.005)	-0.097*** (0.004)	-0.065*** (0.003)	-0.073*** (0.007)	-0.078*** (0.005)
ln difference GDP per capita	-0.022*** (0.002)	-0.014*** (0.004)	-0.015*** (0.003)	-0.004** (0.002)	-0.001 (0.005)	0.000 (0.003)
trade costs index services	-0.094*** (0.014)	-0.066** (0.032)	-0.081*** (0.024)	-0.060*** (0.017)	-0.035 (0.042)	-0.047 (0.030)
N	27141	4332	9256	25344	3989	8416
adj. R square	0.455	0.436	0.415	0.133	0.088	0.099

Panel F. Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof (HS 87)

	Grubel Lloyd index			Marginal intra industry trade index		
	total services	computer services	other business services	total services	computer services	other business services
ln distance	-0.085*** (0.002)	-0.065*** (0.006)	-0.076*** (0.004)	-0.057*** (0.003)	-0.057*** (0.006)	-0.051*** (0.005)
ln difference GDP per capita	-0.013*** (0.002)	-0.016*** (0.004)	-0.016*** (0.003)	-0.004** (0.002)	0.003 (0.005)	0.001 (0.003)
trade costs index services	-0.143*** (0.015)	-0.126*** (0.034)	-0.135*** (0.025)	-0.113*** (0.015)	-0.107*** (0.037)	-0.083*** (0.027)
N	26089	4319	9140	24067	3969	8284
adj. R square	0.353	0.326	0.276	0.133	0.098	0.079

Note: Standard errors are in parenthesis. *, **, and *** signify statistical significance at a 10, 5 and 1% level respectively. The first column under each set of regressions contains the estimated bilateral trade costs for total services, while the second and third columns contain the estimated bilateral trade costs of computer services and other business services respectively.

It is first noted that the regressions explain between a quarter and 45% of the variation in bilateral intra-industry trade as measured by the Grubel-Lloyd index, but only between 6 and 18% of the variation in the marginal intra-industry trade index. It is also noted that distance and differences in GDP per capita have the expected negative sign in all regressions, and in most cases are statistically significant at least at a 10%, level and distance always at a 1% level. The economic importance of distance for the GL index is about the same for all sectors included in the analysis, whereas distance appears to play a smaller role for the marginal intra-industry trade index. Differences in GDP per capita matter the most in pharmaceuticals, as one would expect, given the R&D-intensity of the sector. The economic significance of GDP per capita is smallest in the motor vehicle industry. A possible explanation is that vertical intra-industry trade is more prominent in this sector.

Turning to the variable of interest, services trade costs, the relation between such costs and intra-industry trade varies a lot between sectors. It has the largest both economical and statistical significance in the motor vehicle sector, where a ten percentage point increase in the overall services trade cost index reduces the GL index by 14 percentage points at the mean, while the MIIT index falls by 11.3 percentage points. Likewise a 10 percentage point increase in business services trade costs reduces the GL index by 13.5

percentage points at the mean.[9] Services trade costs are also strongly associated with intra-industry trade in the plastics and rubber sector. In the pharmaceuticals sector in contrast, only trade costs in computer services appear to matter for the GL-index, while both computer services and total services matter for the MIIT index. A likely explanation for this is that services such as R&D and professional services are the core value adding activities in the pharmaceutical industry, largely provided in-house, while computer services are non-core and more readily sourced externally. Marketing and trading in this sector is presumably highly information-intensive since the features of the different varieties of these products cannot easily be assessed by the customer.

In contrast computer services trade costs appears to be unrelated to intra-industry trade in the clothing sector, where total services trade costs and other business services trade costs are negatively associated with the GL index. The latter is also relatively strongly associated with the MIIT index, suggesting that business services are important for a dynamic shift towards more differentiated products in this sector.

Business services are traded cross-border, but commercial presence is thought to be a more important mode of supplying services. Furthermore, there is some evidence that cross border trade and foreign direct investment are complementary in many services sectors, including business services (Kox and Nordås, 2008). I therefore also run the regression of GL and MIIT as depicted by equation (5) replacing trade costs with an index of openness to foreign direct investment developed by the OECD.[10] Since this index is developed for restrictions on inward FDI by country, the regressions were made using the GL and MIIT indices for trade with the rest of the world in each sector (not bilateral trade), and due to much fewer observations the regressions were run on pooled data using sector dummies. The results are presented in Table 4.

Table 4. Regression results, intra-industry trade and FDI restrictions

	GL index	MIIT index
ln GDP per capita	-0.034***	-0.031**
	(0.012)	(0.014)
FDI restrictiveness, business services	-0.34***	-0.210**
	(0.088)	(0.104)
HS 39 dummy	-0.149***	0.11**
	(0.042)	(0.050)
HS 61 dummy	-0.055	-0.106**
	(0.043)	(0.050)
HS 62 dummy	-0.050	-0.110**
	(0.043)	(0.050)
HS 85 dummy	0.155***	0.058
	(0.043)	(0.050)
HS 87 dummy	0.046	-0.117**
	(0.043)	(0.050)
N	528	522
adj. R square	0.131	0.08

Note: Standard errors are in parenthesis. *, **, and *** signify statistical significance at a 10, 5 and 1% level respectively.

[9] Given the specification of the regression equation (5), the GL index, the MIIT index and the trade cost index all fall between 0 and 1 and they are not logged in the equation. Thus, the parameter on the trade cost index reflects the percentage point changes in the GL (and the MIIT index) at the mean.

10 . See Koyama and Golub (2006).

The FDI restrictiveness index takes values between zero and one and is not logged in the regression. The parameter thus indicates the percentage points change in the GL and MIIT index respectively at the mean of a percentage point change in the FDI restrictiveness index. The regression result suggests that both indicators are sensitive to restrictions to FDI in business services, and indeed the impact appears to be higher than the impact of services trade costs. The sector dummies confirms that plastics and rubber are less and electrical machinery more subject to intra-industry trade than are pharmaceuticals which is the omitted sector dummy.

To conclude this analyis, services trade costs in general and business services trade costs in particular appear to be strongly associated with intra-industry trade in manufacturing sectors characterized by product differentiation. The regression results suggest a relatively large economic impact where a ten percentage point increase in the trade cost index reduces the GL index by between 7 and 19 percentage points where statistically significant. Restrictions on foreign direct investment appear to have an even stronger effect where a ten percentage point increase in the index reduces the GL index by 34 percentage points and the MIIT index by 21 percentage points. Furthermore, the results from the MIIT regressions suggest that reducing services trade costs and FDI restrictions may help countries move into more differentiated products, which is often associated with moving up the value added ladder. The latter finding is further explored in the next section which presents regressions linking value added as measured by the value to weight ratio.

It is worth stressing that the regression results presented here provides evidence of a robust correlation between services trade costs and intra-industry trade in selected manufacturing industries.[11] This does not imply causality and the relatively low explanatory power of the MIIT regressions calls for caution. Finally, the relatively weak coverage of services trade data at the sector level also suggest that results should be interpreted with caution. Nevertheless, the results are interesting, quite intuitive and suggest that more research would provide further insights into this important and somewhat under-researched area.

Trade costs and the value to weight ratio

A possible relation between services trade costs and FDI restrictions and the value to weight ratio of exports was explored, using the estimated trade costs reported in section 5 and the OECD FDI restrictiveness index. Here no robust results can be reported. An alternative strategy is to analyse the relation between the services content of total output in the sectors concerned and the value to weight ratio, using the following regression equation:

$$\ln(value_i / weight_i) = a_i + a_1 \ln(1 + BS_i / GO_i) + \mu_i \qquad (6)$$

BS represents business services and GO gross output while subscript *i* indicates sector.[12] The parameter on the services content (a_1) was estimated at 4.7 with standard error 1.5, which implies statistical significance at a 1% level. The number of observations were 305 and the adjusted R^2 = 0.77. The regression was run on pooled data using sector fixed effects. This implies that the share of business services in total costs is strongly and positively related to the value to weight ratio obtained in export

[11] Robustness checks have been conducted using different specifications of the regression equation, including taking logs of the GL, MIIT and trade cost indices, using the PPML estimator, and using trade costs measures estimated from different gravity regression techniques. The parameter values do vary somewhat with the estimation techniques, but the sign, level of significance and the order of magnitude of the parameter values are robust to methodology.

12 . Gross the services share of gross output was calculated from OECD input-output data. A new set of input-output tables have been released recently and will be included in the analysis in the final version of the paper.

markets (using the European Union as the representative OECD market). Thus, a one percentage point higher business services share of total costs is found to be associated with about 5% higher value to weigh ratio. The same regression was also run for the cost share of total services, but here no statistically significant relation to the value to weight ratio was found.

Correlation does not imply causality and it is not argued that an increased services share *causes* an increase in the value to weight ratio. The results rather suggest that a high value to weight ratio goes together with a high business services share. A reasonable interpretation is that business services are needed to raise value added within a manufacturing sector. By the same token, a shallow business services sector appears to be a constraint on moving up the value chain in manufacturing. Conversely, demand for business services from the manufacturing sector creates market opportunities for business services firms.

7. Summary and conclusions

This paper has analyzed possible relations between trade and trade costs in business services and performance in downstream industries. It has demonstrated that services trade costs are significant even for presumably highly tradable services subject to few trade restrictions such as computer services. Trade costs and foreign direct investment restrictions have a relatively large impact on the performance of downstream manufacturing sectors. In particular, it appears that high trade costs and barriers to foreign direct investment in business services are strongly and negatively associated with the ability to engage in product differentiation as measured by the static and dynamic intra-industry trade index. Product differentiation in turn typically goes together with higher value added. Direct evidence on the relation between value added and trade costs could not be robustly established, but the value to weight ratio of exports is strongly correlated with the business services content of the product. Such business services are presumably more diversified and cost effective in an open and competitive market.

The role of business services for competitive markets in other sectors does not feature prominently in the trade and industrial policy debate. Trade policy tends to focus on market access for a country's exports, whereas industrial policy tends to focus on manufacturing. The findings of this study suggest that policy makers need to take a broader perspective. First it would be useful to investigate what are the sources of trade costs in business services. Given that many of these services are non-routine and interactive, occasional face-to-face communications may be required, often at short notice. A possible source of trade costs may thus be restrictions on movement of people. Other possible sources of trade costs are domestic regulations that set standards and qualification requirements. Even when perfectly legitimate, these may impose substantial compliance costs for foreign suppliers because of implementation procedures and large differences in the architecture of regulation. More research is needed in order to explore the relation between such regulation, both its level and heterogeneity, and trade costs in services.

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ANNEX

Table A.1 Grubel-Lloyd index. selected countries and sectors 2007

Country	HS 30	HS 39	HS 61	HS 62	HS 85	HS 87
ALB	0.01	0.08	0.99	0.78	0.21	0.02
ARE	0.05	0.54	0.08	0.07	0.01	0.01
ARG	0.71	0.74	0.81	0.38	0.17	0.87
ARM	0.03	0.07	0.12	0.01	0.14	0.00
AUS	0.68	0.38	0.09	0.10	0.26	0.29
AUT	0.85	0.99	0.68	0.63	0.95	0.98
AZE	0.01	0.73	0.15	0.02	0.03	0.01
BDI	0.04	0.06	0.00	0.11	0.21	0.31
BEL	0.93	0.73	0.97	0.95	0.93	0.96
BGD	0.38	0.13	0.00	0.08	0.14	0.28
BGR	0.58	0.55	0.55	0.34	0.61	0.10
BLR	0.28	0.71	0.41	0.25	0.72	0.77
BOL	0.05	0.07	0.45	0.95	0.01	0.00
BRA	0.35	0.82	0.99	0.50	0.59	0.76
BWA	0.14	0.33	0.28	0.71	0.21	0.10
CAN	0.75	0.99	0.28	0.28	0.56	0.99
CHE	0.65	0.94	0.38	0.59	1.00	0.34
CHL	0.27	0.37	0.05	0.23	0.10	0.15
CHN	0.75	0.76	0.02	0.04	0.85	0.82
CIV	0.04	0.48	0.09	0.23	0.24	0.83
COL	0.51	0.93	0.27	0.28	0.24	0.46
CRI	0.79	0.45	0.92	0.97	0.84	0.02
CYP	0.76	0.09	0.06	0.04	0.21	0.00
CZE	0.52	0.79	0.81	0.95	0.97	0.68
DEU	0.84	0.72	0.65	0.74	0.91	0.57
DNK	0.58	0.82	0.94	0.94	0.96	0.49
DOM	0.11	0.50	0.86	0.46	0.65	0.01
DZA	0.00	0.05	0.00	0.01	0.01	0.00
ECU	0.10	0.22	0.34	0.10	0.13	0.30
ESP	0.88	0.89	0.59	0.67	0.63	0.95
EST	0.25	0.64	0.82	0.91	0.92	0.58
ETH	0.00	0.01	0.06	0.03	0.01	0.03

FIN	0.62	1.00	0.26	0.39	0.81	0.78
FRA	0.82	0.93	0.62	0.73	0.94	0.99
GBR	0.82	0.83	0.37	0.40	0.74	0.74
GEO	0.28	0.03	0.14	0.38	0.06	0.26
GHA	0.20	0.31	0.56	0.03	0.02	0.04
GRC	0.45	0.64	0.86	0.31	0.41	0.14
GTM	0.58	0.39	0.14	0.50	0.14	0.08
GUY	0.18	0.01	0.88	0.60	0.01	0.01
HKG	0.30	0.12	0.48	0.36	0.03	0.00
HND	0.03	0.37	0.14	0.47	0.66	0.11
HRV	0.58	0.64	0.99	0.85	0.71	0.17
HUN	0.98	1.00	0.94	0.84	0.97	0.89
IDN	0.75	0.93	0.03	0.04	0.76	0.86
IND	0.31	0.84	0.02	0.03	0.41	0.64
IRL	0.25	0.65	0.19	0.19	0.81	0.13
ISL	0.78	0.15	0.03	0.02	0.03	0.08
ISR	0.46	0.96	0.77	0.32	0.58	0.16
ITA	0.97	0.99	0.95	0.73	0.94	0.85
JAM	0.03	0.05	0.14	0.02	0.02	0.00
JOR	0.86	0.35	0.18	0.74	0.20	0.03
JPN	0.46	0.63	0.03	0.04	0.70	0.17
KAZ	0.05	0.05	0.07	0.01	0.06	0.01
KEN	0.48	0.42	0.43	0.32	0.17	0.12
KGZ	0.01	0.42	0.67	0.13	0.36	0.49
KOR	0.36	0.56	0.88	0.41	0.78	0.24
KWT	0.05	0.55	0.00	0.01	0.08	0.02
LBN	0.04	0.43	0.26	0.44	0.58	0.06
LKA	0.03	0.24	0.06	0.04	0.60	0.18
LTU	0.38	0.88	0.70	0.67	0.72	0.58
LUX	0.32	0.95	0.33	0.79	0.98	0.58
LVA	0.70	0.47	0.99	0.99	0.51	0.36
MAR	0.24	0.12	0.26	0.11	0.80	0.14
MDA	0.14	0.12	0.36	0.53	0.11	0.06
MDG	0.00	0.11	0.03	0.06	0.05	0.03
MEX	0.56	0.49	0.73	0.55	0.92	0.78
MKD	0.72	0.40	0.45	0.16	0.40	0.19
MLI	0.01	0.12	0.00	0.18	0.07	0.06
MLT	0.62	0.47	0.46	0.89	0.85	0.58
MNG	0.00	0.07	0.37	0.81	0.03	0.04
MOZ	0.02	0.14	0.04	0.19	0.07	0.08
MUS	0.35	0.37	0.03	0.20	0.58	0.03
MWI	0.00	0.53	0.24	0.61	0.04	0.04
MYS	0.36	0.95	0.31	0.55	0.97	0.53
NAM	0.02	0.20	0.24	0.06	0.17	0.30
NGA	0.11	0.09	0.17	0.19	0.00	0.00
NLD	0.97	0.68	0.84	0.82	0.96	0.86
NOR	0.57	0.35	0.10	0.07	0.57	0.21
NZL	0.36	0.43	0.13	0.23	0.39	0.06
OMN	0.07	0.83	0.44	0.05	0.56	0.00
PAK	0.45	0.25	0.03	0.04	0.06	0.06
PAN	0.11	0.06	0.14	0.15	0.00	0.00
PER	0.01	1.00	0.31	0.85	0.23	0.00

PHL	0.12	0.41	0.08	0.07	0.98	0.99
POL	0.37	0.76	0.85	0.77	0.99	0.93
PRT	0.35	0.82	0.61	0.94	0.87	0.84
PRY	0.40	0.29	0.27	0.92	0.02	0.00
ROM	0.11	0.49	0.54	0.27	0.79	0.54
RUS	0.09	0.32	0.03	0.12	0.22	0.17
RWA	0.00	0.05	0.01	0.01	0.04	0.00
SAU	0.12	0.44	0.01	0.01	0.20	0.01
SEN	0.17	0.45	0.05	0.07	0.15	0.18
SGP	0.40	0.66	0.95	0.68	0.86	0.86
SVK	0.33	0.88	0.98	0.76	0.97	0.75
SVN	0.57	0.80	0.63	0.96	0.92	0.97
SWE	0.60	1.00	0.49	0.56	0.94	0.88
SYR	0.57	0.44	0.01	0.02	0.73	0.02
THA	0.35	0.81	0.09	0.24	0.97	0.51
TUN	0.12	0.47	0.32	0.30	0.91	0.46
TUR	0.18	0.50	0.13	0.27	0.72	0.87
TWN	0.24	0.52	0.78	0.72	0.74	0.66
TZA	0.02	0.31	0.95	0.47	0.11	0.01
UGA	0.02	0.09	0.16	0.07	0.09	0.09
UKR	0.13	0.41	0.89	0.47	0.83	0.23
URY	0.77	0.69	0.58	0.82	0.14	0.41
USA	0.73	0.88	0.08	0.05	0.61	0.62
VNM	0.07	0.40	0.02	0.06	0.71	0.50
ZAF	0.18	0.49	0.24	0.18	0.34	0.77
ZMB	0.02	0.07	0.04	0.06	0.26	0.09
Sample average	0.35	0.50	0.38	0.38	0.47	0.35

Table A.2 MIIT index selected countries and sectors. 2007

Country	HS 30	HS 39	HS 61	HS 62	HS 85	HS 87
ALB	0.03	0.01	0.95	0.70	0.67	0.02
ARE	0.05	0.48	0.00	0.00	0.01	0.00
ARG	0.61	0.00	0.51	0.00	0.16	0.89
ARM	0.00	0.06	0.00	0.30	0.19	0.00
AUS	0.75	0.48	0.02	0.16	0.24	0.22
AUT	0.91	0.84	0.72	0.78	0.88	0.85
AZE	0.00	0.00	0.40	0.00	0.06	0.00
BDI	0.00	0.00	0.00	0.00	0.00	0.00
BEL	0.85	0.87	0.92	0.92	0.85	0.84
BGD	0.37	0.10	0.00	0.12	0.00	0.00
BGR	1.00	0.62	0.54	0.77	0.63	0.31
BLR	0.20	0.66	0.91	0.35	0.90	0.74
BOL	0.00	0.00	0.00	0.76	0.00	0.00
BRA	0.24	0.60	0.00	0.00	0.00	0.56
BWA	0.43	0.32	0.10	0.34	0.31	0.00
CAN	0.72	0.00	0.00	0.00	0.00	0.00
CHE	0.53	0.94	0.40	0.47	0.92	0.41
CHL	0.17	0.03	0.00	0.61	0.21	0.32
CHN	0.66	0.77	0.01	0.06	0.68	0.70
CIV	0.00	0.60	0.03	0.36	0.00	0.00
COL	0.15	0.86	0.31	0.48	0.46	0.56
CRI	0.73	0.69	0.00	0.00	0.00	0.01
CYP	0.70	0.04	0.04	0.00	0.28	0.00
CZE	0.52	0.84	0.92	0.89	0.87	0.73
DEU	0.73	0.66	0.84	0.98	0.63	0.41
DNK	0.42	0.70	0.93	0.89	0.76	0.53
DOM	0.00	0.69	0.81	0.07	0.29	0.01
DZA	0.00	0.00	0.00	0.00	0.00	0.00
ECU	0.00	0.49	0.00	0.00	0.00	0.60
ESP	0.94	0.97	0.52	0.62	0.36	0.92
EST	0.24	0.71	0.72	0.64	0.93	0.65
ETH	0.01	0.04	0.08	0.06	0.03	0.00
FIN	0.80	0.99	0.25	0.50	0.93	0.51
FRA	0.93	0.76	0.67	0.96	0.00	0.62
GBR	0.90	0.65	0.45	0.54	0.30	0.69
GEO	0.65	0.02	0.62	0.16	0.08	0.28
GHA	0.28	0.00	0.86	0.09	0.03	0.11
GRC	0.30	0.61	0.13	0.00	0.10	0.30
GTM	0.94	0.48	0.07	0.16	0.36	0.38
GUY	0.08	0.02	0.00	0.00	0.01	0.02
HKG	0.20	0.65	0.00	0.01	0.02	0.00
HND	0.01	0.67	0.17	0.21	0.00	0.26
HRV	0.60	0.66	0.52	0.31	0.86	0.27
HUN	0.55	0.93	0.00	0.51	0.94	0.87
IDN	0.98	0.63	0.14	0.00	0.32	0.87
IND	0.30	0.06	0.04	0.00	0.35	0.80
IRL	0.38	0.79	0.07	0.00	0.00	0.21
ISL	0.60	0.16	0.01	0.00	0.00	0.21
ISR	0.37	0.91	0.00	0.33	0.00	0.39

ITA	0.85	0.95	0.90	0.45	0.86	0.89
JAM	0.06	0.00	0.03	0.60	0.01	0.00
JOR	0.57	0.27	0.86	0.00	0.16	0.62
JPN	0.00	0.50	0.03	0.00	0.88	0.11
KAZ	0.07	0.05	0.08	0.00	0.07	0.01
KEN	0.84	0.16	0.47	0.00	0.18	0.06
KGZ	0.00	0.00	0.00	0.00	0.68	0.55
KOR	0.51	0.53	0.00	0.00	0.98	0.36
KWT	0.12	0.31	0.00	0.06	0.09	0.12
LBN	0.05	0.50	0.00	0.72	0.39	0.04
LKA	0.00	0.00	0.06	0.00	0.00	0.00
LTU	0.48	0.46	0.89	0.00	0.47	0.45
LUX	0.48	0.70	0.37	0.12	0.34	0.79
LVA	0.86	0.54	0.54	0.00	0.59	0.44
MAR	0.35	0.21	0.00	0.47	0.34	0.12
MDA	0.17	0.15	0.00	0.89	0.00	0.00
MDG	0.00	0.27	0.04	0.04	0.04	0.05
MEX	0.39	0.91	0.30	0.00	0.55	0.83
MKD	0.68	0.51	0.59	0.13	0.18	0.12
MLI	0.00	0.00	0.00	0.00	0.07	0.00
MLT	0.00	0.48	0.45	0.00	0.00	0.74
MNG	0.00	0.00	0.33	0.00	0.00	0.00
MOZ	0.18	0.54	0.00	0.00	0.15	0.00
MUS	0.87	0.53	0.09	0.14	0.97	0.00
MWI	0.00	0.79	0.00	0.21	0.68	0.05
MYS	0.80	0.07	0.68	0.89	0.92	0.46
NAM	0.00	0.22	0.00	0.00	0.18	0.61
NGA	0.00	0.21	0.97	0.00	0.00	0.01
NLD	0.84	0.74	0.87	0.87	0.88	0.84
NOR	0.73	0.36	0.10	0.07	0.56	0.16
NZL	0.40	0.42	0.01	0.07	0.18	0.06
OMN	0.24	0.73	0.00	0.00	0.57	0.00
PAK	0.31	0.00	0.00	0.77	0.00	0.00
PAN	0.00	0.00	0.00	0.18	0.01	0.00
PER	0.00	0.00	0.94	0.90	0.00	0.00
PHL	0.17	0.64	0.00	0.06	0.12	0.79
POL	0.55	0.78	0.60	0.65	0.87	0.88
PRT	0.61	0.87	0.79	0.89	0.97	0.63
PRY	0.36	0.31	0.12	0.00	0.03	0.00
ROM	0.27	0.51	0.00	0.00	0.72	0.53
RUS	0.27	0.40	0.00	0.04	0.08	0.09
RWA	0.00	0.13	0.02	0.03	0.07	0.00
SAU	0.26	0.48	0.00	0.00	0.22	0.00
SEN	0.56	0.97	0.00	0.00	0.94	0.62
SGP	0.09	0.78	0.69	0.00	0.54	0.90
SVK	0.20	0.96	0.76	0.68	0.99	0.70
SVN	0.55	0.80	0.47	0.54	0.99	0.99
SWE	0.00	0.97	0.56	0.54	0.26	0.98
SYR	0.25	0.24	0.03	0.00	0.00	0.00
THA	0.32	0.67	0.00	0.00	0.94	0.33
TUN	0.21	0.77	0.05	0.36	0.61	0.39
TUR	0.17	0.57	0.26	0.55	0.62	0.33

TWN	0.45	0.18	0.40	0.65	0.78	0.27
TZA	0.02	0.86	0.00	0.90	0.30	0.00
UGA	0.01	0.05	0.15	0.10	0.00	0.00
UKR	0.13	0.33	0.66	0.83	0.64	0.25
URY	1.00	0.69	0.12	0.06	0.26	0.19
USA	0.73	0.08	0.00	0.66	0.05	0.00
VNM	0.07	0.47	0.02	0.00	0.68	0.30
ZAF	0.26	0.17	0.99	0.06	0.64	0.52
ZMB	0.04	0.00	0.12	0.67	0.23	0.35
Sample average	0.36	0.44	0.28	0.28	0.37	0.32

Table A3. Value to weight ratios in exports to the EU by sector, average 2000-2008

country	HS 30	HS 39	HS 61	HS 85	HS 87
AGO	41.63	3.27	37.22	44.18	7.36
ALB	40.38	1.29	7.56	4.29	4.22
ARE	17.84	1.71	10.77	93.11	8.28
ARG	43.97	2.62	38.93	14.94	7.75
ARM	33.24	14.57	33.86	269.52	19.50
AUS	83.16	2.61	44.07	46.74	9.55
AUT	37.25	1.78	40.50	20.38	8.69
AZE		2.70	16.12	26.17	20.64
BDI		3.79	48.66	179.94	16.97
BEN		4.81		61.56	8.86
BFA		7.60	13.38	102.34	8.95
BGD	103.19	1.24		72.76	3.48
BGR	9.11	1.32	16.86	8.22	2.57
BHR		12.30	27.47	165.79	6.20
BIH	6.54	2.50	17.00	12.02	2.61
BLR	78.51	1.22		12.80	2.90
BOL	75.47	3.44	43.07	104.51	12.30
BRA	74.67	1.07	18.32	8.33	5.90
BTN		0.80		587.70	
BWA	86.92	6.85	11.05	31.88	11.52
CAN	89.44	2.69	45.61	89.26	7.80
CHE	123.08	3.37	58.69	27.10	6.38
CHL	35.69	2.19	50.27	44.32	5.74
CHN	10.43	2.44	11.34	11.34	3.32
CMR	20.74	5.88	15.26	23.30	6.07
COL	18.87	1.19	25.60	27.30	8.67
CRI	147.32	2.75	29.62	713.05	7.23
CYP	56.21	2.22	22.86	98.10	11.62
CZE	9.25	1.84	25.87	10.86	7.07
DEU	57.10	1.87	33.02	19.41	10.93
DNK	85.99	2.61	34.28	14.06	5.66
DOM	24.98	7.32	16.99	35.31	11.66
DZA	51.57	1.20	11.04	22.97	4.58
ECU	386.88	3.67	9.49	63.12	10.16
EGY	10.93	1.41	14.44	14.90	3.18
ESP	25.99	1.65	34.82	10.99	8.54
EST	10.24	2.57	23.91	29.05	5.65
ETH	53.16	8.87	12.02	234.17	9.02
FIN	43.72	1.64	46.99	45.63	8.65
FJI		7.07	60.00	172.14	14.98
FRA	39.18	1.57	36.63	13.85	8.61
GAB		7.80	3.50	47.81	11.35
GBR	79.97	2.18	49.77	31.92	9.59
GEO	71.33	6.35	19.24	76.00	5.77
GHA	75.43	3.01	22.79	30.36	5.58
GIN		4.78	18.97	31.64	7.66
GMB		1.58	20.20	139.14	8.54
GNB		4.24		59.43	6.15
GRC	29.87	1.59	28.72	6.69	8.70

GTM	452.14	1.43	18.18	80.37	7.51
GUY			15.79		
HKG	23.19	4.77	19.28	29.91	6.75
HND	272.52	2.03	5.74	31.92	37.78
HRV	49.62	1.15	25.92	12.34	2.74
HTI		5.87	7.12	80.93	10.58
HUN	26.95	1.43	29.53	18.49	8.55
IDN	13.25	1.77	12.40	13.80	5.24
IND	7.71	1.54	11.92	7.89	4.01
IRL	70.03	2.89	26.06	31.33	7.76
IRN	64.19	1.01	12.15	18.44	1.61
ISL	127.10	3.00		6.41	12.83
ISR	162.26	2.23		61.38	7.79
ITA	39.09	1.99	32.39	9.53	7.37
JAM	0.95	8.51	19.91	59.16	9.24
JOR	71.28	2.25	16.60	93.44	14.66
JPN	211.01	3.98	45.42	52.24	10.04
KAZ	227.06	1.97	46.90	103.90	5.45
KEN	25.26	5.45	14.35	64.04	7.85
KHM		7.98	14.84	82.08	421.03
KOR	58.86	1.63	16.10	41.21	6.48
KWT	197.93	0.80		110.93	22.72
LAO		4.78	12.76	127.34	5.86
LBN	200.28	1.81	13.90	9.37	5.84
LBR		1.73	17.10	72.55	17.24
LBY	68.50	0.78	62.99	31.71	5.84
LKA	8.59	1.74	15.57	10.88	2.76
LTU	87.30	1.32	24.75	9.46	5.70
LUX	96.50	2.47	41.17	26.28	8.31
LVA	68.84	1.81	26.20	16.04	4.26
MAR		2.19	14.98	20.01	7.14
MDA	130.58	7.55	17.43	5.30	2.02
MDG	46.73	8.55	31.92	55.57	17.97
MDV		5.48	17.19	176.94	8.51
MEX	22.19	1.31	19.29	33.42	9.17
MKD	1537.47	1.69	14.14	2.78	3.39
MLI	51.09	8.72	14.19	77.14	10.95
MLT	25.45	9.19	39.41	114.15	14.04
MMR		8.27		139.79	7.29
MNG		2.83	47.86	286.72	10.17
MOZ	118.31	1.19	12.44	102.67	13.32
MRT		3.12		21.78	6.49
MUS	380.93	2.42	18.80	116.12	5.08
MWI	95.85	2.15	23.76	163.08	12.76
MYS	3.47	1.38	11.44	43.67	7.32
NAM	19.83	5.04	8.69	69.06	5.26
NER		71.56	31.77	336.42	7.61
NGA	3.07	1.41	17.86	23.59	4.88
NIC	70.44	5.51	10.23	141.32	10.91
NLD	101.39	1.57	34.68	32.41	8.48
NOR	7.01	1.19	40.30	15.40	6.89
NPL	32.44	5.31	15.14	137.28	13.12

NZL	31.18	5.64	32.82	30.69	7.64
OMN	56.96	2.84	12.77	17.48	36.93
PAK	22.52	1.12	7.32	50.55	2.17
PAN	161.43	2.32	8.11	23.90	8.42
PER	117.46	3.93	31.84	105.42	6.37
PGN		28.86		2648.77	13.29
PHL	24.97	4.11	11.17	138.36	6.43
POL	14.82	1.40	27.44	9.68	6.79
PRT	14.25	1.39	23.53	14.48	7.74
PRY	33.33	2.86	22.07	186.81	4.33
QAT		0.96		169.06	26.01
ROU	9.67	1.51	25.36	10.79	7.93
RUS	71.91	1.53	13.06	6.75	3.57
RWA	16.24	7.05	14.92	71.72	14.30
SAU	9.32	0.80	40.91	145.15	10.20
SDN	271.26	8.29	26.87	72.31	7.33
SEN	283.60	3.30	17.45	39.70	6.34
SGP	796.55	3.63	16.87	107.56	8.55
SLE	134.97	4.25	16.05	17.63	8.68
SLV	51.97	2.96	10.76	112.07	7.65
SRB	13.74	1.14	15.10	4.17	1.86
SVK	25.93	1.32	20.88	13.20	11.46
SVN	71.84	1.16	32.73	8.08	7.67
SWE	70.57	1.88	37.70	26.76	8.94
SYC		15.13	26.09	80.38	8.71
SYR	10.71	1.50	10.31	9.01	8.63
TCD	0.72	7.45	14.51	122.68	9.70
TGO		4.71		71.84	6.56
THA	5.82	1.61	14.68	27.59	7.49
TJK	13.59	4.90	10.72	212.83	6.40
TKM		7.19	5.86	89.11	9.08
TTO	23.11	2.04		26.04	27.12
TUN	14.53	4.21	22.42	15.36	6.86
TUR	21.65	1.93	17.20	7.07	5.52
TWN	7.81	2.29	19.09	35.80	8.60
TZA	549.15	6.35	10.04	70.97	6.36
UGA	77.02	20.14	137.71	143.41	14.35
UKR	93.44	1.21	13.71	14.19	3.23
URY	94.36	3.55	49.72	33.07	5.95
USA	198.58	3.63	30.31	66.05	11.21
UZB	238.92	2.80	6.77	336.25	10.32
VEN	48.22	0.82	15.65	19.58	6.15
VNM		2.02	10.34	9.06	5.96
ZAF	10.81	2.06		13.94	8.14
ZMB	14.29		17.88		10.28

Source: Eurostat. Note a number of outliers. These have low trade volumes and are excluded from the statistical analysis.