

REGULATORY HARMONIZATION AND TRADE IN SERVICES: VOLUMES AND CHOICE OF MODE

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Abstract

This study analyses how domestic regulation affects trade in services through commercial presence and to what extent regulation, level and heterogeneity, has an impact on the choice of mode of servicing a foreign market for total services, financial services, transport, communication, computer, and other business services. Regulatory heterogeneity is found to have a relatively large impact on trade through commercial presence. The study also assesses what determines services suppliers' choice of mode. Modes of supply are found to be complementary to various degrees. Commercial presence is more dominant the more similar a country pair is as far as regulation and business environment are concerned and countries sharing a common language are more likely to trade through commercial presence. For some sectors it is found that the disadvantage of remoteness is amplified by strict regulation. In most services sectors trade liberalisation generates meaningful market access only if commercial presence is allowed. Furthermore, absence of explicit barriers to trade and investment is not necessarily sufficient to attract foreign investors.

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1. Introduction

In the past services were seen as non-tradable, and restricting cross-border trade in services largely a non-issue, except in a few sectors such as transport and finance. However, the rapidly rising share of trade to GDP, and the ease with which information and ideas flow across borders involve internationalisation of services as well. One driving force has been multinational firms in manufacturing and extractive industries that require suppliers to provide services to the entire international operations network. Other driving forces have been market opportunities in foreign countries following technology improvements and a general shift in demand from goods to services, including more services-intensive ways of organizing production and trade. International production networks, more complex regulation, private standards related both to products and production processes come to mind.

Growing internationalisation has revealed services trade barriers which have become subject to negotiations with the view to reducing them both at multilateral and regional levels. Some services trade barriers are explicit, such as restrictions on foreign ownership, scope of business of foreign services providers or corporate form. However, OECD members have relatively low explicit services trade barriers and remaining barriers mainly stem from different approaches to regulation. Concerns about international investment and foreign takeovers appear, however, to be on the rise and several OECD countries have tightened regulation and administrative practices for national security reasons, it is claimed. The services sectors in which strategic and security considerations have arisen in relation to foreign investment are transport, media and finance (OECD, 2007a). As will be discussed in this paper, complying with regulation can inflict considerable costs on a company. Regulation is of course necessary in complex economies and some compliance costs are unavoidable, but complying with multiple regulatory regimes implies additional costs on foreign services providers, some of which could be avoided with smarter and better coordinated regulation.

The WTO definition of international services trade includes different supply modes: not only cross-border trade, but also the foreign provision of services through local subsidiaries (FDI,

"commercial presence"), and temporary movement of natural persons. This paper provides an empirical analysis of the impact of regulatory differences on services trade through commercial presence. In addition it provides a first attempt at estimating how such differences affect whether services suppliers would enter a foreign market through investment or cross-border trade in sectors where cross-border trade is feasible. Understanding how modes of supply are related is important when conducting impact analysis of regulation on international trade. If for instance commercial presence or cross-border movement of natural persons is essential for supplying a foreign market, having free cross-border trade only may not amount to much in terms of market access on the ground. By the same token cross-border trade restrictions would not add much if other modes are restricted too. Conversely, if trade can be easily shifted from commercial presence to cross-border trade, for instance via the internet, then restricting commercial presence only will have a small impact.³

The rest of the paper is organised as follows: Section two sets the scene by reviewing existing literature and describing recent developments in trade by mode. Section three presents the model and reports the regression results. Policy implications are discussed in Section four.

2. Relation to previous research

Regulatory measures may affect cross-border trade in services through two mechanisms. It increases the fixed cost of entering a market and the variable costs of servicing that market. For a firm that enters a new country market the costs of adapting its operations to local regulations is a fixed costs entry barrier. If the regulation is very country-specific, such costs are sunk. If market entry is unsuccessful, the incurred costs for adapting to local regulations are forfeit. Firms —because of the sunk entry costs— consider the entry of foreign markets as an investment decision: do they expect that the net present value of summed future profits in the export market outweigh the fixed costs that the firm has to absorb at the moment of entry? This decision drives a self-selection process that is central in the

³ Examples of sectors that fit this description are some audiovisual services and gambling.

recent theory on trade with heterogeneous firms.⁴ If exporting firms are confronted with up-front market-entry costs they need a 'performance premium' in order to compensate such costs and at least break even. The firms make an assessment of their own chances of success on the basis of their relative productivity. Only the firms with the highest productivity or lowest marginal costs can profitably overcome sunk market-entry costs and thus self-select into becoming an exporter.

Entry barriers consist of direct investment costs and the cost of complying with regulation. The latter contains costs such as registration fees and other fees and charges payable to the host government authorities. Such charges can be trivial in OECD countries, often in the range of a few hundred dollars.⁵ Indirect compliance cost with regulation, in contrast, can be substantial and foreign investors often incur considerable legal expenses in order to familiarise themselves with regulation and adjust their business practices accordingly.⁶ Cross-border trade costs include communications costs, restrictions on cross-border transactions and restrictions on business travel.⁷

Exporting services firms often deliver part of their product by a temporary local presence in the foreign market, which means that they have to deal with local, country-specific product-market regulations and labour laws. Service firms with local subsidiaries in a foreign market are affected by sunk costs resulting from local regulations in the area of environment, labour and spatial planning.

Trade and entry barriers play a role both for the volume of FDI and its importance relative to trade.

There is a vast literature on the determinants of foreign direct investment. Several papers argue that firms that set up a foreign subsidiary through FDI generally incur larger country-specific sunk costs than firms that access a foreign market through exports (Helpman *et al.* 2004; Mayer and

⁴ Melitz (2003); Helpman, Melitz and Yeaple (2004); Bernard, Redding and Scott (2007); Chaney (2008).

⁵ The PMR survey provides information on how much it costs an entrepreneur to complete all the mandatory processes in the pre-registration and registration phase when establishing a company.

⁶ The World Bank collects data on a country basis of the Cost of Doing Business, based on identical, well-defined business cases. Major consulting firms such as KPMG and Price Waterhouse Coopers produce annual compliance cost surveys for a number of countries..

⁷ According to the EBOPS, trade in services is defined as transactions between a citizen and a non-citizen, and thus includes the services provided by business travelers, unless the services are embodied in sales of foreign affiliates.

Ottaviano 2007). The literature distinguishes between horizontal and vertical investment on the one hand and green-field investment versus mergers and acquisitions on the other. The two dimensions bring different aspects into the analysis. For horizontal investment the analysis typically focuses on the relative importance of cross-border trade costs and the entry cost of setting up production in a foreign location. There is of course the old tariff-jumping motive for preferring FDI over trade when tariffs make cross-border exports unprofitable (Blonigen et al. 2002). Investment also becomes the preferred mode if trade costs are high and entry barriers low relative to the size of the targeted market (e.g. Markusen, 2002).

Vertical foreign investment is usually seen as complementary to international trade and allows a firm to optimize its supply chain by locating production of parts, components, tasks and assembly where it is the most cost effective (e.g. Markusen, 2002 ch 9; Helpman and Rossi-Hansberg, 2008). Gains from vertical FDI stem from differences in factor prices and firm-level scale economies, which can be more easily exploited the lower are trade and investment barriers. Mergers and acquisitions bring strategic motives into the picture. Empirically this is the most important way of establishing a commercial presence in a foreign market. M&A typically come in waves and often shortly after episodes of trade liberalisation (Neary, 2007).

Services are typically heterogeneous and leave room for a broad variety of services providers - large and small, cost-effective and less so and specialised niche providers alongside high-volume low margin providers. The coexistence of a vast variety of services within a sector suggests that services may be poor substitutes for each other. If so, there will be some positive demand for local services even in the event of the entry of more efficient multinational services providers. Thus, with heterogeneous services, local firms are more likely to survive trade liberalisation even if they do not match foreign competitors' prices and cost effectiveness (Melitz and Ottaviano, 2008). However, Chaney (2008) shows that a low elasticity of substitution makes entry of foreign firms more sensitive

to changes in trade costs. Since competition is less fierce, entrants can expect a larger market share the lower the elasticity of substitution.

Regulation levels have come down in OECD countries in the major services sectors during the past 20 years, so one would expect that their role as a trade barrier would also fade out.⁸ Nevertheless, a study by Coeurdacier *et al.* (2008) establishes that the relative strictness of national product-market regulations has a particularly strong and negative impact on cross-border mergers and acquisitions in the services industry. In an earlier paper we found that regulatory heterogeneity has a relatively large negative impact on both market entry and subsequent trade flows (Kox and Nordås, 2007). Moreover, regulation in the home country also appears to influence the behaviour of firms; regulatory barriers appeared to have a negative effect on the country's services export performance. Table 1 summarises the potential regulatory impacts on services trade. It distinguishes between the effects of regulation on up-front costs that arise at firm entry in a foreign market, and the effects on

Table 1 Main impacts of regulation on services trade, by GATS mode of supply

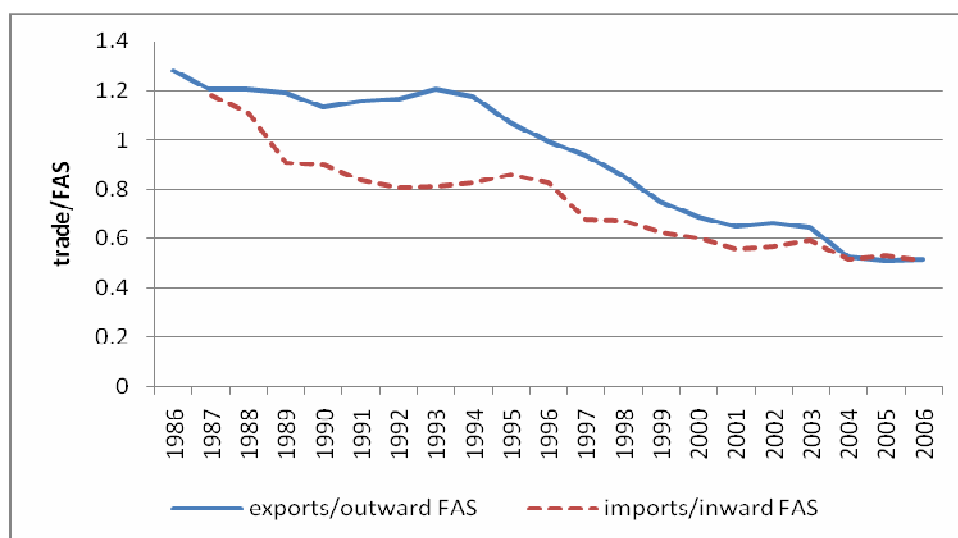
	Extensive margin impact		Intensive margin impact
	Entry	Mode choice	
Mode 3 (FDI, commercial presence)	General country-specific fixed / sunk entry costs	* Different entry costs for FDI versus exports * Potential use of destination country as export platform (vertical FDI)	* Operational costs of subsidiaries * On variable trade costs for complementary trade through modes 1+2+4
Mode 1+2 (cross border trade)	General country-specific fixed / sunk entry costs	Different entry costs for FDI versus exports	* Variable trade costs

⁸ For instance between 1987 and 2003 entry barriers as measured by the OECD product market regulation indicators for major non-manufacturing sectors declined from 5.0 to 1.6 on average. The index comprises transport (except maritime transport), telecommunications, postal services, electricity and gas and ranks between 0 and 6 with 6 being the most restrictive.

variable operational costs that on a more permanent basis influence transaction volumes after entry choices and mode choices have been made. Lanz, Miroudot and Nordås (2009) find that the extensive margin of services trade is more sensitive to changes in trade costs than is goods trade. Heterogeneous products that are traded on the basis of a legal contract between sellers and buyers are found to be sensitive to differences in legal systems (Turrini and Ypersele, 2006). Indeed, it is argued that the border effect found in most studies on determinants of international trade occurs precisely because a national boundary draws the frontier between two legal systems. Since services are even more dependent on contractual relationships between sellers and buyers than are differentiated goods, it is likely that differences in legal frameworks and regulation in general are important determinants of bilateral trade and investment flows in services.

The relative importance of FDI has increased as depicted in Figure 1 which shows the ratio of cross-border exports to outward foreign affiliate sales (FAS) and cross-border imports relative to inward FAS respectively in the US during the two decades between 1986 and 2006. The relative

Figure 1. Mode shift: changing relation between cross-border trade and sales of foreign affiliate (FAS), all services, USA 1986-2006



(Source: BEA)

importance of foreign affiliate sales has increased sharply since 1994 for outward FAS and during the entire period for inward FAS. Cross-border exports of services were almost 30% larger than outward FAS in 1986, while exports were only half of outward FAS in 2006.

The contribution from this paper is mainly empirical. We focus on the impact of regulatory barriers —both regulation levels and bilateral regulatory differences - on aggregate foreign direct investment in services.⁹ More in particular, we explore how regulatory barriers affect both the volume of FDI flows and the choice of mode of services trade. We pay particular attention to the role of regulatory *heterogeneity* between home country and potential host countries as a determinant of the trade versus investment decision. The fixed costs of complying with regulation could be a source of scale economies in foreign expansion, if compliance with the home-market regulation would be recognized in other countries. But since such mutual recognition is lacking between most countries, regulatory heterogeneity between countries can be an effective trade barrier. One important insight from the paper is that the perhaps most important barriers to trade and investment in services are not on the negotiation table in the WTO, as explicit barriers to trade and investment are few in OECD countries while harmonization or mutual recognition of regulation are not on the agenda.

3. The model

The gravity model has become the workhorse model for assessing the relationship between trade costs and trade flows; i.e. the allocation of output between different markets as a function of relative trade costs and relative market size. The model has also been widely used for analyzing the geographical allocation of investment funds (Barba Navetti and Venables, 2004; Bergstrand and Egger, 2007).

The gravity model features monopolistic competition in the market for final services where consumers maximize utility by spreading their consumption on all available varieties offered in the local market according to the relative price of each variety. They obtain utility from both the quantity

⁹ We would have liked to focus on the differences in factors that drive the firm behaviour at the intensive and extensive margin of trade through commercial presence. A lack of internationally comparative data prevents us from studying the weight of these factors at the firm level.

of each variety consumed and from having access to a broader variety of goods and services. A common assumption is that consumers spend a constant share of their income on each product category (i.e. a nested CES function where product categories or sectors are nested according to Cobb Douglas preferences) while individual varieties within a services category are nested according to a CES function where the elasticity of substitution between individual varieties is larger than unity. Demand in country j for a variety produced in country i in sector s is given by:

$$x_{ij}^s = \sigma^s E_j \left(\frac{p_i^s t_{ij}^s}{P_j^s} \right)^{1-\varepsilon} \quad (1)$$

Where E_j is total consumer expenditure in country j , σ_j^s is the expenditure share on sector s , lower case letters represent the price of the individual variety of the service in question, while upper case letters represent a price index which is a CES aggregate of the price of all available varieties within sector s . Bilateral variable trade costs are denoted t_{ij}^s and are of the iceberg type. Each firm in the sector produces one variety of the service in question. The population of firms servicing the market in country j consists of local firms producing and selling in country j (and possibly exporting), national firms in countries $i \neq j$ exporting the service across the border, and foreign affiliates of multinationals with headquarters in countries $i \neq j$.

In addition to the iceberg trade cost, exporters face a fixed trade cost denoted f_{xij}^s . Affiliates of multinational companies in contrast face a fixed cost of establishing a plant in country j , denoted $f_{ij}^s > f_{xij}^s$, but saves on the iceberg trade costs. The empirical model estimated in this paper builds on Bergstrand and Egger (2007) and combines it with the gravity model introduced by Chaney (2008), which features heterogeneous firms and fixed as well as variable trade costs. In this model bilateral exports in sector s are determined by the following equation:

$$X_{ij}^s = \sigma^s \frac{Y_i Y_j}{Y} \left(\frac{w_i t_{ij}^s}{P_j^s} \right)^{-\chi^s} (f_{xij}^s)^{-(\chi^s/(\varepsilon-1)-1)} \quad (2)$$

Here w_i is a vector of factor prices in country i , χ^s represents the parameter in a Pareto distribution of firm productivity. Applying the same model to foreign affiliate sales we get:

$$FAS_{ij}^s = \sigma^s \frac{Y_i Y_j}{Y} \left(\frac{w_j}{P_j^s} \right)^{-\chi^s} (f_{ij}^s)^{-\chi^s/(\varepsilon-1)} \quad (3)$$

Hence the relation between trade and FDI becomes:

$$\frac{X_{ij}^s}{FAS_{ij}^s} = \left(\frac{w_i f_{ij}^s}{w_j} \right)^{-\chi^s} \frac{(f_{xij}^s)^{-\chi^s/(\varepsilon-1)}}{(f_{ij}^s)^{-\chi^s/(\varepsilon-1)}} \quad (4)$$

Thus, the relationship depends on relative factor prices, variable trade costs and the ratio of fixed trade and fixed FDI costs. There are several ways of deriving a regression equation from equation (3). The standard log-linear version reads as follows:

$$\ln FAS_{ij} = \alpha_0 + \alpha_1 \ln D_{ij} + \alpha_2 hg_reg + \lambda_i + \gamma_j + \mu_{ij} \quad (5a)$$

The left-hand side variable is the log of inward FAS in country i from country j . D_{ij} contains the usual bilateral gravity variables (bilateral distance, dummies that capture whether or not the country pair has a common land border, shares a common official language, has a common colonial past or is members of the European Union). The third term captures regulatory heterogeneity, the variable of particular interest to this study. Finally home country and partner country dummies and an error term are included. The regression is run for total services and for the individual services sectors for which data are available.

It has been shown in the literature that the OLS estimation technique represented by equation (5a) may be biased because it excludes country pairs that do not invest in each others' markets. Besides OLS regressions tend to overestimate the impact of distance and are prone to heteroskedasticity. In order to correct for these problems, using pseudo Poisson Maximum likelihood estimators is suggested (Da Silva and Tenereyro, 2006). The estimation equation would then read:

$$FAS_{ij} = \exp(\alpha_0 + \alpha_1 \ln D_{ij} + \alpha_2 hg_reg + \lambda_i + \gamma_j + \mu_{ij}) \quad (5b)$$

An alternative way of expressing equation (3) when applied to FAS data is to introduce combined GDP of the country pairs and the similarity of their market sizes. With considerable investment costs, market size is crucial for the investment decision and it is useful to study the effect of market size explicitly rather than lumping it together with other country-specific variables in the country dummy. The combined markets and the difference in market size are both bilateral variables.

$$\ln FAS_{ij} = a_0 + a_1 \ln(Y_i + Y_j) + a_2 \ln S_{ij} + \ln D_{ij} + a_3 hg_reg + \lambda_i + \gamma_j + \mu_{ij} \quad (6a)$$

$$FAS_{ij} = \exp(a_0 + a_1 \ln(Y_i + Y_j) + a_2 \ln S_{ij} + \ln D_{ij} + a_3 hg_reg + \lambda_i + \gamma_j + \mu_{ij}) \quad (6b)$$

$$\text{with: } S_{ij} = \left[1 - (Y_i / (Y_i + Y_j))^2 - (Y_j / (Y_i + Y_j))^2 \right]$$

Egger (2008) has shown that in models with differentiated products, exports can be expressed as the product of the number of exporting firms, the average output price of these firms and the average quantity exported by each firm. He also shows that with this specification the marginal impact of distance on trade flows is non-linear and depends on the number of products being exported and relative prices. We use this insight to include the product of the *level* or regulation in the source and host country respectively and distance. This takes into account that the impact of distance on trade and FAS flows depend on the resistance terms, and the regulatory restrictiveness level is assumed to be one determinant of the resistance term. In addition it creates a bilateral variable that incorporates the regulatory level. This is useful, since it is reasonable to control for regulatory level when analysing the impact of regulatory heterogeneity, and it is otherwise difficult to distinguish the regulatory levels from the country dummies (data on regulation is available for two years only). Having explored various specifications of the gravity model, we prefer the following for commercial presence:

$$FDI_{ij} = \exp(a_0 + a_1 \ln(Y_i + Y_j) + a_2 \ln S_{ij} + a_3 \ln D_{ij} + a_4 reg_i * \ln D_{ij} + a_5 reg_j * \ln D_{ij} + a_6 hg_reg + \lambda_i + \gamma_j + \mu_{ij}) \quad (7)$$

where bilateral stocks of FDI are used as a proxy for sales of foreign affiliates. We are aware that a fully specified gravity model according to Egger (2008) should include a number of additional interaction variables (income and bilateral trade costs). However, the limited number of observations in our sample creates problems of distinguishing between direct and indirect impact of bilateral trade costs, and we therefore limit the combination variable to the ones of interest; regulatory barriers.

4. The data

The FDI data covers 42 importing/host countries¹⁰ and 60 partner/source countries¹¹ for the period 1998-2006. This should in principle give us 2520 observations per year and 22680 observations altogether, but due to shorter time series for some of the explanatory variables on regulation and missing values, the number of observations in each regression is substantially smaller. The countries for which FDI data are available have few zero investment flows among themselves. This means that the extensive margin of FDI is only visible to a limited extent. Table 2 presents the sectors that are included in the analysis. Trade data are given according to Extended Balance of Payment (EBOPS) categories, while FDI stocks are given according to ISIC classification.

Table 2 Sectors included, trade and FDI stocks

Sector name	EBOPS	ISIC
Transport	205	60-63
Post and telecommunications	245	64
Financial services	260	65
Computer and related services	262	72
Other business services	268	74

¹⁰ All OECD members except Iceland, Mexico and Turkey plus Bulgaria, Brazil, China, Croatia, Estonia, Hong Kong, India, Lithuania, Latvia, Romania, Russia, Singapore, Slovenia, Ukraine and South Africa. However, for the non-OECD countries data on regulation is limited to the World Bank Cost of Doing Business Indicators and banking regulation. There are several gaps in the trade and investment data for all countries included.

¹¹ The partner countries are the same as the reporting countries plus Algeria, Argentina, Chile, Egypt, Ghana, Indonesia, Iceland, Israel, Morocco, Malaysia, Mexico, Nigeria, Pakistan, the Philippines, Tunisia, Turkey, Taiwan, and Venezuela

Among the services analysed in this study, business services (EBOPS 268) are the largest exporting sector, overtaking transport in the year 2000. Exports of financial services have also expanded steadily over the past decade. Services imports follow the same pattern, but the OECD countries combined have a positive trade balance for total services, financial services and business services, and a negative trade balance for transport and communication services. Turning to commercial presence, total OECD data is not available, but for the US financial services are by far the largest foreign investment sector, dwarfing the others. Furthermore, the growth rate has also been among the highest in this sector, but comes second to transport, which has grown fast from a low base.

Information on regulation is from the following sources: the OECD Product Market Regulation (PMR) survey provides information on regulation for all OECD countries for 1998 and 2003. Sector-specific indices of regulation on the network industries (telecommunication and transport) are available for all years during the period 1998-2003. The heterogeneity indices are bilateral indices developed on the basis of the results of the PMR questionnaire as explained in Kox and Nordås (2007) and briefly in Annex 2 of the present paper. Regulatory heterogeneity indices have also been developed based on the World Bank Cost of Doing Business indicators and for the World Bank's data on banking regulation using the same methodology. The two sub-indicators in the Cost of Doing Business survey that capture restrictions or costs directly related to trade and investment are "trading across borders" and "starting a business" (although the former relates to administrative procedures related to trade in goods and the latter does not explicitly account for discriminatory measures).¹² The World Bank method not only measures the content of regulation itself, but also the perceived efficiency of regulatory implementation. The Cost of Doing Business indicators are available for all countries in the sample from 2003 to 2006, while the banking regulation data is available for all countries in 1998 and 2003.

¹² Heterogeneity indices for all Doing Business indicators were developed and introduced in the regressions, one by one. Only the statistically significant are reported.

5. Results

5.1 Regulation and FDI

The gravity model is first used to estimate the relation between regulation and commercial presence where the bilateral inward FDI stock is used as a proxy. This is motivated by the fact that FDI stocks are better covered in the data than foreign affiliate sales. Besides the capital output ratio is usually fairly stable over time since the capital stock determines production capacity, and changes in capacity utilization is not likely to be large enough to create serious problems for the results.¹³ The results for aggregate services are presented in Table 3. We only report regressions with statistically significant regulatory measures. In all tables ***, **, * refer to statistical significance at a 1, 5 and 10% level respectively. In all tables standard errors are reported in parenthesis. The results are robust to using the alternative specifications 5b or 6b.

Total services

Bilateral FDI for total services falls off with distance while increasing in combined market size, market size similarity and other similarities captured by common language and belonging to the European Union. Regulatory heterogeneity as captured by the aggregate bilateral PMR heterogeneity indicator has a relatively large and negative impact on bilateral FDI stocks. It is also found that the disadvantage of remoteness is larger the stricter is regulation so that a country will attract less FDI in services from distant sources the stricter is its regulation. This result appears for the aggregate PMR indicator as well as the several sub-indicators. The only individual heterogeneity sub-indicator that is significantly related to FDI when regulatory level is controlled for is barriers to competition, a result

¹³ The correlation between inward FDI stocks and inward FAS for total services was found to be 0.77 (based on 1131 observations). For financial services the correlation was 0.80 (464 observations), but for the other services sectors correlation was weaker (0.55 for telecoms, 0.53 for other business services, 0.32 for computer services and only 0.10 for transport). Since the correlation is very high for total services and the highly specialised financial services, a possible reason for weaker correlations in other sectors is that multinational firms are multiproduct firms that sell goods and services other than the products falling under their main activities.

that underscores the complementarity between trade policy in a broad sense and competition policy.¹⁴ Also the Cost of Doing Business heterogeneity indices are significantly and negatively associated with bilateral FDI stocks. The effect of being a member of the European Union disappears when regulatory heterogeneity is included in the regression, which suggests that regulatory harmonisation is one of the key factors behind the estimated positive impact of EU membership on bilateral FDI. In order to explore the possibility that EU attracts investments from non-members, a dummy which is one if the host country is an EU member and the source country is not was introduced together with the heterogeneity indices. This turned out not to produce significant results at the aggregate services level, but as we shall see below, for some services sectors it did.

Financial services

The determinants of bilateral foreign direct investment in financial services were explored using the general bilateral PMR heterogeneity indices, the Cost of Doing Business indicators and the bilateral Banking Regulation heterogeneity indices. The details of the regression results are reported in the Annex. It is observed that commercial presence is more sensitive to market size than the average for services sectors. EU membership appears to stimulate intra-EU investment, but EU does not seem to attract more third country investments.¹⁵ The PMR heterogeneity indicators that are statistically significant when controlling for the (distance adjusted) level of regulation are: the overall PMR indicator; state control; and barriers to competition, while the (distance-adjusted) PMR levels in the potential host country that are significantly and negatively related to bilateral FDI are the overall index; barriers to trade and investment; public ownership; public intervention in business operations; and administrative burdens on start-ups. Stricter regulation captured by these indicators is associated with lower inward investments.

¹⁴ Here it is referred to trade policy applying the GATS definition of trade in services.

¹⁵ This result contrasts findings in the literature for total FDI as discussed above.

Table 3. The relationship between inward investment and regulation, total services

	EU	PMR	BT	SC	PO	IBO	BC	EBT	SAB	TAB
In GDP combined	0.991 (0.737)	3.524* (2.070)	1.674*** (0.281)	3.959 (2.566)	2.696*** (0.335)	4.365*** (0.656)	1.961 (2.160)	2.641 (2.099)	2.493 (3.032)	2.604*** (0.33)
In similar GDP	0.852** (0.375)	2.256** (1.044)	1.390*** (0.181)	2.467* (1.290)	1.916*** (0.183)	2.700*** (0.344)	1.527 (1.088)	1.816* (1.068)	1.622 (1.519)	1.675*** (0.175)
In distance	-0.369*** (0.0373)	-0.423*** (0.0783)	-0.487** (0.224)	-0.411*** (0.0910)	-0.0929 (0.218)	0.0789 (0.296)	-0.490*** (0.0775)	-0.455*** (0.0821)	-0.360*** (0.079)	-0.259 (0.246)
Border	0.372*** (0.0536)	0.353*** (0.108)	0.392*** (0.140)	0.351*** (0.111)	0.439*** (0.143)	0.293** (0.123)	0.403*** (0.113)	0.395*** (0.106)	0.352*** (0.079)	0.335** (0.145)
Common language	0.402*** (0.0593)	0.558*** (0.154)	0.672*** (0.183)	0.577*** (0.144)	0.574*** (0.161)	0.597*** (0.184)	0.682*** (0.136)	0.653*** (0.144)	0.329*** (0.08)	0.447*** (0.138)
Colony	0.226*** (0.0575)	0.167 (0.133)	0.0901 (0.143)	0.158 (0.127)	0.137 (0.133)	0.298* (0.166)	0.0666 (0.119)	0.101 (0.121)	0.154* (0.086)	0.290* (0.172)
Both EU	0.537*** (0.164)								0.608*** (0.157)	0.684** (0.294)
Only host EU	-0.0959 (0.166)									
Heterogeneity		-1.343** (0.588)	-0.160 (0.686)	-0.509 (0.320)	0.495 (0.526)	-0.0800 (0.268)	-1.163** (0.491)	-0.376 (0.337)	-0.673*** (0.179)	-0.471** (0.216)
Host reg x distance		-0.0877*** (0.0311)	-0.324** (0.143)	-0.0658** (0.0260)	-0.270*** (0.0583)	-0.404*** (0.109)	0.0184 (0.0391)	-0.0544** (0.0269)	0.04 (0.122)	-0.323 (0.22)
Source reg x dist		0.0406 (0.0329)	0.311 (0.204)	0.0185 (0.0241)	0.0823 (0.0676)	-0.0188 (0.147)	0.0353 (0.0333)	0.0501** (0.0253)	-0.152 (0.165)	0.089 (0.234)
Observations	5200	596	400	596	400	400	596	596	1950	650
Pseudo R-squared	0.921	0.937	0.943	0.937	0.947	0.945	0.936	0.936	0.919	0.917

Note: The PPML estimator is used in all regressions. Country and time dummies are used. Column headings refer to the heterogeneity indicator used, which are defined as follows: PMR=product market regulation; BT=barriers to trade and investment; PO=state control; SC=state control; PO=public ownership; IBO= government involvement in business; BC=barriers to competition; EBT=explicit barriers to trade and investment; SAB=regulation related to starting a business (from World Bank); TAB=regulation related to crossing a border (from World Bank). Standard errors are in parentheses.

Heterogeneity in the Cost of Doing Business policy areas covered by “starting a business”, “trade across borders” and “getting credit” are also negatively associated with bilateral investment. Among the banking regulation heterogeneity indicators, bank supervision was the only one that had a statistically significant impact in the regressions. These results are qualitatively similar to a study on German banks that found that country risk and banking supervision were the most important determinants of FDI (Buch and Lipponer, 2007).

Telecommunications

Among the standard gravity variables that have the strongest statistical and economical association with bilateral FDI stocks in telecommunications are common language where countries that share a common language had almost 7-fold higher bilateral FDI stocks.¹⁶ Having a common border, in contrast, is estimated to be negatively related to bilateral FDI, and the effect is relatively large. A possible explanation is that a neighbouring country is easier to service through cross-border trade, which is in fact what is found in the next section where the impact of regulation on choice of mode is analysed. There is finally weak support for the hypothesis that EU membership both stimulates intra-EU investments and attracts investment from third countries. None of the PMR heterogeneity indices were statistically significant in determining FDI in this sector, but the levels of regulation as captured by the overall PMR indicator, state control and administrative burden on start-ups in the host country are negatively associated with FDI inflows. Among the World Bank Cost of Doing Business indicators, heterogeneity on the sub-indicator related to the enforcement of contracts is negatively associated with bilateral FDI stocks.

OECD provides sector-specific indicators of both FDI restrictiveness and product market regulation for telecommunications. These indicators do not contain sufficient details for a meaningful

¹⁶ The impact is calculated on the basis of the lowest coefficient in the regressions reported in Table A3 which is 1.888.

heterogeneity index to be developed.¹⁷ The relationship between the level of restrictiveness and FDI was therefore the focus of analysis, and evidence is found that FDI restrictions are strongly and negatively associated with FDI. Interestingly, the impact in the source country appears to be the strongest. Thus, a one standard deviation increase in the FDI restrictiveness index for telecommunications reduces FDI outward stock by about 60% and inward stock by about 30%, everything else equal. It should be noted, however that the FDI restrictiveness index has a broad dispersion and one standard deviation is a relatively large change (the mean is 0.25 and the standard deviation 0.18).¹⁸ The result that outward investment is more strongly related to restrictions on FDI probably indicates that highly protected local telecoms companies are less likely to venture into foreign markets than those operating in more competitive markets.

Also the telecommunication-specific PMR indicator is negatively correlated with both inward and outward FDI stocks in the communication sector, and the relation is of a similar magnitude for inward and outward stock. Again the estimated coefficients are relatively large as a one standard deviation increase in regulatory restrictions is associated with as much as 60% smaller FDI stocks. This should, however, not be surprising since the regulations that are included in the PMR indicator for telecommunications reflect public ownership and restrictions on the number of firms being allowed to enter the market.

Transport services

No statistically significant relation between sector specific regulation and bilateral FDI stocks were found for the transport sector. This applies both for the PMR indicator and the FDI restrictiveness

¹⁷ A simple measure of difference in regulation for these indicators is a dummy that is 1 if a country pair's regulatory index differs by more than one (or alternatively two) standard deviations and zero otherwise. This was tried for both communication and transport services, but the variable was dropped because of collinearity with other variables. It should be noted that the trade and FDI data lump together post and telecommunication, while data on regulation applies to telecommunication only. However, there is evidence that a quite small share of trade and investment can be attributed to postal services, at least for the period covered by these data.

¹⁸ It is noted, however, that the coefficients lose their statistical significance when country fixed effects are added. This does not necessarily mean that the results are invalid, only that they are less precisely estimated when combined with country fixed effects that are correlated with regulation.

index for the sector, suggesting that such regulations either are not the binding restrictions on FDI, or there is too little variation among the OECD countries for which regulatory data are available for it to have a discernible impact on FDI.

There are nevertheless some interesting findings. First, EU membership is negatively related to bilateral FDI in transport, although there is no evidence that EU membership attracts transport FDI from third countries. As we will see in the next section this could have to do with the impact of EU membership on choice of mode. Second, product market regulation in the potential host country of FDI discourages investment, and this is found for the overall PMR index and the sub-indicators for state control, public ownership and administrative burden on start-ups.

Computer services and other business services

Computer services constitute a relatively small sector with a sample mean bilateral FDI stock of \$52 mill. while other business services are a large category with a sample mean of \$1100 mill. While computer services are lightly regulated, other business services are much more heavily regulated. For computer services we find that heterogeneity on state control and on state intervention in business operations have a statistically significant and negative relationship to bilateral FDI. In addition, the level of restrictions related to public ownership in the host country is also negatively associated with inward FDI. Thus, interestingly, for computer services it appears that government direct involvement in the economy is the most restricting factor. Possible explanations are that government is a large consumer of computer services, and may have a higher propensity to source from domestic firms, or provide computer services in-house.

Interestingly, heterogeneity in employment regulation (from the World Bank Cost of Doing Business survey) is negatively related to investment in computer services, an effect that is not observed for any of the other sectors. This may reflect the relatively labour/skills intensive technology used in this sector, and indicates possible complementarity between commercial presence and movement of natural persons. Differences in restrictions on starting a business are also found to be

negatively related to bilateral FDI as do differences in the overall doing business indicator and getting credit.

For other business services the same picture emerges. EU membership has a positive impact of FDI, EU members having about 50% higher bilateral FDI stocks than they otherwise would have. Heterogeneity in the PMR indicators did not have a statistically significant impact on bilateral FDI flows in this sector, but the level of regulation in the area of public ownership is negatively associated with inward investment, but positively associated with outward investment. The latter result is somewhat puzzling, but the likely explanation seems to be that countries with high barriers to trade and investment are less sensitive to distance for their outward investments. As for computer services, government intervention in business operations are negatively associated with inward FDI, and in this

Table 4. Summary regression results for regulatory heterogeneity and inward FDI

Sector	Statistically significant heterogeneity indicators	Impact of a one standard deviation reduction in heterogeneity
Total services	Overall indicator (PMR)	9%
	Barriers to competition (PMR)	11%
	Starting a business (WB)	15%
	Trade across borders (WB)	25%
	Overall indicator (WB)	27%
Post and telecommunications	Enforcing a contract (WB)	19%
Financial services	Overall indicator (PMR)	19%
	Barriers to competition (PMR)	19%
	State control (PMR)	11%
	Bank supervision (WB)	10%
	Starting a business (WB)	26%
	Trade across borders (WB)	19%
	Overall indicator (WB)	21%
Computer and related services	State control (PMR)	26%
	Government involvement (PMR)	13%
	Starting a business (WB)	33%
	Getting credit (WB)	19%
	Trade across borders (WB)	22%
	Overall indicator (WB)	22%
Other business services	Trade across borders (WB)	19%

case also for outward FDI. Heterogeneity in restrictions in trade across borders as measured by the World Bank Cost of Doing Business indicators, and the overall heterogeneity index based on this

survey have a significant negative impact. The results for the relations between regulatory heterogeneity and inward FDI stocks for all sectors are summarised in Table 4.

What is interesting to notice in this table is that the two sectors that are possibly the most easily traded through all modes of supply, financial services and computer and related services, are the most sensitive to differences in regulation. Whether this is because trade can shift more easily to other modes in these sectors will be further explored below, but Kox and Nordås (2007) found that regulatory heterogeneity also affects cross-border trade negatively, so it is likely that heterogeneity affects both the total volume of trade through all modes and the choice of mode. Finally, it is noticeable that differences in employment regulation features prominently in the computer services industry, and only this sector.

5.2 The relation between regulation and choice of mode

Before assessing how regulation may affect the choice of mode of entering a foreign market, i.e. trade as measured in the balance of payment statistics versus commercial presence, it is useful to establish to what extent modes of supply are interrelated. In order to supply a service across borders it may be necessary to establish a commercial presence in the form of a distribution channel, customer service, a joint venture with a local firm etc. For services which can easily be transmitted electronically across borders on the other hand, trade may be either independent of commercial presence or it could be a substitute. If onerous regulation makes it costly to establish a commercial presence, services suppliers may decide to service the market through cross-border trade. Finally, almost half of total services trade is in transport and travel. These two services sectors are likely to be strongly related to trade in goods and to investment both in goods and services.

In order to explore to what extent FDI and trade in services are complementary, substitutes or independent, several analytical approaches were taken. First, we ran seemingly unrelated regressions (SUR) for the gravity model for trade and investment, testing whether their error terms are correlated,

which in most cases they were.¹⁹ Second, it is found that restrictions on foreign direct investment in services, as measured by the OECD investment restrictions index, are negatively, but weakly, related to cross-border trade in services.²⁰ This indicates that cross-border trade and commercial presence are complementary. If one is restricted, the other is negatively affected too. Further evidence of dependence between modes was found when running simultaneous equations where trade and foreign direct investment were determined simultaneously. Here restrictions on cross-border trade were found to impede FDI flows, while restrictions on establishing a business were found to impede trade flows.²¹ In addition, trade is positively associated with FDI stocks, but not the other way around. It is therefore concluded that cross-border trade and commercial presence are on average complementary. Detailed results are reported in the annex.

In the following results regarding the relations between regulatory heterogeneity and choice of mode are discussed. One caveat should be made upfront. In some cases the number of observations is small and it cannot be guaranteed that the results are representative for all OECD countries.²² It is also noticed up front that regulatory heterogeneity appears to be more important for explaining variations in choice of mode among countries than variations in FDI stocks for most sectors.

Table 5 presents the results for total aggregate services, while results for individual services sectors are presented in the annex. Highly regulated countries tend to import relatively more and attract relatively less foreign investment. Tentatively the regression results suggest that on average the

¹⁹ Seemingly unrelated regressions find that the error terms of a gravity regression for trade and for FDI are positively correlated and pass the Breusch-Pagan test at a 1% confidence level for total services and transport services 5% level for communication services, 10% for other business services. For financial services the Breusch-Pagan test gave different results depending on the specification of the equations.

²⁰ Before multilateral resistance is introduced in the regressions the FDI restrictiveness indicator is statistically significant. It remains negative, but loses its statistical significance when controlling for resistance.

²¹ The relation is statistically significant at a 5% level when using the Poisson maximum likelihood estimator, but not significant when using OLS with fixed effects. These results, when significant, also suggest complementarity between trade in goods and services.

²² The number of observations where there is information on trade, FDI stocks and regulation can in some cases be quite small. The regression equation is equation (4) in the technical annex (taking logs of both sides and estimated by OLS country and time fixed effects).

ratio of imports over inward FDI increases by 25% if the PMR heterogeneity index increases with one standard deviation. Similar results are found for the PMR heterogeneity sub-indicators for state control and government involvement in business. Thus, a country tends to attract investment from partner countries with a similar regulatory environment, and import from countries with a different regulatory environment. A similar result is found for the overall indicator from the World Bank Cost of Doing Business heterogeneity indicator.

The individual sub-indicators that have a statistically significant impact on the choice of mode are access to credit and enforcement of contracts, which both favour trade. This makes intuitively sense as FDI is likely to depend more on credit and contract enforcement than does trade. It is also noticeable that these two indicators are associated with differences among countries as far as choice of mode is concerned, but does not explain variation in bilateral FDI. Among the standard gravity variables, the most significantly and robustly associated with the choice of mode is common official language, which favours commercial presence over cross-border trade. Countries that share a common language on average have a 50% lower trade to FDI ratio.

In the **transport sector**, neighbouring countries tend to service each other's market through cross-border trade to a larger extent than countries that do not share a common border. It is recalled that there is a negative border effect in the estimates of determinants of commercial presence in the sector, so this result reinforces the conclusion that neighbouring countries tend to trade transport services while FDI is less important. Countries sharing a common language in contrast, tend to service each other's markets through commercial presence to a larger extent also in this sector. Turning to regulatory measures, more heterogeneous regulation on the overall PMR heterogeneity indicator; explicit barriers to trade and investment; state control; public ownership; and government involvement in business all tilt the trade versus investment towards trade. It is also found that heterogeneity in access to credit and registration of property from the World Bank Cost of Doing Business indicators tilt the trade versus investment ratio towards trade in the former and investment in the latter.

Table 5. Relation between regulation and choice of mode, total services

	<i>PMR</i>	<i>SC</i>	<i>IBO</i>	<i>SAB</i>	<i>CRE</i>	<i>ENC</i>	<i>ABA</i>
In relative GDP per capita	-5.078* (2.995)	-5.136* (3.003)	1.995*** (0.410)	-1.328 (2.204)	-1.368 (2.232)	-1.564 (2.224)	-1.620 (2.202)
In distance	0.0227 (0.172)	0.0234 (0.173)	-0.0514 (0.175)	0.0961 (0.0856)	0.0692 (0.0875)	0.0789 (0.0865)	0.0436 (0.0860)
Border	-0.358 (0.314)	-0.380 (0.314)	-0.413 (0.358)	-0.0465 (0.183)	-0.0517 (0.186)	-0.113 (0.185)	-0.0347 (0.183)
Common language	-0.796** (0.400)	-0.824** (0.400)	-1.255*** (0.421)	-0.726*** (0.186)	-0.614*** (0.200)	-0.864*** (0.188)	-0.645*** (0.187)
Both EU	0.598 (0.455)	0.562 (0.455)	0.618 (0.435)	0.169 (0.186)	0.158 (0.189)	0.163 (0.188)	0.124 (0.186)
Colony	-0.213 (0.398)	-0.203 (0.399)	-0.0745 (0.431)	0.193 (0.202)	0.0886 (0.204)	0.0890 (0.203)	0.141 (0.201)
Regulatory heterogeneity	3.210** (1.583)	1.659* (0.924)	1.309* (0.790)	1.627*** (0.273)	0.558*** (0.210)	0.676*** (0.171)	2.321*** (0.379)
Observations	424	424	287	1139	1139	1139	1139
R-squared	0.576	0.575	0.592	0.579	0.568	0.571	0.579
memo: impact of one sd change in HG	25%	19%	25%	49%	16%	22%	45%

Note: Column headings refer to the heterogeneity indicator used, which are defined as follows: PMR overall product market regulation; SC= state control; IBO= government involvement in business; SAB=regulation related to starting a business (from World Bank); CRE=getting credit (from World Bank); ENC=enforcement of contracts (from World Bank); ABA=overall regulation (from World Bank). Standard errors are in parentheses.

The border effect is similar for **communication services** as it is for transport. Neighbouring countries tend to engage relatively more in cross-border trade, while countries that share a common language tend to service each other's markets relatively more through commercial presence. The only heterogeneity indicator that is significantly associated with the choice of mode in this sector is dealing with licenses from the World Bank indicators. Higher tilts the choice of mode towards trade. Since licensing is very important in this sector, the result makes intuitively sense.

In **computer services** the heterogeneity indices that were significantly associated with the choice of mode are explicit barriers to trade and investment, which strongly tilts the balance towards trade; government involvement in business; dealing with licenses and overall heterogeneity on the World Bank Cost of Doing Business indicators. The more heterogeneous the indicators, the higher is the relative importance of trade. Heterogeneity in administrative burden on start-ups in contrast, has the opposite effect, which seems somewhat counterintuitive.

For **other business services** the relative importance of trade in bilateral relations is strongly and positively associated with regulatory heterogeneity. In fact, for this sector it is the only variable included in the regression that is significantly associated with a the choice of mode (together with country dummies) which suggests that countries differ a lot on what determines the choice of mode.

Finally, for **financial services** sharing a common language is strongly associated with commercial presence as the preferred mode of supply, while neighbouring countries tend to trade more with each other. Interestingly, heterogeneity in the tax regime tilts the trade versus investment regime towards investment. Again our results are similar to Buch and Lipponer (2007) who found that German banks would trade with countries with a weak regulatory system, but they would not invest there. Further, the larger a bank's FDI in a given market, the more it trades with that country, and vice versa, suggesting that trade and commercial presence are complementary. Nevertheless, since trade is more widespread than FDI, FDI is not necessary for trade to take place.

6. Policy implications

This paper has explored the role of regulation and regulatory heterogeneity for trade through commercial presence and for the choice of mode for services trade. It was found that regulatory heterogeneity is negatively associated with commercial presence and tilts the choice of mode towards trade. The empirical analysis also finds that cross-border trade and commercial presence are complementary to various degrees. That implies that services trade through cross-border supply is restricted if there are barriers to commercial presence, and vice versa. It has not been possible to estimate the impact of restrictions on movement of natural persons, but it is likely that this mode is also to a significant extent complementary to trade and FDI.

The sectors in which the evidence for a relationship between regulatory heterogeneity and trade is strongest are financial services and computer services, where a wide range of regulatory indicators have a statistically significant effect. These are also the sectors that are most easily traded through all modes of supply. Interestingly, the network industries (transport and communications) are the most affected by regulation related to licensing and enforcement of contracts; the choice of mode in the financial sector depends on regulation related to the tax regime; while computer services are affected by regulation in the labour market. From these findings we draw the following policy conclusions:

Commercial presence appears to be increasingly the preferred mode of supply in most services sectors even when cross-border trade is more and more feasible due to improvements in communication technology. Absence of explicit barriers to trade and investment is not necessarily sufficient to attract foreign investors. Thus, regulatory heterogeneity is found to constitute a barrier to entry in its own right. Therefore, regulatory reform may be necessary in order to ensure market access for foreign services providers. Furthermore, international cooperation on regulatory reform, including continuous search for best practice and benchmarking would help reduce unintended regulatory barriers to trade and investment in services. Continuation of work with the view to binding agreements on regulatory principles in the GATS would also help reduce regulatory barriers globally.

Modes of supply are found to be complementary, but not perfect complements. Therefore trade restrictions in services are best assessed when taking restrictions in all modes of supply into account. A full commitment in the GATS or regional trade agreements on cross-border supply may be worth little in terms of market access if there are strong restrictions on commercial presence. By the same token, a liberal foreign investment regime may result in limited investment flows if movement of natural persons are strictly regulated. Strict and different regulation also discourages *outward* investment as local firms find it more difficult to enter foreign markets the more restricted they are at home.

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ANNEX 1 REGRESSION RESULTS

Table A1. The relationship between inward investment and regulation, financial services

	EU	PMR	BT	SC	PO	IBO	ABS	BC	SAB	TAB	CRE	SUPERV.
In GDP combined	2.687** (1.204)	8.355** (3.979)	1.270*** (0.389)	8.303* (4.462)	2.366*** (0.406)	4.429*** (1.082)	8.995** (4.211)	7.710* (4.054)	3.047 (5.143)	2.586*** (0.401)	2.617 (9.648)	4.226 (3.076)
In similar GDP	1.551** (0.604)	4.631** (1.978)	1.294*** (0.269)	4.599** (2.225)	1.814*** (0.275)	2.878*** (0.591)	4.947** (2.095)	4.387** (2.033)	1.752 (2.569)	1.505*** (0.210)	1.488 (4.827)	2.176 (1.579)
In distance	-0.464*** (0.0465)	-0.525*** (0.153)	-0.511 (0.363)	-0.546*** (0.143)	0.377 (0.359)	-0.214 (0.478)	-0.599*** (0.108)	-0.491*** (0.111)	-0.513*** (0.116)	-0.192 (0.417)	-0.669*** (0.128)	-0.720*** (0.0919)
Border	0.241** (0.108)	0.143 (0.218)	-0.134 (0.293)	0.141 (0.220)	0.196 (0.274)	-0.0259 (0.285)	0.157 (0.228)	0.250 (0.225)	0.096 (0.159)	0.038 (0.269)	0.07 (0.193)	0.212 (0.223)
Common language	0.787*** (0.0866)	1.254*** (0.239)	1.625*** (0.336)	1.335*** (0.234)	1.360*** (0.320)	1.686*** (0.328)	1.352*** (0.251)	1.386*** (0.217)	0.825*** (0.126)	0.865*** (0.227)	0.647*** (0.62)	0.455** (0.223)
Colony	0.190* (0.106)	-0.0677 (0.222)	-0.548* (0.286)	-0.112 (0.225)	-0.316 (0.259)	-0.241 (0.311)	-0.170 (0.217)	-0.149 (0.215)	-0.0408 (0.153)	0.184 (0.233)	0.047 (0.169)	0.191 (0.210)
Both EU	0.804*** (0.208)								0.917*** (0.179)	0.928*** (0.304)	0.967*** (0.210)	
Only host EU	-0.183 (0.204)											
Heterogeneity		-2.926** (1.157)	1.015 (1.145)	-1.135* (0.589)	1.400 (0.853)	-0.811 (0.495)	-0.312 (0.468)	-1.956** (0.939)	-1.243*** (0.260)	-0.766*** (0.265)	-0.669*** (0.199)	-0.691** (0.290)
Host reg x distance		-0.117* (0.0607)	-0.820*** (0.281)	-0.0598 (0.0401)	-0.522*** (0.119)	-0.330* (0.173)	-0.0427*** (0.0198)	-0.0943 (0.104)	0.159 (0.193)	-0.574 (0.573)	0.10** (0.04)	
Source reg x distance		0.0635 (0.0740)	0.418 (0.315)	0.0209 (0.0465)	0.0163 (0.0990)	0.0316 (0.232)	0.0196 (0.0280)	0.00913 (0.0500)	-0.133 (0.264)	-0.001 (0.365)	0.015 (0.045)	
Observations	5200	596	400	596	400	400	596	596	1950	650	1300	1106
Pseudo R-squared	0.869	0.876	0.898	0.874	0.903	0.893	0.872	0.873	0.865	0.871	0.869	0.866

Note: The PPML estimator is used in all regressions. Country and time dummies are used. Column headings refer to the heterogeneity indicator used, which are defined as follows: PMR=product market regulation; BT=barriers to trade and investment; SC= state control; PO=public ownership; IBO= government involvement in business; ABS=administrative burden on start-ups; BC=barriers to competition; SAB=regulation related to starting a business (from World Bank); TAB=regulation related to crossing a border (from World Bank); CRE=getting credit (from World Bank); SUPERV= bank supervision (from World Bank) Standard errors are in parentheses.

Table A2. The relationship between inward investment and regulation, post and telecommunication

	EU	PMR	SC	ABS	ENC
In GDP combined	0.316 (1.549)	4.462 (3.087)	1.091 (3.725)	1.633 (3.768)	6.666 (6.414)
In similar GDP	0.446 (0.789)	2.640* (1.555)	0.956 (1.861)	1.250 (1.917)	3.645 (3.215)
In distance	-1.057*** (0.106)	0.409 (0.458)	0.377 (0.443)	-0.110 (0.312)	-1.207*** (0.444)
Border	-1.621*** (0.242)	-1.585* (0.846)	-1.577* (0.857)	-1.372* (0.764)	-1.708*** (0.380)
Common language	1.944*** (0.202)	2.028*** (0.540)	2.081*** (0.518)	1.888*** (0.537)	2.045*** (0.296)
Colony	0.131 (0.145)	-0.0627 (0.405)	-0.105 (0.423)	0.0248 (0.382)	0.294 (0.206)
Both EU	0.584** (0.240)				-0.004 (0.287)
Only host EU	1.016*** (0.368)				
Heterogeneity		-1.817 (1.977)	0.129 (0.965)	0.0845 (0.770)	-0.708*** (0.320)
Host reg x distance		-0.675*** (0.229)	-0.337*** (0.103)	-0.162** (0.0661)	0.272 (0.483)
Source reg x distance		-0.0836 (0.118)	-0.122 (0.0811)	-0.199 (0.126)	0.095 (0.422)
Observations	5200	596	596	596	1950
Pseudo R-squared	0.867	0.905	0.903	0.901	0.895

Note: The PPML estimator is used in all regressions. Country and time dummies are used. Column headings refer to the heterogeneity indicator used, which are defined as follows: PMR=product market regulation; SC= state control; ABS=administrative burden on start-ups; BC=barriers to competition; ENC=enforcing a contract (from World Bank). Standard errors are in parentheses.

Table A3. The relationship between inward investment and levels of sector-specific regulation, communication services

	(1)	(2)
In GDP combined	1.023*** (0.190)	0.925*** (0.101)
In GDP similar	0.662*** (0.212)	0.374*** (0.111)
In distance	-0.798*** (0.180)	-1.522*** (0.0964)
border	-1.173** (0.478)	-2.258*** (0.287)
common language	1.973*** (0.368)	1.927*** (0.232)
colony	0.644 (0.423)	1.312*** (0.184)
host FDI restrictions	-2.301*** (0.772)	
source FDI restrictions	-5.721*** (0.909)	
In price host	0.642 (1.273)	2.964*** (1.050)
In price source	-2.419*** (0.809)	-0.596 (0.596)
host PMR telecoms		-0.956*** (0.163)
source PMR telecoms		-0.916*** (0.117)
Fixed effects	No	No
Observations	924	2526
Pseudo R-squared	0.628	0.709

Note: The price variable is the price level relative to the world average for communications services as reported in the UN comparison project. These are used as a proxy for the multilateral resistance term in the gravity model where country fixed effects could not be used since they are collinear with the regulation variables of interest.

Table A4. The relationship between inward investment and general regulation, transport services

	EU	PMR	SC	PO	ABS	RAO
In GDP combined	0.924 (1.181)	6.992** (3.196)	4.228 (3.011)	1.353*** (0.488)	3.923 (3.532)	2.227 (3.501)
In similar GDP	0.742 (0.595)	3.677** (1.597)	2.302 (1.490)	0.928*** (0.316)	2.173 (1.747)	1.302 (1.744)
In distance	-1.039*** (0.0719)	-0.321 (0.258)	-0.518** (0.225)	0.134 (0.538)	-0.811*** (0.176)	-0.864*** (0.189)
Border	-0.669*** (0.158)	-1.030** (0.441)	-1.044** (0.431)	-1.110*** (0.393)	-0.995** (0.457)	-0.974** (0.437)
Common language	1.048*** (0.121)	1.052*** (0.294)	1.140*** (0.282)	1.059** (0.470)	1.089*** (0.300)	1.336*** (0.302)
Colony	0.153 (0.135)	0.554* (0.329)	0.498 (0.323)	0.351 (0.408)	0.534* (0.321)	0.450 (0.338)
Both EU	-0.927*** (0.340)					
Only host EU	-0.163 (0.368)					
Heterogeneity		-0.934 (1.701)	-0.427 (0.755)	-1.625 (1.290)	-0.0281 (0.575)	2.501** (1.163)
Host reg x distance		-0.455*** (0.131)	-0.185** (0.0726)	-0.596*** (0.190)	-0.153*** (0.0520)	-0.0541 (0.0336)
Source reg x distance		-0.0818 (0.0986)	-0.0655 (0.0610)	0.0215 (0.148)	-0.0368 (0.0402)	-0.0309 (0.0369)
Observations	5200	596	596	400	596	596
Pseudo R-squared	0.779	0.769	0.764	0.783	0.763	0.764

Note: The PPML estimator is used in all regressions. Country and time dummies are used. Column headings refer to the heterogeneity indicator used, which are defined as follows: PMR=product market regulation; SC= state control; PO=public ownership; ABS=administrative burden on start-ups. Standard errors are in parentheses.

Table A5. The relationship between inward investment and regulation computer and related services

	SC	PO	IBO	SAB	EMP	TAB	CRE	ABA
In GDP combined	7.616 (6.968)	4.296*** (0.477)	5.910*** (1.645)	5.597 (4.770)	3.823 (4.272)	3.547*** (0.321)	15.88** (8.304)	3.689*** (0.338)
In similar GDP	4.001 (3.433)	2.179*** (0.249)	3.177*** (0.900)	3.068 (2.396)	2.166 (2.149)	2.113*** (0.216)	8.228** (4.024)	2.334*** (0.232)
In distance	0.0532 (0.219)	1.155** (0.509)	0.0636 (0.581)	-0.766*** (0.148)	-0.101 (0.183)	-0.590* (0.305)	-1.003*** (0.164)	1.014 (1.105)
Border	0.505* (0.261)	0.894*** (0.226)	0.904*** (0.289)	0.269 (0.187)	0.416** (0.170)	0.119 (0.265)	0.402* (0.235)	0.100 (0.230)
Common language	0.691 (0.465)	0.947*** (0.328)	1.011* (0.518)	0.706*** (0.189)	0.379*** (0.186)	0.704*** (0.260)	0.357 (0.235)	0.498** (0.207)
Colony	0.422 (0.472)	0.276 (0.294)	0.216 (0.490)	-0.133 (0.221)	0.201 (0.193)	0.247 (0.255)	0.085 (0.246)	-0.108 (0.262)
Both EU				-0.436 (0.308)	-0.544* (0.299)	-0.473 (0.567)	-0.363 (0.409)	-0.915* (0.521)
Heterogeneity	-3.017*** (0.729)	1.161 (1.156)	-0.836* (0.494)	-1.638*** (0.337)	-0.398*** (0.173)	-0.870** (0.374)	-0.758** (0.308)	-2.793*** (0.887)
Host reg x distance	-0.312*** (0.0710)	-0.846*** (0.192)	-0.528** (0.263)	0.053 (0.275)	-0.780*** (0.157)	-0.348 (0.338)	0.143*** (0.05)	-2.664** (1.086)
Source reg x distance	0.0626 (0.0657)	0.131 (0.144)	0.125 (0.282)	-0.011 (0.265)	-0.007 (0.106)	-0.019 (0.267)	0.053 (0.053)	0.107 (0.940)
Observations	596	400	400	1950	1950	650	1300	650
Pseudo R-squared	0.903	0.946	0.930	0.878	0.885	0.912	0.885	0.908

Note: The PPM estimator is used in all regressions. Country and time dummies are used. Column headings refer to the heterogeneity indicator used, which are defined as follows: SC= state control; PO=public ownership; IBO= government involvement in business; SAB=regulation related to starting a business (from World Bank); TAB=regulation related to crossing a border (from World Bank); EMP=employment regulation; CRE=getting credit (from World Bank); ABA=overall regulation (from World Bank). Standard errors are in parentheses.

Table A6. The relationship between inward investment and regulatory heterogeneity, other business services

	EU	BT	PO	IBO	TAB
In GDP combined	2.125 (1.632)	3.434*** (0.540)	4.841*** (0.564)	5.995*** (1.228)	3.368*** (0.396)
In similar GDP	1.347 (0.821)	2.153*** (0.398)	2.823*** (0.321)	3.281*** (0.673)	1.892*** (0.246)
In distance	-0.511*** (0.0898)	-2.112*** (0.537)	-1.026* (0.606)	0.864** (0.422)	-0.151 (0.419)
Border	-0.00504 (0.111)	0.224 (0.238)	0.208 (0.261)	0.169 (0.239)	-0.104 (0.206)
Common language	0.493*** (0.153)	1.225*** (0.337)	0.603* (0.347)	0.0651 (0.488)	0.852*** (0.231)
Colony	0.341** (0.145)	-0.180 (0.338)	0.417 (0.298)	1.050*** (0.320)	0.735** (0.305)
Both EU	0.538** (0.257)			0.834* (0.485)	
Only host EU	0.108 (0.278)				
Heterogeneity		1.715 (1.310)	-0.541 (1.002)	0.418 (0.892)	-0.874*** (0.301)
Host reg x distance		0.465 (0.358)	-0.368*** (0.122)	-0.644*** (0.192)	-0.749* (0.398)
Source reg x distance		1.763*** (0.472)	0.555*** (0.186)	-0.415** (0.198)	-0.010 (0.410)
Observations	5200	400	400	400	650
Pseudo R-squared	0.911	0.935	0.942	0.931	0.945

Note: The PPML estimator is used in all regressions. Country and time dummies are used. Column headings refer to the heterogeneity indicator used, which are defined as follows: BT= barriers to trade and investment; PO=public ownership; IBO= government involvement in business; TAB=regulation related to crossing a border (from World Bank); Standard errors are in parentheses.

Table A7. The relation between trade and restrictions on FDI and vice versa, total services

	Total services			Finance		Communication	
	Trade	FDI	FDI	Trade	FDI	Trade	FDI
In GDP combined	1.626*** (0.068)	2.597*** (0.331)	2.212*** (0.091)	15.36** (7.161)	2.590*** (0.397)	1.782*** (0.125)	0.811 (5.116)
In similar GDP	0.640*** (0.095)	1.697*** (0.177)	0.740*** (0.109)	7.651** (3.551)	1.542*** (0.214)	0.793*** (0.081)	0.615 (2.552)
In distance	-0.53*** (0.057)	-0.675*** (0.105)	-0.603*** (0.0984)	-0.634*** (0.130)	-0.528*** (0.115)	-0.633*** (0.0787)	-0.859*** (0.208)
Border	0.0419 (0.126)	0.256*** (0.154)	-1.148*** (0.255)	0.339 (0.272)	0.0477 (0.262)	0.0399 (0.195)	0.705*** (0.416)
Common language	0.648*** (0.129)	0.451*** (0.130)	1.573*** (0.218)	0.598*** (0.191)	0.830*** (0.209)	1.150*** (0.170)	0.284* (0.165)
Colony	-0.0273 (0.127)	0.0446 (0.138)	-0.414 (0.253)	-0.650*** (0.164)	0.0140 (0.216)	-0.317 (0.198)	0.242 (0.326)
Both EU	0.166 (0.128)	0.600** (0.272)	0.181 (0.212)	-0.457 (0.319)	0.755*** (0.284)	0.518** (0.217)	-0.632 (0.788)
Host FDI restr.	-0.373 (0.649)		-2.786 (1.701)			-0.0647 (0.355)	
Source FDI restr.	-0.954 (0.664)		-2.955*** (1.035)			-0.813** (0.368)	
Host price index	1.369*** (0.373)		5.480*** (1.616)			-1.561*** (0.442)	
Source price index	0.737*** (0.218)		3.199*** (0.423)			1.128*** (0.214)	
Heterogeneous SAB	1.626*** (0.0681)	0.233* (0.120)	-0.761** (0.376)	1.025*** (0.385)	-1.408*** (0.426)	0.511** (0.215)	0.175 (0.670)
Heterogeneous TAB	0.640*** (0.095)	-0.322*** (0.230)	-0.482** (0.230)	-0.765*** (0.218)	-0.871*** (0.254)	-0.082 (0.182)	-0.780* (0.427)
Observations	514	2477	619	1063	650	1111	650
Pseudo R-squared	0.864	0.942	0.819	0.941	0.876	0.784	0.914

Note: The PPML estimator is used in all regressions. Country and time dummies are used.

Table A8. The relation between trade and restrictions on FDI and vice versa, transport, communication and other business services

	Transport		Computer services		Other business services				
	Trade	FDI	Trade	FDI	Trade	FDI			
ln GDP combined	1.736*** (0.0399)	5.640* (3.187)	1.692*** (0.155)	2.086*** (0.216)	8.668 (7.066)	3.390*** (0.391)	2.019*** (0.0952)	4.415 (4.280)	3.614*** (0.332)
Ln similar GDP	0.765*** (0.0435)	2.931* (1.594)	1.146*** (0.168)	0.563*** (0.188)	4.281 (3.538)	1.953*** (0.242)	0.592*** (0.119)	2.173 (2.139)	2.199*** (0.219)
ln distance	-0.458*** (0.0379)	-0.503*** (0.0418)	-1.133*** (0.165)	-0.602*** (0.154)	-0.571*** (0.107)	-0.538*** (0.178)	-0.686*** (0.0692)	-0.588*** (0.0512)	-0.854*** (0.136)
Border	0.192** (0.0875)	0.500*** (0.0689)	-0.715** (0.313)	-0.00219 (0.237)	-0.574** (0.228)	0.0181 (0.184)	0.0107 (0.197)	0.407*** (0.136)	-0.118 (0.242)
Common language	0.304*** (0.0787)	0.169** (0.0770)	1.029*** (0.268)	0.422** (0.185)	0.143 (0.206)	0.771*** (0.234)	0.665*** (0.212)	0.337*** (0.128)	0.736*** (0.242)
Colony	0.184** (0.0910)	0.135 (0.104)	0.0857 (0.309)	-0.0220 (0.206)	0.533** (0.214)	0.231 (0.260)	-0.644*** (0.173)	-0.342*** (0.117)	-0.116 (0.283)
Both EU	0.200** (0.101)	0.209* (0.126)	-0.876 (0.638)	0.406 (0.401)	0.609* (0.350)	0.504 (0.460)	-0.290** (0.139)	0.109 (0.205)	-0.650 (0.528)
Host FDI restrictions	0.750*** (0.261)		0.0256 (1.303)				-0.744 (0.835)		
Source FDI restrictions	0.901*** (0.313)		-0.424 (1.180)				-1.809*** (0.478)		
Host price index	0.481** (0.201)		1.954*** (0.687)				1.237* (0.684)		
Source price index	1.385*** (0.136)		1.829*** (0.394)				1.423*** (0.190)		
Heterogeneity SAB		0.0386 (0.165)	-0.490 (0.584)		0.597* (0.340)	-1.385** (0.564)		-0.236 (0.165)	-1.912*** (0.452)
Heterogeneity TAB		-0.154 (0.123)	-0.720 (0.444)		-0.158 (0.215)	-0.823*** (0.294)		-0.215* (0.116)	-0.770** (0.389)
Observations	1248	2179	650	598	1005	650	691	1217	650
Pseudo R-squared	0.825	0.902	0.808	0.690	0.925	0.946	0.832	0.952	0.910

Note: The PPML estimator is used in all regressions. Country and time dummies are used.

Table A9 . Relation between regulation and choice of mode, financial and communication services

	<i>Finance</i>		<i>Communication</i>	
	SAB	TAX	ABA	LIC
In relative GDP per capita	4.253 (7.864)	0.775 (0.502)	3.512 (7.915)	0.576* (0.326)
In distance	-0.339 (0.216)	-0.374 (0.457)	-0.434* (0.222)	-0.259 (0.286)
Border	2.027*** (0.525)	2.730*** (1.020)	1.976*** (0.529)	1.414* (0.742)
Common language	-2.935*** (0.472)	-3.430*** (0.922)	-2.766*** (0.487)	-0.468 (0.659)
Both EU	0.634 (0.690)	0.628 (1.590)	0.578 (0.696)	1.692 (1.214)
Colony	1.236*** (0.465)	0.902 (0.921)	1.089** (0.464)	0.815 (0.623)
Regulatory heterogeneity	2.239*** (0.704)	-2.432* (1.302)	2.749** (1.233)	1.516** (0.643)
Observations	393	139	393	164
R-squared	0.621	0.642	0.616	0.701
memo: impact of one sd change in HG	73%	-52%	55%	57%

Note: Column headings refer to the heterogeneity indicator used, which are defined as follows: SAB=regulation related to starting a business (from World Bank); TAX=paying taxes (from World Bank); LIC=dealing with licences (from World Bank); ABA=overall regulation (from World Bank). Standard errors are in parentheses.

Table A10 Relation between regulation and choice of mode, transport services

	PMR	EBT	SC	PO	IBO	RAO	SAB	RPR	CRE	ABA
In relative GDP per capita	-3.042 (3.566)	-3.322 (3.563)	-3.234 (3.568)	1.992** (1.008)	2.325** (0.993)	-3.593 (3.583)	-4.557 (3.180)	4.140 (6.199)	-4.638 (3.178)	-4.785 (3.174)
In distance	0.0452 (0.210)	0.0244 (0.210)	0.0433 (0.210)	-0.165 (0.227)	-0.133 (0.226)	0.0939 (0.210)	0.151 (0.124)	0.324* (0.166)	0.109 (0.125)	0.112 (0.124)
Border	0.896** (0.376)	0.812** (0.375)	0.883** (0.375)	0.829* (0.455)	0.799* (0.453)	0.823** (0.375)	0.696** (0.263)	0.590* (0.333)	0.703*** (0.263)	0.694*** (0.263)
Common language	-0.587 (0.509)	-0.676 (0.508)	-0.637 (0.509)	-1.229** (0.577)	-1.329** (0.577)	-0.658 (0.509)	-0.762** (0.289)	-0.767** (0.365)	-0.521* (0.303)	-0.649** (0.292)
Both EU	0.676 (0.580)	0.901 (0.588)	0.635 (0.579)	0.714 (0.593)	0.669 (0.590)	0.693 (0.579)	1.150*** (0.283)	1.451*** (0.462)	1.130*** (0.283)	1.135*** (0.282)
Colony	-0.371 (0.469)	-0.339 (0.465)	-0.370 (0.468)	0.131 (0.538)	0.0422 (0.542)	-0.257 (0.466)	0.335 (0.288)	0.279 (0.366)	0.322 (0.288)	0.313 (0.287)
Regulatory heterogeneity	3.220* (1.894)	1.744** (0.796)	2.103* (1.103)	2.160* (1.250)	1.782* (0.915)	-1.642** (0.811)	1.151*** (0.396)	-0.772* (0.412)	0.964*** (0.305)	1.984*** (0.548)
Observations	405	405	405	266	266	405	1021	693	1021	1021
R-squared	0.519	0.522	0.520	0.570	0.571	0.521	0.532	0.560	0.532	0.534
memo: impact of one sd change in HG	26%	30%	24%	29%	35%	-21%	33%	-20%	29%	37%

Note: Column headings refer to the heterogeneity indicator used, which are defined as follows: PMR= overall product market regulation EBT= explicit barriers to trade and investment; SC= state control; PO= public ownership; IBO= government involvement in business; SAB=regulation related to starting a business (from World Bank); RPR=registering property (from World Bank); CRE=getting credit (from World Bank); ABA=overall regulation (from World Bank). Standard errors are in parentheses.

Table A11 Relation between regulation and choice of mode, computer and related services

	<i>EBT</i>	<i>IBO</i>	<i>ABS</i>	<i>LIC</i>	<i>ABA</i>
In relative GDP per capita	-4.760 (7.017)	1.729* (0.914)	1.722 (6.949)	0.124 (0.462)	4.229 (5.028)
In distance	-0.934** (0.382)	-0.802* (0.424)	-1.025*** (0.379)	-0.347 (0.419)	-0.478** (0.196)
Border	0.222 (0.694)	1.322 (0.835)	-0.136 (0.686)	-0.558 (1.036)	0.118 (0.496)
Common language	-0.0786 (0.836)	-1.215 (0.927)	0.0989 (0.817)	0.255 (0.960)	-0.805* (0.467)
Both EU	0.617 (1.302)	-0.322 (1.383)	-0.00522 (1.272)	1.128 (1.682)	0.715 (0.630)
Colony	-0.657 (0.861)	0.291 (0.958)	-0.760 (0.849)	0.859 (0.903)	1.169*** (0.447)
Regulatory heterogeneity	4.058*** (1.473)	3.052** (1.463)	-4.247*** (1.250)	1.561* (0.938)	2.276* (1.165)
Observations	154	92	154	144	411
R-squared	0.645	0.714	0.656	0.667	0.603
memo: impact of one sd change in HG	85%	67%	-48%	59%	44%

Note: Column headings refer to the heterogeneity indicator used, which are defined as follows: EBT= explicit barriers to trade and investment; IBO= government involvement in business; ABS=administrative burden on start-ups LIC=dealing with licences (from World Bank); ABA=overall regulation (from World Bank). Standard errors are in parentheses.

Table A12. Relation between regulation and choice of mode, other business services

	<i>BT</i>	<i>EBT</i>	<i>IBO</i>	<i>RAO</i>	<i>SAB</i>	<i>ENC</i>
In relative GDP per capita	-0.294 (0.852)	-6.325 (6.897)	0.0328 (0.830)	-0.396 (7.044)	-1.603 (3.836)	-1.535 (3.838)
In distance	-0.327 (0.346)	-0.509 (0.355)	-0.330 (0.346)	-0.513 (0.364)	-0.286 (0.177)	-0.315* (0.178)
Border	0.578 (0.734)	-0.218 (0.691)	0.803 (0.739)	-0.317 (0.705)	0.993** (0.451)	0.973** (0.452)
Common language	-1.175 (0.814)	-0.613 (0.836)	-1.388* (0.819)	-0.264 (0.847)	-0.423 (0.400)	-0.479 (0.401)
Both EU	-0.0491 (1.302)	-0.538 (1.327)	-0.922 (1.247)	-1.475 (1.348)	-0.874 (0.563)	-0.852 (0.563)
Colony	0.687 (0.773)	0.298 (0.810)	0.683 (0.772)	0.362 (0.829)	0.00139 (0.405)	-0.130 (0.400)
Regulatory heterogeneity	5.578** (2.472)	4.198*** (1.311)	2.829** (1.223)	2.437* (1.306)	1.135** (0.577)	0.679* (0.379)
Observations	114	186	114	186	469	469
R-squared	0.834	0.727	0.835	0.714	0.713	0.713
memo: impact of one sd change in HG	78%	89%	61%	41%	32%	22%

Note: Column headings refer to the heterogeneity indicator used, which are defined as follows: BT= barriers to trade and investment; EBT= explicit barriers to trade and investment; IBO= government involvement in business; RAO=regulatory and administrative opacity; SAB=regulation related to starting a business (from World Bank); RPR=registering property (from World Bank); ENC=enforcing contracts (from World Bank).

ANNEX 2. DOCUMENTATION OF THE APPLIED POLICY INDICATORS

This annex describes the methodology for the policy indicators used in the present paper. Emphasis is on the documentation of the non-OECD indicators.

To investigate econometrically how and how much the regulatory environment affects the decisions by individual firms we need quantitative indicators. The indicators must cover multiple dimensions of regulatory differences between countries, such as the area of regulation, the types of regulatory instruments, the responsible agencies, the legal status, the sector coverage, exemptions, transparency, and treatment of foreign companies. All dimensions of the regulatory climate may affect the relative costs and attractiveness of direct investment between two countries. A combination of different regulatory indicators may be required to cover all relevant policy differences. For ranking countries in terms of the strictness of their product-market regulation we may need a different indicator than when we want to grasp the overall cost impact of a country's regulatory system on the costs of individual firms. Both indicator approaches are useful, but for different purposes. More detailed indicators are required when we want to pinpoint what types of regulation are most decisive for bilateral trade and FDI. This annex briefly documents the regulation indicators we used in the present study.

Two ways of quantifying differences in economic policies and business environment

The OECD system of indicators for product-market regulation (PMR) forms a seminal contribution to a comprehensive measurement of many aspects of product market regulation across countries (Nicoletti, Boylaud and Scarpetta 2002). The emphasis in the OECD system of PMR indicators is on providing a consistent set of indicators that measures the *relative strictness of product market regulation in a country compared to that in other OECD countries*. It also provides summary indicators for sub-areas of product market regulation: barriers to competition; administrative barriers for start-ups; regulatory and administrative opacity; explicit barriers to trade and investment; and state control (Conway *et al.* 2005). The information is based on a large number of different data points, and the information is mainly provided by OECD member governments. Limitations of these indicators are that they do not cover non-OECD countries, and that -at the moment of writing- they were only available for 1998 and 2003.

A different measurement approach is adopted by the Cost of Doing Business project of the World Bank, following prior work by a group of Harvard economists (Djankov *et al.* 2002; 2008). They apply a new way for measuring national differences in business climate and institutions. The approach uses fictive but well-defined business cases (e.g. a very specific trading transaction, a firm's request for a specific expansion of a storehouse, or setting up a new firm). The Doing Business team (with local assistance) subsequently quantifies how such standardized business plans are typically handled by a country's regulatory and judicial system and government apparatus (World Bank, 2008). The same business case is applied in all countries. For each country (in 2008: 181), they use different and

not always revealed private and governmental information sources.²³ They provide an ‘Ease of Doing Business’ country ranking, for every business area. A ranking list is for our purposes a somewhat inferior way of measuring the relative performance of countries. For this reason we have constructed our own regulation-level indicators on the basis of the World Bank Cost of Doing Business database. This procedure is documented below. The Cost of Doing Business indices are updated each year and they are available for a very large set of countries. The number of measuring points per country is less than for the OECD PMR (sub-)indicators.

A third approach to measuring differences in policy and business environment is developed by CPB Netherlands Bureau for Economic Policy Analysis. Its emphasis is not on the ranking of countries, but on assessing to what extent specific policies differ between any pair of countries. The background idea is that for the individual company that considers export or FDI, it is important to know *to what degree policies in the target country are dissimilar to policies in the firm’s home country.*²⁴ For the firm this may even be more important than the question of relative country rankings, since adaptation to and compliance with different policies goes along with changes in working practices and sunk costs. Such adaptation and compliance costs are in fact a latent variable that we cannot observe directly. But we may proxy the importance of such costs by the degree of regulatory heterogeneity (dissimilarity) between country pairs. The basic measurement approach is virtually free of subjective judgements. The method digitalizes policy differences for each pair of countries, thus allowing to aggregate policy items across different dimensions. The reliability of the approach increases with the number of data points used in the measurement. The heterogeneity indices have been calculated on the basis of the full databases that are beneath the OECD’s PMR indicators and the World Bank’s Cost of Doing Business indicators

Table A2.1 Regulatory indicators used for quantitative analysis in this paper

		Topic of comparison	
		Product-market regulation of countries	Regulatory impact on Cost of Doing Business
Regulatory aspect	Relative ranking of policy strictness in countries	1. OECD PMR ranking (sub-) indicators	2a. Level indicators WB Cost of Doing Business 2b. FDI Restrictiveness Index OECD
	Bilateral heterogeneity (dissimilarity) between country pairs	3. CPB bilateral heterogeneity indices based on OECD International Regulation database	4. CPB bilateral heterogeneity indices based on WB Cost of Doing Business database

²³ A recent independent evaluation of the World Bank Cost of Doing Business indicator system (IEG 2008) concluded that “overall the indicators objectively and reliably measure what they set out to measure” and that the indicators indeed depicted regulatory aspects that matter for individual firms. However the evaluators stressed that this is not yet a welfare analysis that also weighs the potential benefits of regulation (e.g. regarding policy areas like ‘employing workers’ and ‘paying taxes’). The evaluation has led to a few changes (World Bank 2008).

²⁴ See for a more comprehensive description of the bilateral policy heterogeneity indicator, its analytical underpinning and its empirical derivation, Kox and Nordås (2007) and Kox (2009). The full dataset will become available soon at www.cpb.nl early in 2009.

Table A2.1 summarises the main differences and correspondences between these policy indicators. For an analytical description of the third set of indicators in Table A2.1 we refer to a former OECD document (Kox and Nordås 2007, Annex 3). Here we describe the method for deriving the regulation indicators 2a and 4 that have been developed for this publication.

Regulation level indicators based on World Bank Cost of Doing Business database

Since the World Bank only produces country rankings on the basis of the Doing Business (DB) database we have decided to produce our own indicators of regulation-caused costs of doing business per country. The Doing Business (DB) database was started in 2003 and in recent years includes 97 data points per year per country on the basis of which the costs of doing business for that country are determined. A large part of the data is collected by measuring the way in which a country handles business plans in specified areas. The following business areas are covered: *Starting a Business, Dealing with Licenses, Employing workers, Registering Property, Getting Credit, Protecting investors, Paying Taxes, Trading Across Borders, Enforcing Contracts, and Closing a Business*. With the exemption of *Trading Across Borders*, all regulation areas cover behind-the-border types of regulation. For each of these areas a number of sub-indicators are available. We have used a selection of 28 sub-indicators.²⁵ For two business areas (Getting Credit, Protecting Investors) the selection criteria meant that no variables were left. This leaves us with eight DB regulation areas and 28 subsumed variables that can be used to make comparisons across countries and comparisons over time. All subsumed variables are defined such that an increase of the indicator can be expected to increase the costs of business transactions, and hence also the costs of international trade or FDI transactions with firms in the country. These variables are used to derive regulation level indicators for specified business areas.

We have applied the following aggregation procedure.

1. Divide sub-indicator j score of country i by country-sample average for sub-indicator j , yielding index numbers Q_{ji} (time suffix suppressed);
2. Divide item Q_{jit} score of country i in year t by the corresponding country-sample average in base year 0 , yielding normalised indicator $R_{ijt}=Q_{jit}/Q_{j0}$;
3. Correct annual country score R_{ijt} for annual percentage of change in sample average, multiplying by $[1 - [(Q_{jt} - Q_{j,t-1}) / Q_{j,t-1}]]$ which yields corrected country scores RC_{ijt} . We have applied simple averages, thus avoiding that subjective elements are added as weights.
4. Aggregate all RC_{ijt} for regulation area A to arrive at transformed and normalised country score RC_{iAt} for regulation area A . It describes the relative costs of doing business in country i that is associated with regulation in business area A . Scoring high on this index can be expected to represent relatively high regulatory costs at firm level. Since the indicator is also normalised with respect to a common base year, RC_{iAt} can also be applied to represent the impacts of deregulation over time. This aspect is useful in the time panel dimension of analysis.

²⁵

The selection criteria are: (a) only continuous numerical sub-indicators; (b) only sub-indicators that are directly affected by national regulatory policies; (c) no sub-indicators that rather than describing a country's regulatory characteristics describe strictly political preferences of the country like tax levels or the use of minimum wages (we left out the latter indicators).

5. Except for these area-specific RC_{iAt} indicators, we have also aggregated the eight business areas by simple averaging to get an indicator for overall regulation-caused cost of doing business in a country. This indicator is called ABA_{it} (All Business Areas).

The acronyms per business areas are: ENC - Enforcing contracts; EMP - Employing Workers; TAB - Trading across Borders; SAB - Starting a Business; CLO - Closing a Business; LIC - Dealing with Licenses; RPR - Registering Property; TAX - Paying Taxes; ABA - All Business Areas.

Bilateral heterogeneity indices based on World Bank Cost of Doing Business database

This set of indicators of bilateral policy heterogeneity is derived from the 2008 version of the World Bank's Doing Business (DB) database.²⁶ The dataset has backward extended to include data from 2003 onwards. The DB database in 2008 included 10 policy areas as indicated in Table A2.2.

The basic principle of the DB heterogeneity indicator is that multiple-dimension and partly qualitative information on the business environment is reduced to dimensionless binary information. The numbers of dimensions in which overall bilateral differences are measured ranges between 13 and 86. The information from this large number of dimensions is subsequently digitalised and compressed to arrive at dimensionless heterogeneity indicators, specific for each pair of countries. The bilateral heterogeneity indicator is based on a simple average over all policy items for each of the ten areas of the business environment depicted in Table A2.2.

Table A2.2. Bilateral heterogeneity indicators derived from World Bank DB database

Business environment area	Bilateral heterogeneity variables	
	Name	Number of separate data point used for calculating bilateral indices
1. Starting a business	HG_SAB	4
2. Dealing with licenses	HG_LIC	4
3. Employing workers	HG_EMP	5
4. Registering property	HG_RPR	3
5. Getting credit	HG_CRE	10
6. Protecting investors	HG_PIN	2
7. Paying taxes	HG_TAX	6
8. Trading across borders	HG_TAB	6
9. Enforcing contracts	HG_ENC	3
10. Closing a business	HG_CLO	3
All business environment areas	HG_ABA	46

²⁶ For the general methodology of the World Bank Cost of Doing Business indicators we refer to www.doingbusiness.org where the Doing Business methodology is described and from which the full database can be downloaded.

The aggregation procedures do not apply any weights, so that the composite heterogeneity indicator per area is not based on subjective information elements. We briefly summarise how the aggregation procedure works, starting with the simplest case:

A. Suppose for instance that business environment area “Registering Property” is measured through three data points P, Q and R for each of which it can unequivocally be assessed whether or not these regulation attributes apply in a country. This gives logical information of a binary nature: we can assess unambiguously whether or not this regulation attribute applies or not. Take item R that we compare for two countries i and j . The dissimilarity indicator h_{ij}^R has the value of 1 when both countries are *dissimilar* with respect to R , and 0 in the opposite case. The same can be done for the other regulation attributes P and Q and the corresponding dissimilarity indicators h_{ij}^P, h_{ij}^Q . The combined bilateral heterogeneity indicator for “Registering Property” then becomes: $HG_RPR = \frac{1}{3}(h_{ij}^P + h_{ij}^Q + h_{ij}^R)$. It always has a value between 0 and 1. If $HG_RPR=1$ it means that the two countries differ in all policy attributes that together measure the area “Registering Property”.

B. This was the simplest case where the basic country information has a binary nature. It becomes a bit more complex when for instance policy item G can have 4 different, discrete values, like ‘non-existent’, ‘low’, ‘average’ and ‘high’. Here we can nonetheless still unequivocally assess whether countries are different or not. But because the number of possible values for G is higher, the likelihood that two countries are different increases. To prevent that the heterogeneity score becomes a function of the number of discrete values that G can have, the number of possible values for a comparison item is compressed, so that it never can have more than six different values. Note that all countries are compared with regard to the same item G , so that the heterogeneity pattern *between* countries is never disturbed by the fact that some comparison items may take more than two discrete values.

C. Some of the basic variables in the DB database have a continuous numerical value, e.g. the number of days it takes for a firm to get a start-up license. Since continuous variables by their nature can have lots of different values a variety-reducing method has been applied by assigning a limited range of different intervals for a specific continuous variable. Per variable we first determine the maximum range that contains all numerical values in the sample. The range is divided by the standard deviation, yielding a value K . The next step takes care of the higher moments of the distribution by a correction factor E that corrects for the relation between the mean and the standard deviation.²⁷ Now it is possible to determine the potential number of different value intervals for that numerical variable, using a lower threshold of three categories and a ceiling of maximum six categories:

$$Z = \left| \text{int}(K.E) \right| \quad \text{with } 3 \leq Z \leq 6$$

This procedure is applied individually for each continuous variable. Subsequently, for all countries the continuous variable is re-coded according to the number of intervals Z . The bilateral heterogeneity indicator per item can now be derived as in steps A and B.

²⁷ The correction factor is calculated as: $E = 1 - \frac{M - \sigma}{(\sigma - M)^2}$ in which M is the mean value and σ is the standard deviation. The denominator is squared so that it is always positive.

D. The overall bilateral heterogeneity indicator for a specific regulation area X is derived by summing all item-wise heterogeneity indicators for area X and dividing by the number of non-empty data points for that area.

The heterogeneity indicators thus obtained are dimensionless numbers based on digitalising the bilateral differences in economic policy and regulation items. For comparisons over time, it is important that the number and nature of comparison items are constant over time. Otherwise the heterogeneity indicator should be treated as an annual cross section rather than as a time series. We have calculated bilateral heterogeneity indicator HG_ABA2 which is based on those data cells for which information is available over the entire period (covering policy areas HG_SAB, HG_CRE, HG_ENC and HG_CLO).

Table A2.3. Summary statistics on banking regulation heterogeneity

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
Entry into banking	2213	0.66	0.22	0	1
Ownership restrictions	2213	0.44	0.38	0	1
Capital requirements	2213	0.30	0.22	0	1
Activity restrictions	2213	0.64	0.26	0	1
Liquidity & Diversification Requirements	2213	0.30	0.27	0	1
Discipline/ Problem Institutions/Exit	2213	0.63	0.25	0	1
Supervision	2213	0.47	0.16	0	1
All business areas	2213	0.52	0.10	0	0.77

Table A2.4. Summary statistics on Doing Business heterogeneity

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
Starting a business	6535	0.34	0.25	0	1
Dealing with licenses	3128	0.52	0.30	0	1
Employing workers	6535	0.43	0.42	0	1
Registering property	4946	0.38	0.28	0	1
Getting credit	6535	0.52	0.27	0	1
Paying taxes	3128	0.45	0.30	0	1
Trading across borders	3128	0.62	0.28	0	1
Enforcing contracts	6535	0.54	0.29	0	1
Closing a business	6535	0.48	0.31	0	1
All business areas	6535	0.47	0.15	0	0.92
All business areas (indicator over those policy areas for which a complete time series is available)	6535	0.46	0.16	0	0.92