Abstract
International trade in services is hampered by national regulatory differences for service markets. Many regulatory measures affect fixed market-entry costs. Service firms must decide whether or not they invest in fixed qualification costs in a regulated services market. Due to international regulatory heterogeneity, upfront market-entry costs are sunken investments. The theoretical framework shows that exports are negatively affected by regulatory heterogeneity. We have tested this framework for bilateral trade among EU member states. For this purpose we have developed a new index for bilateral regulatory heterogeneity between countries, applying it in a gravity model. The empirical results are in line with the predicted pattern: regulatory heterogeneity hampers bilateral service trade. Simulations for the EU show that if countries make more use of mutual recognition, bilateral trade in commercial services among EU countries could increase very substantially.

Key words: regulatory barriers, fixed market-entry costs, services trade, internal market EU
JEL codes: L1, L5, L8, F12, F14
Introduction

This paper analyses how national product-market regulations affect export decisions of service firms, and how they function as non-tariff barriers in international services trade.

There are several reasons why government regulation has a strong impact on international services trade. Many exported services can only be delivered through local presence of the service provider. Whereas with goods trade only the goods themselves are exported, in the case of service provision it is often the provider himself, his staff, his equipment and material that cross national borders. As a result, some or all of the stages of the business process may take place in the country where the service is provided, thus become subject to national regulatory intervention in the export destination country. Such regulation may have simple protectionist reasons, but often national product-market regulation is motivated by market failures like externalities, monopolist tendencies or quality-related information asymmetries. Intervention arises if the service involved causes externalities for third parties, like the impact of bank reliability on the overall financial system, the public health impacts of medical qualifications, the safety aspects of building design, the urban planning aspects of distribution networks, or the environmental effects of transport.

Because production and consumption of services are difficult to separate in time and place, there is little product standardisation. Service consumers tend to have more a priori uncertainty about product quality than holds for buyers of manufacturing goods. The information asymmetry can be serious for complex professional services using specialist knowledge inputs (e.g. medical services). Governments have a long history of imposing ex ante quality regulations, operational restrictions, and market entry barriers for suppliers of services.¹

These product-market regulations are perhaps fine in an autarkic system, but they are certainly a great nuisance with international trade. An important part of the problem is that each national authority uses its own system of quality safeguards and regulatory standards for service providers. Service exporters are confronted with different regulations and requirements in each destination country. Because of the regulations, service exporters incur fixed market entry costs that are country-specific, and therefore sunk costs for that particular export market.

This paper focuses on the trade impact of regulatory heterogeneity by national authorities. Section 2 discusses the types of NTB’s that affect international service trade. Regulatory non-tariff barriers typically have an impact upon fixed costs, and function as market entry barriers. In Section 3 we analyse how international regulatory heterogeneity in services markets affects the export decision. Section 4 develops a new indicator for measuring bilateral regulatory heterogeneity between countries. Section 5 applies this indicator in the context of a gravity analysis for bilateral service trade among EU countries. We conclude that the heterogeneity in regulation does indeed hamper commercial services trade. If the heterogeneity in

¹ Quality-inspired regulations have, for instance, since ancient times been applied to the medical profession. The regulations formed one of the sources of the medieval guild system. The Royal College of Physicians of London received its charter in 1518 and got a monopoly over the practice of physic in London, and the oversight of physicians throughout England. Fellows of the College were not allowed to engage in trade, practice surgery or compound or sell medicines. These 'pure physicians' were limited to examining patients, diagnosing disease, and prescribing (but not dispensing) medications (Carr-Saunders and Wilson, 1993).
regulation would be completely eliminated, commercial services trade could double within the EU. In section 6 we apply our results to assess the effect of a proposal by the European Commission to reduce the intra-EU heterogeneity in regulation. We find that the proposal can be expected to increase bilateral services trade in European Union by 15% to 30%. Our conclusions are brought together in Section 7.

2 Non-tariff barriers in services trade

Services trade is hardly subject to import tariffs. Most trade barriers in services are of a non-tariff nature. This section discusses the nature of barriers for international trade in services. In the literature many estimates of these barriers appear in which these barriers are often interpreted as variable costs. We argue that most of the relevant barriers have to be interpreted as fixed and sunk costs of market-entry.

Types of NTB’s

The variety in NTB’s is large as is their impact. Following Hoekman and Primo Braga (1997) we distinguish several types of NTB’s. The first group consists of quantitative-restrictive policies. These are commonly applied to service providers. An example is the bilateral agreements for air transportation services. In many other services industries, foreign providers are simply not allowed. This is often the case for network industries. A sub-class of this NTB group\(^2\) is formed by discriminatory access to distribution networks like railways, cable networks, telephone system, electricity distribution, and more in general communication systems. A second group of NTB’s consists of price-based policies. This can be price controls for specific services (e.g. banking, insurance and telecommunication), or the use of prices that discriminate between foreign origins or destinations (e.g. visa fees, entry or exit taxes, and post taxes). A third and very large group of NTBs is formed by the use of licences, qualification and certification requirements, and operational restrictions for foreign services providers. Governments applying such regulations tend to disregard the fact that service providers often have qualified themselves in other countries.

Some of these NTB types are obviously discriminatory for foreign service providers. Limited or denied access to distribution and communication networks is an example for that. The same holds for quantity restrictions or price-based policies. The third group (regulatory requirements) is, however, different. The simple fact that service providers have to meet regulatory standards is not in itself a trade barrier. Often these requirements are not explicitly discriminatory for foreign providers; both domestic and foreign providers have to comply with the national regulations in a country. Such national regulatory standards can therefore be fully compatible with WTO principles of non-discrimination. In practice these standards are trade barriers because the regulatory requirements come on top of regulatory qualifications that are already complied with in the home market and in other countries where the service firm operates. Service providers

\(^2\) Hoekman and Primo Braga (1997) classify this as a separate group.
thus face additional regulation-compliance costs. This creates a 'border effect' of which the implications will be analysed further in this paper.

**Measurement of NTB-related trade costs**

Various quantification approaches have been applied to estimate the trade-cost impact of NTB’s. Mostly used are frequency measures, price-based measures, and quantity-based measures.

Frequency measures are based on an inventory approach. Researchers first assess the existence of rules and regulations for specific industries or traded products. Subsequently they establish whether the regulations are discriminatory for the foreign service providers. The frequency index can be based on the percentage of rules that are discriminatory. Sometimes the index is weighted on base of the economic importance of these rules. When industries are aggregated, the weights can be derived from the economic weight of the industries involved. Hoekman (1995) did a first comprehensive attempt in this line of research. Brown and Stern (2001) survey studies that apply this approach. In general, the resulting frequency indices cannot be interpreted as tariff equivalents.

Price-based measures indicate the price or cost-price effect of the non-tariff barrier. This has been done for banking and maritime services (cf. Findlay and Warren, 2000). The tariff equivalent of the NTB can be calculated straightforwardly from its price effect.

The economic effects of the non-tariff barriers can also be expressed as a "lacking trade" volume, compared to some counterfactual. The trade-volume effect of NTB’s can be derived using gravity equations. Given demand elasticity, the volume effect can subsequently be translated into a tariff equivalent. Anderson and Van Wincoop (2004) survey many studies using this approach.

All three methods have their drawbacks. Quite often the methods do not isolate the effects of the NTB from other possible trade-hampering causes, or trade measurement imperfections. NTB-frequency indices inevitably require arbitrary judgments by the researchers with regard to the categorisation of measures by the criterion of their discrimination for foreign firms. Despite these drawbacks, all quantification methods provide a proxy of the relative importance of NTB’s and their differences between countries. As such they can be useful. The empirical results often confirm the researcher’s intuition. NTB’s in services trade are higher for developing countries than for the developed ones. In countries in which the market economy is less regulated, the NTB’s also are in general lower.

**Variable costs versus fixed costs**

The tariff equivalents derived from price measures and quantity-based estimates implicitly assume that the NTB’s affect variable trade costs. In the case of manufacturing and commodity trade, it makes sense to interpret trade costs and NTB’s as variable costs. Most of these costs are indeed directly related to the trade volume. Although some border-related costs like information costs can be interpreted as volume-

---

3 Cf. surveys by Deardorff and Stern (1998); Anderson and van Wincoop (2004); Messerlin (2001).

4 The estimates of NTB’s in services range from a few percent of the import value to ten percent, or in some cases even hundred percent, such as in some transport services (e.g. Hoekman 1995; Findlay and Warren, 2000).
### Table 2.1 National product-market regulations for service markets

<table>
<thead>
<tr>
<th>Specific product-market regulations</th>
<th>Primary impact on:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fixed costs</td>
</tr>
<tr>
<td>Restrictions on import quantity (entry prohibition, local content requirements, restricted network access)</td>
<td>X</td>
</tr>
<tr>
<td>Controlled import prices (reference, minimum or maximum price)</td>
<td>X</td>
</tr>
<tr>
<td>Market access costs related to import volume (entry or exit taxes, visa costs, differentiated tariffs by firm origin, postal tariffs)</td>
<td>X</td>
</tr>
<tr>
<td>Firm start-up licenses and associated authorisation requirements</td>
<td>X</td>
</tr>
<tr>
<td>Service-providing personnel must have locally recognised professional qualifications (may necessitate re-qualification)</td>
<td>X</td>
</tr>
<tr>
<td>Obligatory membership of local professional association</td>
<td>X</td>
</tr>
<tr>
<td>Juridical requirements (owners or managers of service-providing firm must have local residence or nationality, firms must have a specific legal form)</td>
<td>X</td>
</tr>
<tr>
<td>Requirement that service providers have nationally recognised liability insurance or professional indemnity insurance.</td>
<td>X</td>
</tr>
<tr>
<td>All service activities in export destination country fully subject to regular administrative and tax procedures</td>
<td>X</td>
</tr>
<tr>
<td>Limitations on inter-professional co-operation or on the variety of services provided by one firm (may require unbundling)</td>
<td>X</td>
</tr>
<tr>
<td>Temporary service personnel from origin country fully subject to rules of the social security system of the destination country</td>
<td>X</td>
</tr>
<tr>
<td>Impediments for material inputs, suppliers and personnel from origin country (may require a search for new local suppliers)</td>
<td>X</td>
</tr>
</tbody>
</table>

a) This table is for illustrative purposes. Studies that assess the relative frequency or incidence of the different types of regulatory trade barriers in this table are still lacking, or only cover a limited number of countries.

---

independent, for most border-related costs in goods trade—like currency exchange, language and security costs—it holds that they are in some way related to the trade volume.\(^5\) This does not hold for services. The group of NTB’s that affect the service exporter’s variable costs is just a sub-set of all NTB’s for service markets. Most other types of NTB’s in service markets are not volume-dependent. This is illustrated in Table 2.1. Although some market-access costs in services are related to the trade volume (e.g. postal tariffs), many trade barriers stem from national measures that primarily affect fixed costs of the service providers. Licences, qualification and certification requirements, and operational restrictions for (foreign) services providers tend to be one-off costs, and therefore impact on fixed costs. Many qualification costs are fixed-

---

\(^5\) This does not necessarily imply that these costs are linear in the volume of trade. But these are certainly no fixed costs. It is very likely, that NTB’s per unit of trade volume are lower for high volumes of trade.
cost entry barriers. The firm must (re-)qualify itself before it has sold one single product. The foreign service provider has to fulfil these requirements before entering the market, but the effort and costs to fulfil them are often not related to the trade volume.\(^6\)

Despite their name—non-tariff barriers—trade barriers in service markets have almost always been dealt with as if they were a volume-proportional cost mark-up, like transport costs or tariffs. While this could be adequate for international trade in manufacturing products, this is in our view not the case for non-tariff barriers in service markets.

Recent literature\(^7\) has modelled the export decisions of manufacturing firms as a kind of investment decision with sunk costs. Firms do not only face per-unit costs such as transport costs, but also fixed costs that do not vary with the export volume. Melitz (2003) lists several arguments why firms face fixed costs upon entering new export markets. Firms have to find and inform foreign buyers about its products, establish distribution channels, and adapt its products to the standards of that national market. Firms also have to learn the regulatory environment.

There is surprisingly little direct evidence on the magnitude of fixed market entry costs. The existence of these costs is confirmed in interviews with managers, but there are no statistics. There is only indirect and anecdotic evidence. Melitz (2003) and Roberts and Tybout (1997) find evidence that the decision of firms to export to a particular market is positively affected by the firms' export size in the previous period to that market. This could be explained by the existence of fixed market-entry costs.

To our knowledge, no study has so far investigated the implications of fixed and sunken export costs for international trade in services. Recent research by the European Commission based on interviews with service providers suggests that these firms face high costs for complying with regulations in foreign markets. In a survey among a large number of business service firms in the EU, 44 per cent of the firms mentioned costs as a "very important" barrier to setting up a local operation in other countries (CSES 2001, p.43). Those firms that were able to estimate the size of the setup costs estimated the latter to be of the order of 6 months sales proceeds (ibid, p.191). Elsewhere the European Commission (2001) states: "Evidence collected from SMEs and SME-supporting organisations suggests that many SMEs back off after initial inquiries about administrative requirements and procedures because they feel they do not have the necessary resources to deal with the current complexity. Such agencies report that micro enterprises in particular were easily dissuaded from engaging in cross-border activities".

The evidence presented in this section suggests that regulation-related fixed costs are important in the export decisions of service firms. Opposed to the overall treatment of NTB's these costs have to be interpreted as fixed and sunk costs. Because the requirements to fulfil are sunk costs, the firms' export decision becomes to some extent an investment decision.

---

\(^6\) Because the fixed qualification costs are generally independent of firm size, the largest cost effect in relative terms falls upon small and medium-sized enterprises.

\(^7\) Examples are Bernard and Jensen (1999); Roberts and Tybout (1997); Melitz (2003). Some of their arguments are already proposed by Baldwin and Krugman (1989).
3 Market-entry decisions by service exporters

Trade barriers for services have traditionally been analysed as a tariff or a quasi-tariff problem. But since many regulation-caused trade barriers in service markets affect the fixed rather than the variable costs of exporters, the market-entry decision itself deserves more attention. We analyse how the export decision is affected by international regulation differences and country-specific qualification costs. First for the case that there are no market-entry costs in the potential export market, and subsequently for the case that the latter country imposes regulations with an impact on fixed entry costs.

Export decision in the free-entry case

Consider the situation of firm $i$ that is active in its national home market (suffix $h$), and considers whether or not it will start exporting to country $j$. Demand in both country markets is characterised by product differentiation and a consumer preference for variety. This results in the following demand structure:

$$x_{ki} = \left( \frac{p_{ki}}{p_k} \right)^{-\sigma} Y_k \quad \text{with} \quad k \in \{h, j\}$$

(3.1)

in which $Y_k$ represents net income, price index $p_k$ is a CES-type aggregate for competing products, and $p_{ki}$ is firm $i$’s price in country $k$. Following the Dixit-Stiglitz approach, firm $i$ ignores the (very small) effect of its actions on net income and the overall price index, so that:

$$x_{ki} = \phi_k p_{ki}^{-\sigma} \quad \text{with} \quad \phi_k = Y_k p_k^\sigma \quad \text{and} \quad k \in \{h, j\}$$

(3.2)

Firm $i$ produces its product with only labour. One part of labour inputs consists of fixed labour costs for complying with qualification requirements in the home country. Let the wage rate ($w$) be given. Total production costs per market are $w (F_k + c_{vi} x_{ki})$ in which $c_v$ and $F$ are, respectively, are given variable labour inputs per unit and fixed labour inputs. $F_j$ is assumed to be zero for the moment. So there are no fixed entry costs in the export market. Profits per market are $\Pi_k$. The firm first maximises profits by setting its domestic and foreign price. The optimal price equals

$$p_{ki}^* = \frac{\sigma}{\sigma - 1} c_{vi} w \quad \text{with} \quad k \in \{h, j\}$$

(3.3)

Following equation (3.3), marginal profits are independent of the production size. The fraction ($\sigma / (\sigma - 1)$) is the mark-up over marginal costs. It reflects consumer preferences for variety, and it is positive for all values $\sigma > 1$. Note that optimal prices for the home and foreign country are identical because wages, marginal costs and the mark-up do not differ for each destination market. The optimal price $p_{hi}^*$ can be substituted into the

---

8 See Annex 2 for the aggregation procedure.
home-market profit equation to derive the break-even point in production. Production becomes profitable if it exceeds the break-even point, $x_{hi}^*$:

$$\pi_{hi} > 0 \text{ if } x_{hi} > x_{hi}^* = (\sigma - 1) \frac{F_h}{c_{vi}}$$

(3.4)

The break-even point depends on the factor $F_h/c_{vi}$ as a measure of scale effects, and on demand conditions, represented by the substitution elasticity. If the home market size is small ($x_{hi} < x_{hi}^*$) the firm needs to export to exploit fully the scale effect. Firm $i$'s marginal revenue in the export market only depends on the substitution elasticity in the foreign market. Figure 3.1 illustrates this for the case that $\sigma = \sigma_h = \sigma_j$.

Figure 3.1 Contribution of export market to profits of firm $i$ when home market is small

The results so far show that regulatory standards with an impact on fixed costs are not in themselves an impediment to international trade, even when the home market is small. Once having incurred these fixed costs, firm $i$ would have more rather than less incentive to export. Because entry to export market $j$ is completely free, there is no real difference between the home market and the foreign market, apart from its specific demand-side characteristics. The same holds for the case that all countries would apply an identical set of qualification requirements for providers in a particular service branch. Firms then need a one-off effort to comply with the qualification criteria, and the associated fixed costs do not form an obstacle to trade.

---

9 As Neary (2001) points out, it is a property of the Dixit-Stiglitz model that scale effects depend on a consumer taste parameter. If the consumer preference for variety diminish, $\sigma$ becomes higher; there will be a weaker demand for specific varieties and the break-even point for each variety increases, because the price for each firm's variety drops.
Export barriers resulting from heterogeneous regulatory standards

Different from the reference model, national qualification standards for service firms are hardly if at all co-ordinated among countries. Each country applies its own qualification requirements for service firms. Very few countries acknowledge each other’s quality standards for service providers. This has some important implications.

If country \( j \) imposes own qualification standards for foreign service providers, this creates new (fixed) market-entry costs \( F_j \) for complying with such regulations. The costs have to be borne up-front by exporting firms, thus reducing initial profits. This in itself may be sufficient to deter market-entry by small and medium-sized firms.

If the qualification standards of country \( j \) are country-specific, the market-entry costs for a foreign firm are not only fixed but also sunk costs, i.e. they can neither be recovered upon exiting country \( j \) nor can they be exploited in other country markets. Let \( \delta_j F_j \) be the country-specific and therefore sunk fraction \((0 \leq \delta_j \leq 1)\) of fixed qualification costs in country \( j \). An ‘investment’ in \( \delta_j F_j \) is irreversible, and hence represents exit costs in case the export venture in market \( j \) is not a success. The presence of country-specific fixed costs means that scale effects are now different by destination country, and that firms have to optimise profits per destination country because of the market-entry costs. Firm \( i \) will enter the market of country \( j \) only if this market is able to generate positive profits. The break-even condition is:

\[
\pi_{ji} > 0 \quad \text{if} \quad x_{ji} > x_{ji}^* = (\sigma - 1) \frac{\delta_j F_j}{c_{vi}} \tag{3.5}
\]

The break-even export volume is associated with the optimal export price \( p_{ji}^* \) according to equation (3.3). Then the price exceeds the average costs. If \( \lambda_{ji} \in \{0,1\} \) represents the export decision, it follows that:

\[
\lambda_{ji} = \begin{cases} 
1 & \text{if} \quad p_{ji}^* \geq w \left[ c_{vi} + \frac{\delta_j F_j}{x_{ji}^*} \right] \\
0 & \text{otherwise}
\end{cases} \tag{3.6}
\]

From this we may infer the threshold of fixed qualification costs beyond which no export takes place:

\[
F_j^* = \frac{(p_{ji}^* - c_{vi} w) x_{ji}^*}{\delta_j w} \tag{3.7}
\]

It implies that firm \( i \) only enters the export market if it can recover the exit costs.\(^{11}\) The entry-deterring threshold of fixed national qualification costs \( (F_j^*) \) is inversely related to the degree of ‘sunkness’, \( \delta_j \) (bilateral heterogeneity in regulatory standards). Once having made the investment in sunk costs, firms will

---

\(^{10}\) Owen and Ulph (2002) show that the distribution between fixed and sunk market-entry costs can make a difference for the welfare outcomes of an economic integration process.

\(^{11}\) Cf. Tirole (1988), Roberts and Tybout (1997), and Hausmann (2001) on this behavioural pattern with sunk costs.
postpone exiting even if market and profit developments are unfavourable. Roberts and Tybout (1997) find evidence that manufacturing firms incur sunk costs for exporting (information costs, establishing brand name, setting up distribution network), and that the sunk costs involved indeed give rise to tractable hysteresis effects in entry and exit behaviour in export markets.

Note that the export decision depicted in (3.6) and (3.7) is based on full information. Uncertainty lowers the no-export threshold. Uncertainty plays a role for firms with export plans if they are completely ‘blank’ as to the characteristics of demand and competitors in an export market. Demand structure, strength and reaction patterns of competitors, price elasticity and imminent regulation changes can be unknown to a foreign service firm that has not yet entered that export market. Firm-growth models based on Jovanovic (1982) assume that individual firms are initially uncertain where they are located in the industry distribution of relative productivities. Because of this a priori uncertainty on relative productivities, each firm initially assumes that its productivity is a random draw from the industry population. In case of adverse experience they exit, otherwise they stay in business. Several empirical studies (e.g. Evans 1987; Baldwin 1994) have found evidence in support of this firm-growth model. This same mechanism of ‘noisy selection’ may well hold for entering export markets. That exporting goes along with a selection process is shown by evidence from many empirical studies. Exporting firms are on average more productive than those that do not export (e.g. Melitz 2003; Bernard and Jensen 1999).

**Firm-level inefficiencies due to heterogeneous national regulations**

Figure 3.3 pictures the effect on average costs for a service firm that subsequently enters three export markets, and each time incurs the same level of additional fixed qualification costs. It means the firm at market entry starts with high average costs. This effect is compared with the situation (dotted line) that the firm would one have one-off qualification costs in its home country. This counterfactual case would also arise if countries mutually recognise home-country accomplished qualifications of the firm. It can be seen that cost and efficiency gains can be attained by an internationally co-ordinated qualification system for service firms. It allows firms to achieve more economies of scale in dealing with regulation requirements.

---

12 Dixit and Pindyck (1994) stress the option value of waiting with market entry because with more time the firm could get valuable additional information, thus getting a higher net present value from investment. In the investment decision the firm will want to be compensated for the loss of this option value. Introducing option value considerations in equation (3.6) means that \( p_{ij} \) must always be a factor 1 + \( \psi \) larger−with \( 0 < \psi \leq 1 \) being the option value effect—than the right-hand side term of the equation. Dixit (1989) shows for plausible stochastic scenarios that option value considerations give rise to a higher market entry and exit thresholds (delay of exit).
Generalisation for $n$ firms

So far the trade impact of regulatory heterogeneity is considered at the level of the individual firm. But how do individual market-entry decisions affect bilateral services trade between two countries, i.e. what is the aggregate effect?

To analyse this we again use a Dixit-Stiglitz model of monopolistic competition in which consumers have a preference for variety. We assume that products offered by foreign firms from country $i$ are in the export market regarded as one (homogenous) product variety because of their shared country origin. Total supply from country $i$ to country $j$ depends on the number of exporting firms and on their average size. Additional firms from country $i$ enter the export market as long as they can make positive profits in country $j$. The result of this free entry process is that the equilibrium exports for the average firm are such that it breaks even. The process is pictured in Figure 3.3. Individual foreign firms opt for output level $x_{ji}^{\text{max}}$, but free entry pushes the size of the average firm back to its equilibrium value that coincides with break-even export volume $x_{ji}^*$. The presence of country-specific fixed qualification costs has two effects. First, the scale economies involved imply that the break-even point and therefore also the average firm's export size becomes larger. The second effect is that less firms from country $i$ will enter the export market. Annex 2 formally shows that for normal values of the substitution elasticity, the second effect dominates. This implies the higher fixed qualification costs have a negative effect on trade.
Conclusions

In this section we have argued that regulation-caused fixed qualification costs are not in themselves an impediment to international trade in services. The regulatory requirements do however become a trade barrier if they differ strongly between countries. In that case, the cost for complying with regulation turn into country-specific sunk costs. Such sunk costs are at the same time exit costs in case of failure. The lump-sum costs create a market-entry hurdle for small- and medium-sized firms and will affect exports negatively. Firms only enter the market if the expected sales are large enough to cover the sunk market-entry costs. Uncertainty about the export market may further lower the export threshold.

The theoretical framework of this section allows us to derive two testable empirical predictions when we apply it to bilateral services trade. The first prediction is that a higher degree of regulatory heterogeneity between countries (implying a higher level of $\delta_j$) results in less bilateral trade. The second prediction is that a bilateral services trade will be lower if product market regulations of the destination country are relatively strict, requiring a higher level of fixed qualification costs.
Quantifying policy heterogeneity

Policy heterogeneity has many dimensions, and does not easily lend itself for a quantitative analysis, let alone in an internationally comparative context. In order to test the predictions from our theoretical framework empirically, we had to develop an index for bilateral policy heterogeneity.

We could build on the path-breaking work by a team of OECD researchers (Nicoletti, Scarpetta and Boylaud 2000). They have identified the important comparison items with respect to product-market regulation, and developed indices for international differences in regulatory intensity. Their public database on international regulation differences is mainly fed by official inputs from governments of OECD member states. The OECD International Regulation database is by far the most detailed and structured dataset on national differences in product-market regulation. It gives information on 1600 economic policy comparison items for the benchmark year 1997. We have removed all items that were too industry-specific, too general or irrelevant for service markets. In the end we preserved 183 detailed aspects of product market regulation for assessing heterogeneity in economic policies. Most of the remaining items are of a more or less general nature, or at least they can be considered as representative (pars pro toto) for a country’s overall product market regulation approach.13

Our index for bilateral regulatory heterogeneity builds upon detailed pair-wise comparisons between individual countries for specific aspects of product market regulation, both regarding the form and the contents of the regulation. For each item of the cleaned-up database we assess whether two countries are identical or not. It yields information of a binary nature: when the two countries differ in that particular regulation item we assign a value of 1, and when there is no difference we assign the value of 0 to the regulation heterogeneity index. The results per item are aggregated for all relevant country pairs.14 Its value ranges between 1 in case of complete dissimilarity and 0 in case of identical product-market regulations. Table 4.1 reports the average bilateral policy heterogeneity. It is lowest between Denmark and Ireland (0.26) and highest between the UK and Poland (0.70).

The impact of regulatory heterogeneity on fixed market-entry costs may differ by policy area. We have therefore decomposed the overall heterogeneity index into five specific policy areas, identified in the OECD regulation database. The five sub-domains of product-market regulation are: barriers to competition; administrative barriers for start-ups; regulatory and administrative opacity; explicit barriers to trade and investment; and state control. The disaggregating allows us to test in which policy areas the international

---

13 The data selection procedure is described in Kox, Lejour and Montizaan (2004, Annex I).
14 Annex 1 describes the index in more formal detail.
<table>
<thead>
<tr>
<th>Country</th>
<th>Denmark</th>
<th>Greece</th>
<th>Sweden</th>
<th>UK</th>
<th>Austria</th>
<th>Belgium</th>
<th>Finland</th>
<th>France</th>
<th>Germany</th>
<th>Ireland</th>
<th>Italy</th>
<th>Netherlands</th>
<th>Portugal</th>
<th>Spain</th>
<th>Czech Republic</th>
<th>Poland</th>
<th>Hungary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>0.00</td>
<td>0.46</td>
<td>0.40</td>
<td>0.36</td>
<td>0.45</td>
<td>0.39</td>
<td>0.43</td>
<td>0.46</td>
<td>0.38</td>
<td>0.26</td>
<td>0.46</td>
<td>0.40</td>
<td>0.46</td>
<td>0.42</td>
<td>0.53</td>
<td>0.63</td>
<td>0.62</td>
</tr>
<tr>
<td>Greece</td>
<td>0.00</td>
<td>0.42</td>
<td>0.44</td>
<td>0.43</td>
<td>0.36</td>
<td>0.44</td>
<td>0.43</td>
<td>0.41</td>
<td>0.48</td>
<td>0.39</td>
<td>0.38</td>
<td>0.41</td>
<td>0.43</td>
<td>0.43</td>
<td>0.39</td>
<td>0.34</td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td>0.00</td>
<td>0.34</td>
<td>0.48</td>
<td>0.39</td>
<td>0.47</td>
<td>0.43</td>
<td>0.39</td>
<td>0.32</td>
<td>0.49</td>
<td>0.32</td>
<td>0.51</td>
<td>0.45</td>
<td>0.48</td>
<td>0.54</td>
<td>0.43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td>0.00</td>
<td>0.50</td>
<td>0.40</td>
<td>0.43</td>
<td>0.46</td>
<td>0.37</td>
<td>0.30</td>
<td>0.50</td>
<td>0.40</td>
<td>0.49</td>
<td>0.37</td>
<td>0.57</td>
<td>0.70</td>
<td></td>
<td>0.46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austria</td>
<td>0.00</td>
<td>0.50</td>
<td>0.43</td>
<td>0.43</td>
<td>0.46</td>
<td>0.46</td>
<td>0.37</td>
<td>0.40</td>
<td>0.42</td>
<td>0.45</td>
<td>0.45</td>
<td>0.45</td>
<td>0.36</td>
<td>0.46</td>
<td>0.46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium-Lux</td>
<td>0.00</td>
<td>0.38</td>
<td>0.35</td>
<td>0.39</td>
<td>0.43</td>
<td>0.45</td>
<td>0.34</td>
<td>0.42</td>
<td>0.37</td>
<td>0.52</td>
<td>0.50</td>
<td>0.50</td>
<td>0.44</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>0.00</td>
<td>0.41</td>
<td>0.41</td>
<td>0.45</td>
<td>0.44</td>
<td>0.42</td>
<td>0.43</td>
<td>0.45</td>
<td>0.45</td>
<td>0.45</td>
<td>0.45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>0.00</td>
<td>0.43</td>
<td>0.43</td>
<td>0.37</td>
<td>0.34</td>
<td>0.42</td>
<td>0.42</td>
<td>0.48</td>
<td>0.46</td>
<td>0.45</td>
<td>0.45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>0.00</td>
<td>0.32</td>
<td>0.43</td>
<td>0.37</td>
<td>0.39</td>
<td>0.40</td>
<td>0.48</td>
<td>0.57</td>
<td>0.48</td>
<td>0.48</td>
<td>0.57</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ireland</td>
<td>0.00</td>
<td>0.49</td>
<td>0.44</td>
<td>0.42</td>
<td>0.40</td>
<td>0.52</td>
<td>0.62</td>
<td>0.55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>0.00</td>
<td>0.41</td>
<td>0.44</td>
<td>0.43</td>
<td>0.51</td>
<td>0.40</td>
<td>0.40</td>
<td>0.49</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>0.00</td>
<td>0.35</td>
<td>0.41</td>
<td>0.38</td>
<td>0.46</td>
<td>0.35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portugal</td>
<td>0.00</td>
<td>0.44</td>
<td>0.44</td>
<td>0.43</td>
<td>0.43</td>
<td>0.39</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>0.00</td>
<td>0.53</td>
<td>0.53</td>
<td>0.43</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Czech Republic</td>
<td>0.00</td>
<td>0.36</td>
<td>0.46</td>
<td>0.36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>0.00</td>
<td>0.38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Country data are corrected for non-response or missing data.*
regulatory heterogeneity has its largest trade impacts for services. The decomposition was done on basis of additional information from the OECD regulation database.\textsuperscript{15} Table 4.2 shows the relative weights.

<table>
<thead>
<tr>
<th>Components of heterogeneity indicator and covered policy domains</th>
<th>Number of items in the dataset</th>
<th>Weight as % of total number of items for overall PMR heterogeneity indicator</th>
<th>Expected impact of sub-domain heterogeneity on bilateral trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulatory and administrative opacity</td>
<td>13</td>
<td>7.1</td>
<td>negative</td>
</tr>
<tr>
<td>Explicit barriers to trade and investment</td>
<td>14</td>
<td>7.7</td>
<td>not clear</td>
</tr>
<tr>
<td>Other outward barriers (a)</td>
<td>5</td>
<td>2.7</td>
<td>(a)</td>
</tr>
<tr>
<td>Administrative burdens on start-ups</td>
<td>45</td>
<td>24.6</td>
<td>positive</td>
</tr>
<tr>
<td>Barriers to competition</td>
<td>61</td>
<td>33.3</td>
<td>negative</td>
</tr>
<tr>
<td>State control</td>
<td>45</td>
<td>24.6</td>
<td>negative</td>
</tr>
<tr>
<td>Overall PMR heterogeneity indicator</td>
<td>183</td>
<td>100</td>
<td>negative</td>
</tr>
</tbody>
</table>

\(a\) The policy heterogeneity index for this sub-domain is not used in the regressions because it is only based on five reported items.

The table also indicates how we expect that heterogeneity in policy sub-domains affect bilateral trade (expected sign of coefficient). These expectations take into account that exports and foreign direct investment (setting up a local production unit) can be substitutes as a form of international service supply.

*Explicit barriers to trade and investment* includes for instance quantity restrictions, measures that can be expected to have a strong and directly negative impact on bilateral trade. However, heterogeneity with regard to this sub-domain may also imply high costs for complying with regulatory requirements in investment. If investment is hampered, firms could decide to serve the foreign market through exports. The overall effect is difficult to predict a priori.

*Administrative burdens for start-ups* is also an area where were more heterogeneity in regulation could perhaps stimulate trade. The reason is that administrative burdens make it more difficult for foreign service firms to set up a local subsidiary in the other country. The latter increases the relative attractiveness of exporting as a way of delivering services to these markets. Hence, a positive impact on bilateral service trade might result.

*State control* is most important in services that use fixed infrastructures (rail, communication, distribution of electricity, water and gas), although there is still little international trade in most of these services.

Regulatory *Barriers to competition* is an area that is close to the operational functioning of service firms, so that we expect a negative impact of heterogeneity in this sub-domain.

\textsuperscript{15} Per comparison item, the OECD has classified to which type of policy area it refers. This classification is based on the analytical approach developed in Nicoletti, Scarpetta and Boyau (2000). The classification distinguishes main policy domains and sub-domains in a 4-layered hierarchy. We only use the 3 top layers of their classification.
5 Empirical analysis

The impact of international regulatory heterogeneity on international service trade has been investigated in the context of a gravity model. Reminiscent to the gravity law in physics, the crux of the gravity model is that it predicts bilateral trade from the market size of the partner countries, and the distance between them, as a proxy for variable trade costs. The gravity model is a multi-purpose work horse for empirical trade theory. Helpman and Krugman (1985), and Bergstrand (1989) have shown that the model can be derived from a trade model with differentiated goods and monopolistic competition. Deardorff (1998) demonstrated that it can also be consistent with the Heckscher-Ohlin trade theory. Recently, Anderson and van Wincoop (2004) have generalised these earlier findings. They show that the gravity model can be derived from any trade model obeying three conditions. The first is the trade-separability assumption, i.e. the allocation of production and consumption is separable from the bilateral allocation of trade across countries. It implies that separable preferences and technology have to be imposed, but this is already quite standard. The second assumption is that the aggregator of product varieties is of a CES-type, and identical across countries. The third assumption is that ad-valorem tax equivalents of trade costs do not depend on the quantity of trade.16

These conditions imply that the gravity equation may follow from any kind of demand equation based on an Armington demand structure. This structure also forms the basis for our reference model (cf. section 3 and Annex 2). We assume that a country's demand for imported services distinguishes product varieties by their country origin, and that all firms from the same origin country are perceived to produce interchangeable products. The number of varieties is endogenous, and depends on sunk market-entry costs resulting from product-market regulations, and the degree of heterogeneity in product-market regulations. Less heterogeneity in regulation lowers market-entry costs. Based on this model we have derived that heterogeneity in regulation hampers services trade. Now we test this theoretical predication in a gravity equation derived from our theoretical model.

Numerous studies have applied the gravity model to total trade or manufacturing trade. Nicoletti et al. (2003) is one of the first to apply this analysis to bilateral trade in services, and also includes regulation variables.17 They find that a higher regulation level in an import country has a negative effect on that country's bilateral service trade. Their analysis only considers the intensity level—on a scale relative to other OECD countries—of a country's product-market regulation. In our opinion this approach only identifies a small part of the regulatory trade barriers, because the aggregation level of their regulation indicator is too high. As we have argued in the first part of the paper, it is the policy heterogeneity at a more disaggregate level that creates the real sunk-cost effects for service exporters. What Nicoletti et al. (2003) may have found is that a high level of product market regulation in the import country combined with (unobserved) heterogeneity in regulation between the partner countries causes a negative trade impact.18 In order to check

16 Anderson and Van Wincoop (2004) show that under some conditions the second and third assumption can be relaxed.
17 Other studies in this regard are: Grünfeld et al. (2003), Kimura et al. (2004), and Lejour et al. (2004).
18 Other differences between our paper and Nicoletti et al. (2003) are in the country coverage (EU versus OECD), period of analysis (1999-2000 versus 1999-2001), and the type of bilateral service trade (total services versus other commercial services).
this conjecture, we also include the level of product-market regulation as an explanatory variable. We do this for the home and foreign market. This also allows us to test for the hypothesis that low-regulation in home markets has a positive effect on the competitiveness of its service exporters in the world market (e.g. Porter 1990).

In our specification of the gravity model we explain bilateral trade in other commercial services (all commercial services except for transportation) by GDP in the country of origin, GDP in the country of destination, distance and language distance. The basic gravity model is augmented with regulation variables. The gravity equation that we test reads:

\[
\ln(\text{TRD}_{ij}) = \beta_0 + \beta_1 \ln(\text{GDP}_i) + \beta_2 \ln(\text{GDP}_j) + \beta_3 \ln(\text{DIS}_{ij}) + \beta_4 \text{Lan}_{ij} \\
+ \beta_5 \text{PMR}_i + \beta_6 \text{PMR}_j + \sum_k \beta_{7k} \text{HET}_{ijk} + \beta_8 D_{00} + \beta_9 D_{01} + \epsilon_{ij}
\]

in which \(\text{TRD}\) represents the bilateral exports between region \(i\) and \(j\). These exports are explained by the basic variables GDP in the exporting region \(i\), GDP in the importing region \(j\), and the geographical distance (\(\text{DIS}\)) and language distance (\(\text{Lan}\)) between those regions. The other explanatory variables represent the level and heterogeneity in regulation. \(\text{PMR}\) represents the level of product-market regulation in the country of origin \(i\), or country of destination \(j\). \(\text{HET}\) represents the indicator for the heterogeneity in regulation between both EU countries. The suffix \(k\) represents the five sub-domains in regulation heterogeneity. We include year dummies for the year 2000 (\(D_{00}\)) and 2001 (\(D_{01}\)) to represent the time dimension. In some regressions we also include dummies for the country of origin or destination in order to account for unobserved country characteristics.

In our empirical analysis we focus on bilateral trade in commercial services, hence disregarding government services. Moreover, we exclude transport and tourism because both services trade categories are quite special. Transport because it is strongly related to the total volume of goods trade, and is subject to particular regulatory regimes quite different from overall product-market regulation (e.g. because of environmental externalities). Tourism trade is excluded because in most of this trade consumers rather than producers move to the foreign country, and because it to a large extent is determined by factors like climate, weather conditions and cultural heritage. Tourism is also subject to relatively few product-market regulations. As a control for the robustness of our findings we also have run a regression for total service trade. These findings are reported briefly after presenting our main results.

Data sources

The bilateral services trade data on ‘Other Commercial Services’ and ‘Total Services’ are from the OECD trade statistics (OECD 2003) for the period 1999-2001. We have focussed on the countries that were EU members in that period. Only 9 of these EU countries report bilateral trade data. The original data were not

\[\text{The level variables are all expressed in logarithms.}\]
\[\text{The data for Belgium and Luxembourg are combined.}\]
made consistent by the OECD. It means that there are possibly two reporting sources: the country of origin and the country of destination. Their reporting can deviate significantly. In order to get a consistent set of bilateral trade data we have applied a method developed by Lejour et al. (2004) for selecting the reporting countries that across all trading partners have the least bias for over- or underreporting in comparison to all trade partners. By using the data of the most reliable reporting countries we have constructed our dataset. For the EU countries with missing data we took the data as reported by their bilateral partners. In this way, we only miss bilateral trade data between the countries Denmark, Greece, Ireland, Spain and Sweden. Data for 2000 and 2001 are corrected for nominal differences caused by US dollar inflation.

GDP data are from the World Bank (2003) and distance data from CEPII (Gaulier et al. 2003). The language data are based on linguistic differences between languages, derived from the place of the language on the language classification tree (Belot and Ederven 2005).

With regard to the relative intensity of product-market regulation we use OECD summary indicators for the relative strictness intensity of each country's product market regulation (cf. Nicoletti et al. 2000). Data on bilateral regulatory heterogeneity indicators are based on our own bilateral regulation heterogeneity index, described in section 3 of this paper. We applied it to country data from the OECD International Regulation Database for 1997/1998.

Results

Table 5.1 summarises our regression results, using several estimation methods. We first discuss the OLS estimates in the first data column, and subsequently the estimation results in the other columns. The OLS results in Table 5.1 show that the estimated coefficients of the basic gravity model are significant, have plausible magnitudes, and also have the expected signs. The market size (GDP) coefficient for the origin country is higher than the one for the destination country. The physical distance coefficient is about $-0.9$. This is a standard result; most gravity studies find coefficients for geographical distance of about $-1$. The language distance indicator is significant at the 5% level; the estimated coefficient suggests that a larger language distance between trading countries depresses the bilateral service trade volume. This variable may also pick up non-regulation trade barriers such as cultural differences.

Turning to the estimates for the policy variables, we first discuss the results with regard to the indicators for the regulation level, and subsequently those for regulation heterogeneity. The level of product market regulation (PMR) in the origin country has a significant negative impact on bilateral trade. This could support the Porter hypothesis: much regulation in the home country shields markets off, and hampers the international competitiveness of domestic service providers, thus reducing their export possibilities. The regulation level in the destination country (Barriers to entrepreneurship) does not have a significant effect. The indicators for bilateral regulatory heterogeneity are all statistically significant in the OLS regression without fixed effects. Heterogeneity in Barriers to competition, and in Regulatory and administrative opacity affect bilateral service trade in a negative way according to the predicted pattern. The same appears to hold for heterogeneity in Explicit barriers to trade and investment, and in State control. Heterogeneity in

---

21 This is also the case if we represent regulation by the indicator product market regulation for the destination country.
<table>
<thead>
<tr>
<th>Table 5.1 Regression results: explaining bilateral trade in other commercial services, EU-14 countries, 1999-2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent variable: Other Commercial Services trade</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Gravity variables</strong></td>
</tr>
<tr>
<td>Ln GDP Origin</td>
</tr>
<tr>
<td>Ln GDP Destination</td>
</tr>
<tr>
<td>Ln Distance</td>
</tr>
<tr>
<td>Language distance</td>
</tr>
<tr>
<td><strong>Regulation variables</strong></td>
</tr>
<tr>
<td>Heterogeneity, administrative barriers for start ups</td>
</tr>
<tr>
<td>Heterogeneity, barriers to competition</td>
</tr>
<tr>
<td>Heterogeneity, regulatory and administrative opacity</td>
</tr>
<tr>
<td>Heterogeneity, state control</td>
</tr>
<tr>
<td>Heterogeneity, barriers to trade and investment</td>
</tr>
<tr>
<td>Product market regulation Origin</td>
</tr>
<tr>
<td>Barriers for entrepreneurship Destination</td>
</tr>
<tr>
<td>Year dummy 2000</td>
</tr>
<tr>
<td>Year dummy 2001</td>
</tr>
<tr>
<td>Constant</td>
</tr>
<tr>
<td><strong>Country dummies</strong></td>
</tr>
<tr>
<td>Origin, significant</td>
</tr>
<tr>
<td>Destination, significant</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
</tr>
</tbody>
</table>

*Absolute value of standard error in brackets. Code: *** = coefficient significant at 1% confidence level; ** = coefficient significant at 5% confidence level; * = coefficient significant at 10% confidence level.

b) Seemingly Unrelated Regression (SUR), applying simultaneous estimation of equations for origin and destination countries. All bilateral variables expressed as deviation from the mean, separately from the origin (exporting) country perspective, and from the destination (host) country perspective. (see main text)
Administrative barriers for start-up firms appears to have a stimulating impact on exports. This is consistent with our hypothesis that this indicator has the strongest impact on FDI, thus increasing the attractiveness of exports (relative to FDI) as a way of delivering services to foreign markets.

In bilateral equations one should control for unobserved factors that are specific to each country, each partner, and each country-partner pair. In order to check for the possibility that the coefficients of the explanatory variables pick up the effects of unobserved country variables, we first introduced fixed effects (country dummies) in the OLS regressions. The second and third data columns of Table 5.1 represent the regression results with fixed effects for the origin or for the destination country.\(^{22}\) The coefficients for heterogeneity in Explicit barriers to trade and investment, and in State control become insignificant when we included fixed effects for the destination countries (last column Table 5.1). Only heterogeneity in Barriers to competition and Administrative barriers for start-ups are significant at the one per cent level. The negative impact of heterogeneity in Barriers to competition on bilateral trade is stronger than the positive impact of Administrative barriers for start-ups. Heterogeneity in Regulatory and administrative opacity is still significant at the 10\% level. This suggests that in the OLS estimates some of the heterogeneity indicators pick up unobserved heterogeneity of the destination countries.

In order to check for time specific effects, we have also included year dummies in the specification. The dummy for the year 2001 is statistically significant, while the one for the year 2000 is not. Separate regressions for the various years do not show many significant differences in the values of the estimated parameters.\(^{23}\)

After correcting for period effects (time dummies) and country effects (dummies for origin and destination country), there is still the possibility that unobserved variables play a role in country-partner pairs. However it was not viable to include dummies for all country-partner pairs, due to an excessive loss of degrees of freedom. We solved this by applying the “transformed least squares” (TLS) approach, which Erkel-Rousse and Mirza (2002) have introduced this method to deal with the possibility of unobserved factors in bilateral country pairs.\(^{24}\) This is done by transforming the regression equation. For each destination country it focuses on the differences between origin countries, and for each origin country it assesses the differences between destination countries. Hence, two equations for bilateral exports are obtained: an “origin” equation; and a “destination”. The “origin” equation expresses bilateral exports and all explanatory variables as deviations from their values for the average origin (=export) country. In mathematical terms, if variable \(Z_{ij}\) is a representative (bilateral) variable of equation (12) the variables of the ‘origin’ equation read as:

\(^{22}\) Fixed effects or in this case country dummies represent all country-specific heterogeneity that is not captured by the other country-specific variables (like GDP and PMR) in the first specification (OLS without fixed effects). The disadvantage is that we can not ascribe this heterogeneity to specific economic variables. For analytical reasons it is therefore not attractive to combine country dummies for the origin and destination countries in one specification.

\(^{23}\) Results are available upon request. Moreover, we have also estimated a panel regression, but that gives similar effects as the ones presented in table 5.1.

\(^{24}\) The method is also used and described by Nicoletti et al. (2003).
\[ \Delta_i Z_{ij} = Z_{ij} - \frac{1}{I} \sum_{i}^{I} Z_{ij} \]  

(5.2)

in which \( I \) and \( J \) represent the number of countries for origin and destination. If \( Z \) represents exports from country \( i \) to \( j \) the transformed variable \( \Delta_i Z_{ij} \) indicates the exports of country \( i \) to country \( j \) in deviation of the average exports to country \( j \). Similarly, the “destination” equation expresses bilateral imports and all explanatory variables as deviations from their values for the average destination (=import) country:

\[ \Delta_j Z_{ij} = Z_{ij} - \frac{1}{J} \sum_{j}^{J} Z_{ij} \]  

(5.3)

The two equations are estimated simultaneously by the seemingly unrelated regression (SUR) method. The advantage of this procedure is that in the origin equations destination-specific unobserved effects are accounted for prior to estimation in a nonparametric way, and only origin-specific effects have to be estimated. Conversely, in the destination equations it is the origin-specific unobserved effects that are accounted for non-parametrically, and the destination-specific effects are estimated. This reduces the number of parameters to be estimated in each equation. Additional degrees of freedom are gained by assuming that in each of the two equations the incremental information provided by the unobserved country-pair effect over the “pure” origin or destination effect is random, and can be included in the error term.\(^{25}\) In both equations we impose identical coefficients for the bilateral variables: distance, language distance, the indicators for regulatory heterogeneity, and the year dummies.

The two last columns of Table 5.1 show the TLS regression results with fixed effects. The coefficients of most variables are comparable to the ones found for OLS with fixed effects, while standard errors are often smaller. The coefficient for physical distance is higher, and close to the \(-1\) that is rather standard in gravity regressions. The coefficients for regulatory heterogeneity in \emph{Administrative barriers to start-ups} and in \emph{Barriers to competition} remain firmly significant and have approximately the same values as in the OLS-plus-fixed-effects estimates, with the effect of heterogeneity in \emph{Barriers to competition} being strongest. None of the other sub-indicators for regulatory heterogeneity appears to be significant in the TLS regressions. It probably means that these variables in the OLS regressions picked up other forms of partner-specific heterogeneity. The year dummy for 2001 is no longer significant in the TLS estimates.

Summing up, the regression results for bilateral trade in ‘other commercial services’ appear to be fairly stable over various specifications. A robust result is that regulatory heterogeneity in \emph{Barriers to competition} has a significant negative impact on bilateral service trade. Heterogeneity with regard to \emph{Administrative barriers to start-ups} invariably has a significant positive impact on bilateral trade, confirming our hypothesis that policy differences in this area strengthen the relative attractiveness of exporting versus setting up a local establishment through FDI. Finally, another firm result is that we consistently find empirical support for the Porter hypothesis that a high level of home-market regulation negatively the international competitiveness of exporters from that country.

\[^{25}\text{The implicit assumption is that the deviations of bilateral fixed effects from their means are i.i.d. random terms.}\]
As a last robustness check we have also tested our regression specification (equation 5.1) for bilateral trade in *total services*. The results for 'total services' and 'other commercial services' can never be fully comparable. The reason is that total services trade include transport services and tourism services, each accounting for about 25% of total services trade. As argued earlier, these two groups of services are different from other commercial services, partly because they driven by other explanatory factors (total goods trade, bilateral differences in climate and weather conditions, bilateral differences in cultural heritage) that are not included in our gravity equation. However, re-doing our regression for total services makes it possible to compare our results with the few other papers that have applied the gravity model to total international services trade.

The full results of our empirical analysis on total services trade are presented in Annex 3. Here we give a summary of the differences with the results in table 5.1. GDP in the origin country is less important for explaining the variation in total services trade. A possible explanation is that for countries 'exporting' tourism, the size of their economy is less important than their climate and culture. On average differences in language seem to be less important. This is in line with the finding of Lejour et al. (2004) which found that language differences are not significant for trade in transport services.26 Like the result in Nicoletti et al. (2003) and Kimura et al. (2004), we find that the estimated coefficient for the level of product-market regulation in the destination country (represented by *barriers for entrepreneurship*) is now statistically significant and has a negative sign.

With regard to regulatory heterogeneity we find some interesting differences. The heterogeneity in *barriers to start-ups* is no longer significant, which could be explained by the fact that foreign establishments are less important in transport services and tourism than in 'other commercial services'. A bit surprising and difficult to explain is that heterogeneity in *state control* has a positive and statistically significant on trade in total services, according to the TLS regression. Finally, consistent with our earlier finding for 'other commercial services' the coefficient for heterogeneity in *barriers to competition* is still negative and significant, although smaller than for 'other commercial services' trade.

6 **Policy implications**

Our empirical results are consistent with the theoretical model: heterogeneous national product market regulations form an important barrier for international trade in services. This especially regards international differences in regulations affecting barriers to competition. In this section we consider the policy implications of this finding. We use our regression results for simulating the potential effects of recent EU proposals that aim to reduce the role of regulatory heterogeneity in the internal EU market for services.

Our results may be important from a policy perspective. Reducing regulatory heterogeneity could be done by applying more mutual recognition with regard to qualification standards for service providers. It would facilitate more service exports by small- and medium-sized firms, and also more scale-related

---

26 The reason could be that transport services are more standardized than transactions in most other commercial services, so that communication is less hampered by language differences.
efficiency gains by large firms operating in a number of countries. Even if countries have different
preferences for the level of regulation of service industries, they might still adopt a common architecture in
regulation, and make more use of mutual recognition of national regulation in services. Countries that prefer
more stern regulations may co-operate with other countries to share a basic regulation architecture and apply
mutual recognition. Under common regulation architecture, fixed qualification costs made for the more
lenient countries are no longer forfeit when entering an export country with tougher regulation (higher
regulation intensity). The only thing happening is that some additional compliance costs come on top of it.

The European Commission in 2004 launched new policy proposals for the intra-EU service market (EC
2004). The proposed measures allow for more mutual recognition of regulatory regimes in the European
service markets. A key element of the proposals is the 'country of origin' principle. A service provider that
meets the regulatory standards in the member state of origin should no longer be confronted by other or
additional regulatory requirements in the EU country where the service is delivered. Another element in the
proposals is that all EU member states are required to set up a single point of contact where foreign service
firms can fulfil all administrative obligations. Finally, the EU proposals aim to eliminate unnecessary and
discriminatory regulation such as nationality and residence restrictions. The proposals are applicable to a
large part of the EU services sector, ranging from retail distribution to marketing research, from
administration firms to certified accountants, from construction to engineering consultants (cf. Kox, Lejour
and Montizaan 2004).

We have used the regression results of Table 5.1 for calculating the potential effects of the proposed EU
measures. A necessary first step was to assess how the EU proposals would affect the product-market
regulation that we have used as a basis for calculating bilateral policy heterogeneity between EU member
states. The concordance between the EU proposals and all relevant comparison items in the OECD
International regulation database is established through close reading of both. After that we have quantified
the impact of the proposed measures on bilateral regulatory heterogeneity if the European Commission
proposals are integrally adopted and implemented. This information has been aggregated for each of the five
heterogeneity indicators for sub-domains of product-market regulation. If all items for a sub-domain would
be fully affected by the EU directive, the expected impact would 100%. If no items are affected, the
expected impact is 0%.

Because of the uncertain impact of the EU directive on some regulatory comparison items - in particular
for those items that are partially affected - we use a bandwidth indicating minimum and maximum effect.
Table 6.1 gives the expected change in the indicators for sub-domains of product-market regulation. The
heterogeneity components Regulatory and administrative opacity and Explicit barriers to trade and
investment are heavily affected by the EU directive. The heterogeneity components Administrative burdens
for start-ups and Barriers to competition are moderately affected, while the component State control is
hardly affected. In the latter case, this is mainly due to the fact that network sectors are not included in the
EU proposals.
Table 6.1  Expected impacts of proposed EU measures on intra-EU policy heterogeneity, by sub-domain

<table>
<thead>
<tr>
<th>Components of heterogeneity indicator and covered policy domains</th>
<th>Reduction of the components of indicator due to implementation EU directive (^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulatory and administrative opacity</td>
<td>66 – 77 %</td>
</tr>
<tr>
<td>Explicit barriers to trade and investment</td>
<td>73 – 78 %</td>
</tr>
<tr>
<td>Administrative burdens for start-ups</td>
<td>34 – 46 %</td>
</tr>
<tr>
<td>Barriers to competition</td>
<td>29 – 37 %</td>
</tr>
<tr>
<td>State control</td>
<td>3 – 6 %</td>
</tr>
<tr>
<td>Overall PMR heterogeneity indicator</td>
<td>31 – 38 %</td>
</tr>
</tbody>
</table>

\(^a\) Based on detailed item-wise consideration of the match between the proposed EU directive and the 183 specific regulation items selected from the OECD database as basis for calculating the heterogeneity indicators. Source: Kox, Lejour and Montizaan (2004).

We combine the reduction effects described in Table 6.1 with the regression results for the TLS method with fixed effects for the country of origin (last column in Table 5.1) as our starting point. For every bilateral relation we calculated how the services trade would have changed due to the EU proposals. The effect differs for each country pair, because the initial heterogeneity in regulation and the change induced by the EU directive varies for each country pair.\(^27\) We account for uncertainties by combining the uncertainty effects of the parameter estimates – using a spread between plus and minus one standard deviation around the estimated coefficients – with the bandwidth of the heterogeneity effects in Table 6.1. This results in an expected trade increase intra-EU trade in commercial services (excluding transport and tourism) between 13 and 31 per cent. These commercial services form about 10% of total intra-EU trade. Total intra-EU trade could increase by 1% to 3%.

This is a only modest trade increase compared to the case that heterogeneity in regulation would be completely eliminated. Then commercial services trade could increase by 109% using the estimates for the coefficients of heterogeneity indices in the TLS regression with dummies for the origin countries. An identical system of product market regulation could thus double commercial services trade within the European Union.

7  Conclusions

International trade barriers for services are mostly of a non-tariff nature. So far, non-tariff barriers for service industries have been treated as if they were tariffs, i.e. as a volume-related mark-up on variable costs of exporting. Our paper argues that this approach is seriously flawed. It fails to grasp the economic implications of NTB’s in service industries. The regulatory trade barriers with the highest incidence in service industries affect fixed rather than variable export costs. This brings the decision to export in the

\(^{27}\) Note that exports are estimated in logs. So the new export level equals the old export level (2001) times the exponent of the product of the change in heterogeneity and the estimated coefficient. We have calculated this for each country pair and averaged these results to derive the total EU-effect, using the size of bilateral services trade as weight.
realm of investment decisions. We argue that the combination of fixed qualification costs, and international regulatory heterogeneity causes less market entry and higher prices than would otherwise have been the case. These effects are magnified if firms face uncertainty. The corresponding micro-economic analysis explains why fixed-cost qualification requirements deter export growth by small and medium-sized firms. The macro-economic framework also shows that services trade is hampered by differences in regulation. We have empirically tested our approach for the bilateral service trade among EU member states. The results are consistent with our theoretical prediction: more regulatory heterogeneity between two countries has a negative effect on their bilateral service trade, because of the fixed-cost border effects it creates.

The policy implication of this result is that mutual recognition of regulatory standards may generate positive efficiency and scale effects in bilateral service trade. Recent EU policy proposals for the internal EU market in services strengthen the role of mutual recognition. We have applied our empirical results to simulate what effect these measures may have, taking the 2001 bilateral service trade as a point of reference. The simulation results are that total EU trade in commercial services (excluding transport and tourism) could increase by 13 to 31 per cent. This potential effect suggests the importance of international regulatory differences as a trade barrier for services. A complete elimination of the regulatory heterogeneity could even double commercial services trade. Using a wider scope, it suggests that WTO negotiations on the liberalisation of service trade should put more emphasis on mutual recognition as an important principle in international service trade.

Annex 1  Policy heterogeneity index

Let there be \( n \) independent countries that may observably differ with regard to attribute \( R \). The simple bilateral heterogeneity indicator \( h_{ij}^R \) has the value of zero in case of country similarity, and the value of 1 in case of country dissimilarity:

\[
 h_{ij}^R \in \{1,0\} \quad \text{for } \forall \; i, j \in (1,...,n) \tag{A1}
\]

The pair-wise comparisons can be gathered in an item dissimilarity matrix, called \( H^R \). The total degree of international dissimilarity for regulation item \( R \) can be aggregated in a single numerical indicator \( HG^R \):

\[
 HG^R = \sum_i \sum_j h_{ij}^R \tag{A2}
\]

This indicator increases in the international degree of regulation dissimilarity. We can also calculate the country deviancy indicator for country \( i \):

\[
\text{dev}_i = \frac{h_{ij}^R}{\text{dev}_{\text{median}}} \quad \text{for } \forall i \in (1,...,n)
\]

It can also be expressed in relative terms, normalising the indicator for player \( i \) with the performance of the median player, found after ranking the deviancy indicators for all the \( n \) players.

\[28\]
\[ DV^R_i = \frac{1}{n} \sum_j h^{R}_{ij} \]  

(A3)

Country deviancy indicators are dimensionless numbers; they give no information about the nature of the heterogeneity itself, nor on the question whether a player is high/low, strict/lenient or intensive/extensive with regard to a particular regulation characteristic. A heterogeneity or deviancy indicator therefore will always have to be used in combination with a dimensioned level indicator.

So far we considered regulation dissimilarity for a single regulation item. The approach can be extended to much more complex and detailed regulation heterogeneity problems, e.g. by distinguishing \( m \subset \{ R_1, R_2, R_3, \ldots, R_M \} \) functions in product market regulation that may each be dealt with in \( s \subset \{ s_1, s_2, s_3, \ldots, S \} \) different modes.\(^{29}\) This magnifies the comparison base to a matrix of dimensions \( n'ms \). After adapting for the added comparison dimensions the country deviancy indicator becomes:

\[ DV^{ms}_i = \frac{1}{s'mn} \sum_s \sum_m \sum_j h^{ms}_{ij} \]  

(A4)

Annex 2 Derivation negative relation between bilateral trade and policy heterogeneity

The gravity equation may be derived from any kind of demand equation based on an Armington structure. Using a Dixit-Stiglitz consumption variety model, we represent the utility of the representative consumer from country \( j \) as:

\[ U_j = \left( \sum_{i=1}^{R} \sum_{v=1}^{n_i} C_{vij} \frac{\sigma-1}{\sigma} \frac{\sigma}{\sigma-1} \right) \]  

(A2.1)

\( C_{vij} \) represents the consumption of variety \( v \), produced in country \( i \) and consumed in country \( j \). There are \( R \) countries and each country produces \( n_i \) varieties. The number of varieties is endogenous and varies per country. \( \sigma \) represents the elasticity of substitution. The budget constraint reads.

\[ P_j Y_j = \sum_{i=1}^{R} \sum_{v=1}^{n_i} \frac{P_{vij}}{C_{vij}} \]  

(A2.2)

\(^{29}\) Some of these \( s \) modes may be non-existent for particular regulation functions, e.g. because they are of a binary nature (yes-no). In the dissimilarity matrix these modes yield zeros.
$Y_j$ represent real income in country $j$. $P_{vij}$ is the price of variety $v$ produced in country $i$ and consumed in country $j$. The price index, $P_j$ reads

$$P_j = \left( \sum_{i=1}^{R} \sum_{v=1}^{n_i} P_{vij} \right)^{\frac{1}{1-\sigma}}$$ (A2.3)

We derive consumer demand in $j$ for variety $v$, produced in $i$, by maximising the utility function in equation A2.1, given the budget constraint in equation (A2.2). The demand function reads:

$$C_{vij} = \left( \frac{P_{vij}}{P_j} \right)^{-\sigma} Y_j \quad \forall v, i$$ (A2.4)

Using equation (A2.4) we now introduce heterogeneity in regulation. Heterogeneity is represented by fixed entry-costs $F$ for each firm that enters export market $j$. For brevity we disregard the heterogeneity parameter $\delta$, assuming that all regulation-caused fixed costs in country $j$ are country-specific and therefore sunk.

We consider a firm producing a specific variety $v$ in country $i$ that wants to export to country $j$. Labour is the sole production factor. Wages $w_j$ for the workers are given. We assume economies at scale at the firm level. There is free entry and exit of firms at each (export) market. There are $n_i$ firms in country $i$. Profits $\pi_{vij}$ are equal to

$$\pi_{vij} = \sum_{j=1}^{R} \pi_{vij} = \sum_{j=1}^{R} P_{vij} C_{vij} - w_j (F_{vij} + c^M C_{vij})$$ (A2.5)

in which $c^M$ is marginal costs. Firms maximise profits for each market separately. These markets are segmented, such that firms set optimal prices for each market $j$. From profit maximisation it follows that the producer price equals the marginal costs times a mark-up, based on the elasticity of substitution in equation (A2.4). The producer price reads

$$P_{vij} = \frac{\sigma}{\sigma-1} c^M w_j \quad \forall v, i$$ (A2.6)

Entry occurs until profits are zero; imposing a zero-profit condition in equation (A2.5) implies that the production volume is:

---

30 The gravity equation can be derived from this type of equation (cf. Anderson and van Wincoop 2004).
\[ C_{vij} = \frac{(\sigma - 1) F_{ij}}{c_M} \]  

(A2.7)

Export per firm \( v \) from country \( i \) to \( j \) is thus fixed by the fixed costs and the elasticity of substitution. Higher fixed costs raise output per firm under the zero-profit condition. The number of firms is however lower. It can be shown that the effect of fewer firms dominates. Substituting equation (A2.7) into (A2.4) and differentiating to the fixed market-entry costs and the number of firms we get

\[
\frac{dn_i}{dF_{ij}} = \frac{n_i (1 - \sigma) \sigma_{ij}}{F_{ij} \sigma} < 0 \quad \text{if} \quad \sigma > 1, \quad \text{with} \quad \sigma_{ij} = n_i \frac{P_{ij}^{1-\sigma}}{\sum_{i=1}^{R} n_i P_{ij}^{1-\sigma}} \leq 1
\]  

(A2.8)

\( \sigma_{ij} \) is the share (\( \leq 1 \)) of country \( i \) in the price index of country \( j \). This implies that higher market-entry costs reduce the number of firms that export to country \( j \) and the volume of exports. Less heterogeneity in regulation, leads thus to higher exports, assuming that the market-entry costs are reduced by less regulatory heterogeneity. Moreover, the following condition has to be satisfied (\( C_{ij} = n_i C_{vij} \)):

\[
\frac{dC_{ij}}{dF_{ij}} = \frac{C_{ij}}{F_{ij}} \left( 1 + \frac{1 - \sigma}{\sigma \sigma_{ij}} \right) < 0 \quad \text{if} \quad \sigma (1 - \sigma_{ij}) > 1
\]  

(A2.9)

In case of a large number of countries the share of a country in the price index of another country is in general less than 10% (\( \sigma_{ij} < 0.1 \)). If the elasticity of substitution is larger than 1.1, this condition is satisfied.
## Annex 3  Regression results for Total Services trade

Dependent variable: Total Services trade, EU-14 countries, 1999-2001

<table>
<thead>
<tr>
<th></th>
<th>OLS a)</th>
<th>OLS + fixed effects origin</th>
<th>OLS + fixed effects destination</th>
<th>SUR b)</th>
<th>SUR b)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gravity variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ln GDP Origin</td>
<td>0.70***</td>
<td>0.72***</td>
<td>0.71***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.03)</td>
<td>(0.03)</td>
<td>(0.03)</td>
<td>(0.02)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ln GDP Destination</td>
<td>0.74***</td>
<td>0.74***</td>
<td></td>
<td>0.77**</td>
<td></td>
</tr>
<tr>
<td>(0.03)</td>
<td>(0.03)</td>
<td></td>
<td></td>
<td>(0.02)</td>
<td></td>
</tr>
<tr>
<td>Ln Distance</td>
<td>−0.89***</td>
<td>−1.02***</td>
<td>−0.80***</td>
<td>−0.95***</td>
<td>−0.95***</td>
</tr>
<tr>
<td>(0.07)</td>
<td>(0.06)</td>
<td>(0.06)</td>
<td>(0.05)</td>
<td>(0.05)</td>
<td></td>
</tr>
<tr>
<td>Language distance</td>
<td>−0.31**</td>
<td>0.02</td>
<td>−0.54***</td>
<td>−0.25**</td>
<td>−0.25**</td>
</tr>
<tr>
<td>(0.12)</td>
<td>(0.12)</td>
<td>(0.12)</td>
<td>(0.10)</td>
<td>(0.10)</td>
<td></td>
</tr>
<tr>
<td><strong>Regulation variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heterogeneity, administrative barriers for start ups</td>
<td>−0.03</td>
<td>0.18</td>
<td>−0.02</td>
<td>−0.05</td>
<td>−0.05</td>
</tr>
<tr>
<td>(0.23)</td>
<td>(0.21)</td>
<td>(0.22)</td>
<td>(0.19)</td>
<td>(0.19)</td>
<td></td>
</tr>
<tr>
<td>Heterogeneity, barriers to competition</td>
<td>−1.35***</td>
<td>−1.47***</td>
<td>−1.19***</td>
<td>−1.05***</td>
<td>−1.05***</td>
</tr>
<tr>
<td>(0.31)</td>
<td>(0.32)</td>
<td>(0.33)</td>
<td>(0.31)</td>
<td>(0.31)</td>
<td></td>
</tr>
<tr>
<td>Heterogeneity, regulatory and administrative opacity</td>
<td>−0.30**</td>
<td>0.23</td>
<td>−0.37**</td>
<td>−0.25</td>
<td>−0.25</td>
</tr>
<tr>
<td>(0.17)</td>
<td>(0.17)</td>
<td>(0.17)</td>
<td>(0.16)</td>
<td>(0.16)</td>
<td></td>
</tr>
<tr>
<td>Heterogeneity, state control</td>
<td>0.12</td>
<td>−0.06</td>
<td>0.61**</td>
<td>0.76**</td>
<td>0.76**</td>
</tr>
<tr>
<td>(0.34)</td>
<td>(0.32)</td>
<td>(0.34)</td>
<td>(0.29)</td>
<td>(0.29)</td>
<td></td>
</tr>
<tr>
<td>Heterogeneity, barriers to trade and investment</td>
<td>−0.92***</td>
<td>−0.82***</td>
<td>−0.15</td>
<td>0.09</td>
<td>0.09</td>
</tr>
<tr>
<td>(0.26)</td>
<td>(0.27)</td>
<td>(0.26)</td>
<td>(0.24)</td>
<td>(0.24)</td>
<td></td>
</tr>
<tr>
<td>Product market regulation Origin</td>
<td>−0.06</td>
<td>0.09</td>
<td>−0.09**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.067)</td>
<td>(0.067)</td>
<td>(0.06)</td>
<td>(0.06)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barriers for entrepreneurship Destination</td>
<td>−0.06</td>
<td>−0.12***</td>
<td></td>
<td>−0.12***</td>
<td></td>
</tr>
<tr>
<td>(0.05)</td>
<td>(0.04)</td>
<td></td>
<td></td>
<td>(0.04)</td>
<td></td>
</tr>
<tr>
<td>Year dummy 2000</td>
<td>0.10</td>
<td>0.03</td>
<td>0.03</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>(0.07)</td>
<td>(0.06)</td>
<td>(0.06)</td>
<td>(0.05)</td>
<td>(0.05)</td>
<td></td>
</tr>
<tr>
<td>Year dummy 2001</td>
<td>0.15**</td>
<td>0.07</td>
<td>0.07</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>(0.07)</td>
<td>(0.06)</td>
<td>(0.06)</td>
<td>(0.05)</td>
<td>(0.05)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>−4.58***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.85)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Number of observations:

<table>
<thead>
<tr>
<th></th>
<th>485</th>
<th>485</th>
<th>485</th>
<th>485</th>
<th>485</th>
</tr>
</thead>
</table>

### Adjusted R-squared

<table>
<thead>
<tr>
<th></th>
<th>0.86</th>
<th>0.89</th>
<th>0.88</th>
<th>0.77</th>
<th>0.79</th>
</tr>
</thead>
</table>

---

a) Absolute value of standard error in brackets. Codes: *** = coefficient significant at 1% confidence level; ** = coefficient significant at 5% confidence level; * = coefficient significant at 10% confidence level.

b) Seemingly Unrelated Regression (SUR), applying simultaneous estimation of equations for origin and destination countries. All bilateral variables expressed as deviation from the mean, separately from the origin (exporting) country perspective, and from the destination (host) country perspective (see main text).
References


