

Firm Heterogeneity in Services Trade: Micro-Level Evidence from Eight OECD Countries

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April 2019

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ABSTRACT

This paper shows that smaller and less productive firms, as well as first-time exporters are overproportionally affected by services trade barriers using micro-data from Belgium, Finland, Germany, Italy, Japan, Sweden, the United Kingdom, and the United States. For these firms, both the propensity to export and export volumes to less restrictive destinations are significantly higher than to more restrictive destinations. In contrast, policy barriers measured by the OECD Services Trade Restrictiveness Index (STRI) do not affect export decisions of the largest, most productive and experience services firms. The pattern holds for two major modes of supply, cross-border services exports and foreign affiliate sales of services firms. The findings are consistent with firm sorting mechanisms in trade models with heterogeneous firms and hysteresis of export participation in the presence of sunk export costs.

ACKNOWLEDGEMENTS

The authors would like to thank Hongyong Zhang (RIETI) and Stefano Federico (Bank of Italy) for the joint analysis of Japanese and Italian micro-data. The authors are also grateful for the help and co-operation from the National Bank of Belgium, the Central Bank of Costa Rica, The Research Institute of the Finnish Economy (Etila), Statistics Finland, the Deutsche Bundesbank, the Bank of Italy, the Research Institute of Economy, Trade and Industry (Japan), Statistics Sweden (SCB), the UK Office of National Statistics (ONS) and the US Bureau of Economic Analysis. The authors would like to thank Ken Ash, Giuseppe Berlingieri, Chiara Criscuolo, John Drummond, Peter Egger, Peter Gal, Robert Grundke, Luca Marcolin, and Hildegunn Kyvik Nordås for their insightful comments and suggestions.

This work contains statistical data from ONS which is Crown Copyright. The use of the ONS statistical data in this work does not imply the endorsement of the ONS in relation to the interpretation or analysis of the statistical data. This work uses research datasets which may not exactly reproduce National Statistics aggregates.

The statistical analysis of firm-level US data on multinational companies and services exporters was conducted by the Bureau of Economic Analysis, US Department of Commerce under arrangements that maintain legal confidentiality requirements. The views expressed are those of the authors and do not reflect official positions of the US Department of Commerce.

TABLE OF CONTENTS

1	Introduction	1
2	Related Literature	2
3	Data.....	4
4	Empirical Specification.....	7
5	Results.....	11
5.1	Cross- Border Exports	11
5.2	Foreign affiliate sales	20
6	Conclusion.....	23
7	Bibliography.....	24
8	Appendix.....	28

1 INTRODUCTION

The internationalisation of services markets has proceeded at a fast pace in recent decades, fuelled by technological advances and a rapid decline in the cost of communication and travel. At the same time, the fragmentation of services regulations raises the cost of doing business across markets for services providers – as documented by the OECD Services Trade Restrictiveness Index (STRI). Such regulatory restrictions may have a bearing on the decision to serve a foreign market, on the amount exported once present in a country, or on the choice of whether to supply a given market through cross-border exports or by setting up a local establishment. In this paper, detailed firm-level data on trade in services and foreign affiliate sales in several OECD economies are analysed to assess the costs of trade policy barriers in services, and the channels through which they affect services exporters.

Recent OECD work has analysed several datasets on trade in services and foreign affiliate micro-data covering trading firms in Belgium, Finland, Germany, Italy, Japan, Sweden, the United Kingdom and the United States. These data and the results of such analysis have been described in greater detail in a recently published OECD Trade Policy Paper (Rouzet et al., 2017), which is – to our knowledge – the first study to explore comparable enterprise data on international services transactions for eight countries and all modes of supply. While the country coverage has been primarily driven by the existence and availability of confidential enterprise-level datasets, generalising the results obtained requires a reasonably varied sample of countries. The datasets analysed include both small and large economies and span different continents to reach sufficient representativeness of global services traders.

The analysis carried out in this paper builds upon existing research by highlighting the heterogeneous impact of services trade barriers on different types of firms. Unlike tariffs or transport costs, non-tariff barriers do not affect all firms equally. Instead, some firms seem to be more fit to cope with services trade regulatory hurdles than others. While the available data do not consent observing the existence of specific abilities in firms, the analysis shows that these are correlated with observable firm characteristics, such as firm's size, productivity and previous export experience. The analysis uncovers patterns of re-allocations of market shares within services industries that are induced by advances in globalisation. It is important to be aware of these patterns when quantifying gains from trade liberalisation, in a world where most bilateral and multilateral trade negotiations increasingly cover services.

This paper extends Rouzet et al. (2017) by introducing an estimation procedure to simulate an increase in the number of exporter-destination combinations following a liberalisation of services trade. Moreover, in this paper additional results are reported with respect to the main activity of services exporters, not included in Rouzet et al. (2017). The remainder of the paper is organised as follows: the next section places our contribution within the existing literature. Section 3 describes our empirical strategy. Section 4 introduces the micro-datasets used for analysis. Section 5 describes the main results for cross-border exports and foreign affiliate sales. Section 6 concludes.

2 RELATED LITERATURE

Firm-level data on services trade became available for researchers only recently. One of the first descriptive studies was published by Breinlich and Criscuolo (2011). They show that a number of stylised facts, which shortly before had been identified for firms exporting goods, do also hold for services exporters in the United Kingdom.¹ Only a small share of firms engage in international trade in services and services traders are larger in terms of employment, turnover and gross value added, pay higher wages, and are more capital intensive and more productive in terms of both labour productivity and total factor productivity (TFP). Service traders are also more likely to be foreign-owned or to be part of a UK MNE. Subsequently, similar patterns have been identified for other countries.²

Building on these firm-level datasets of services trade, several authors have shown that the negative effect of trade frictions in the services sectors can be identified from micro-data. Kelle et al. (2013) analyse the trade-off between cross-border exports of services and exports via the establishment of a foreign affiliate. They find that high wages in the importing country tend to foster cross-border trade rather than affiliate sales and bilateral distance is especially detrimental to cross-border sales. In a similar analysis for the United States, Christen and Francois (2015) confirm the negative effect of distance on the importance of cross-border sales relative to foreign affiliate sales. In both studies, a large foreign market has no consistent effect on the choice between cross-border exports and commercial establishment.

1. Bernard and Jensen (1995) provide first evidence that larger and more productive firms are more likely to export. The analysis of customs data shows that trade is dominated by few firms which export a high number of products to many countries (Bernard et al. 2007; Eaton et al. 2011).

2. Most notably, by Kelle and Kleinert (2010) for Germany, Gaulier et al. (2010) for France, Federico and Tosti (2012) for Italy, Ariu (2016a) for Belgium, Walter and Dell'mour (2010) for Austria, as well as a comparative study by Haller et al. (2014) for Finland, France, Ireland and Slovenia. Ariu et al. (2017a) decompose aggregate export growth using firm-level data for Belgium, France, Germany and Spain. Crozet and Milet (2017) show that the performance of manufacturing firms improves after starting to sell services. Regarding trade via a commercial presence abroad, Tanaka (2015) analyses the role of heterogeneous firm productivity in shaping the activity of Japanese multinationals' foreign distribution affiliates.

Crozet et al. (2013) show that restrictive domestic services regulations in an importing country, as measured by the OECD Product Market Regulation index, reduce the probability that French firms export to that market. In addition, such regulation also reduces the value of individual export sales of these firms to the country. Christen et al. (2013) find similar results for Austrian firms. Firm-level data from Belgium has also been used by Ariu (2016b) to study the “great trade collapse”. He shows that services trade declined much less than goods trade during the 2008-09 crisis, with most of the effect being accounted for by business services.

To date, comprehensive indicators for non-tariff barriers in services are only available on a country-sector dimension with at best very short time series. However, due to the existence of multilateral trade resistance (Anderson and van Wincoop, 2003) it is not possible to obtain consistent estimates from variation of trade costs at the country-sector level. To solve this problem, one solution is to interact the trade cost variables with firm-level characteristics. This allows for the identification of the heterogeneous impact of services trade barriers on trade flows, which is unaffected by multilateral trade resistance.³

The analysis is guided by two key contributions from the economic literature. Chaney (2008) lays out a theoretical framework for gravity analysis at the firm level. In order to shed light on such firm heterogeneity, it is important to distinguish between the intensive margin and the extensive margin of trade. The intensive margin refers to the trade volume of firms currently exporting. In turn, trade growth at the extensive margin is determined by firms which enter new export markets.

Under the assumption that the establishment of a commercial presence abroad entails higher fixed costs but lower variable costs than exporting cross-border, Helpman et al. (2004) show that the most productive firms establish a commercial presence in order to leverage their efficiency to sell higher volumes in each market, while less productive firms serve foreign consumers via cross-border exports and the least productive firms focus exclusively on the domestic market. The approach used in this paper builds on these insights by considering cross-border services exports as well as foreign affiliate sales of services.

3. Using an alternative strategy, Ariu et al. (2017b) interact unilateral measures of services trade restrictiveness with bilateral RTA indicators, finding significant linkages between exports of goods and services.

3 DATA

The data used in the analysis are extracted from confidential International Trade in Services surveys and Foreign Affiliate Trade Statistics (FATS), collected by national statistical offices or central banks for the compilation of international trade statistics. They contain information on annual exports and foreign affiliate sales by firm, partner country and service type. The data on enterprise-level trade outcomes are complemented with information from structural business surveys to gather further insights into firms' characteristics including size, productivity, industry classification and ownership structure. The datasets for all countries span an overlapping, although not fully identical, period of time (2008 to 2014). A short description of the data is provided in Table 1 below. A more detailed description of those datasets and sources is included in Rouzet et al. (2017).

Restrictions to services trade and investment are measured by the OECD STRI by partner country and sector. Hence, the regression sample only comprises the 42 countries included in the OECD STRI database as services importers or host countries for foreign affiliate sales. The indices for 2014 are applied to the whole time period, considering that the STRI data are not available for earlier years and regulation is to a large extent persistent over a short period of time.⁴

In order to analyse the heterogeneous impact of non-tariff barriers on different groups of firms, we construct interactions of the STRI with several variables, which have been shown to be important determinants of international orientation and export performance. Productivity is measured as either labour productivity, following the findings of Helpman et al. (2004) that the most productive firms self-select into becoming exporters or multinational companies.⁵ Firm size captures the benefits of scale for expanding internationally. It is measured by total firm turnover and number of employees. Firm size is also expected to be correlated with productivity within a country unless allocative inefficiencies are high.

Previous export experience in the same country reflects the benefit of not having to incur initial sunk costs of exporting; that is, costs that are incurred once and for all the first time a firm penetrates a foreign market. Those costs are not recovered even if the firm stops exporting after the first period, but they are also not repeated for returning exporters. However, it should be noted that over a relatively short time period, previous export

4. A panel analysis was preferred over a cross-section analysis to maximise the firm coverage by sector and smooth out differences that may arise across years (for a given exporting country and service) due to sampling techniques such as rotating the set of firms being sampled annually. For sensitivity analysis, regressions in several countries have been run for the post-crisis period only (2010 to 2013 or 2014) and results for the shorter period are consistent with those for the entire sample.

5. Labour productivity is calculated as either turnover per employee or value added per employee. Total factor productivity (TFP) could not be estimated for some countries due to lack of data on firm's capital stock. Therefore results using labour productivity are reported for better comparability among countries.

decisions are likely to be correlated with other explanatory variables and could bias their estimated impact downwards. This is the case in particular with the STRI if a favourable regulatory environment encouraged market entry in the past and regulation is “sticky” over time. Differences in the export probability between firms that have not previously sold in a given market and experienced exporters in the same market can be used to infer the importance of *sunk costs*.

Table 1. Sources of micro-data on cross-border exports and foreign affiliate sales

Belgium	Belgian data are drawn from the survey on trade in services conducted by the National Bank of Belgium (NBB) for the compilation of the balance of payments. The sample used in our study covers around 9,800 exporting firms for 2013 and 2014. The 12 main Extended Balance of Payment Services (EBOPS) categories are included, as well as a more specific breakdown by STRI sectors.
Finland	Firm-level data for Finland are drawn from the International trade in services and Foreign affiliate statistics maintained by Statistics Finland. The sample used in our study covers around 2,500 exporting firms over a period of seven years (2008-2014) and nine types of services, as defined in the EBOPS classification. Statistics Finland also collects data on enterprise groups located in Finland that have affiliates, branches or associated companies (outward FATS). This study focuses only on foreign affiliates whose main activity is in services, for which it is possible to match fourteen STRI services types. The sample is composed of approximately 3,000 Finnish affiliates abroad and 800 parent companies, from 2008 to 2014.
Germany	Services trade data at the firm level are collected by the Deutsche Bundesbank and published in its Statistics on International Trade in Services (SITS). Because of the statutory nature of the survey and the low reporting threshold, the coverage (in terms of number of firms) is by far the largest of the countries analysed. Information on foreign affiliates, as well as foreign owners of German firms, is collected in the Micro-database Direct Investment (MiDi). In total, data are available for around 28,000 exporting firms and 6,600 German parent companies with 21,000 foreign affiliates for the years from 2008 to 2013.
Italy	Firm-level data for Italy are limited to international trade in services from the Bank of Italy. Trade in services data have been collected through quarterly surveys since 2008. The sample used in this study covers around 1,700 exporting firms over a period of seven years (2009-2013). However, the initial sample is reduced to 1,000 exporting firms when matched to the STRI sectors. Further information on firms’ global ultimate owners is sourced from the Bureau van Dijk Orbis database together with additional data on the Italian affiliates abroad. The sample is composed of approximately 7,500 Italian affiliates abroad and 3,800 parent companies, over a time period covering 2008 to 2014.
Japan	For Japan, only outward FATS data, collected in the Basic Survey on Overseas Business Activities (BSOBA) by the Ministry of Economy, Trade and Industry (METI), have been made available for this study. The survey targets both parent companies, i.e. Japanese corporations that own overseas affiliates, and the foreign affiliates themselves, directly or indirectly owned by Japanese companies. The final sample covers

	approximately 13,000 foreign affiliates and 4,500 parents, over a period of six years (2008-2013).
Sweden	Firm-level data for Sweden are drawn from the survey of Foreign trade in services, compensation of employees and current transfers. This survey is conducted on a quarterly basis by Statistics Sweden, on behalf of Sweden's Riksbank, and based on a stratified sample of approximately 6,000 enterprises, with about 1,500 firms, corresponding to the largest firms in terms of turnover or trade, regularly included. The sample used in this study covers around 1,400 exporting firms over a period of five years (2008-2012).
United Kingdom	Firm-level data for the United Kingdom are drawn from the International Trade in Services (ITIS) Inquiry and the Annual inquiry into Foreign Direct Investment (AFDI), carried out by the Office for National Statistics (ONS) for the compilation of the UK Balance of Payments statistics. ITIS is a statutory inquiry conducted on a quarterly and annual basis, and addressed to private sector companies resident in the United Kingdom with ten or more employees. The sample selected for this analysis comprises about 13,700 exporting firms over a period of seven years, from 2009 to 2014.
United States	Firm-level data on services trade for the United States come from the Survey of Transactions in Selected Services and Intellectual Property with Foreign Persons (BE-120 and BE-125) over the period 2008-2012, as collected by the US Bureau of Economic Analysis (BEA). The quarterly survey comprises approximately 2,000 firms and the annual survey approximately 10,000 firms. Data on the foreign affiliates of US parents are drawn from the Surveys of US Direct Investment Abroad (BE-11, BE-10 and BE-577) conducted by the BEA.

In the regression these interactions are included one-by-one. Due to correlation among firm size, firm productivity and export status, this choice has implications for the resulting coefficients.⁶ Control variables for firm size and productivity are included in all specifications, while previous export experience is controlled for only when including this variable as interaction with the STRI.

Moreover, different firm-level characteristics that might be related to cross-border exports or foreign affiliate sales in services are controlled for in the regression specifications. The international status of firms is indicated by dummy variable for being foreign-owned (according to the location of the global ultimate owner). As a robustness check, a dummy variable for having a global ultimate owner in the destination country (i.e. exporting to its home country), and one for being a multinational parent (i.e. having at least one foreign affiliate in manufacturing or services) are also included. The latter variable is only used in the analysis of cross-border exports. Considering that services trade by manufacturing firms is often linked to trade in goods transactions and may follow

6. We are aware of the fact that these variables are jointly determined by firm's activities and we do not try to answer questions related to the relationship among the three variables. In particular, we acknowledge that learning from exporting might lead to a positive effect of past export experience on firm productivity, while sorting into exporting and a certain "stickiness" of productivity levels implies a reversed causality.

different patterns than exports by firms that have their core activity in the same service sector, a binary variable indicates firms whose primary activity is in goods or services.

As robustness checks, experiments are also conducted using firm-level controls for services imports and the presence of foreign affiliates in the same country and service sector. The latter variables are only included in the cross-border export estimations and address potential interdependence between modes of supply. A positive coefficient signals that cross-border exports and FDI tend to be complementary, including through intra-firm trade; while a negative sign suggests that they constitute alternative means to serve a given market.

A set of standard control variables for market potential and trade costs are included in all regressions. These comprise: market size, measured by the importer's GDP from the World Development Indicators; the distance between the two countries and whether they share a common border, a common language and common legal origin, all extracted from CEPII; whether both trading partners belong to the EEA or EFTA agreements (for Belgium, Finland, Germany, Italy, Sweden and the United Kingdom) or to a preferential trade agreement covering services (for Japan and the United States). For Germany and Italy additional specifications are used where the distance and contiguity variables are defined at the level of the state or region where the firm's primary establishment is located to better capture intra-European distances. Similarly for the United States, the distance variables are defined between the capital of the headquarter state and the foreign capital.

4 EMPIRICAL SPECIFICATION

A firm-level specification of the gravity equation is the framework used for the empirical analysis.⁷ However, not all countries provide both types of data.⁸ Since the confidential micro-datasets cannot be merged across countries, the analysis is conducted separately for each exporter country. Specifications are estimated sector by sector on a panel going from 2008 to 2014, or a slightly shorter period where data are not available for all years. The sector coverage and aggregation differ slightly between countries for reasons of data availability.

7. While the gravity framework has been developed in the context of trade in goods, it has been shown to be a good fit to aggregate data for trade in services as well (e.g. Kimura and Lee, 2006; Kox and Lejour, 2005; Nordås and Rouzet, 2016; Benz, 2017). In the case of services, the effect of distance does not capture costs of physically transferring products to foreign destinations, but is more likely to proxy for informational frictions between firms and their network of potential suppliers (Chaney, 2017). Several theories of multinational firms also predict that gravity relationships should hold for foreign affiliate sales (Kleinert and Toubal, 2010).

8. See Table 1 for details on data availability.

Missing values are replaced by zero trade flows (respectively, zero affiliate sales) when a firm reports exporting the same service (respectively, having an affiliate in the same sector) to at least one country in the same year. The firm-level approach applied to bilateral flows results in a large share of observations with zero trade, since most firms only trade with one or very few partner countries. To obtain non-biased estimates in this setting, a Poisson Pseudo Maximum Likelihood (PPML) estimator is used for the value of exports or affiliate sale values. The binary indicator variable for exports or affiliate sales is analysed using Probit regressions.

Poisson Pseudo Maximum Likelihood (PPML)

The Poisson pseudo maximum likelihood regression was established as a standard tool for gravity analysis by Santos Silva and Tenreyro (2006).⁹ The estimation equation for services trade in sector s can be written as:

$$X_{ict}^s = \exp(\alpha + \beta_1 STRI_c^s + \beta_2 STRI_c^s Y_{it} + \gamma Z_{it} + \delta S_{ct} + \theta_t + \varepsilon_{ict}^s) \quad (1)$$

where the outcome variable X_{ict} represents the value of cross-border exports or the value of foreign affiliate sales by firm i in destination (or affiliate host) country c and year t . Y_{it} represents a single variable out of a set of time-varying firm characteristics. Z_{it} contains a vector of firm-level variables, such as turnover, productivity, main activity and being foreign-owned. S_{ct} contains a vector of country-time specific variables, such as importer GDP, and bilateral gravity variables, such as distance, contiguity and common language, which are importer-specific in data with only one exporting country. θ_t is a matrix of year dummy variable with the first year being omitted as base category and ε_{ict}^s is a normally distributed error term. In each country, the equation is estimated sector by sector, for each service s with available data.

As a robustness check, importer fixed effects χ_c are included in order to control for multilateral resistance terms. In these specifications, all importer-specific variables which are constant over time are dropped. These include, in particular, the STRIs and some trade cost variables such as bilateral distance, contiguity, and RTAs established prior to 2008. Including country fixed effects does not affect the estimated coefficients on STRI interactions β_2 . Hence, the specification without importer fixed effects is chosen as the main specification.

9. The PPML estimator is used as a standard method to obtain consistent estimates in data with many zeroes. It may however be that the data-generating process for the zeroes differs from that of the strictly positive observations, creating concerns about overdispersion and selection. As a robustness check, zero-inflated Poisson models and Heckman selection models are also estimated. The results are qualitatively similar.

These estimates can be converted into ad-valorem equivalents or variable costs, i.e. additional costs that are proportional to the amount of services sold, using additional information on the sensitivity of import demand to prices.¹⁰ However, these ad-valorem equivalents of trade barriers are an approximation of the overall burden on exporters, combining variable and fixed costs.¹¹ The estimation strategy chosen in this study does not allow for a decomposition of services trade barriers into variable cost and fixed cost components. The additional ad-valorem equivalent for a small firm i relative to large firms is given by:

$$\tau_i = [\exp(-\beta_2 * stri_c^s(\max(turnover) - turnover_i)/\rho) - 1] * 100, \quad (2)$$

where $\max(turnover)$ indicates the turnover of large firms used as benchmark level of firm size. Only the coefficient β_2 is used for the calculation of the ad-valorem tariff equivalent for heterogeneous firms due to higher confidence in the robustness of this coefficient.

Probit

To study changes in the extensive margin of services exports the propensity of firms to export is analysed in a Probit regression. The estimation equation can be written as:

$$P(X_{ict}^{S*} > 0) = \Phi(a + \beta_1 STRI_c^s + \beta_2 STRI_c^s Y_{it} + cZ_{it} + dS_{ct} + \varphi_t + \omega_{ict}^s) \quad (3)$$

where the outcome variable is a binary variable which takes the value of one if positive cross-border exports or foreign affiliate sales by firm i exist in destination country c and year t and the value of zero otherwise. Φ is the cumulative distribution function of the normal distribution and all explanatory variables are identical to those in the PPML specification. Based on the resulting coefficients, it is possible to calculate the semi-elasticity of an STRI reduction on the probability of foreign exports as:

$$\frac{\partial \ln[\Phi(a + b STRI_c^s + cZ_{it} + dS_{ct} + \varphi_t + \omega_{ict}^s)]}{\partial STRI_c^s} \quad (4)$$

However, while the semi-elasticity is informative about a change in the export probability for a specific firm (e.g. the average firm), it does not convey information on the change in the number of exporters. Therefore, a simulation procedure is considered

10. In mainstream trade models, the import demand elasticity ρ ("rho") is pinned down by the willingness of consumers to substitute between different varieties of traded services, and in particular between domestic and foreign ones, when faced with changes in relative prices. It is called the elasticity of substitution and denoted with σ . Micro-datasets containing financial data on both trading and non-trading firms can be used to derive theory-consistent estimates of σ by service sector (see Annex B in Rouzet et al., 2017). The elasticity of the intensive margin of exports at the firm level to variable trade costs is $\rho=1-\sigma$.

11. Few attempts have been made in the literature to quantify in monetary terms the fixed costs of trade and FDI, and robust methods for their estimation remain to be developed. One interesting contribution is Tintelnot (2017) who devised an estimation procedure for the fixed costs of setting up foreign affiliates, in the case of German multinationals. Irarrazabal et al. (2013) estimate jointly the fixed costs of exports and affiliates by destination for Norwegian manufacturing firms. The few existing estimates of sunk costs also focus on the manufacturing sector (Das et al., 2007; Moxnes, 2010).

in order to calculate the number of newly entering exporters. As a first step, the Matthews' correlation coefficient (MCC) is used to determine a suitable cut-off value to balance the alpha and beta errors of predicting each firm's export status.¹² The MCC is defined as:

$$MCC = 100 \frac{TP*TN - FP*FN}{\sqrt{(TP+FP)*(TP+FN)*(TN+FP)*(TN+FN)}} \quad (5)$$

where TP denotes true positive predictions (i.e. export probability above the cut-off value for firms which actually do export), TN denotes true negative predictions, whereas false positive and false negative predictions are denoted by FP and FN, respectively. The value of MCC is bounded between zero and one.

Subsequently, based on the cut-off value that maximises the MCC, changes in the number of exporting firms can be simulated by calculating the adjustment of the export probability for each firm resulting from a reduction of the STRI score by 0.1. To facilitate the display of results, only the relative changes in the number of exporting firms for certain groups of firms are reported.

An important concern for both PPML and Probit is the endogeneity of some of the regressors. Past literature has uncovered "learning by exporting" effects such that firm productivity and size may be positively influenced by being an exporter. Reverse causality may then be a source of bias in the coefficients on size and productivity variables and their interactions with the STRI. One way of dealing with this concern would be to include firm fixed effects controlling for unobservable firm characteristics. However given the relatively short time horizon of the panel datasets and the large number of firms, including such high dimensional fixed effects in all regressions would be computationally demanding. Specifications with firm fixed effects were tested in a number of instances and yielded very similar results to the baseline specifications.

Two endogenous variables are used in all specifications: the value of international sales (cross-border exports or foreign affiliate sales) made by each firm in a given country and sector, and a binary indicator variable whether such sales are observed. In the following, a short description of the econometric tools used for the analysis of these two types of variables is provided.

12. Originating from the sciences (Matthews, 1975), this indicator has already been used in the international trade literature (e.g. Egger and Wamser, 2013)

5 RESULTS

5.1 CROSS- BORDER EXPORTS

Analytical results on cross-border exports of services are available from seven countries: Belgium, Finland, Germany, Italy, Sweden, the United Kingdom and the United States. Results are reported based on the median estimate among specifications from all seven countries.¹³ This guarantees that results are not based on particular country characteristics, but are more likely to reflect the inherent technological structure of services trade in any given sector.

Firm size

The Poisson Pseudo Maximum Likelihood (PPML) estimation shows that there exists a group of sectors in which large firms are more likely to export higher volumes to more trade restrictive destinations than small firms. Figure 1 is based on regression results from five sectors: audio-visual services, commercial banking, insurance services, maritime transport and telecommunications. While services trade barriers reduce exports to all destination, this effect is smaller for larger firms. In other words, larger firms find it significantly easier than small firms to export higher volumes to more trade restrictive countries. Results for professional services, courier services, land and air transport as well as construction, which show the opposite result are reported in the Annex. Due to the characteristics of these businesses, economies of scale do not seem to be beneficial for services trade in those sectors.

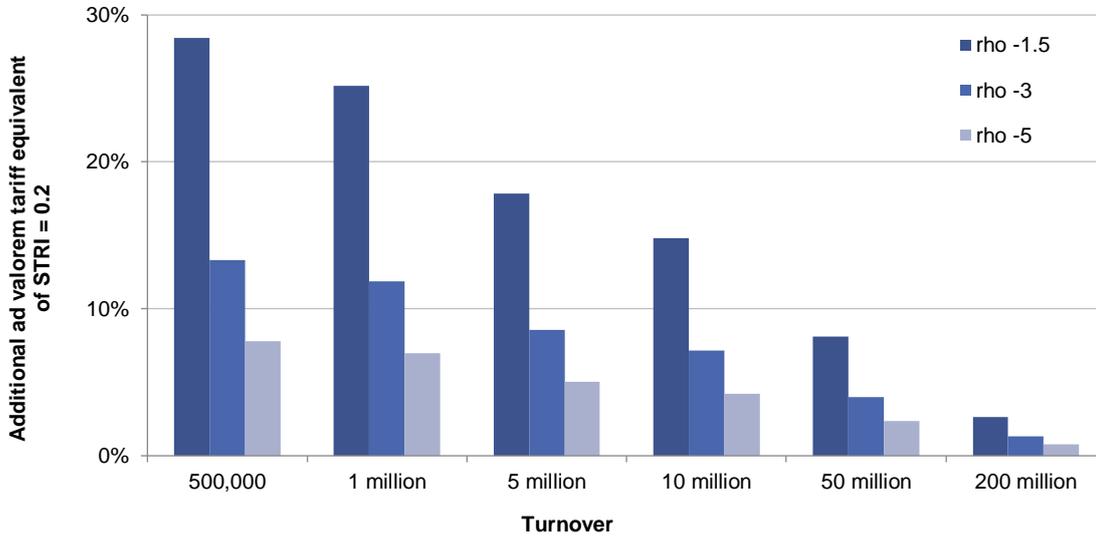
Using the formula presented in equation (2), it is possible to calculate a tariff equivalent of the additional costs borne by small firms when exporting to destinations with restrictive services policies, on top of what has to be paid by large firms exporting to the exact same destinations. For this purpose firms are distinguished by their annual turnover. The additional tariff equivalent is normalised to zero for firms in the largest size class (with a turnover of EUR 400 million or more). The tariff equivalent corresponds to an STRI score of 0.2, which is within the range of observed values in almost all sectors and represents plausible levels of services trade restrictions in many countries.¹⁴

13. Tables A.1. and A.2. report the estimation results for cross-border exports derived from baseline regressions in each country and pooled across sectors, to give a sense of the coefficients on non-STRI control variables. Regression tables by sector and for the specifications with interactions are not reported for conciseness, but are available from the authors upon request.

14. The calculation of the tariff equivalent requires information on the values of import demand elasticities. Based on firm-level data from Statistics Finland and the UK Office of National Statistics, these elasticities are estimated to lie between -0.6 and -4.4 (see Annex Table B.2 in Rouzet et al., 2017). These estimates are very similar to the elasticities (-1.5, -3 and -5) used in previous publications on ad-valorem tariff equivalents of the OECD STRI, most notably Nordås (2016) and Benz (2017). In order to ensure comparability with the existing literature, the tariff equivalent is calculated based on these import demand elasticities between -1.5 and -5.

FIGURE 1. TARIFF MARK-UP FOR SMALL FIRMS ON CROSS-BORDER EXPORTS

ESTIMATED ADDITIONAL TARIFF EQUIVALENT OF AN STRI SCORE OF 0.2, BY TURNOVER IN EUR



Note: The numbers indicate the additional ad valorem tariff equivalent of an STRI score of 0.2 for small and medium sized enterprises. Estimates are based on the median coefficient from sector-level PPML regressions, except professional services. Import demand elasticities used for the calculation of the ad valorem equivalent are indicated as 'rho'.

Source: Own elaborations based on firm-level data from Belgium, Finland, Italy, Germany, Sweden, the United Kingdom and the United States.

Services trade restrictions are particularly harmful to small and medium-sized firms. For example, when comparing large firms, with a turnover of EUR 400 million, to small firms, with a turnover of around EUR 500 000, the small firms perceive an STRI score of 0.2 as an additional *ad-valorem* tariff equivalent, compared to large firms, which ranges between 8% and 28%. This result confirms the prior that regulatory barriers to trade in services create significant fixed export costs. When export costs do at least partly represent fixed costs, which do not depend on how much is exported, the perceived tariff equivalent must necessarily be higher for firms exporting modest volumes. Since total firm turnover is positively correlated with the volume of exports to a given market, this effect can be captured based on firm turnover. While the calculation of the tariff equivalent helps to illustrate the size of the effect, fixed export costs induced by services trade restrictions are likely to be the underlying economic phenomenon.

Table 2 confirms that as firms grow bigger, their export decisions are less and less affected by policy conditions in the importing country. Because larger firms are likely to export higher volumes, their scale should allow them to offset the initial costs of dealing with a challenging regulatory environment. Table 2 shows the semi-elasticity, indicating the

relative change in the export probability from a reduction of the STRI score by 0.1 for firms of different size classes, measured by their turnover and employment, and otherwise average characteristics.

Table 2 reports the median marginal effect covering all sectors and resulting from regression from all countries. For example, based on the median coefficient the export probability for small firms with a turnover of around EUR 500 000 is expected to increase by 12%, whereas larger firms with turnover of around EUR 50 million experience an increase of only 3%.

Table 2. Effect of STRI on export probability, by firm characteristics

Estimated impact of a global 0.1 reduction in STRI							
Turnover	500 000	1 million	5 million	10 million	50 million	200 million	400 million
Median marginal effect	12.37%	11.39%	7.68%	6.12%	3.05%	0.35%	-1.07%
Employment	3	7	20	55	400	3,000	8,000
Median marginal effect	14.74%	11.77%	9.37%	7.79%	4.88%	1.52%	-0.28%
Labour productivity	20 000	55 000	150 000	440 000			
Median marginal effect	4.92%	5.38%	3.59%	2.28%			
Exports in previous year	No	Yes					
Median marginal effect	4.02%	-0.41%					
Main activity services	No	Yes					
Median marginal effect	2.83%	4.26%					

Note: The numbers indicate the median percentage change in the probability to export of a given firm when reducing the STRI score by 0.1. Turnover results are based on 105 sector-level probit regressions; Employment 68 regressions; Labour productivity 124 regressions, while a marginal effect for a labour productivity of 20 000 EUR can only be estimated from 110 regressions. Turnover and labour productivity are in EUR.

Source: Own elaborations based on firm-level data from Belgium, Finland, Italy, Germany, the United Kingdom and the United States.

Results are qualitatively identical when firm size is measured by the number of employees instead of turnover, and the resulting coefficients are of similar magnitude. The export probability for small firms with as few as three employees may increase by around 15% if the importing country reduces its STRI score by 0.1. For large firms with more than 8 000 employees the effect is very close to zero. The relationship between firm size and the extensive margin of export growth is strictly monotonic, based on the median values of the regression coefficients.

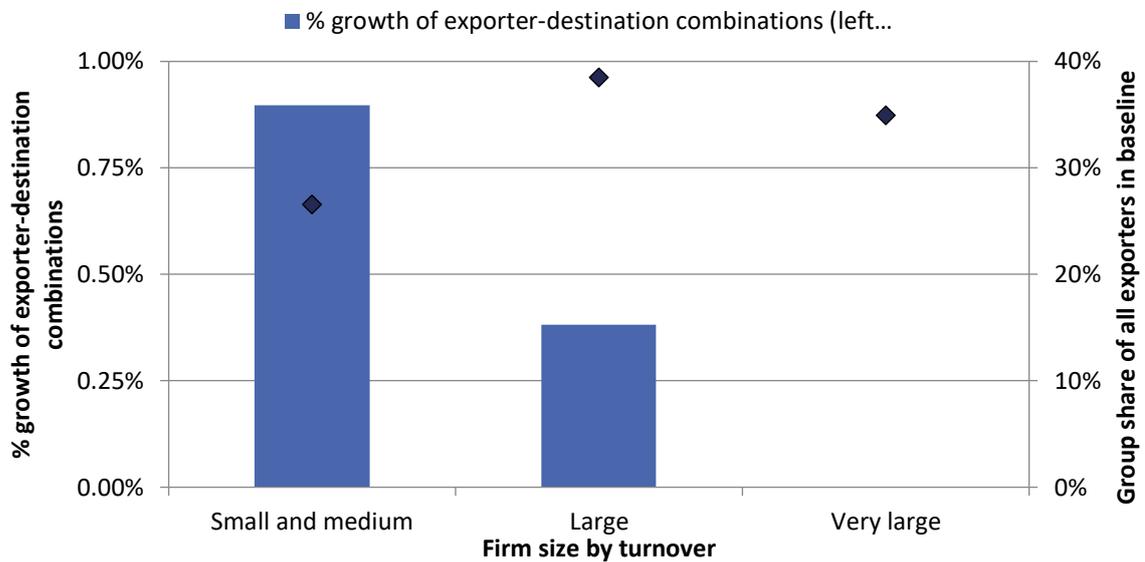
An identical pattern holds when simulating the resulting changes in the number of exporter-destination combinations. As outlined above, the first step of the simulation procedure identifies the exporting cut-off that maximises the goodness of fit of the regression. In the second step, changes in the predicted export status resulting from a reduction of the STRI by 0.1 are assessed relative to the predicted number of exporter-destination combinations in the baseline scenario. In this analysis firms are categorised into three groups according to their size, with thresholds being chosen so that there is a sufficient number of exporters in each group.

Figure 2 shows that small and medium-sized firms with an annual turnover of less than EUR 20 million expand their export destinations by 0.9%. Large firms with an annual

turnover between EUR 20 million and EUR 150 million still experience an increase in the number of export destinations by 0.4%. For very large firms with an annual turnover of more than EUR 150 million, the median effect across all exporting countries and all sectors implies no change in the number of export destinations. An identical pattern results when measuring size by the number of employees, where export destinations increase by 1.45% for firms with less than 100 employees, by 0.1% for firms with between 100 and 1000 employees and remain constant for firms with more than 1000 employees, as shown in Figure 3.

FIGURE 2. EFFECT OF STRI ON NUMBER OF EXPORTERS, BY FIRM SIZE

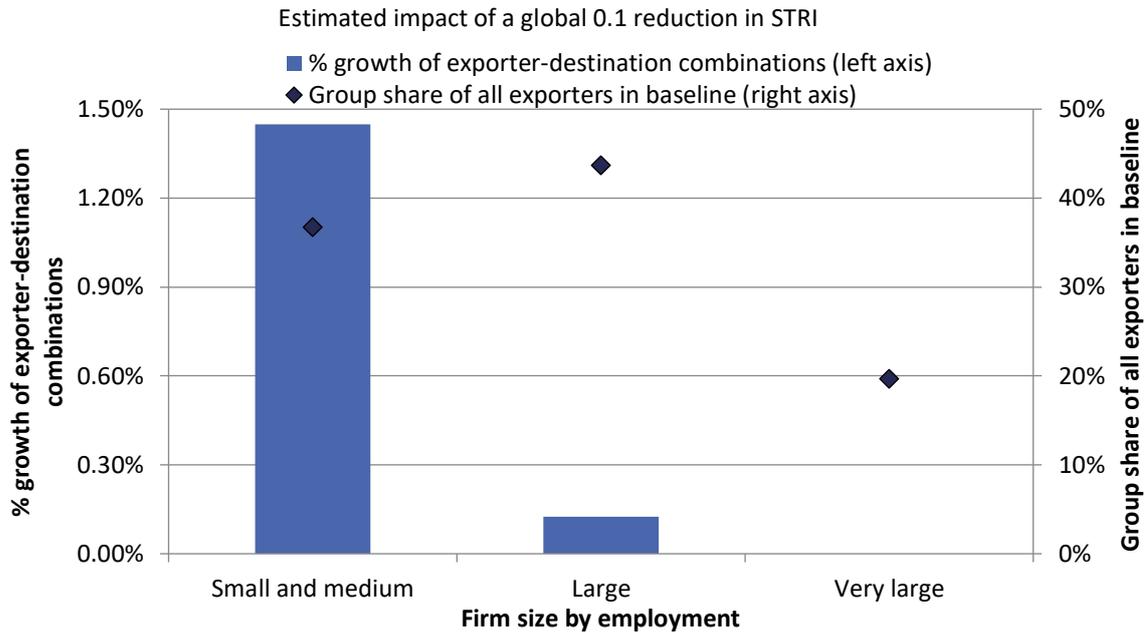
Estimated impact of a global 0.1 reduction in STRI



Note: The numbers indicate the median percentage change in the number of exporter-destination combinations when reducing the STRI score by 0.1. Small and medium firms have an annual turnover of less than EUR 20 million, large firms have an annual turnover of more than EUR 150 million. Thresholds have been chosen to obtain a sufficient number of exporters in each group.

Source: Own elaborations based on firm-level data from Belgium, Finland, Italy, Germany, the United Kingdom and the United States.

FIGURE 3. EFFECT OF STRI ON NUMBER OF EXPORTERS, BY FIRM SIZE



Note: The numbers indicate the median percentage change in the number of exporter-destination combinations when reducing the STRI score by 0.1. Small and medium firms have fewer than 100 employees; very large firms have more than 1000 employees. Thresholds have been chosen to obtain a sufficient number of exporters in each group.

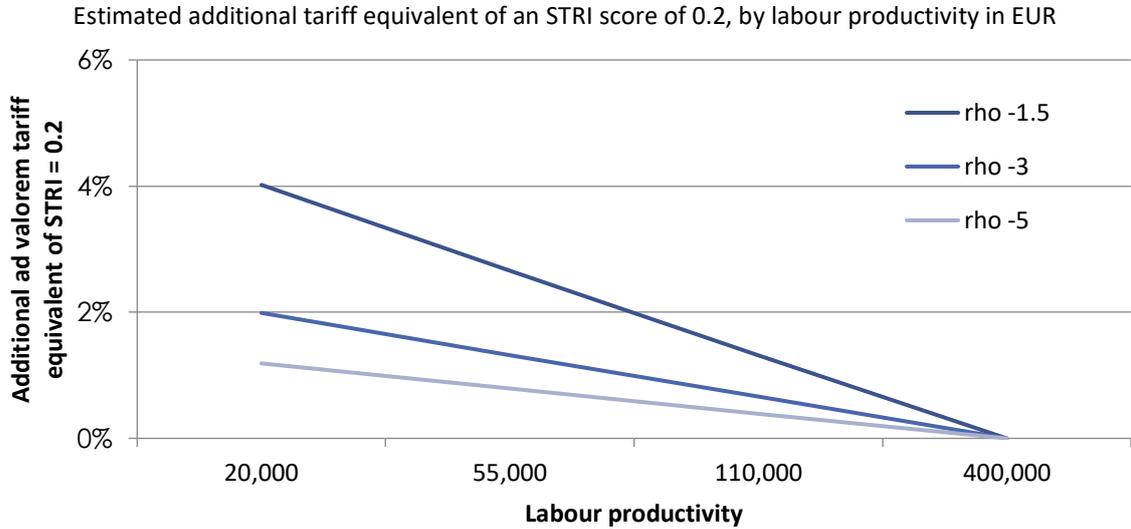
Source: Own elaborations based on firm-level data from Belgium, Finland, Italy, Germany, the United Kingdom and the United States.

Productivity

Similarly to differences in the size of firms, measured by their turnover or by the number of their employees, firms differ with respect to the efficiency of their production process. Naturally, productivity is one of the main determinants of firm turnover, since a more competitive production allows firms to capture larger market shares. Looking at the same five sectors that have already been analysed in the PPML regression in relation to firm size (audio-visual services, commercial banking, insurance services, maritime transport and telecommunications) plus the courier services sector, it is significantly easier for more productive firms in those sectors to export higher volumes to more restrictive countries. Again, this effect is quantified by calculating the additional tariff equivalent that less productive firms have to pay relative to more productive firms when exporting to a country with an STRI score of 0.2 (Figure 4). In the six selected sectors, less productive firms, with an average labour productivity of around EUR 20 000 per worker, perceive services trade restrictions to represent trade costs that are between 2% and 5% higher than what is perceived by very productive firms, with a labour productivity of around EUR 400 000 per worker. In contrast, in the professional services, land and air transport, logistics and construction, highly productive firms do not find it easier than less productive

to overcome services trade restrictions in their export destinations, shown in Table A.2 in the Annex.

FIGURE 4. TARIFF MARK-UP FOR LESS PRODUCTIVE FIRMS ON CROSS-BORDER EXPORTS



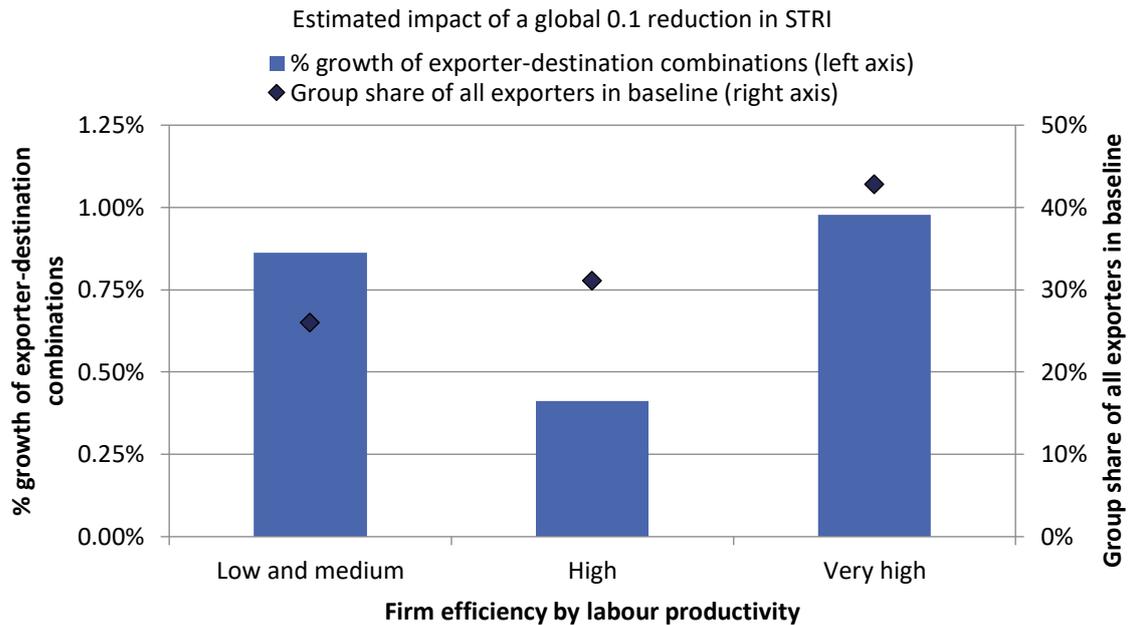
Note: The numbers indicate the additional ad valorem tariff equivalent of an STRI score of 0.2 for less productive firms. Results are based on the median coefficient from sector-level PPML regressions. Import demand elasticities used for the calculation of the ad valorem equivalent are indicated as 'rho'.

Source: Own elaboration based on firm-level data from Belgium, Finland, Italy, Germany, Sweden, the United Kingdom and the United States.

In the probit regressions we estimate the effect of firm productivity on firms' ability to cope with services trade restrictions. In contrast to the PPML specification, results are based on the median coefficient from regressions in all sectors. We find that less productive firms with a labour productivity of below EUR 55 000 per worker are going to experience an increase in their export probability by around 0.5% from a 0.1 reduction in the importer's STRI, whereas the export probability for the most productive firms can only grow by 0.2%.

However, changes in the number of exporter-destination combinations look somewhat different. Figure 5 shows that the relative increase in the number of export destinations is largest for the most productive firms with a labour productivity higher than EUR 360 000. On average, these firms manage to grow the number of markets served by 1%. In contrast, because low- and medium-productivity firms might be further away from the exporting threshold, growth in the number of export destinations is lower for less productive firms than for companies with high labour productivity of more than EUR 360 000.

FIGURE 5. EFFECT OF STRI ON NUMBER OF EXPORTERS, BY FIRM PRODUCTIVITY



Note: The numbers indicate the median percentage change in the number of exporter-destination combinations when reducing the STRI score by 0.1. Low and medium productivity firms have a labour productivity of less than EUR 180 000 per worker, very high productivity firms have a labour productivity of more than EUR 360 000 per worker.

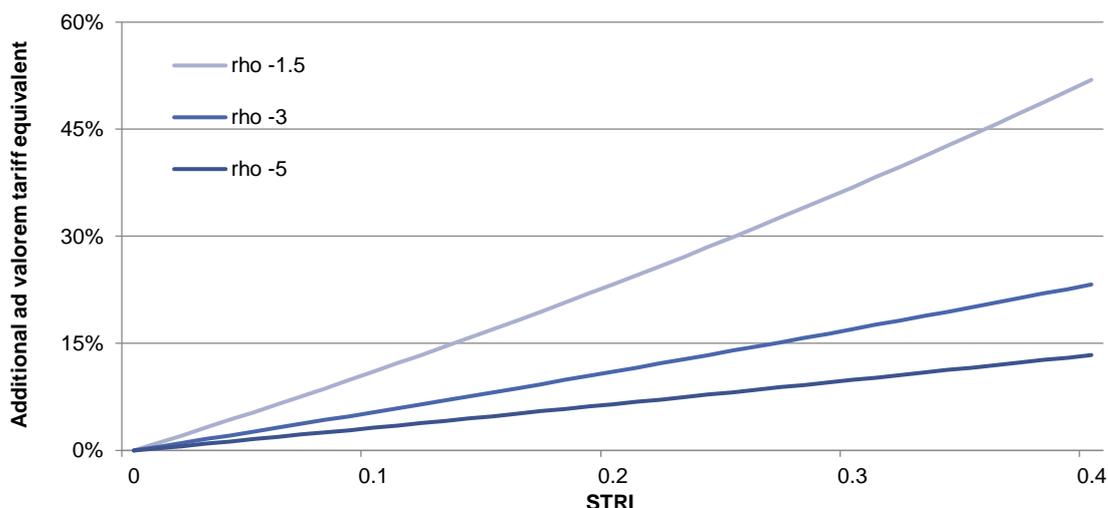
Source: Own elaborations based on firm-level data from Belgium, Finland, Italy, Germany, the United Kingdom and the United States.

Export experience

Just like larger or more productive firms, experienced exporters are able to deal with restrictive services trade regulation more effectively compared to newcomers. Previous export experience is particularly helpful when exporting to destinations with higher services trade barriers. The regressions on export volumes indicate that firms that have been exporting to a country in a given year tend to export substantially higher volumes to the same country also in the following year, and the difference between experienced exporters and newcomers is larger the more restrictive the importing country is. This effect can be identified as a tariff equivalent of services trade restrictions which has to be paid by new exporters on top of what has to be paid by incumbent exporters.¹⁵ For example, Figure 6 shows that if markets are characterised by an STRI score of 0.4, new exporters have to incur costs amounting to an additional 13% to 51% ad-valorem on top of the regulatory costs faced by incumbent exporters.

15. The tariff equivalent does not necessarily capture only the level of sunk export costs. It is a well-established fact that new exporters ship lower volumes to each destination than incumbent exporters (e.g. Eaton et al., 2007). Hence, this tariff equivalent might also indicate the presence of recurring fixed export costs, which represent higher ad-valorem equivalent for new exporters with low export volumes than for incumbent exporters with high export volumes.

FIGURE 6. TARIFF MARK-UP FOR FIRMS WITHOUT EXPORT EXPERIENCE IN THE DESTINATION COUNTRY



Note: The numbers indicate the additional ad valorem tariff equivalent for firms without export experience, where export experience is defined as having exported the same service to the same country in the previous year. Results are based on the median coefficient from sector-level PPML regressions. Import demand elasticities used for the calculation of the ad valorem equivalent are indicated as ‘rho’.

Source: Own elaborations on firm-level data from Belgium, Finland, Italy, Germany, Sweden, the United Kingdom, and the United States.

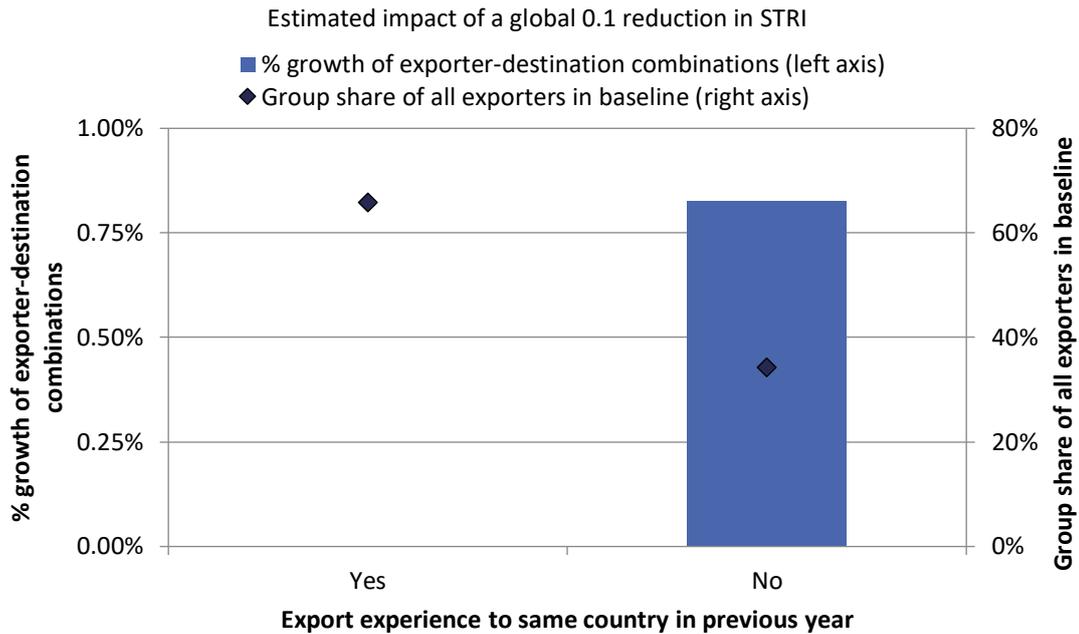
Similarly, firms that have not previously exported to a given country are around 4% more likely to start doing so in the next period if this country opens up slightly to services trade, so that its STRI falls by 0.1 (Table 2). This marginal effect on the export probability translates into an increase in the number of exporter-destination combinations by 0.8% for exporters which have not been providing services to a certain destination in the previous year, shown in Figure 7. In contrast, the number of export destinations for experienced exporters remains constant following a reduction of the STRI. This is because there is already a relatively high chance of exporting in two subsequent periods, irrespective of the services trade restrictiveness of a country.¹⁶ In addition, trade liberalisation might result in growing competition from new exporters.

Several mechanisms may explain why experienced exporters are relatively unaffected by regulatory liberalisation. For example, some restrictions might require adapting to the legal requirements of a specific country or even making adjustments in the way the services themselves are designed and/or supplied. Once these adjustments are made, the restrictions do not constitute barriers to export anymore in all subsequent years. Alternatively, firms that have been present in a market in the past might learn from this experience in order to cope more easily with new regulation adopted by the importer, even though the regulation still creates barriers to these firms’ activity. In other words, this result is evidence of the fact that a significant share of export costs represents sunk

16. See Rouzet et al. (2017) for descriptive information on export survival rates.

costs from exporting to a particular country for the very first time. This gives experienced firms a competitive edge over newly created firms that cannot garner the benefits of previous export experience. Therefore, a reduction of services trade restrictions may create additional gains by exposing incumbent exporting firms to additional competition from firms that only start exporting because of the trade opening effect of such reduction, thereby creating a more dynamic economy.

FIGURE 7. EFFECT OF STRI ON NUMBER OF EXPORTERS, BY FIRM CHARACTERISTICS



Note: The numbers indicate the median percentage change in the number of exporter-destination combinations when reducing the STRI score by 0.1. Small firms have an annual turnover of less than EUR 20 million, large firms have an annual turnover of more than EUR 150 million.

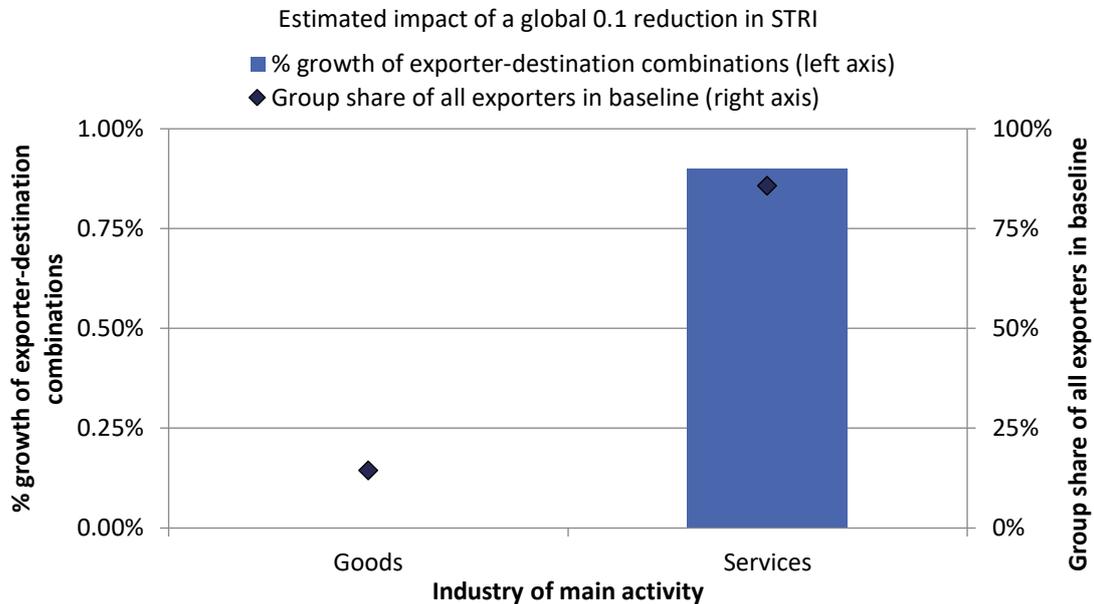
Source: Own elaborations based on firm-level data from Belgium, Finland, Italy, Germany, the United Kingdom and the United States.

Main activity

Also a firm's main activity plays a role for its reaction to services trade liberalisation. No additional firms with their main activity in a manufacturing industry is found to start exporting services to a destination that reduces its STRI by 0.1. In contrast, the number of firms with a main activity in services sectors exporting to this destination increases by 0.9% (see Figure 8). A plausible explanation is that services exports of manufacturing firms are often linked to their exports of goods. For this reason, services trade restrictions are no relevant determinants of services trade, which are rather driven by the location of major

customers for specific goods or by policy barriers to goods trade, such as tariffs or non-tariff barriers.¹⁷

FIGURE 8. EFFECT OF STRI ON NUMBER OF EXPORTERS, BY FIRM CHARACTERISTICS



Note: The numbers indicate the median percentage change in the number of exporter-destination combinations when reducing the STRI score by 0.1. Small firms have an annual turnover of less than EUR 20 million; large firms have an annual turnover of more than EUR 150 million.

Source: Own elaborations based on firm-level data from Belgium, Finland, Italy, Germany, the United Kingdom and the United States.

5.2 FOREIGN AFFILIATE SALES

This section addresses the exports of services via mode 3 of services trade, the commercial presence of foreign suppliers. It provides first evidence on the importance of the services trade restrictions captured in the OECD STRI for trade via foreign affiliate sales in a selection of services sectors. So far there exists only little evidence on firm-level patterns of mode 3 services exports across several countries, highlighting the importance of pioneer work in this area.

Data on foreign affiliate sales can currently be used for regression analysis in four countries: Germany, Finland, Japan and the United States. Due to the lower number of countries analysed so far, results from this sub-section might be somewhat less robust than results from the previous sub-section. Nevertheless, for all four countries, information on the volume of foreign affiliate sales in all host markets is available.

17. This result is related to the servicification of manufacturing, see Miroudot and Cadestin (2017).

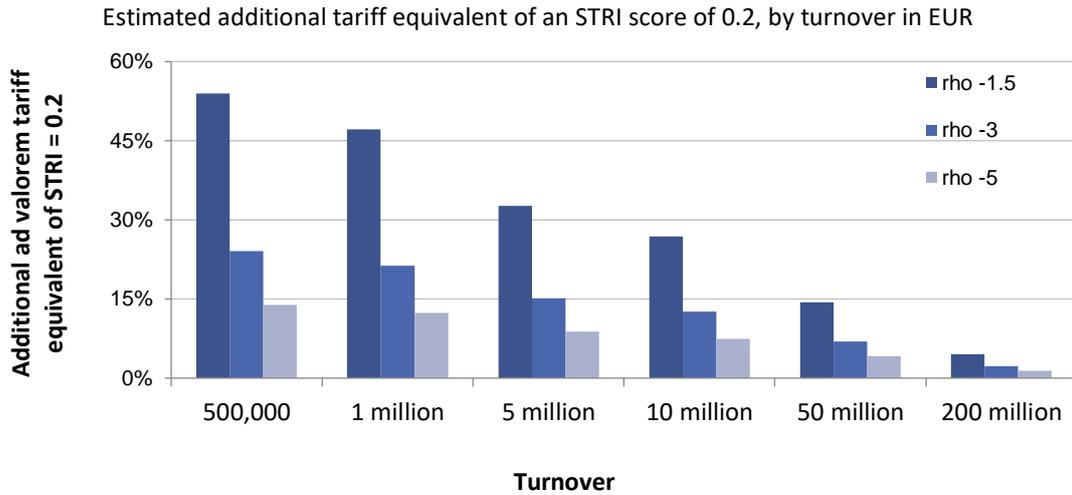
Similarly to the analysis of cross-border exports above, this allows for the analysis of foreign affiliate sales at the intensive margin and the extensive margin, using Probit regressions as well as PPML regressions.¹⁸

Similarly to the patterns identified for the cross-border exports of services, the analysis shows that affiliates of larger and more productive firms sell more in more restrictive markets than affiliates of smaller and less productive firms. The additional trade costs created by services restrictions for small and medium-sized parent firms relative to large MNEs can be expressed as *ad valorem* equivalents. Figure 9 shows that this effect is indeed substantial: an STRI score of 0.2 can represent trade costs exceeding a 50% tariff for small firms with annual turnover of only EUR 500 000. This result shows that setting up foreign affiliates involves a substantial amount of non-recurring costs – even more so than for cross-border exports. More restrictive regulatory barriers further magnify these fixed costs and may end up constituting prohibitively high entry barriers for small and medium-sized firms.

This effect does not only hold when comparing firms of different sizes but also when comparing firms with different levels of labour productivity. For services trade conducted via mode 3, the additional *ad valorem* equivalent of the costs of policy barriers may be as high as 12% for less productive parents compared to highly productive firms (Figure 10). This result highlights the fact that services trade restrictions impose an extra burden on less productive firms, which may deter them from establishing abroad.

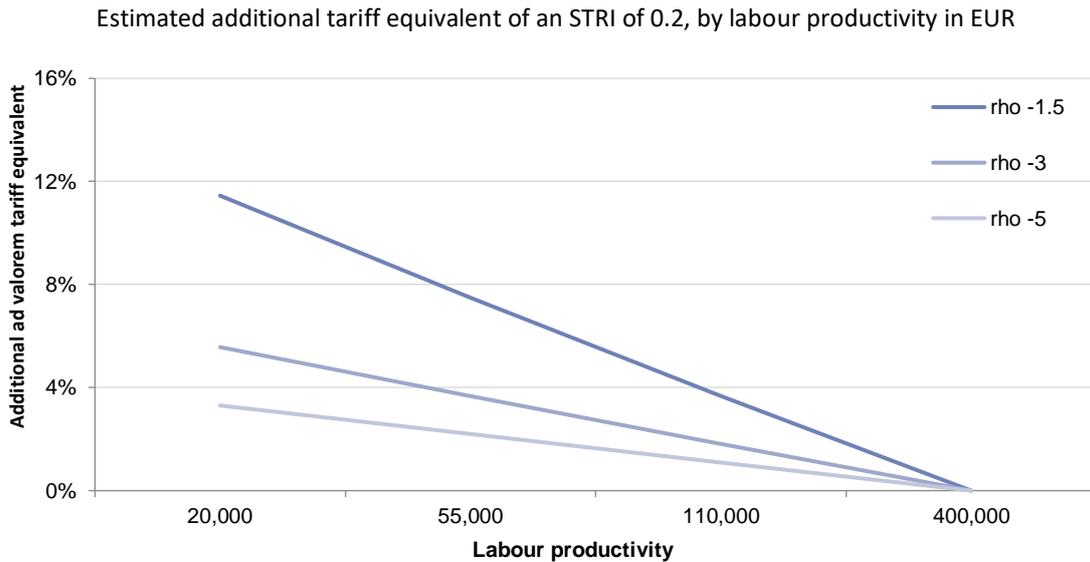
18. Tables A.3. and A.4. report the estimation results for foreign affiliates sales derived from baseline regressions in each country and pooled across sectors, to give a sense of the coefficients on non-STRI control variables. Regression tables by sector and for the specifications with interactions are not reported for conciseness, but are available from the authors upon request.

Figure 9. Tariff mark-up for small firms on foreign affiliate sales, by parent size



Note: The numbers indicate the additional *ad valorem* tariff equivalent of an STRI score of 0.2 for small and medium-sized enterprises. It is based on the median coefficient from sector-level PPML regressions, except professional services. Import demand elasticities used for the calculation of the *ad valorem* equivalent are indicated as 'rho'.
Source: Own elaborations based on firm-level data from Finland, Germany, Japan and the United States.

FIGURE 10. TARIFF MARK-UP FOR LESS PRODUCTIVE FIRMS ON FOREIGN AFFILIATE SALES, BY PARENT SIZE



Note: The numbers indicate the additional *ad valorem* tariff equivalent of an STRI score of 0.2 for less productive firms. It is based on the median coefficient from sector-level PPML regressions with data from Finland, Germany, Japan and the United States. Import demand elasticities used for the calculation of the *ad valorem* equivalent are indicated as 'rho'.
Source: Own elaborations based on firm-level data from Finland, Germany, Japan and the United States.

6 CONCLUSION

This paper draws on detailed firm-level data from eight countries to analyse the importance of services trade restrictions for cross-border exports of services and foreign affiliate sales between 2008 and 2014. In a standard gravity regression framework using PPML and probit models, size and efficiency appear decisive for firms to overcome services trade restrictions for all modes of supply. The impact of regulatory hurdles on export entry and export volumes is significantly less detrimental for larger firms, indicating that some of these barriers represent fixed costs of exporting that deter SMEs from seeking markets abroad. Deeper pockets, in-house legal expertise, broader existing networks of business partners at home and abroad, and the benefits of scale to absorb overhead costs are many reasons why larger firms are better equipped to succeed in complex and challenging regulatory environments. It therefore emerges that small and medium-sized firms would be the chief beneficiaries of services trade liberalisation, resulting in higher volumes of cross-border exports by those firms; higher volumes of foreign affiliate sales; and higher numbers of small and medium-sized firms participating in all modes of services trade.

Previous export experience is also a key asset to succeed in less open countries. Existing exporters in a country are considerably more likely to keep exporting there than are other firms to enter the market. In addition, experienced exporters tend to sell higher volumes in more restrictive countries than newcomers. On average, trade restrictions do not significantly discourage firms that have previously been exporting to the same country from continuing to do so, indicating that the costs created by trade barriers are to a large extent incurred at the time of initial market entry.

These findings advance the general understanding of policy trade barriers in services and how those relate to heterogeneous firms. Unlike an ad valorem tariff, such barriers do not have a homogeneous impact on all types of firms. Instead, it can be shown that different firms react very differently to services trade restrictions. This finding can either be explained by the presence of fixed and sunk export costs or by firm-specific abilities in overcoming services trade barriers. Taking into account this heterogeneity seems crucial for a quantification of gains from services liberalisation. Further analysis is required to quantify the magnitude of fixed and sunk costs for services exports and to identify which factors might allow firms to cope with services trade barriers.

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8 APPENDIX

TABLE A.1. TARIFF MARK-UP FOR LARGE FIRMS ON CROSS-BORDER EXPORTS
ESTIMATED ADDITIONAL TARIFF EQUIVALENT OF AN STRI SCORE OF 0.2, BY TURNOVER IN EUR

		CONSTRUCTION, COURIER, PROFESSIONAL SERVICES, LAND AND AIR TRANSPORT, LOGISTICS						
Turnover (in EUR)		500,000	1 mio.	5 mio.	10 mio.	50 mio.	200 mio.	400 mio.
Tariff mark-up	rho - 1.5	0.00%	0.98%	3.31%	4.32%	6.73%	8.84%	9.91%
	rho -3	0.00%	0.49%	1.64%	2.14%	3.31%	4.32%	4.84%
	rho -5	0.00%	0.29%	0.98%	1.28%	1.97%	2.57%	2.87%

TABLE A.2. TARIFF MARK-UP FOR HIGHLY PRODUCTIVE FIRMS ON CROSS-BORDER EXPORTS
ESTIMATED ADDITIONAL TARIFF EQUIVALENT OF AN STRI SCORE OF 0.2, BY LABOUR PRODUCTIVITY IN EUR/WORKER

		CONSTRUCTION, PROFESSIONAL SERVICES, LAND AND AIR TRANSPORT, LOGISTICS			
Productivity (in EUR/worker)		20,000	55,000	110,000	400,000
Tariff mark-up	rho - 1.5	0.00%	0.39%	0.78%	1.17%
	rho -3	0.00%	0.19%	0.39%	0.58%
	rho -5	0.00%	0.12%	0.23%	0.35%

TABLE A.3. POOLED PROBIT REGRESSION RESULTS: CROSS-BORDER EXPORTS

	BEL	DEU	FIN	GBR	ITA	USA
STRI	0.045 (0.114)	-0.117 (0.163)	-0.163 (0.117)	-0.177* (0.100)	0.128 (0.112)	-0.345** (0.156)
GDP (log)	0.118*** (0.012)	0.127*** (0.0122)	0.121*** (0.012)	0.130*** (0.017)	0.118*** (0.012)	0.199*** (0.014)
Distance (log)	-0.138*** (0.033)	-0.0750*** (0.0252)	-0.259*** (0.055)	-0.100** (0.046)	-0.146*** (0.027)	-0.126*** (0.046)
Contiguity	0.299*** (0.074)	0.112*** (0.0397)	0.106* (0.062)		-0.030 (0.034)	0.038 (0.103)
RTA in services						0.076** (0.032)
EEA-EFTA	0.109 (0.070)	0.135** (0.0530)	0.006 (0.084)	0.228* (0.125)	0.045 (0.063)	
Common legal origin					0.309 (0.403)	
Official common language				0.353*** (0.058)		0.193*** (0.041)
Labour productivity (log)	-0.069*** (0.004)	0.00123 (0.00312)	-0.102*** (0.008)	-0.103*** (0.008)	0.052*** (0.009)	-0.024** (0.012)
Turnover (log)	-0.041*** (0.005)	-0.0425*** (0.00477)	0.031*** (0.010)	0.013** (0.005)	-0.055*** (0.008)	0.115*** (0.007)
Main activity in goods	-0.459*** (0.019)	-0.252*** (0.0172)	-0.215*** (0.021)	-0.316*** (0.015)	-0.231*** (0.024)	<i>not disclosed</i>
Foreign-owned	-0.001 (0.012)	0.0237*** (0.00723)	-0.108*** (0.017)	-0.236*** (0.014)	-0.186*** (0.021)	<i>not disclosed</i>
Importer of services	1.164*** (0.033)	1.789*** (0.0194)	1.715*** (0.050)	1.743*** (0.058)	2.028*** (0.033)	<i>not disclosed</i>
Constant	-1.564*** (0.391)	-2.679*** (0.298)	-2.541*** (0.583)	-1.708*** (0.586)	-2.275*** (0.370)	-4.963*** (0.438)
Year Fixed Effects	YES	YES	YES	YES	YES	YES
Sector Fixed Effects	YES	YES	YES	YES	YES	YES
Observations	280,399	1,066,709	132,922	162,295	134,208	317,750
R-squared	0.259	0.321	0.288	0.298	0.411	0.215

Note: The regressions are run on a pooled sample for each country, where the STRI index is country- and sector-specific. The dependent variable is an indicator that takes value 1 if the firm exports to a given country in a given sector and year, and 0 otherwise. Standards errors are clustered by importer. ***, ** and * mean statistical significance at 1%, 5% and 10% respectively.

TABLE A.4. POOLED PPML REGRESSION RESULTS: CROSS-BORDER EXPORTS

	BEL	DEU	FIN	GBR	ITA	SWE	USA
STRI	-0.508 (0.462)	-1.268 (0.978)	1.780* (0.976)	-0.938 (0.777)	-0.821 (0.861)	-1.123 (0.833)	0.370 (1.305)
GDP (log)	0.492*** (0.108)	0.604*** (0.091)	0.390*** (0.078)	0.649*** (0.071)	0.466*** (0.116)	0.760*** (0.037)	0.781*** (0.090)
Distance (log)	-0.626*** (0.137)	-0.179 (0.173)	-0.116 (0.183)	-0.183 (0.145)	-0.241 (0.372)	-0.790*** (0.149)	-0.392 (0.243)
Contiguity	-0.099 (0.251)	0.153 (0.329)	0.139 (0.373)		-0.324** (0.140)	-0.112 (0.163)	-0.590 (0.557)
RTA in services							0.307 (0.348)
EEA-EFTA	-0.675 (0.417)	-0.056 (0.371)	0.182 (0.375)	0.755* (0.419)	0.352 (0.699)	-0.145 (0.316)	
Official common language				0.982*** (0.204)		0.671*** (0.039)	0.797** (0.355)
Labour productivity (log)	-0.041 (0.044)	0.049*** (0.017)	0.017 (0.100)	0.083 (0.063)	0.036 (0.065)	0.332*** (0.047)	0.050 (0.059)
Turnover (log)	0.355*** (0.020)	0.393*** (0.031)	0.607*** (0.063)	0.350*** (0.047)	0.260*** (0.033)	0.806*** (0.039)	0.352*** (0.035)
Main activity in goods	-1.873*** (0.102)	-2.530*** (0.169)	0.038 (0.097)	-0.425* (0.257)	-0.545 (0.353)	-0.791*** (0.130)	<i>not disclosed</i>
Foreign-owned	0.111 (0.169)	-0.431*** (0.151)	-1.123*** (0.096)	0.114 (0.130)	0.411* (0.248)	-0.680*** (0.145)	<i>not disclosed</i>
Importer of services	2.720*** (0.131)	3.939*** (0.181)	3.340*** (0.178)	1.820*** (0.334)	3.783*** (0.253)	0.890*** (0.115)	<i>not disclosed</i>
Constant	-3.036 (2.359)	-9.320*** (2.172)	-15.793*** (2.410)	-7.840*** (1.734)	-8.596*** (2.481)	-27.805*** (1.925)	-6.893*** (2.651)
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES
Sector Fixed Effects	YES	YES	YES	YES	YES	YES	YES
Observations	280,399	1,066,709	132,348	162,295	113,503	353,798	317,748
R-squared	0.024	0.043	0.130	0.026	0.057	0.132	0.008

Note: The regressions are run on a pooled sample for each country, where the STRI index is country- and sector-specific. The dependent variable is the value of exports by firm, destination, service and year. Standards errors are clustered by importer. ***, ** and * mean statistical significance at 1%, 5% and 10% respectively.

TABLE A.5. POOLED PROBIT REGRESSION RESULTS: FOREIGN AFFILIATE SALES

	DEU	FIN	JPN	USA
STRI	-0.525*	-0.163	-0.501	-1.232***
	(0.274)	(0.117)	(0.546)	(0.311)
GDP (log)	0.283***	0.121***	0.656***	0.364***
	(0.0182)	(0.012)	(0.039)	(0.022)
Distance (log)	-0.120**	-0.259***	-0.536***	-0.253***
	(0.0488)	(0.055)	(0.105)	(0.090)
Contiguity	0.208***	0.106*		0.064
	(0.0752)	(0.062)		(0.189)
RTA in services			0.199	0.056
			(0.152)	(0.088)
EEA-EFTA	0.208**	0.006		
	(0.0937)	(0.084)		
Common legal origin			-0.278	
			(0.202)	
Official common language				0.378***
				(0.084)
Parent labour productivity (log)	-0.0964***	-0.102***	-0.093***	-0.074***
	(0.00719)	(0.008)	(0.012)	(0.008)
Parent turnover (log)	0.118***	0.031***	0.210***	0.133***
	(0.00733)	(0.010)	(0.022)	(0.008)
Parent in goods	-0.403***	-0.215***	-0.033	<i>not disclosed</i>
	(0.0354)	(0.021)	(0.098)	
Parent foreign-owned	-0.211***	-0.108***		<i>not disclosed</i>
	(0.0264)	(0.017)		
Parent importer of services	0.400***	1.715***		<i>not disclosed</i>
	(0.0411)	(0.050)		
Constant	-10.443***	3.847	-9.890***	-9.890***
	(2.794)	(3.752)	(3.267)	(3.267)
Year Fixed Effects	YES	YES	YES	YES
Sector Fixed Effects	YES	YES	YES	YES
Observations	1,391,748	132,922	467,188	297,252
R-squared	0.262	0.288	0.384	0.175

Note: The regressions are run on a pooled sample for each country. The STRI index is country- and sector-specific. The dependent variable is an indicator that takes value 1 if the firm has strictly positive affiliate sales in a given country, sector and year, and 0 otherwise. Standards errors are clustered by importer. ***, ** and * mean statistical significance at 1%, 5% and 10% respectively.

TABLE A.6. POOLED PPML REGRESSION RESULTS: FOREIGN AFFILIATE SALES

	DEU	FIN	JPN	USA
STRI	-0.794 (0.576)	-3.448* (1.970)	1.299 (2.895)	-3.185*** (1.084)
GDP (log)	0.822*** (0.070)	0.746*** (0.078)	1.037*** (0.109)	0.704*** (0.132)
Distance (log)	-0.382* (0.212)	-1.871*** (0.192)	0.573 (0.449)	-0.226 (0.334)
Contiguity	0.152 (0.248)	0.800*** (0.227)		0.930 (0.834)
RTA in services			-0.171 (0.517)	-0.511** (0.239)
EEA-EFTA	0.219 (0.350)	-1.272*** (0.325)		
Common legal origin			0.309 (0.403)	
Official common language				0.902*** (0.282)
Parent labour productivity (log)	-0.128*** (0.027)	-0.098 (0.161)	-0.446*** (0.053)	0.192*** (0.059)
Parent turnover (log)	0.655*** (0.042)	0.703*** (0.085)	1.258*** (0.060)	0.643*** (0.064)
Parent in goods	-1.274*** (0.091)	-0.369 (0.427)	0.241 (0.193)	<i>not disclosed</i>
Parent foreign-owned	-0.458*** (0.153)	0.042 (0.133)		<i>not disclosed</i>
Parent importer of services	1.452*** (0.137)			<i>not disclosed</i>
Constant	-12.181*** (1.764)	-6.062*** (1.826)	-31.415*** (5.677)	-15.445*** (4.536)
Year Fixed Effects	YES	YES	YES	YES
Sector Fixed Effects	YES	YES	YES	YES
Observations	1,391,748	111,056	464,367	297,252
R-squared	0.0905	0.0500	0.174	0.104

Note: The regressions are run on a pooled sample for each country. The STRI index is country- and sector-specific. The dependent variable is the value of foreign affiliate sales by firm, destination, sector and year. Standards errors are clustered by importer. ***, ** and * mean statistical significance at 1%, 5% and 10% respectively.