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The Costs of Regulatory Barriers to Trade in Services: New Estimates of *Ad Valorem* Tariff Equivalents

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This paper presents new estimates of policy-induced trade costs in five services sectors for 46 countries. Results demonstrate the significant untapped economic potential of multilateral, plurilateral, and unilateral services trade liberalisation. Even though services trade has more than tripled in the last two decades, the results show that trade costs are still high. The results are not only interesting in and of themselves, but they can also be used as input for further analysis on the economic benefits from different scenarios regarding the dismantling of barriers to trade in services. This paper exploits recent advances related to the measurement of services barriers in the OECD Services Trade Restrictiveness Index (STRI).

Keywords: Services trade, trade cost, trade liberalisation, services trade restrictions

JEL Codes: F13, F14, F15, F68

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Key messages

- Trading services is costly. For cross-border trade in services, regulatory barriers correspond to trade costs of around 57% of total trade value for communication services, 54% for business services, 60% for transport services, 103% for insurance services, and 255% for financial services.
- Within the European Single Market, policy-induced costs of cross-border services trade persist at around 10% in most sectors and around 32% for financial services.
- Regulatory trade barriers also affect services trade via the commercial presence of foreign businesses (Mode 3). All effects are of similar magnitude to those for cross-border services trade.
- These results demonstrate the significant untapped economic potential of multilateral, plurilateral, and unilateral services trade liberalisation.

Executive Summary

This paper presents new estimates of policy-induced trade costs in five services sectors for 46 countries. Results demonstrate the significant untapped economic potential of multilateral, plurilateral and unilateral services trade liberalisation. Even though services trade has more than tripled in the last two decades, the results show that trade costs are still high. Expressed as percentages of total trade value (*ad valorem* equivalents), average costs of regulatory barriers to cross-border services trade stand at around 57% for communication services and 54% for business services, around 60% for transport services, around 103% for insurance services, and around 255% for financial services. All numbers should be understood as the potential for reduction of services trade costs in the long run.

Notwithstanding strong linkages between members of the European Economic Area and continued efforts towards liberalisation (OECD, 2020[1]), remaining services trade restrictions within the European Single Market are not negligible. On average, costs of cross-border services trade within the Single Market persist at around 10% in most sectors and around 32% for financial services. The results are not only interesting in and of themselves, but they can also be used as input for further analysis on the economic benefits from different scenarios regarding the dismantling of barriers to trade in services.

The paper also investigates short-term effects of services trade liberalisation by exploiting variation over time. Results from panel analysis support the notion that unilateral services reforms promote services trade. This analysis controls for the fact that some countries are more likely to liberalise unilaterally than others are, supporting the view that the results reflect a causal relationship. The analysis also identifies a positive impact of recent RTAs on cross-border services trade in most sectors.

Regulatory trade barriers also affect Mode 3 services trade (commercial presence of foreign businesses). All effects are of similar magnitude to those for cross-border services trade. This implies a comparable potential for future growth of services trade via different modes of services trade and suggest that a general services liberalisation does not necessarily favour any of the modes.

The paper exploits recent advances related to the measurement of services barriers in the OECD Services Trade Restrictiveness Index (STRI). Most notably, these advances include the availability of longitudinal data for the period 2014-2018, a period covering a substantial number of regulatory policy changes in a wide and heterogeneous range of countries. While the STRI measures multilateral trade restrictiveness, the analysis also benefits from the availability of the intra-EEA STRI, which quantifies the regulatory regime in the Single Market characterised by the freedoms of the internal market (free movement of goods, people, services and capital) and a harmonisation of rules in areas such as competition policy or regulatory transparency.

1. Introduction

Services account for more than two-thirds of GDP in advanced economies. More and more business models rely on services rather than sales of manufactured goods, the so-called "servitisation" of manufacturing (Miroudot and Cadestin, 2017[2]). Often this takes the form of goods and services bundles, which are sold domestically but also exported globally. However, even though services trade has more than tripled in the last two decades, the costs resulting from barriers to trade in services are much higher than those for trade in manufactured goods are.

At the same time, there is a growing recognition that the dismantling of barriers to trade in services offers opportunities to exploit untapped economic potential. Yet, the difficulty of quantifying the costs of regulatory restrictions on trade in services has often hampered efforts to analyse the economic effects of services trade liberalization.

This paper relies on information from the OECD Services Trade Restrictiveness Index (STRI) to estimate *ad valorem* equivalents (henceforth AVEs) of services trade barriers for 46 countries using a structural gravity model. While such estimates are interesting in and of themselves, they can also be used as input for further analysis. In order to facilitate the use of these AVEs, our estimates are based on the GTAP sector classification, a classification that is used in the vast majority of CGE models, including the OECD METRO model.[1]

Our analysis exploits recent progress that addresses the challenge of identifying the effect of multilateral (MFN-based) trade policies in the gravity framework (Yotov et al., 2016[3]). The approach relies on the incorporation of international services trade and countries' consumption of services from domestic sources in a structural gravity model. While MFN-based trade policies apply identically to all trading partners, intra-national services consumption is not subject to those policies. Consequently, it is possible to obtain unbiased estimates for the effect of such multilateral trade policies even when using (time-varying) exporter fixed effects and importer fixed effects to control for multilateral resistance (Anderson and Van Wincoop, 2003[4]).

This analysis is further facilitated by recent advances related to the measurement of services trade restrictions. Most notably, these advances include the availability of longitudinal data for the period 2014-2018, a period covering a substantial number of regulatory policy changes. In addition, we exploit the distinction between barriers to intra-EEA services trade and services trade between EEA members and third countries. The combination of new data with a state-of-the-art econometric strategy yields robust estimates of the magnitude of policy-induced services trade barriers, representing a significant improvement relative to existing work.

The General Agreement on Trade in Services (GATS) distinguishes between four modes of supply.[2] The analysis presented in this paper draws on data covering trade in services via all modes. The empirical part differentiates between services trade flows recorded in the balance of payments – which are used for the estimation of AVEs – and services trade recorded in foreign affiliate trade statistics (FATS). A breakdown into the four modes is not possible, since the concept of services trade by mode is not fully integrated into the collection of services trade statistics.

[1] The correspondence between STRI sectors, GTAP sectors and other relevant sectoral classifications is presented in Annex A.

[2] Cross-border trade (Mode 1), consumption abroad (Mode 2), commercial presence (Mode 3), and temporary movement of natural persons (Mode 4).

While foreign affiliate trade statistics are a proxy for Mode 3 services trade[3], cross-border services trade recorded in the balance of payments is defined as transactions between residents and non-residents according to the Manual on Statistics of International Trade in Services 2010. This definition is broader than the definition of cross-border services trade (Mode 1) in the GATS, which only covers transactions "from the territory of one Member into the territory of any other Member". In general, service transactions between residents and non-residents, as captured in the balance of payments, broadly cover Modes 1, 2 and 4 (United Nations, 2012[5]). Throughout the rest of the document, "cross-border services trade" is used in reference to the value of services trade measured in the balance of payments.

The contribution of this paper is threefold. First, this paper reports AVEs for cross-border services trade, which corresponds to around 40% of global services trade (Wettstein et al., 2019[6]).[4] Second, using a comprehensive set of fixed effects, we exploit information on STRI policy changes to investigate the time dimension of services trade liberalisation. Third, an extension of the main analysis draws on new data from the OECD Analytical AMNE database[5] in order to shed light on the link between regulatory barriers and Mode 3 services trade.

The main results show that policy-induced services trade costs are relatively high. Expressed as percentages of total trade value, average multilateral costs for cross-border services trade are around 57% for communication services and 54% for business services, around 60% for transport services, around 103% for insurance services, and around 255% for financial services. For financial services, half of all countries impose barriers in the range between 127% and 273%, with one quarter of countries being more liberal and one quarter more restrictive (interquartile range). For the insurance sector, the interquartile range spans from 56% to 104%, while it typically stretches between roughly 35% and 65% for the other three sectors. Even exporting to the most liberal countries still requires compliance with regulation at a cost that correspond to around 30% of the export value in most sectors and nearly 90% for financial services.[6] Within the European Single Market, however, services trade costs are significantly lower.

While unnecessary trade costs harm consumers and businesses and reduce domestic welfare, it is acknowledged that a liberalisation of all policy measures included in the STRI may not necessarily be optimal for all countries at any point in time. Some of these measures are used to achieve other policy objectives, which might have a higher domestic priority. However, estimates of these AVEs can inform policy makers on relevant trade-offs when using trade-restrictive measures for the pursuit of domestic policy priorities.

[3] There are two main differences: (1) Mode 3 services trade also includes the provision of a services through a branch or representative office, while FATS only take into account locally established enterprises; (2) Mode 3 services trade is limited to domestic sales of foreign affiliates, while FATS data used in this analysis include all output – even when exported to the country of the parent company or a third country.

[4] In the dataset used for the analysis presented in this paper, cross-border services trade (defined as the value of services trade measured in the balance of payments) corresponds (on average across all five sectors and after summing values by sector) to 43% of total observed services trade, while the remaining 57% correspond to Mode 3 services trade.

[5] This database measures the output of foreign affiliates along the host country, industry and parent country dimension (Cadestin et al., 2018[37]). For services sectors, this is a proxy for Mode 3 services trade. The Trade in Services by Mode of Supply (TiSMos) dataset (Wettstein et al., 2019[6]) produced by the WTO provides similar data on foreign affiliate sales. Yet, the TiSMos dataset does not report bilateral trade flows between individual economies (it provides information on 200 economies' trade with the rest of the world).

[6] While these results demonstrate that liberalising reforms could substantially reduce services trade costs, the dismantling of regulatory barriers to services trade should be considered as part of a comprehensive approach aimed at establishing institutions that support economic development and international trade. Especially in developing countries, steps towards greater openness to services trade, e.g. in financial services, should be combined with efforts to establish a prudential and robust institutional framework.

The rest of the paper is structured as follows. The next section briefly describes the OECD Services Trade Restrictiveness Index, our measure of services trade policy barriers. Section 3 summarises the related literature and discusses existing approaches to estimate *ad valorem* equivalents of services trade costs. Section 4 describes our econometric approach. Section 5 reports the main regression results for cross-border services trade and Section 6 explores the association between regulatory restrictiveness and Mode 3 services trade based on the Analytical AMNE database. Section 7describes the transformation of regression coefficients into *ad valorem* equivalents for services trade costs and discusses the estimates. Section 8 concludes.

2. Measuring non-tariff barriers in services

The OECD Services Trade Restrictiveness Index (STRI) is a database of qualitative information on trade policy measures. It can be used to create composite indices on a scale from zero to one, using a codified algorithm for scoring and weighting.[7] The STRI currently covers 46 countries, 22 sectors and six years (2014-2019).[8] Information in the OECD STRI is updated on an annual basis. The update procedure tracks policy changes and calculates new composite indices using most up to date regulatory information. On average, the STRI records almost 1200 policy changes each year that affect the score of individual measures.[9]

Most services trade policies apply multilaterally to all trading partners. To some extent, this is because services barriers include behind-the-border measures related to the domestic regulatory regime, applying to domestic as well as all foreign services providers. However, also in relation to market access, most countries apply multilateral policies. Preferential liberalisation of the applied regimes in regional trade agreements (RTAs) is not common (Lamprecht and Miroudot, 2018[7]). For this reason, the STRI is a measure of MFN restrictions and does not take into account any specific concessions, such as regional trade agreements or mutual recognition agreements (Geloso Grosso et al., 2015[8]).[10]

However, such multilateral indices are inadequate measures of regulatory barriers in regional blocs where services trade has been liberalised. The most important of these blocs is the European Economic Area (EEA). An additional database under the STRI framework resolves this issue. The intra-EEA STRI database allows for the measurement of services trade restrictiveness within the preferential regime of the EEA, characterised by the freedoms of the internal market (free movement of goods, people, services and capital) and a harmonisation of rules in areas such as competition policy or regulatory transparency (Benz and Gonzales, 2019[9]).

[7] Existing estimates show that these barriers are important determinants of global cross-border services trade patterns, but they also have an impact on downstream manufacturing sectors (Benz, 2017[18]; Benz, Khanna and Nordås, 2017[47]; Nordås and Rouzet, 2017[17]; Rouzet, Benz and Spinelli, 2017[38]).

[8] It stands in the tradition of earlier work by the Australian Productivity Commission, which made a first attempt at cataloguing and quantifying services trade restrictions across countries and sectors in the mid-1990s (Findlay and Warren, 1990[49]). Some years later, the World Bank published information on policies that affect international trade in services in 103 countries and five broad sectors for the year 2008 (Borchert, Gootiiz and Mattoo, 2013[50]).

[9] In this number, horizontal policy changes that affect all sectors are counted as policy changes in all 22 sectors. Average absolute changes in the sector-level STRI scores are around 0.014 each year, which is not negligible in light of an average STRI restrictiveness of only 0.26.

[10] Identifying the effect of multilateral trade barriers has been notoriously difficult. More information on this aspect and on our solution to this challenge is given in Section 4.

The analysis in this study exploits the most recent version of the OECD STRI database, including variation over time from policy changes since 2014 and information on preferential services trade liberalisation from the intra-EEA STRI. In comparison with earlier work, these features allow for a more robust identification of policy-induced trade costs for services. Even though this represents a significant step forward for the empirical quantification of services trade costs, it has to be acknowledged that the five-year time span covered in this study is still relatively short. Results can be expected to become even more robust once there is a longer overlap between data on services trade restrictiveness and services trade flows.

3. Relation to existing work

The gravity model is the standard framework for the investigation of the determinants shaping the value of trade flows between two countries (Tinbergen, 1962[10]; Head and Mayer, 2014[11]).[11] It has been widely used for the analysis of trade in goods and foreign direct investment (FDI) but recently also for the analysis of cross-border services trade.[12] Existing studies aimed at quantifying the costs of cross-border trade in services can be grouped into two broad categories corresponding to different applications of the gravity model: indirect and direct approaches.[13]

In the first group, several contributions have estimated services trade costs without using information on policies affecting services trade. Such indirect strategies generally rely on comparisons of observed trade flows with a benchmark and identify bilateral trade costs relative to that benchmark. Studies in this group estimate cross-border services trade costs relative to the country with highest services trade considering its observable characteristics (Fontagne, Guillin and Mitaritonna, 2011[12]; Fontagné, Mitaritonna and Signoret, 2016[13]) or relative to the cost of domestic sales using information on the extent to which a country consumes domestically produced services (Miroudot, Sauvage and Sheperd, 2013[14]).[14] These indirect approaches highlight differences across sectors and countries. However, the fact that such strategies do not include variables on regulatory measures limits their capacity to isolate those parts of trade costs that are amenable to policy action.

Contributions in the second category exploit recent improvements related to the availability of data on regulatory restrictions in order to attribute trade costs to policy measures. Using a World Bank dataset on country-specific time-invariant services trade restrictions, Van der Marel and Shepherd (2013[15]) explore the sensitivity of cross-border services trade flows in 2005 to regulatory measures, whereas Gooris and Mitaritonna (2015[16]) use the same data source to estimate AVEs for three services sectors. Nordås and Rouzet (2017[17]) use information from the OECD STRI for 2014 to examine how services trade flows are affected by restrictive policies and regulatory heterogeneity.

[11] More information on the gravity model can be found in Section 4.

[12] Mode 3 services trade has been analysed much less, because harmonised data for a large number of countries has become available only recently. Existing studies on Mode 3 services trade usually focus on a single country (Christen and Francois, 2015[56]) or a limited number of countries (Rouzet, Benz and Spinelli, 2017[43]).

[13] Note that the concise literature review provided in this section is not exhaustive. A limited number of studies cannot be clearly attributed to either of those two categories. For example, Fontagné and Mitaritonna (2012[62]) and Jafari and Tarr (2015[51]) link data on the prices of services to variables capturing regulatory policies to estimate trade costs. Information on the spatial distribution of production and demand has also been used to infer trade costs (Gervais and Jensen, 2019[52]). Furthermore, several aspects of the indirect and direct empirical approaches covered in this section are similarly relevant to the wider literature on non-tariff measures (NTMs) beyond services trade. For a broader discussion of the measurement of trade costs associated with NTMs, see Chen and Novy (2012[59]) and Francois and Hoekman (2019[60]).

[14] This approach was originally applied to show the reduction of trade costs for the United States between 1970 and 2000 (Novy, 2012[53]).

Due to the scarcity of longitudinal data on regulatory measures, existing studies in this second group only use data on services regulations at a single point in time. However, the lack of time variation complicates efforts to address sources of bias, e.g. regarding omitted variables (Gooris and Mitaritonna, 2015[16]). Common techniques of controlling for unobservable country-specific characteristics (importer and exporter fixed effects) are incompatible with the identification of multilateral trade policies in such a gravity framework applied to data on bilateral international trade flows.

In a recent study based on the OECD STRI, Benz (2017[18]) overcomes this methodological challenge by adding information on countries' internal trade – defined as the share of domestic production that is not exported – to the analysis. This theory-consistent strategy is recommended in the recent literature because it allows for the inclusion of multilateral resistance terms: a set of dummy variables controlling for unobservable characteristics of every exporter and importer (Yotov et al., 2016[3]). Adopting the same methodology but using World Bank data on regulatory measures, Borchert et al. (2020[19]) analyse trade costs based on services imports observed in 2016.

This paper uses the same approach. It exploits new OECD STRI data in order to go beyond existing studies in three regards. First, it draws on STRI data for the period 2014-2018, whereas earlier work relied on time-invariant information on regulatory policies. The use of longitudinal data covering this five-year period strengthens the overall robustness of the statistical analysis by allowing robustness checks with panel specifications and cross-sectional specifications and by enhancing the capacity to control for temporary shocks and short-term fluctuations. Secondly, it uses a new dataset on regulatory barriers within the European Economic Area (EEA) to calculate AVEs for services trade between EEA member countries. Third, the main analysis focused on cross-border services trade is complemented by an exploratory gravity analysis of the services sales of multinational enterprises, corresponding to Mode 3 services trade.

4. Estimation strategy

The empirical strategy is based on the gravity model, the workhorse model of the empirical trade literature. Traditionally employed primarily to analyse patterns of trade in goods, gravity equations have also been widely applied to cross-border trade in services (Eaton and Kortum, 2018[20]; Nordås and Rouzet, 2017[17]; Van der Marel and Shepherd, 2013[15]; Anderson et al., 2015[21]). In its simplest form, the model relates bilateral trade patterns to the economic size of the trading partners and the physical distance between them — in analogy to the Newtonian theory of gravitation. Just as planets attract each other in proportion to their size and proximity, GDP proportionality and systematic negative distance effects shape the trading relationships between country pairs. The gravity model therefore explains two key features of trade data: First, exports and imports increase proportionately with the exporter's GDP and importer's GDP. Second, there is a strong and persistent negative relationship between physical distance and trade (Disdier and Head, 2008[22]).

While these fundamentals are at the core of the gravity model, various geographical, historical and cultural characteristics of the relationship between the two countries should also be considered. For example, strong cultural ties between two countries tend to facilitate trade (Felbermayr and Toubal, 2010[23]). A set of additional gravity controls are therefore customary in the literature, including common language, common legal system, common religion, shared border, and shared colonial history.

Beyond these variables shaped by geography and history, one of the main purposes of the gravity model is the analysis of policy factors on trade flows. Many studies explore the relevance of regional trade agreements (RTAs) and differences in depth across RTAs (Cipollina and Salvatici, 2010[24]; Baier, Yotov and Zylkin, 2019[25]). Similarly, gravity equations are used to investigate the effects of currency unions (Larch et al., 2018[26]; de Sousa, 2012[27]), non-tariff barriers measures affecting trade in goods (Cadot and Gourdon, 2016[28]; Cadot, Gourdon and van Tongeren, 2018[29]) and international regulatory co-operation (Disdier, Stone and van Tongeren, 2019[30]). This study's use of the gravity

model to estimate trade costs associated with regulatory policies affecting services trade therefore builds upon a large body of literature that adopts this framework to examine the effect of policies on trade.

In the theory-consistent gravity model it is important to take into account each country's aggregate trade costs with the rest of the world in addition to bilateral trade costs between two countries (Anderson and Van Wincoop, 2003[4]). For a given level of bilateral trade costs, two countries will trade more with each other if both of them are surrounded by oceans (e.g. New Zealand and Australia) than if both of them are surrounded by large trading economies, as in the case of the Netherlands and Belgium being close to Germany and France. These country-specific costs of trade with the rest of the world (so-called multilateral resistance terms) are typically controlled for using country-specific fixed effects.

Formally, the gravity model can be expressed as follows:

$$Exports_{ij} = \frac{GDP_i\, GDP_j}{GDP_{world}} \left(\frac{tradecost_{ij}}{\Pi_i P_j}\right)^{(1-\sigma)}$$

where the left-hand side variable represents the trade flow from exporter *i* to importer *j*. The second term ensures that the model takes into account GDP proportionality, whereas the third term captures the role of trade costs which encompass two main components: First, pair-specific costs of economic transactions between two countries *i* and *j*. Second, the above-mentioned country-specific costs of engaging in trade with the rest of the world, here represented by Π_i and P_j. The parameter σ is the elasticity of substitution between foreign and domestic goods and services.

This model remains valid when *i* and *j* reference the same country. In this case, the variable $tradecost_{ij}$ indicates internal trade costs within a country, while Π_i and P_j are defined as above and now indicate inward multilateral resistance and outward multilateral resistance of the same country.[15] Calculated as the value of gross production that is consumed domestically, the addition of a country's trade with itself aligns the gravity estimations with the modelling of choices between domestic and foreign goods (Yotov et al., 2016[3]; Dai, Yotov and Zylkin, 2014[31]; Yotov, 2012[32]). While multilateral resistance terms would fully absorb the effect of multilateral trade policy variables in a model without internal trade, the inclusion of within-country trade allows for the analysis of these policies (Heid, Larch and Yotov, 2015[33]). The reason is that multilateral resistance terms are now identified from information on total services consumption and production, including the domestic component, while the STRI effect is still identified from the same data as in the gravity model without internal trade.[16]

The gravity estimations presented in this paper are run separately for each sector and estimated using the Poisson Pseudo Maximum Likelihood (PPML) technique introduced by (Santos Silva and Tenreyro, 2006[34]).[17] The regressions rely on variations of the following specification:

$$exports_{ij,k} = \exp(\beta_1 STRI_{j,k} INTL\_BRDR_{ij} + \beta_2 INTL\_BRDR_{ij} + \gamma\, Z_{ij} + \eta_{i,k} + \mu_{j,k} + \varepsilon_{ij,k})$$

[15] With symmetric trade barriers, theoretical inward and outward multilateral resistance are identical (Anderson and Van Wincoop, 2003[4]).

[16] Adding a country's internal trade allows for the inclusion of an interaction term (STRI X INTL_BRDR) that varies across partner countries, as internal trade flows do not cross the border. Exporter and importer fixed effects do not absorb this interacted variable. Hence, the approach can identify the effect of multilateral policies without omitting the fixed effects required to control for multilateral resistance.

[17] This approach is now commonly used for the estimation of the gravity model. It is superior to the traditional log-linearized estimation with ordinary least squares, due to its robustness to different patterns of heteroscedasticity. Moreover, it allows retaining zeros in bilateral trade data, which would otherwise get lost in the logarithmic transformation of the model.

where the dependent variable are services exports from country *i* to country *j* in sector *k* measured in million USD. Exporter and importer fixed effects $\eta_{i,k}$ and $\mu_{j,k}$ control for multilateral resistance terms and all other country-specific variables (Anderson and Van Wincoop, 2003[4]; Feenstra, 2016[35]). A set of standard gravity variables (represented by *Z*) control for other determinants of bilateral trade costs. β_1 is the main coefficient of interest, identified from an interaction of the STRI with a border dummy that equals one if the corresponding trade flow is international. It represents the effect of changes in the STRI score of the importer *j* on the estimated flow of services exports from country *i* to country *j* relative to the consumption of domestically sourced services in country *j*.

In the main gravity regressions that inform the subsequent estimation of AVEs, we take the average of all variables across the five-year period covered by our dataset. Similar to earlier studies that drew upon data observed at one specific point in time (e.g. Benz (2017[18])), the main analysis therefore relies on cross-sectional variation. Compared to previous studies based on a cross-sectional analysis, collapsing the data across the years 2014-2018 reduces the likelihood that our estimates are influenced by mismeasurement or fluctuations affecting observations in a given year. In additional steps complementing the main analysis, we also run regressions separately for every year and exploit the dataset's longitudinal dimension in panel regressions that include direction-specific pair fixed effects.[18]

Standard gravity controls include distance (which corresponds to internal distance in the case of within-country trade flows), contiguity, common language, shared colonial history, common legal origin, and common religion. In addition, all regressions include two variables to capture the role of RTAs: a dummy equalling one if the two countries share membership of a trade agreement other than the EEA and a dummy equalling one if both trade partners are EEA members.[19] The latter dummy controls for the profound economic integration and institutional coordination among EEA member states, which may be insufficiently captured by the intra-EEA STRI.[20] Standard errors in the main analysis are clustered by exporter and importer.

5. Gravity analysis of cross-border services trade

Data on cross-border services trade come from the OECD International Trade in Services Statistics (ITSS), covering services trade for a large number of services categories based on the Extended Balance of Payments Services Classification (EBOPS) 2010 classification.[21]

Descriptive evidence on import penetration and the STRI

As a starting point to this section, we present a descriptive analysis of the global patterns of services trade and services trade restrictiveness. This is useful for two reasons: First, it helps to clarify the concept of import penetration, which is relevant for gravity modelling with internal trade as described in Section 4. The gravity model with added internal trade flows identifies the effect of regulatory barriers on the value of international services trade relative to the value of the consumption of services sourced domestically. In other words, it provides estimates of the impact of the STRI on import penetration.

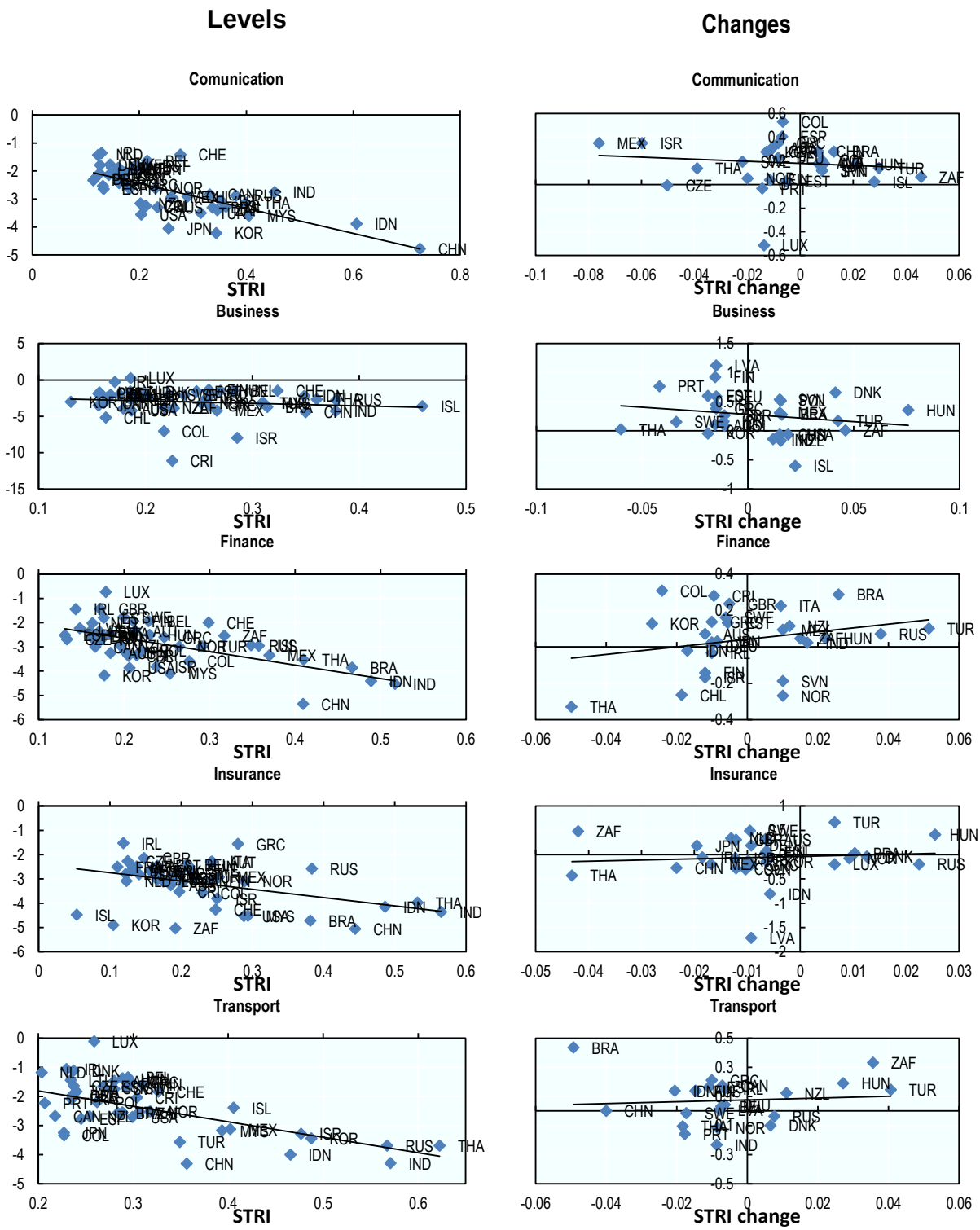
[18] The formal specification employed in the panel analysis is provided in Annex **B**.

[19] All data sources are described in Annex A.

[20] However, our results show that the intra-EEA STRI is a relatively good representation of services trade barriers within the Single Market, indicated by the fact that the coefficient of the EEA dummy is usually not significantly different from zero.

[21] While the coverage of the ITSS dataset starts in 2006, the STRI is only available from 2014 onwards. As ITSS data for 2019 will only become available in early 2021, the analysis presented in this section is limited to the interval between 2014 and 2018.

Figure 1. Import penetration and the STRI



Note: Countries with unchanged STRI are not included in the right column for the sake of visibility.

Second, the descriptive analysis provides a first insight into the difference between cross-country variation and variation over time, both of which can be used independently in the subsequent regression analysis.

The scatterplots in the left column of Figure 1 report information on each country's STRI on the horizontal axis and each country's log import penetration on the vertical axis. Both values refer to the year 2018. The scatterplots also include a linear regression line that indicates the relationship between the two variables. It can easily be seen that higher levels of services trade restrictiveness are associated with lower levels of import penetration. In other words, regulatory barriers to services trade seem to impede access of consumers and domestic businesses to foreign services. These scatterplots (in the left column of Figure 1) rely on cross-country variation, comparing different countries characterised by different trade patterns and regulatory regimes.

The scatterplots in the right column report information on changes of the STRI and changes in log import penetration. Changes in the STRI between 2014 and 2018 are indicated on the horizontal axis, with countries that liberalised their regimes being on the left and countries that tightened their regimes being on the right. The vertical axis indicates changes in log import penetration. Importantly, changes in log import penetration may differ from changes in log import values over the same period. The communications sector in Mexico is a case in point. While the value of imports remained fairly constant over the five years, the import penetration rate grew by roughly 50%, due to the simultaneous price reduction in the Mexican telecommunications sector that led to a decline in the value of domestic output. This indicates that Mexico became more open to foreign telecommunications providers after the reform of 2014.

The graphs in the right column also include a linear regression line, indicating the relationship between changes in the STRI and changes in log import penetration. For communication services and other business services, there is a weak negative relationship. Liberalising countries seem to have experienced stronger growth of import competition than countries tightening their regimes. For communication services, this is particularly true for Mexico and Israel, which went through ambitious liberalisation during those years. However, in finance, insurance and transport this relationship seems to be flat or even upward sloping. The figure reveals the difficulty of identifying a relationship between STRI changes and changes in import competition from a descriptive analysis of the data. As the next step, we turn to the regression analysis, which allows identifying the effect of the STRI on import penetration, controlling for other observable and unobservable factors.

Cross-sectional analysis

In the regression analysis, the main specification exploits only cross-sectional variation of the data. On the one hand, this can be done by calculating average values of services exports over all years with available data. This approach mitigates potential measurement error and allows for straightforward comparison of our approach with existing studies. On the other hand, we use data from individual years in order to track the development of regression coefficients over time.

In both cases, coefficients identified exclusively from cross-sectional variation indicate the long-run effect of trade liberalisation. The estimation relies on differences across countries and trading partners at a given point in time. These differences do not only reflect different levels of services trade restrictiveness, but also differences in the business structure and network of value chains that are optimal in the light of each country's regulatory environment. Consequently, the level of policy-induced trade costs derived from such cross-sectional variation must be interpreted as the potential for trade cost reduction in the long run, after businesses have had time to make investments in tangible and intangible capital, establish new business contacts and adjust their production and sales networks.

For all sectors, more restrictive services trade regulation is associated with lower values of international services trade relative to domestic services consumption. The resulting coefficients range between -3.5 for transport services and -7.3 for financial services. All of the corresponding regression coefficients are highly significant at the 1%-level.

Services liberalisation within the European Economic Area creates stronger trade linkages between members than with countries outside of this bloc. This effect is captured by the STRI coefficient, because the STRI measures actual intra-EEA services trade policies. Hence, it is not surprising that the coefficient of the EEA dummy is not significant in most sectors: the relevant regulatory differences are captured by the STRI variable instead. For example, in communications services, the average intra-EEA STRI has a value of 0.06, while the average MFN-STRI of EEA members has a value of 0.19.[22] Despite the negative (and insignificant) coefficient on the EEA dummy, this indicates that EEA members would trade 29% more with another EEA member than with a third country that is not in the EEA and does not have a special agreement with the EU but has otherwise identical characteristics.[23]

Table 1. Cross-border cross-sectional results

	(1)	(2)	(3)	(4)	(5)
Sector	Communication	Business	Finance	Insurance	Transport
Log distance	-0.737***	-0.584***	-0.170	-0.690***	-0.360***
	(0.103)	(0.133)	(0.315)	(0.186)	(0.094)
Contiguity	-0.257*	0.009	0.191	-0.139	0.273**
	(0.126)	(0.133)	(0.338)	(0.319)	(0.115)
Common language	0.961***	0.903***	1.499***	0.869***	0.703***
	(0.229)	(0.199)	(0.168)	(0.225)	(0.110)
Previous colonial relationship	-0.251**	-0.172*	0.458***	0.458**	0.600***
	(0.099)	(0.102)	(0.134)	(0.225)	(0.171)
Common legal origin	-0.086	0.011	-0.215	0.076	-0.028
	(0.109)	(0.117)	(0.177)	(0.170)	(0.133)
Common religion	0.040	-0.097	0.151	-0.209	0.230
	(0.306)	(0.306)	(0.661)	(0.548)	(0.268)
RTA	-0.035	-0.399**	-0.320	-0.594**	0.012
	(0.252)	(0.162)	(0.244)	(0.252)	(0.126)
EEA	-0.332	-1.041***	-0.106	-0.202	0.006
	(0.301)	(0.371)	(0.505)	(0.541)	(0.320)
International border	-3.674***	-4.256***	-4.467***	-4.063***	-4.152***
	(0.315)	(0.363)	(0.705)	(0.536)	(0.331)
International border x STRI	-4.515***	-3.920***	-7.335***	-5.002***	-3.543***
	(0.991)	(1.372)	(1.608)	(0.957)	(1.039)
Constant	17.916***	18.225***	13.952***	17.059***	14.803***
	(0.731)	(0.951)	(2.207)	(1.331)	(0.659)
Observations	1,549	1,518	1,343	1,294	1,436
Exporter F.E.	YES	YES	YES	YES	YES
Importer F.E.	YES	YES	YES	YES	YES

Note: Standard errors clustered by exporter and importer in parentheses *** p<0.01, ** p<0.05, * p<0.1. RTA indicates a bilateral regional trade agreement. EEA indicates simultaneous EEA membership of exporter and importer.

[22] Remaining restrictions to cross-border services trade arise from, *inter alia*: inadequate ex ante regulation of providers with significant market power in the telecommunications sector; a slot allocation mechanism at airports that allows to carry over slots from one year to the next; restrictions on the recognition of qualifications in certain professional services; regulation of interest rates on certain banking products; or measures that affect independence of a national supervisory authority.

[23] Using the coefficients for the STRI and the EEA dummy, this effect can be calculated as exp(4.515*(0.19-0.06)-0.332)-1 = 29%. A robustness check excluding the intra-EEA STRI yields a similar EEA effect of exp(0.21)-1 = 23% in Table A C.2.

The consumption of services from domestic sources is substantially higher than services imports in all sectors. The coefficient of the border dummy, which equals one if the corresponding observation refers to an international trade flow rather than the consumption of domestically produced services, is in all cases negative and strongly significant. The size of the coefficients on the border dummy indicates that services imports currently represent just between 1% and 3% of their potential level in the absence of all natural barriers, technological constraints and consumer preferences that lead to the consumption of domestic services rather than imported services.

Most other regression coefficients are in line with the literature (Head and Mayer, 2014[11]). Common language and bilateral geographic distance have the expected sign in all sectors and are highly significant. Geographic distance seems to be less important for trade in financial services. Contiguity is often insignificant, indicating that distance is a good indicator for geographic trade costs in most services sectors. Exceptions are transport, where countries trade more with their direct neighbours than with other countries, and communications services, where contiguity is negatively associated with the value of cross-border services trade.

While the negative coefficient of the RTA variable for four of the five sectors may appear counterintuitive, one has to bear in mind that many RTAs included in this analysis were concluded with a focus on trade in goods and do not cover specific services provisions.[24] Focusing on a subset of more recent RTAs and only exploiting time variation, coefficients turn mostly positive (Table 4). The results reported in Table 2 rely on separate regressions run for each year between 2014 and 2018. The numbers show a high degree of robustness, where coefficients from the annual analysis are always very similar to those identified from five-year averages. The robustness of the coefficients based on averages across this five-year period (Table 1) is very reassuring with respect to their further use in the calculation of *ad valorem* equivalents in Section 6.

Table 2. STRI effects estimated in cross-sectional regressions

Sector	Communication	Business	Finance	Insurance	Transport
Average	-4.515***	-3.920***	-7.335***	-5.002***	-3.543***
	(0.991)	(1.372)	(1.608)	(0.957)	(1.039)
2014	-4.617***	-3.419***	-7.328***	-5.022***	-3.536***
	(1.004)	(1.290)	(1.762)	(1.123)	(1.093)
2015	-4.372***	-3.742***	-7.874***	-5.314***	-3.359***
	(1.040)	(1.435)	(1.748)	(1.112)	(1.053)
2016	-4.440***	-3.837***	-7.862***	-5.401***	-3.543***
	(0.998)	(1.466)	(1.701)	(0.984)	(1.058)
2017	-4.337***	-3.791***	-7.373***	-4.331***	-3.735***
	(0.964)	(1.456)	(1.545)	(0.958)	(1.009)
2018	-4.390***	-4.821***	-6.742***	-5.091***	-3.573***
	(0.944)	(1.254)	(1.515)	(0.946)	(0.988)

Note: This table reports the coefficient of the STRI-border interaction from 30 independent cross-sectional regressions, including exporter and importer fixed effects and all control variables that are also included in the main specification. Mean refers to the simple average over all years 2014 to 2018. Standard errors clustered by exporter and importer in parentheses *** p<0.01, ** p<0.05, * p<0.1.

[24] On average across all country pairs and the five years covered by the analysis, the RTAs included in the analysis entered into force 11 years and 3 months prior to the year under observation.

Panel analysis

As the main robustness check, this section describes the results of a panel analysis where the coefficients are identified from two sources of variation: variation across countries and variation over time.[25] The first specification employs two types of fixed effects: exporter-year and importer-year fixed effects, relying on data for the years 2014 to 2018. Table 3 reports results for this specification. All coefficients are virtually identical to the main results described above. This confirms the robustness of the cross-sectional specification and implies that the results are reliable estimates of the long-term effects of services regulation on cross-border services trade.

At the same time, the panel dataset can be used to identify short-run effects of services liberalisation. These short-run effects indicate the effect of services trade reform in the same year that the reforms enters into force. In general, trade effects in the first year of reform can be expected to be smaller than long-term effects reported above. The reason is that firms do not adjust immediately to regulatory reform and often it takes a while before they can fully exploit a liberalised trade regime.

For the identification of short-run trade effects, asymmetric country-pair fixed effects are added to the existing fixed effects structure. [26] This implies that all coefficients are identified only from variation over time within country pairs. In other words, coefficients would be negative and significant only if trade growth is stronger between countries with liberalising policy changes than in countries with constant or tightening regimes.

The specification with country-pair fixed effects has another important advantage: it allows for a more robust causal interpretation of the resulting coefficients on the STRI and on RTAs. Because trade policy is not exogenous, this interpretation is not always justified when relying on a specification without pair fixed effects. For example, a specific historical relationship between two trading partners might simultaneously determine services regulation and bilateral exports. Pair fixed effects control for such bilateral determinants of services trade. Therefore, it is recommended to use this specification for a causal interpretation of coefficients (Baier and Bergstrand, 2007[36]).

The results suggests that a reduction of services trade barriers could indeed lead to higher values of services exports already in the year of liberalisation. The resulting coefficients are all negative and significant in two of the five sectors. Moreover, the magnitude of the coefficients suggests that an important share of services trade adjustment already happens in the year of reform. Not all coefficients are significantly different from zero, probably due to the relatively low number of policy changes that can be exploited for the identification of the effect.

Also the coefficients on regional trade agreements are positive and statistically significant for communication, business services, insurance services and transport services. The result suggests that bilateral RTAs boost services trade in these sectors already in the year of entry into force. This immediate effect is no surprise because RTAs take time to negotiate and to be ratified. Businesses that anticipate potential outcomes can adjust already in advance. The effect corresponds to 21% for business services, 27% for communication services, 34% for insurance services and 41% for transport services. In comparison to the analysis of RTAs in Tables 1 and 3, these coefficients are exclusively identified from a recent subset of RTAs that entered into force since 2014. The change in the sign of the coefficient can partly be explained by the fact that these agreements include provisions on services, while services are less frequently covered in older RTAs. This is evidence that services RTAs have a significant causal impact on cross-border trade in services in these sectors, even though they often do not liberalise but only bind the applied regime (Lamprecht and Miroudot, 2018[7]).

[25] On average across the five sectors included in the analysis, variation over time corresponds to 5.3% of the cross-sectional variation in the data.

[26] These country-pair fixed effects replace all time-invariant explanatory variables normally included in gravity analysis, such as bilateral distance, contiguity, common language, etc., while exporter-year and importer-year fixed effects control for other macroeconomic factors, such as productivity shocks, exchange rate fluctuations, terms of trade changes, etc. (Baier, Yotov and Zylkin, 2019[25]).

Table 3. Cross-border panel results

	(1)	(2)	(3)	(4)	(5)
Sector	Communication	Business	Finance	Insurance	Transport
Log distance	-0.730***	-0.600***	-0.147	-0.674***	-0.351***
	(0.101)	(0.130)	(0.309)	(0.177)	(0.092)
Contiguity	-0.252**	-0.005	0.200	-0.163	0.282**
	(0.128)	(0.133)	(0.338)	(0.312)	(0.115)
Common language	0.952***	0.859***	1.476***	0.862***	0.703***
	(0.229)	(0.201)	(0.168)	(0.219)	(0.109)
Previous colonial relationship	-0.241**	-0.160	0.451***	0.459**	0.599***
	(0.094)	(0.099)	(0.129)	(0.231)	(0.169)
Common legal origin	-0.087	0.022	-0.210	0.095	-0.030
	(0.108)	(0.113)	(0.175)	(0.165)	(0.132)
Common religion	0.051	-0.131	0.159	-0.255	0.229
	(0.312)	(0.299)	(0.643)	(0.551)	(0.266)
RTA	-0.023	-0.350**	-0.258	-0.531**	0.018
	(0.235)	(0.161)	(0.218)	(0.224)	(0.112)
EEA	-0.319	-1.070***	-0.086	-0.145	0.009
	(0.299)	(0.378)	(0.501)	(0.514)	(0.313)
International border	-3.697***	-4.225***	-4.496***	-4.070***	-4.169***
	(0.315)	(0.368)	(0.695)	(0.529)	(0.328)
International border x STRI	-4.451***	-3.946***	-7.379***	-5.010***	-3.547***
	(0.961)	(1.388)	(1.612)	(0.960)	(1.021)
Constant	17.869***	18.343***	13.800***	16.942***	14.747***
	(0.718)	(0.934)	(2.167)	(1.263)	(0.648)
Observations	7,383	7,429	6,121	6,001	6,943
Exporter-Year F.E.	YES	YES	YES	YES	YES
Importer-Year F.E.	YES	YES	YES	YES	YES

Note: Standard errors clustered by exporter, importer and year in parentheses *** p<0.01, ** p<0.05, * p<0.1. RTA indicates a bilateral regional trade agreement. EEA indicates simultaneous EEA membership of exporter and importer.

While this analysis provides insightful preliminary results on the short-term effects of multilateral and bilateral services trade liberalisation, a more comprehensive analysis would require data on services barriers and cross-border services trade on a larger number of years, which is not available at the moment. However, it seems worthwhile to repeat this analysis once there is a larger overlap between the availability of data on services trade and the OECD STRI.

Table 4. Short-term trade effects

	(1)	(2)	(3)	(4)	(5)
Sector	Communication	Business	Finance	Insurance	Transport
RTA	0.239**	0.194**	-0.017	0.292*	0.341***
	(0.119)	(0.089)	(0.067)	(0.152)	(0.032)
Border x STRI	-6.284**	-4.503	-5.403	-11.657***	-1.371
	(3.178)	(3.269)	(3.403)	(1.437)	(1.727)
Constant	12.764***	13.878***	12.620***	12.316***	12.165***
	(0.026)	(0.019)	(0.026)	(0.006)	(0.024)
Observations	7,337	7,402	5,992	5,765	6,912
Exporter-Year F.E.	Yes	Yes	Yes	Yes	Yes
Importer-Year F.E.	Yes	Yes	Yes	Yes	Yes
Asymmetric Pair FE	Yes	Yes	Yes	Yes	Yes

Note: Standard errors clustered by exporter, importer and year in parentheses *** p<0.01, ** p<0.05, * p<0.1. RTA indicates a bilateral regional trade agreement, excluding EEA membership, which is taken into account by the asymmetric pair fixed effect.

Additional robustness checks

The overall pattern emerging from this analysis continues to hold in several robustness checks. We start with an additional set of regressions focused on business services, a sector for which there is no direct correspondence in the STRI. Instead of a synthetic STRI for business services based on a country's score derived exclusively from horizontal measures, we use four alternative STRIs: The STRI of the telecommunications services sector, the STRI of computer services, the weighted average of a country's STRI scores across all sectors (with the weights corresponding to the respective sector's output shares in major OECD economies), as well as the unweighted average of the STRI of professional services and logistics services. The STRI for computer services includes exclusively horizontal restrictions that affect services trade in all sectors. Telecommunications services play a pivotal role for activities involving the frequent exchange of complex information. The resulting coefficients are broadly similar but not identical (Table A C.1), highlighting the potential improvements in terms of precision that could be achieved through the collection of regulatory information that would be required for the creation of a specific STRI for other business services.

In order to analyse the results' sensitivity with respect to the measurement of barriers within the European Single Market, we perform an additional analysis where we simply apply the standard multilateral STRIs to all trade flows – including flows within the EEA (Table A C.2). The coefficients are somewhat larger, but still reasonably close to those in our main specifications. In a further robustness check, we exclude all observations corresponding to flows between EEA members from the analysis (Table A C.3). The STRI coefficients are again in a broadly similar range.

In addition, we conduct an additional check based on an alternative STRI computed without taking into account any measures referring to Mode 3. We instead only incorporate measures related to Mode 1, Mode 4 and barriers behind the border related to all modes of services trade (Table A C.4). The coefficients remain negative and, with the exception of other business services, statistically significant.[27] The lack of statistical significance in the case of business services is likely to indicate the

[27] The larger coefficient sizes in most sectors reflect the lower mean of this "reduced STRI", as any increase of the STRI score would now correspond to a larger change relative to the mean score. When comparing elasticities across the two specifications or when comparing regression coefficients of normalised STRI variables, results are relatively similar. AVEs based on these coefficients are in the same order of magnitude as the AVEs from the main specification.

importance of intermodal linkages in this sector.[28] Moreover, we still obtain a similar set of results when choosing a very different gravity estimation method; we use OLS (rather than PPML) and omit intra-national flows from the analysis (Table A C.5).

6. Gravity analysis of Mode 3 services trade

While the main analysis presented in Section 0 that informs the estimation of AVEs focuses on cross-border services trade recorded in the balance of payments, this section explores the link between regulatory barriers and services delivered via commercial presence (Mode 3). The analysis of Mode 3 services exports relies on the OECD Analytical AMNE database. This database contains information on the activities of multinational enterprises (MNEs), including a full matrix of the output of foreign affiliates in 59 countries (in the host country, industry, parent country dimension) over the period 2005-2016 (Cadestin et al., 2018[37]). As the coverage of the STRI database only starts in 2014, the analysis presented in this section relies on data between 2014 and 2016. Moreover, it is restricted to the 46 countries covered in the STRI database. Disaggregated information for finance and insurance is not available in the Analytical AMNE database. Therefore, the two sectors are analysed jointly and services barriers in the sector are measured as the simple average of the STRIs in commercial banking and insurance.

Cross-sectional analysis

Due to the availability of data for only three years, in the main specification we use average values over these three years. As above, this implies that the indicated potential for trade expansion takes a long-run view, assuming businesses have time to make investments in tangible and intangible capital, establish new business contacts and adjust their production and sales networks before the full trade effect can materialise.

Results from the gravity specification are in line with expectations. Distance has a strong negative impact on Mode 3 services trade in all sectors, while the effect of a common language is strongly positive. Doubling the distance between two countries would reduce the value of their bilateral trade in services via Mode 3 by between 50% and 60%. The effect of a common language is even more remarkable, with a potential increase of services trade by between 75% for transport services and 180% for communication services. The coefficients for the two variables are similar to those estimated for cross-border services trade (Section 5).

Similarly, a common legal origin can promote bilateral trade in services via Mode 3. While there is no significant effect for financial services and insurance, a common legal origin boosts services trade by between 25% and 55% in the three other sectors. As above, the usually insignificant coefficient of the EEA dummy suggests that the intra-EEA STRI is a good measure of barriers affecting Mode 3 services trade within the Single Market.[29]

[28] Oldenski (2012[58]) finds that the provision via foreign affiliates is particularly important in the case of services that require frequent direct interaction with consumers.

[29] RTAs seem to be negatively correlated with Mode 3 services exports in other business services and communication services. It is possible that this is driven by the large number of RTAs without investment provisions or by potential endogeneity of RTAs. A more careful analysis should be based on a panel specification with asymmetric pair fixed effects covering a longer period of time. However, this is outside the scope of this paper.

Table 5. Mode 3: Cross-sectional analysis

	(1)	(2)	(3)	(4)
Sector	Communication	Business	Finance & insurance	Transport
Log distance	-0.797***	-0.843***	-0.662***	-0.927***
	(0.178)	(0.157)	(0.235)	(0.167)
Contiguity	-0.817***	-0.368*	0.045	-0.136
	(0.256)	(0.219)	(0.248)	(0.254)
Common language	1.083***	0.774***	0.628***	0.590***
	(0.206)	(0.206)	(0.224)	(0.206)
Previous colonial relationship	-0.062	0.649***	0.710***	0.188
	(0.222)	(0.241)	(0.162)	(0.267)
Common legal origin	0.371**	0.185**	-0.021	0.277*
	(0.164)	(0.088)	(0.155)	(0.144)
Common religion	0.206	-0.148	0.301	-0.163
	(0.324)	(0.390)	(0.500)	(0.426)
RTA	-0.626**	-0.482*	-0.172	-0.108
	(0.252)	(0.276)	(0.268)	(0.160)
EEA	-1.846***	-0.423	-0.982	-0.904
	(0.523)	(0.602)	(0.728)	(0.586)
International border	-2.646***	-3.336***	-1.933***	-3.244***
	(0.467)	(0.375)	(0.395)	(0.581)
International border x STRI	-4.460***	-2.092	-6.376***	-3.968***
	(1.102)	(1.661)	(1.694)	(1.153)
Constant	18.445***	19.010***	17.474***	18.771***
	(1.290)	(1.089)	(1.734)	(1.183)
Observations	2,116	2,116	2,116	2,116
Exporter F.E.	YES	YES	YES	YES
Importer F.E.	YES	YES	YES	YES

Note: Standard errors clustered by exporter and importer in parentheses *** p<0.01, ** p<0.05, * p<0.1. RTA indicates a bilateral regional trade agreement. EEA indicates simultaneous EEA membership of exporter and importer.

Applied services policies measured in the STRI are an important determinant of services exports via Mode 3 in three out of four sectors. A reduction of the STRI by 0.1 would boost Mode 3 services by between 50% and 90% in communication services, finance, insurance and transport services. The coefficient also has the expected sign for other business services, but statistically it is not significantly different from zero. The results suggest that growth potential for Mode 3 services trade is of similar magnitude as growth potential for cross-border services trade in most sectors. The only exception are business services, where Mode 3 services trade seems to benefit less from liberalisation of applied services policies.

The strongly significant effect of regulatory policies on Mode 3 services exports is confirmed in various robustness checks. A cross-sectional analysis using individual years reported in Table 6 shows that the STRI coefficient is extremely robust over the three years with available data. This indicates that patterns of Mode 3 services trade are very robust over time when considering this interval.

Table 6. Mode 3: STRI effects estimated in cross-sectional regressions

Sector	Communication	Business	Finance & Insurance	Transport
Average	-4.460***	-2.092	-6.376***	-3.968***
	(1.102)	(1.661)	(1.694)	(1.153)
2014	-5.029***	-1.685	-6.614***	-3.454**
	(1.164)	(1.924)	(1.857)	(1.352)
2015	-4.920***	-2.502	-6.726***	-3.778***
	(1.260)	(1.769)	(1.709)	(1.290)
2016	-4.000***	-2.236	-5.958***	-4.904***
	(1.097)	(1.625)	(1.667)	(1.106)

Note: This table reports the coefficient of the STRI-border interaction from 16 independent cross-sectional regressions, including exporter and importer fixed effects and all control variables that are also included in the main specification. Mean refers to the simple average over all years 2014 to 2016. Standard errors clustered by exporter and importer in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 7. Mode 3: Panel analysis

	(1)	(2)	(3)	(4)
Sector	Communication	Business	Finance & insurance	Transport
Log distance	-0.798***	-0.848***	-0.658***	-0.936***
	(0.174)	(0.159)	(0.230)	(0.164)
Contiguity	-0.802***	-0.359*	0.050	-0.134
	(0.259)	(0.211)	(0.244)	(0.242)
Common language	1.035***	0.747***	0.614***	0.577***
	(0.195)	(0.212)	(0.216)	(0.213)
Previous colonial relationship	-0.052	0.636***	0.728***	0.187
	(0.212)	(0.242)	(0.157)	(0.244)
Common legal origin	0.387**	0.200**	-0.022	0.274**
	(0.171)	(0.095)	(0.152)	(0.140)
Common religion	0.161	-0.172	0.300	-0.159
	(0.331)	(0.405)	(0.491)	(0.425)
RTA	-0.551**	-0.484*	-0.116	-0.118
	(0.231)	(0.293)	(0.255)	(0.146)
EEA	-1.823***	-0.414	-0.959	-0.926
	(0.518)	(0.600)	(0.721)	(0.580)
International border	-2.627***	-3.328***	-1.946***	-3.227***
	(0.470)	(0.374)	(0.388)	(0.582)
International border x STRI	-4.598***	-2.100	-6.432***	-4.014***
	(1.146)	(1.733)	(1.710)	(1.252)
Constant	18.453***	19.044***	17.446***	18.841***
	(1.258)	(1.092)	(1.694)	(1.164)
Observations	6,348	6,348	6,348	6,348
Exporter-Year F.E.	YES	YES	YES	YES
Importer-Year F.E.	YES	YES	YES	YES

Note: Standard errors clustered by exporter, importer and year in parentheses *** p<0.01, ** p<0.05, * p<0.1. RTA indicates a bilateral regional trade agreement. EEA indicates simultaneous EEA membership of exporter and importer.

Panel analysis

Using the full panel of available data for three years and a panel specification with exporter-year and importer-year fixed effects yields coefficients (reported in Table 7) that are extremely similar to those in the main specification. As in the analysis of cross-border services trade (Section 5), this suggests that the regression coefficients in the panel regression reported above are mostly identified from cross-sectional variation.

Additional robustness checks

A very similar pattern arises when using the cross-sectional specification to focus on regulatory barriers to Mode 3 services trade rather than using data on all measures included in the STRI (Table A C.1).[30] As in the main specification of this section (reported in Table 5), the effect is negative and insignificant for other business services, but strongly significant in the three other sectors. As expected, the effect of Mode 3 restrictions on Mode 3 services trade is larger than the effect of the full bundle of regulatory barriers. Not surprisingly, a targeted liberalisation of Mode 3 barriers does more to facilitate the commercial presence of foreign investors than a less targeted liberalisation. The coefficients on all other variables are virtually identical to those in the main specification. Detailed results are reported in the annex.

The annex also reports additional robustness checks from gravity specifications where domestic sales are not included and when using OLS instead of the PPML estimator Table A C.7. All robustness checks broadly confirm the results from the main specification.

7. *Ad valorem* equivalents

Trade elasticities

Regression coefficients in Table 4 and Table 5 report estimates for the elasticity of cross-border trade flows with respect to services trade restrictiveness. For easier reference, these elasticities are summarised in the first and third column Table 8. The exponential of these estimates indicates the factor of export growth that is associated with a given change in the STRI score, assuming that all other variables remain equal.

Table 8. Trade elasticities

Sector	Cross-border trade elasticity (coefficient)	Cross-border trade elasticity in % (based on reduction of STRI by 0.1)	Mode 3 trade elasticity (coefficient)	Mode 3 trade elasticity in % (based on reduction of STRI by 0.1)
Communication	-4.515	57.1%	-4.460	56.2%
Business services	-3.920	48.0%	-2.092	23.3%
Financial services	-7.335	108.2%	-6.376	89.2%
Insurance	-5.002	64.9%	-6.376	89.2%
Transport	-3.543	42.5%	-3.968	48.7%

Note: The trade elasticity in % indicates the percentage change in trade flows resulting from a reduction of the STRI by 0.1, calculated as exp(-0.1 * coefficient) – 1.
Source: Regression coefficients from Table 1 and Table 5.

[30] The analysis reported in Annex C focuses exclusively on barriers to Mode 3. However, results are similar in a joint analysis of barriers to Mode 3 and barriers behind the border.

Elasticities of substitution

The link between trade elasticities and trade cost equivalents requires information on the elasticity of substitution between varieties of traded services.[31] Commonly, this elasticity is referred to as sigma. The applicable values for sigma are very important for the calculation of trade costs and can potentially have a large impact on the resulting services AVEs.

Notwithstanding their crucial role in major trade models, empirically recovering elasticities of substitution for services has proven challenging and their estimation remains a relatively new topic in the trade literature. The calculation of the AVEs for cross-border services trade presented in this paper relies on estimates for sigma reported in five recent studies, which use advanced econometric approaches to tackle this challenge. Considering all estimates for a specific sector, the ratio between the highest and lowest estimate is typically larger than two. In light of this high variation and an inherent difficulty to judge the reliability of individual estimates, the calculation of the AVEs is based on the simple average of elasticities from all five sources. By taking the mean of the estimates from these five recent studies, we combine the strengths of different estimation methods and data sources, whilst simultaneously limiting the influence of any shortcomings of individual studies. Table 9 summarises all elasticities and their respective sources, together with the simple average used in the calculation of AVEs in this section.

To the best of our knowledge, there are no established estimates for the elasticity of substitution between domestic services and services that are produced in the local economy by foreign MNEs. This represents a significant challenge for the calculation of AVEs. It seems unlikely that a given increase in the price of domestic services would lead to an equally strong growth in demand for cross-border imports of foreign services and domestic services of foreign MNEs. Intuitively, it might be plausible that a switch to domestic services of foreign MNEs is more likely than a switch to cross-border imports.

Table 9. Elasticities of substitution for cross-border services trade

Sector	(Rouzet, Benz and Spinelli, 2017[38])	(Egger et al., 2020[39])	(Fontagné, Orefice and Santoni, 2019[40])	(Christen, Pfaffermayr and Wolfmayr, 2019[41])	(Blank et al., 2018[42])	Simple average
Communication (cmn)	2.55	4.27	-	3.95	3.92	3.67
Business services (obs)	2.18	4.02	1.57	3.77	4.51	3.21
Financial services (ofi)	1.6	4.18	1.59	2.05	3.27	2.54
Insurance (isr)	2.2	4.18	1.59	2.59	3.27	2.77
Transport (otp)	2.6	3.8	1.79	3.59	5.16	3.39

Note: In the first column, the elasticity for communication is the simple average of telecommunications (2.7) and courier services (2.4); the elasticity for business services is the simple average of computer services (2.1), accounting and auditing (2.3), architecture and engineering (2.2) and legal services (2.1); the elasticity for transport is the simple average of air transport (1.9), maritime transport (2.8) and rail and road transport (3.1). In the second column, the elasticity for transport services is the simple average of inland transport (4.14), water transport (3.98) and air transport (3.29). In the third column, the elasticity for business services is the simple average of renting of machinery and equipment (1.312), computer and related activities (1.484) and R&D and other business activities (1.976). In the fourth column, the elasticity for financial services is the simple average of financial services (1.51) and auxiliary financial (2.59). The estimates rely on firm-level data on profit margins from the United Kingdom and Finland (Rouzet, Benz and Spinelli, 2017[43]), sector-level data on trade and unit labour costs from a set of 41 countries covered in the WIOD database (Egger et al., 2020[39]), firm-level data on profit-margins from Austria (Christen, Pfaffermayr and Wolfmayr, 2019[41]), firm-level data on profit-margins from Germany (Blank et al., 2018[42]) and sector-level data on unit labour costs from a set of 59 economies covered in the OECD TiVA database (Fontagné, Orefice and Santoni, 2019[40]).

[31] The next subsection explains how the trade elasticities presented Table 8 can be converted into estimates of *ad valorem* equivalent trade costs.

Such a high willingness to replace domestic services by domestic services of foreign MNEs would be reflected by a high elasticity of substitution. In turn, a high elasticity of substitution results in a low *ad valorem* equivalent of the estimated trade effect. Due to the lack of robust data on these patterns, we abstain from the calculation of AVEs for Mode 3 services trade. The rest of this section focuses on cross-border services trade only.

In the final step of this analysis, sector-specific trade elasticities are combined with estimated elasticities of substitution in order to obtain the trade cost equivalent for services imports. The calculation is implemented using the following formula for the *ad valorem* equivalent of services imports in country *j* from country *i* in sector *k* at time *t*. The distinction between exporters *i* only is relevant in the case where *k* is an EEA member, exhibiting lower barriers towards other EEA members than towards third countries. In this formula, exp is an exponential function, $\boldsymbol{\beta_k}$ is the trade elasticity reported in Table 8 and σ_k is the average elasticity of substitution reported in the sixth column of Table 9.[32]

$$AVE_{ijkt} = \exp\left(-\frac{STRI_{ijkt} * \beta_k}{(\sigma_k - 1)}\right) - 1$$

Results

Table 10 provides an overview of the AVE estimates for the five sectors based on the STRI for 2019. The right panel of the table shows the minimum, median, average and maximum AVE for services trade between two EEA members. Conversely, the left panel refers to all other trade flows. The estimated trade costs are considerably lower for trade between EEA members. The minimum across the five sectors amounts to 0% (in business services) for intra-EEA trade, whereas the lowest level observed at the MFN level is 26% (communications). This contrast reflects the profound economic integration and regulatory alignment among EEA countries.

The estimates shed light on substantial heterogeneity across sectors, with the median MFN AVE for financial services (166%) being more than three times as high as the one for communication services (46%). Interestingly, the sectoral ranking in terms of AVE levels is different when considering flows between EEA members. While financial services also display the highest median AVE (27%), all other sectors are relatively close to each other with respect to the median AVE. Business services is the sector with the lowest AVE level for intra-EEA services trade.

Table 10. *Ad valorem* equivalents for cross-border services trade 2019 by sector

Summary statistics

	Non-preferential				Intra-EEA			
Sector	Min. AVE	Median AVE	Average AVE	Max. AVE	Min. AVE	Median AVE	Average AVE	Max. AVE
Communication	24%	46%	57%	184%	5%	9%	10%	28%
Financial services	86%	166%	255%	1073%	15%	27%	32%	61%
Insurance	34%	77%	103%	394%	2%	8%	9%	16%
Business services	26%	49%	54%	126%	0%	5%	6%	14%
Transport	31%	53%	60%	152%	8%	12%	12%	17%

Note: Intra-EEA refers to services trade between two EEA members. Non-preferential refers to all other trading partners.

[32] AVE_{ijkt} expresses the *ad valorem* tariff equivalent as a number, i.e. results have to be multiplied by 100 for transformation into percentage values. Annex B reports a derivation of this expression.

Whereas the estimates presented in Table 10 were calculated using the STRI for 2019 in order to reflect the most recent data on regulatory policies affecting services trade, Annex D also provides a disaggregation of the estimated AVEs by country, sector and year for the period 2014-2019 (see Table A D.1 to Table A D.6). The detailed information for this six-year period can be used to illustrate the effect of regulatory changes on trade costs, assuming that all other variables remain equal.

For example, Mexico approved a set of regulatory reforms concerning the telecommunications sector in 2014. According to the estimates presented here, these regulatory changes correspond to a reduction of Mexico's AVE in communications by 10 percentage points (from 77% to 67%). In the case of China, several policy changes affecting the transport sector led to a reduction of the STRI of that sector by roughly 0.03 points between 2014 and 2016. According to the AVE estimates shown in Table 10, this change in the STRI score translates into a drop of China's AVE for this sector from 80% in 2014 to 72% in 2016.

The comparison of our estimates with AVEs reported in the existing literature is complicated by methodological differences, e.g. regarding the choice of the elasticity of substitution. Fontagné, Mitaritonna and Signoret (2016[13]) also find that maximum AVE levels are higher for financial services than for communications, insurance, other business services, and transport.[33] Adopting a methodology closely related to the one chosen for this paper, Benz (2017[18]) similarly finds the highest AVE levels with respect to financial services, the maximum reported for that sector (1246%) is relatively close to the maximum estimated in this study (1073%). In addition, the range of AVEs provided by Benz (2017[18]) for communications (between 51% and 299%) is also similar to the non-preferential AVEs for this sector listed in Table 10.

The AVEs quantify the impact of the STRI on the relative attractiveness of imported services versus domestically sourced services. Being based on observed trade values, rather than prices, it would not be correct to say that the *ad valorem* equivalent trade costs actually have to be paid for a cross-border services transaction. Consequently, this analysis does not inform whether services trade liberalisation contributes to a reduction in the prices of imported services. This would require an analysis of import prices, which is challenging for services due to the difficulty of defining comparable "units" of services. Moreover, the AVEs must be interpreted as the percentage point reduction of trade costs corresponding to a reduction of the STRI from its current level to zero. Only under the additional assumption that policy-induced trade costs are equal to zero at an STRI of zero, the AVEs also correspond to the current level of policy-induced trade costs.

8. Conclusion

This paper makes three main contributions. First, it presents the results of gravity regressions for cross-border services imports in five services sectors covering 46 countries. The results show that services trade barriers, as measured by the OECD STRI, are significantly associated with lower services trade in all five sectors. The main specification uses a cross-sectional dataset based on five-year averages of all annual data points. However, results are very similar when applying a panel specification to data for five years from 2014 to 2018, exploiting cross-sectoral variation and variation over time from almost 1200 policy changes, or based on annual data for the five years individually. Subsequently, gravity coefficients are transformed into *ad valorem* equivalents of services trade costs in these five sectors. The transformation relies on import demand elasticities taken from existing literature.

[33] The highest AVE reported by these authors is 290.6% (in the case of Laos and financial services), but their adoption of a benchmark approach and the use of a higher elasticity of substitution (5.6) limit the comparability of their estimates with the AVEs presented in this paper.

The results show that policy-induced services trade costs are relatively high. Average multilateral services trade costs are around 57% for communication services and 54% in business services, around 60% for transport services, around 103% for insurance services, and around 255% for financial services. Even exporting to the most liberal countries still requires to comply with regulation at a cost that correspond to around 30% of the export value in most sectors and nearly 90% for financial services. While barriers to services trade are lower within the European Single Market, even trade costs within the EEA cannot be neglected. On average, services trade costs within the Single Market are estimated at around 10% in most sectors and around 32% for financial services.

Second, it provides first evidence on trade effects of services liberalisation over time, using a gravity specification that only relies on time variation within country pairs over the five years covered by the analysis. The results show that services liberalisation can lead to an immediate growth of services trade imports in some sectors. For communication services, business services, and insurance services, there is additional evidence that RTAs boost bilateral services trade by between 21% and 41%.

Third, it identifies a significant relationship between services trade barriers and Mode 3 services trade in most sectors. It examines the impact of services regulation and shows that Mode 3 services trade and cross-border services trade seem to benefit to similar extent from liberalisation of communication services, financial and insurance services, and transport services.

These estimates of services trade costs are based on state-of-the-art methodology, comprehensive data and a longer time series compared to related studies. However, it has to be acknowledged that the growing availability of data on services trade and services trade barriers, as well as improvements in the measurement of services trade flows, may raise the precision of such estimates in the future.[34] Moreover, the availability of data for longer periods would permit to describe the time path of transitory adjustment after periods of regulatory liberalisation or tightening, informing on the number of years before regulatory reform is fully reflected in economic outcomes.

In addition, trade cost equivalents of specific regulatory barriers might change over time or might even change in response to policy interventions.[35] For example, technological progress, such as digitalisation, may make certain types of policy-related trade barriers less relevant for cross-border trade than they currently are. If exporters are able to overcome these barriers more easily, the AVEs of the corresponding sectors must be corrected downwards. Therefore, this analysis could be repeated in the future, when STRI data and services trade data for additional years become available.

[34] In particular, better coverage of services trade data for all modes, including commercial presence, would allow taking into account interactions and complementarities between different modes of services trade.

[35] This aspect is reflected in the famous Lucas critique (Lucas, 1976[54]).

Annex A. Data

Sector correspondence

Cross-border services trade flows are recorded in the EBOPS (Extended Balance of Payments Services) classification. A correspondence to GTAP sectors is established in order to estimate AVEs for METRO, shown in Table A A.1. Codes from the first column are used to reference sectors throughout the rest of this document. The table also shows the STRI sector used as measure of services trade restrictiveness in each GTAP sector. A synthetic STRI based on horizontal measures only is constructed for business services, due to the large variety of activities included in this sector. While economic data for financial services includes all financial service activities, except insurance and pension funding, the STRI for commercial banking is limited to lending, deposit-taking and payment services. However, it is assumed that the commercial banking STRI is a good proxy also for restrictions to trade in other financial services, such as investment banking and asset management. For the analysis of Mode 3 services trade, financial services and insurance services are aggregated into one sector, see Table A A.2. Table A A.3reports a detailed list of activities included in each sector, based on the ISIC rev. 4 classification.

Table A A.1. Sectors correspondence for cross-border services trade

Description	GTAP sector code	EBOPS 2010	ISIC rev. 4	STRI
Business Services	obs	SJ	69-82	Synthetic STRI based on horizontal measures
Communication	cmn	SI, SC4	53 + 58-63	Telecommunications, courier services, computer services°
Financial services	ofi	SG	64 + 66*	Commercial banking
Insurance	isr	SF	65 + 66**	Insurance
Transport	otp, wtp, atp	SC12, SC2, SC3C, SC3B2, SC3G	49-52	Air transport, maritime transport, rail freight, road transport°°

Note: Transport includes water transport, air transport and transport not elsewhere classified. Not covered are electricity; gas manufacture, distribution; water; construction; trade; recreational and other services; public administration, defence, health, education; dwellings. * Two thirds of ISIC66 (Activities auxiliary to financial service and insurance activities) is attributed to the GTAP sector ofi. ** One third of ISIC66 (Activities auxiliary to financial service and insurance activities) is attributed to the GTAP sector isr. ° Simple average of STRIs for telecommunications, courier services and computer services. °° Simple average of all transport STRIs available for a country (maritime transport is not available for landlocked countries).

Table A A.2. Sector correspondence for Mode 3 services trade

Description	GTAP sector code	ISIC rev. 4	STRI
Business Services	obs	69-82	Synthetic STRI based on horizontal measures
Communication	cmn	58-63	Telecommunications, courier services, computer services °
Finance and Insurance	ofi, isr	64-66	Commercial banking, insurance°°
Transport	otp, wtp, atp	49-53	Air transport, maritime transport, rail freight, road transport °°°

Note: Transport includes water transport, air transport and transport not elsewhere classified. Not covered are electricity; gas manufacture, distribution; water; construction; trade; recreational and other services; public administration, defence, health, education; dwellings. ° Simple average of STRIs for telecommunications, courier services and computer services. °° Simple average of STRIs for commercial banking and insurance. °°° Simple average of all transport STRIs available for a country (maritime transport is not available for landlocked countries).

Table A A.3. Sector classification by reference to ISIC rev. 4

GTAP	ISIC rev. 4	Description
obs	M, N	Professional, scientific and technical activities and Administrative and support service activities
cmn	53	Postal and courier activities
	58	Publishing activities
	59	Motion picture, video and television programme production, sound recording and music publishing activities
	60	Programming and broadcasting activities
	61	Telecommunications
	62	Computer programming, consultancy and related activities
	63	Information service activities
ofi	64	Financial service activities, except insurance and pension funding
	661	Activities auxiliary to financial service activities, except insurance and pension funding
	663	Fund management activities
ins	65	Insurance, reinsurance and pension funding, except compulsory social security
	662	Activities auxiliary to insurance and pension funding
otp	49	Land transport and transport via pipelines
	50	Water transport
	51	Air transport
	52	Warehousing and support activities for transportation

STRI

To measure policy-related barriers to trade in services, the analysis uses the OECD STRI for 46 countries for the years 2014 to 2018. Note that the STRI indicators are country-specific, rather than specific to country-pairs. The analysis includes two different STRI indicators in order to take into account that services trade regulation is substantially less restrictive among member states of the European Economic Area (EEA). The non-preferential STRI is applied to transactions involving at least one non-EEA country (e.g. Norway- China or South Africa-Brazil), whereas the newly available intra-EEA STRI (Benz and Gonzales, 2019[9]) is used for flows between EEA members (e.g. Norway and Poland).

Trade data, gravity variables, controls

Cross-border services trade data come from the OECD TISP database from 2014 to 2018 for all 46 countries included in the OECD STRI. As customary in the related literature (Benz, 2017[18]; Nordås and Rouzet, 2017[17]), information provided by a country's trade partners was used in those cases where the exporter provides insufficiently disaggregated data. This mirroring of trade flows allows for the inclusion of all major economies with large services exports and ensures that the analysis covers all 46 countries for which STRI data are available.[36]

In those cases where the exporter is the same country as the importing country, the export variable corresponds to within-country trade, defined as the share of gross services production in the corresponding sector that is consumed domestically. Data for within-country trade are constructed by

[36] Mirror statistics are also used in the construction of the OECD-WTO Balanced Trade in Services (BaTIS) dataset (Fontanier et al., 2017[61]) as well as in the construction of the UN Comtrade base. Mirrored statistics have several drawbacks, including the challenges related to asymmetries (e.g. the sum of all exports reported by country *i* does not correspond to all imports from *i* reported by all of *i*'s trade partners) as well as the neglect of exports to non-reporting countries (especially relevant to intra-African trade). Notwithstanding these caveats, the advantages of ensuring a broad coverage of major services exporters justify the use of mirrored statistics for the specific purpose of this analysis.

deducting a country's sector-level exports to the world (taken from the OECD EBOPS 2010 database) from gross production in that sector.

Data on gross production mostly come from the OECD national accounts and STAN databases. However, for some country-sector-year combinations there is no data available from these two sources. In cases where no data is available for a country-sector combination, we extract information on gross production form the GTAP database, which corresponds to the year 2014. An imputation procedure is used to fill the remaining observations for the years 2015-2018: We calculate the corresponding sector's gross output (taken from the GTAP database) as a share of the country's total GDP (based on the World Bank's WDI database) in 2014. A check drawing on non-missing observations (taken from OECD national accounts and STAN databases) confirms that this GDP share is relatively constant over the four years covered by the analysis. We then proceed to estimate the missing gross output values for 2015-2018 by multiplying the GDP share of 2014 with the total GDP values for the years 2015-2018.[37] In cases where data from the OECD national accounts or STAN is available for at least one year, the same imputation procedure is used to obtain values for the other years.

Data on Mode 3 services trade come from the OECD Analytical AMNE database (Cadestin et al., 2018[37]). The database reports output of foreign affiliates in 59 countries (in the host country, industry, parent country dimension) over the period 2005-2016. The database also includes information for the cases where host country and parent country are identical. In this situation, the numbers indicate the joint output of domestic MNEs and other local businesses. These numbers serve as measures of domestic services consumption in the case of Mode 3 services trade.

Data for standard gravity controls (distance, contiguity, common language, former colony, common legal system, common religion) are provided by CEPII. The regressions also include dummy variables for membership in the same RTA. Data on RTA membership comes from the DESTA database (Dür, Baccini and Elsig, 2014[44]). Moreover, a dummy equaling one if both trade partners are EEA members is included in order to control for the profound economic integration and institutional coordination among EEA member states.

[37] Several imputation methods were tested, including an approach based on the observed change of sectoral output in countries with complete data. The different techniques provided very similar results, the estimates based on the approach eventually chosen (based on GDP shares) display the highest correlation (.99) with the observed output data in OECD national accounts and STAN for countries with complete data.

Annex B. Derivation of the AVE formula

The gravity equation is given by the formula

$$Exports_{ij} = \frac{GDP_i\, GDP_j}{GDP_{world}} \left(\frac{tradecost_{ij}}{\Pi_i P_j}\right)^{(1-\sigma)}$$

In this expression, it is commonly assumed that the natural logarithm of the multiplicative trade cost factor is an additive function of individual trade cost components, where the different components are weighted with individual scaling factors α.

$$\ln tradecost_{ij} = \alpha_1 distance + \alpha_2 language + \alpha_3 colony + \alpha_4 religion + \alpha_5 border + \alpha_6 border * STRI + etc.$$

Consequently, policy induced trade costs are given by $tradecost_{pol} = \exp(\alpha_6 border * STRI)$ and the AVE of any given change in the STRI ($\Delta STRI$) is given by

$$AVE_{ij}^{\Delta STRI} = \frac{tradecost_{ij}^{new}}{tradecost_{ij}^{old}} - 1 = \frac{\exp(\alpha_6 border * STRI^{new})}{\exp(\alpha_6 border * STRI^{old})} - 1$$

For estimation with the PPML technique, the first expression is transformed into

$$Exports_{ij} = exp\ (\ln GDP_i + \ln GDP_j - \ln GDP_{world} + (1-\sigma) \ln tradecost_{ij} - (1-\sigma) \ln \Pi_i - (1-\sigma) \ln P_i)$$

Most terms on the right side of this expression are captured by the fixed effects in this regression, except for the term $(1-\sigma) \ln tradecost_{ij}$. Using the definition of $\ln tradecost_{ij}$ above, it becomes clear that the regression coefficient of the STRI interacted with the border dummy β_6 must be equal to $\beta_6 = (1-\sigma)\alpha_6$.

In other words, the change in the policy induced *ad valorem* equivalent of cross-border trade, where the border dummy is equal to one, is given by

$$AVE_{ij}^{\Delta STRI} = \frac{tradecost_{ij}^{new}}{tradecost_{ij}^{old}} - 1 = \frac{\exp\left(-\frac{STRI^{new} * \beta_6}{(\sigma-1)}\right)}{\exp\left(-\frac{STRI^{old} * \beta_6}{(\sigma-1)}\right)} - 1$$

In the straightforward case where a specific STRI is evaluated relative to a situation without any policy-induced services trade barriers, the denominator is equal to 1 and the expression can be written as

$$AVE_{ij}^{STRI} = \exp\left(-\frac{STRI * \beta_6}{(\sigma-1)}\right) - 1$$

Further information on the derivation of this expression can be found in (Rojas-Romagosa, 2018[45]).

Specification used in panel regressions

The panel analysis presented in Table 4 only exploits variation over time within a given importer-exporter pair. It relies on the general methodology described in Section 4, but also includes direction-specific fixed effects:

$$exports_{ijt,k} = \exp(\beta_1 STRI_{jt,k} INTL\_BRDR_{ij} + \gamma\ RTA_{ijt} + \eta_{it,k} + \mu_{jt,k} + \theta_{ij} + \varepsilon_{ijt,k})$$

These pair fixed effects control for all time-invariant characteristics of the relationship between exporter *i* and importer *j.* This implies that the international border dummy as well as all variables included in the vector Z_{ij} in the main analysis are absorbed by the pair fixed effects – with the exception of the (time-varying) dummy equalling one if the two countries share membership of a trade agreement other than the EEA. Exporter-year and importer-year fixed effects $\eta_{it,k}$ and $\mu_{jt,k}$ control for multilateral resistance terms and all other country-specific variables. As recommended in the recent literature on gravity estimations, we cluster standard errors in the panel regressions at three levels: exporter, importer, and year (Egger and Tarlea, 2015[46]; Larch et al., 2018[26]).

Annex C. Additional robustness checks

Cross-border services trade

Table A C.1. Regression results: Robustness check on business services restrictions

	(1)	(2)	(3)	(4)	(5)
Specification	Main specification	Telecom STRI	Computer services STRI	Weighted average STRI	Professional services and logistics STRI
Log distance	-0.584***	-0.590***	-0.584***	-0.585***	-0.574***
	(0.133)	(0.140)	(0.132)	(0.133)	(0.140)
Contiguity	0.009	0.014	0.015	0.010	0.034
	(0.133)	(0.144)	(0.127)	(0.133)	(0.131)
Common language	0.903***	0.851***	0.902***	0.872***	0.802***
	(0.199)	(0.206)	(0.197)	(0.194)	(0.193)
Previous colonial relationship	-0.172*	-0.079	-0.190*	-0.117	-0.078
	(0.102)	(0.102)	(0.103)	(0.116)	(0.113)
Common legal origin	0.011	0.020	0.011	0.027	0.019
	(0.117)	(0.101)	(0.117)	(0.106)	(0.109)
Common religion	-0.097	-0.199	-0.099	-0.154	-0.179
	(0.306)	(0.314)	(0.297)	(0.291)	(0.297)
RTA	-0.399**	-0.429**	-0.382**	-0.364**	-0.326*
	(0.162)	(0.169)	(0.157)	(0.157)	(0.168)
EEA	-1.041***	-0.492***	-1.108***	-0.939***	-0.963***
	(0.371)	(0.180)	(0.386)	(0.318)	(0.318)
International border	-4.256***	-4.243***	-4.194***	-4.101***	-4.133***
	(0.363)	(0.381)	(0.357)	(0.383)	(0.318)
International border x STRI	-3.920***	-2.609***	-4.356***	-4.390***	-3.776***
	(1.372)	(0.736)	(1.437)	(1.328)	(0.994)
Constant	18.225***	18.103***	18.244***	18.201***	18.137
	(0.951)	(0.963)	(0.948)	(0.948)	(0.997)
Observations	1,518	1,518	1,518	1,518	1,518
Exporter-Year F.E.	YES	YES	YES	YES	YES
Importer-Year F.E.	YES	YES	YES	YES	YES

Note: Standard errors clustered by exporter and importer parentheses *** p<0.01, ** p<0.05, * p<0.1. The first column uses the synthetic STRI also used for this sector in the main specification (Table 1).

Table A C.2. Regression results: Robustness check excluding intra-EEA STRI

	(1)	(2)	(3)	(4)	(5)
Sector	Communication	Business	Finance	Insurance	Transport
Log distance	-0.771***	-0.654***	-0.220	-0.750***	-0.421***
	(0.108)	(0.142)	(0.314)	(0.180)	(0.117)
Contiguity	-0.267**	0.004	0.215	-0.196	0.286**
	(0.115)	(0.145)	(0.349)	(0.332)	(0.112)
Common language	0.911***	0.862***	1.445***	0.901***	0.616***
	(0.224)	(0.208)	(0.193)	(0.231)	(0.128)
Previous colonial relationship	-0.275***	-0.295***	0.393***	0.344	0.533***
	(0.103)	(0.092)	(0.142)	(0.275)	(0.158)
Common legal origin	-0.100	-0.043	-0.265	0.042	-0.020
	(0.108)	(0.135)	(0.185)	(0.173)	(0.115)
Common religion	0.132	0.190	0.282	-0.030	0.347
	(0.337)	(0.316)	(0.733)	(0.512)	(0.272)
RTA	-0.190	-0.758***	-0.728**	-0.868***	-0.256
	(0.258)	(0.294)	(0.360)	(0.291)	(0.161)
EEA	0.206	-0.414***	0.798	0.355	0.536**
	(0.323)	(0.131)	(0.629)	(0.486)	(0.216)
International border	-2.733***	-3.012***	-2.763***	-2.718***	-2.668***
	(0.471)	(0.597)	(0.922)	(0.681)	(0.590)
International border x STRI	-6.830***	-7.247***	-12.365***	-9.033***	-6.955***
	(1.547)	(2.236)	(2.825)	(1.605)	(1.393)
Constant	17.990***	18.501***	14.068***	17.340***	15.044***
	(0.767)	(0.964)	(2.225)	(1.289)	(0.789)
Observations	1,549	1,518	1,343	1,294	1,436
Exporter F.E.	YES	YES	YES	YES	YES
Importer F.E.	YES	YES	YES	YES	YES

Note: Standard errors clustered by exporter and importer in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table A C.3. Regression results: Robustness check excluding intra-EEA trade flows

	(1)	(2)	(3)	(4)	(5)
Sector	Communication	Business	Finance	Insurance	Transport
Log distance	-0.737***	-0.742***	-0.796***	-0.589***	-0.390***
	(0.112)	(0.128)	(0.159)	(0.163)	(0.141)
Contiguity	-0.168	0.331	0.064	0.422	0.188
	(0.235)	(0.272)	(0.401)	(0.402)	(0.186)
Common language	1.088***	0.060	0.688***	0.340	0.355**
	(0.269)	(0.273)	(0.165)	(0.212)	(0.179)
Previous colonial relationship	-0.559**	-0.091	-0.321	-0.244	1.027***
	(0.266)	(0.205)	(0.260)	(0.220)	(0.212)
Common legal origin	-0.310***	-0.269	-0.509***	0.011	-0.316
	(0.079)	(0.204)	(0.154)	(0.116)	(0.253)
Common religion	0.719	0.594	1.322***	0.925	1.193***
	(0.653)	(0.471)	(0.493)	(0.609)	(0.294)
RTA	-0.129	-0.395**	-0.608**	-0.681**	-0.012
	(0.246)	(0.166)	(0.257)	(0.317)	(0.181)
International border	-4.129***	-3.220***	-2.321***	-4.490***	-3.613***
	(0.704)	(0.767)	(0.817)	(0.571)	(0.477)
International border x STRI	-3.026*	-5.619**	-9.692***	-3.904***	-4.393***
	(1.573)	(2.858)	(2.622)	(1.339)	(1.126)
Constant	18.579***	19.746***	18.806***	16.985***	15.485***
	(0.784)	(0.904)	(1.114)	(1.137)	(0.965)
Observations	940	901	785	766	828
Exporter F.E.	YES	YES	YES	YES	YES
Importer F.E.	YES	YES	YES	YES	YES

Note: Standard errors clustered by exporter and importer in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table A C.4. Regression results: Robustness check excluding Mode 3 from STRI

	(1)	(2)	(3)	(4)	(5)
Sector	Communication	Business	Finance	Insurance	Transport
Log distance	-0.761***	-0.605***	-0.101	-0.679***	-0.365***
	(0.109)	(0.139)	(0.339)	(0.194)	(0.092)
Contiguity	-0.279**	0.002	0.240	-0.126	0.259**
	(0.138)	(0.150)	(0.369)	(0.344)	(0.125)
Common language	0.992***	0.898***	1.495***	0.859***	0.755***
	(0.233)	(0.212)	(0.183)	(0.233)	(0.118)
Previous colonial relationship	-0.203**	-0.079	0.565***	0.509**	0.609***
	(0.100)	(0.098)	(0.119)	(0.224)	(0.182)
Common legal origin	-0.102	-0.022	-0.247	0.057	-0.048
	(0.109)	(0.111)	(0.182)	(0.172)	(0.137)
Common religion	0.084	0.087	0.199	-0.174	0.303
	(0.334)	(0.351)	(0.710)	(0.562)	(0.292)
RTA	-0.097	-0.507***	-0.215	-0.534**	-0.029
	(0.240)	(0.186)	(0.222)	(0.271)	(0.131)
EEA	-0.428	-0.627	-0.432	-0.504	0.053
	(0.309)	(0.401)	(0.535)	(0.595)	(0.317)
International border	-3.795***	-4.472***	-4.559***	-4.154***	-4.221***
	(0.341)	(0.407)	(0.732)	(0.540)	(0.352)
International border x STRI (excl. Mode 3)	-6.181***	-2.473	-13.731***	-9.681***	-5.863***
	(1.428)	(2.115)	(2.386)	(1.925)	(2.133)
Constant	18.102***	18.237***	13.571***	17.050***	14.820***
	(0.778)	(1.003)	(2.374)	(1.384)	(0.637)
Observations	1,549	1,518	1,343	1,294	1,436
Exporter F.E.	YES	YES	YES	YES	YES
Importer F.E.	YES	YES	YES	YES	YES

Note: Standard errors clustered by exporter and importer in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table A C.5. Regression results: Robustness check based on OLS

	(1)	(2)	(3)	(4)	(5)
Sector	Communication	Business	Finance	Insurance	Transport
Log distance	-1.774***	-1.828***	-1.956***	-1.831***	-1.719***
	(0.066)	(0.070)	(0.088)	(0.086)	(0.064)
Contiguity	-1.087***	-1.128***	-1.266***	-0.824***	-0.756***
	(0.149)	(0.157)	(0.231)	(0.196)	(0.151)
Common language	1.095***	0.792***	1.939***	1.045***	0.149
	(0.156)	(0.164)	(0.227)	(0.218)	(0.157)
Previous colonial relationship	0.415*	0.403*	0.203	0.098	0.818***
	(0.218)	(0.213)	(0.288)	(0.260)	(0.238)
Common legal origin	-0.101	0.079	-0.046	-0.015	0.264***
	(0.094)	(0.101)	(0.151)	(0.121)	(0.086)
Common religion	0.148	0.321**	0.738***	0.208	-0.325**
	(0.156)	(0.154)	(0.255)	(0.201)	(0.140)
RTA	-0.373***	-0.121	-0.348**	-0.207	0.130
	(0.116)	(0.118)	(0.171)	(0.149)	(0.127)
EEA	-0.878***	-1.454***	-1.572***	-1.078***	-0.706***
	(0.169)	(0.194)	(0.243)	(0.219)	(0.198)
STRI	-3.493***	-5.038***	-4.681***	-3.222***	-3.785***
	(0.493)	(0.616)	(0.791)	(0.584)	(0.547)
Log exporter's GDP	0.823***	0.992***	0.828***	0.865***	0.788***
	(0.024)	(0.026)	(0.044)	(0.036)	(0.025)
Log importer's GDP	0.924***	0.958***	0.779***	0.816***	0.912***
	(0.025)	(0.025)	(0.042)	(0.036)	(0.024)
Exporter's remoteness index	-0.417*	0.016	1.390***	1.631***	0.739***
	(0.242)	(0.235)	(0.336)	(0.316)	(0.286)
Importer's remoteness index	2.250***	1.162***	3.299***	3.260***	1.490***
	(0.252)	(0.244)	(0.345)	(0.314)	(0.294)
Constant	-20.683***	-15.915***	-43.534***	-48.446***	-23.207***
	(3.454)	(3.432)	(4.702)	(4.494)	(4.346)
Observations	1,541	1,513	1,321	1,236	1,436
R-squared	0.715	0.762	0.528	0.602	0.750
Exporter F.E.	NO	NO	NO	NO	NO
Importer F.E.	NO	NO	NO	NO	NO

Note: Standard errors clustered at pair level. For each country, the remoteness index was calculated as the logarithm of the average GDP-weighted bilateral distance to all other countries included in the World Bank's World Development Indicators dataset (Yotov et al., 2016[3]).

Mode 3 services trade

Table A C.1. Mode 3: STRI effects of Mode 3 restrictions

	(1)	(2)	(3)	(4)
Sector	Communication	Business	Finance & Insurance	Transport
Log distance	-0.768***	-0.807***	-0.745***	-0.930***
	(0.175)	(0.162)	(0.236)	(0.167)
Contiguity	-0.766***	-0.310	0.031	-0.128
	(0.233)	(0.224)	(0.264)	(0.248)
Common language	1.017***	0.711***	0.644***	0.521**
	(0.187)	(0.198)	(0.244)	(0.205)
Previous colonial relationship	-0.126	0.521**	0.738***	0.192
	(0.232)	(0.238)	(0.180)	(0.258)
Common legal origin	0.387**	0.201**	-0.033	0.292**
	(0.157)	(0.101)	(0.149)	(0.146)
Common religion	0.268	-0.106	0.695	-0.179
	(0.303)	(0.397)	(0.512)	(0.412)
RTA	-0.637***	-0.497*	-0.366	-0.085
	(0.236)	(0.262)	(0.250)	(0.171)
EEA	-1.452***	-0.184	-0.579	-0.848
	(0.532)	(0.489)	(0.634)	(0.593)
International border	-2.592***	-3.134***	-2.340***	-3.230***
	(0.458)	(0.374)	(0.455)	(0.562)
International border x STRI (only Mode 3)	-11.529***	-10.916	-7.994***	-8.637***
	(2.311)	(7.464)	(3.060)	(2.262)
Constant	18.145***	18.691***	17.927***	18.770***
	(1.262)	(1.108)	(1.709)	(1.184)
Observations	2,116	2,116	2,116	2,11
Exporter F.E.	YES	YES	YES	YES
Importer F.E.	YES	YES	YES	YES

Note: Standard errors clustered by exporter and importer in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table A C.2. Mode 3: Robustness check based on OLS

	(1)	(2)	(3)	(4)
Sector	Communication	Business	Finance	Insurance
Log distance	-1.390***	-1.456***	-1.311***	-1.476***
	(0.085)	(0.095)	(0.101)	(0.096)
Contiguity	-1.133***	-0.545**	-0.707**	-0.699***
	(0.263)	(0.244)	(0.305)	(0.263)
Common language	1.206***	0.951***	0.890***	0.624***
	(0.250)	(0.243)	(0.259)	(0.241)
Previous colonial relationship	0.278	0.106	0.646**	0.106
	(0.294)	(0.275)	(0.307)	(0.300)
Common legal origin	0.104	-0.138	0.166	-0.126
	(0.182)	(0.171)	(0.202)	(0.179)
Common religion	-0.087	0.409	0.312	0.013
	(0.298)	(0.276)	(0.358)	(0.302)
RTA	-0.780***	-1.111***	-0.490**	-0.946***
	(0.170)	(0.184)	(0.215)	(0.186)
EEA	-2.355***	-3.314***	-2.040***	-3.162***
	(0.248)	(0.286)	(0.306)	(0.263)
STRI	-6.997***	-11.086***	-10.248***	-8.675***
	(0.689)	(1.057)	(1.055)	(0.723)
Log exporter's GDP	0.687***	0.749***	0.605***	0.616***
	(0.047)	(0.047)	(0.060)	(0.051)
Log importer's GDP	0.946***	0.895***	1.083***	0.910***
	(0.047)	(0.049)	(0.068)	(0.046)
Exporter's remoteness index	0.818**	1.044***	2.212***	0.547
	(0.343)	(0.359)	(0.407)	(0.356)
Importer's remoteness index	0.086	-2.244***	-1.334***	-2.848***
	(0.344)	(0.370)	(0.453)	(0.393)
Constant	-12.443***	7.703	-13.003**	19.043***
	(4.643)	(5.118)	(5.825)	(4.928)
Observations	1,176	1,209	776	1,078
R-squared	0.493	0.564	0.572	0.574
Exporter F.E.	NO	NO	NO	NO
Importer F.E.	NO	NO	NO	NO

Note: Standard errors clustered at pair level. For each country, the remoteness index was calculated as the logarithm of the average GDP-weighted bilateral distance to all other countries included in the World Bank's World Development Indicators dataset (Yotov et al., 2016[3]).

Annex D. AVEs for cross-border services trade by country, sector and year

Table A D.1. AVEs 2014, by country and sector

	Communication		Business services		Financial services		Insurance		Transport	
Country	MFN	EEA	MFN	EEA	MFN	EEA	MFN	EEA	MFN	EEA
AUS	55.5%		41.3%		154.1%		72.1%		37.0%	
AUT	41.8%	13.8%	58.9%	13.5%	175.0%	45.6%	98.3%	13.1%	51.5%	16.7%
BEL	53.4%	15.3%	64.8%	10.6%	197.1%	44.8%	79.6%	12.1%	56.4%	13.1%
BRA	86.6%		69.6%		716.0%		185.5%		63.8%	
CAN	62.8%		33.1%		120.8%		76.9%		39.6%	
CHE	72.3%		77.5%		315.2%		101.8%		62.3%	
CHL	65.9%		33.5%		190.2%		60.7%		31.1%	
CHN	187.8%		81.1%		609.0%		274.8%		80.0%	
COL	48.0%		49.9%		317.8%		98.3%		40.3%	
CRI	44.1%		49.0%		190.9%		74.7%		56.9%	
CZE	33.2%	18.1%	31.9%	10.6%	88.4%	33.0%	42.3%	10.2%	43.1%	16.4%
DEU	28.6%	11.1%	38.2%	11.3%	125.3%	55.2%	48.4%	12.2%	43.1%	14.9%
DNK	28.0%	9.3%	32.1%	4.9%	113.9%	21.3%	53.3%	7.4%	40.8%	11.1%
ESP	35.1%	12.6%	40.2%	10.6%	86.3%	26.8%	70.0%	16.0%	43.8%	13.1%
EST	46.0%	8.2%	60.5%	2.1%	137.5%	20.2%	63.0%	3.6%	51.3%	10.0%
FIN	48.5%	11.5%	62.8%	7.7%	189.0%	21.6%	101.6%	6.5%	61.8%	16.1%
FRA	26.8%	4.8%	32.8%	2.1%	111.5%	26.9%	37.7%	7.3%	42.4%	12.1%
GBR	38.5%	13.4%	41.9%	5.5%	132.3%	26.1%	57.1%	7.3%	42.8%	10.1%
GRC	47.8%	10.4%	62.8%	9.9%	240.2%	37.8%	126.3%	13.2%	57.8%	11.5%
HUN	37.0%	12.2%	41.2%	7.6%	168.6%	33.9%	68.8%	9.2%	47.4%	13.8%
IDN	129.5%		89.5%		1013.2%		301.7%		105.6%	
IND	114.0%		91.5%		981.2%		394.2%		136.1%	
IRL	31.4%	7.5%	39.2%	2.7%	107.6%	25.8%	47.4%	4.6%	41.9%	10.6%
ISL	97.3%	27.1%	117.0%	12.8%	451.5%	57.8%	171.6%	16.3%	82.7%	12.4%
ISR	91.0%		66.0%		228.5%		110.1%		102.7%	
ITA	46.2%	14.5%	57.4%	12.8%	129.7%	38.8%	99.0%	12.1%	53.4%	13.9%
JPN	45.7%		31.9%		171.1%		69.0%		40.4%	
KOR	64.2%		30.2%		163.8%		36.8%		104.7%	
LTU	28.9%	7.2%	35.6%	4.8%	112.5%	14.9%	42.4%	4.6%	41.5%	10.5%
LUX	35.5%	13.1%	39.1%	10.6%	134.1%	60.9%	60.9%	10.2%	46.8%	15.1%
LVA	30.4%	10.1%	35.7%	7.7%	112.5%	27.6%	49.4%	6.5%	44.4%	14.5%
MEX	77.1%		56.3%		454.5%		114.3%		81.7%	
MYS	80.8%		73.4%		234.8%		129.4%		79.1%	
NLD	26.5%	5.0%	39.0%	2.7%	117.3%	21.6%	47.0%	14.3%	35.2%	8.9%
NOR	64.7%	24.4%	55.5%	4.2%	235.7%	26.9%	120.5%	11.3%	62.2%	13.6%
NZL	41.7%		43.1%		140.0%		47.6%		43.4%	
POL	37.1%	9.7%	39.2%	7.6%	186.1%	52.0%	68.6%	15.0%	46.8%	13.7%
PRT	29.8%	4.9%	42.0%	2.1%	124.0%	32.8%	78.6%	5.4%	39.5%	10.0%
RUS	90.7%		95.4%		339.1%		177.5%		129.3%	
SVK	32.8%	10.2%	34.6%	7.6%	125.8%	32.7%	48.9%	7.3%	49.1%	14.5%
SVN	33.4%	5.2%	48.1%	2.1%	119.7%	21.3%	60.3%	13.4%	50.7%	13.6%
SWE	43.6%	8.5%	57.5%	4.8%	165.9%	14.9%	87.3%	6.4%	58.4%	13.0%
THA	112.4%		110.7%		794.0%		407.6%		158.6%	
TUR	74.6%		60.4%		212.6%		82.2%		57.9%	
USA	48.9%		34.7%		167.2%		125.7%		55.8%	
ZAF	65.7%		37.7%		321.5%		93.7%		49.2%	

Source: Own estimates.

Table A D.2. AVEs 2015, by country and sector

	Communication		Business services		Financial services		Insurance		Transport	
Country	MFN	EEA	MFN	EEA	MFN	EEA	MFN	EEA	MFN	EEA
AUS	55.5%		41.3%		154.1%		72.1%		37.0%	
AUT	41.8%	13.8%	58.9%	13.5%	175.0%	45.6%	98.3%	13.1%	51.5%	16.7%
BEL	53.4%	15.3%	64.8%	10.6%	197.1%	44.8%	79.6%	12.1%	56.4%	13.1%
BRA	83.9%		65.2%		677.7%		178.1%		62.3%	
CAN	62.8%		33.1%		120.8%		76.9%		39.6%	
CHE	72.3%		77.5%		315.2%		101.8%		62.3%	
CHL	65.9%		33.5%		190.2%		60.7%		31.1%	
CHN	187.8%		81.1%		609.0%		261.3%		75.4%	
COL	48.0%		49.9%		299.3%		98.3%		40.3%	
CRI	44.1%		49.0%		178.0%		74.7%		56.9%	
CZE	33.2%	18.1%	31.9%	10.6%	88.4%	33.0%	42.3%	10.2%	43.1%	16.4%
DEU	28.6%	11.1%	38.2%	11.3%	125.3%	55.2%	48.4%	12.2%	43.1%	14.9%
DNK	29.2%	7.0%	37.5%	2.1%	112.9%	14.5%	56.1%	5.4%	41.1%	8.7%
ESP	35.1%	12.6%	40.2%	10.6%	86.3%	26.8%	70.0%	16.0%	43.8%	13.1%
EST	43.0%	8.2%	56.3%	2.1%	126.3%	20.2%	58.8%	3.6%	49.9%	10.0%
FIN	48.5%	11.5%	62.8%	7.7%	189.0%	21.6%	101.6%	6.5%	61.8%	16.1%
FRA	26.8%	4.8%	32.8%	2.1%	121.3%	32.8%	37.7%	7.3%	41.3%	10.9%
GBR	35.6%	11.0%	38.2%	2.7%	131.7%	25.8%	53.0%	4.6%	41.4%	9.1%
GRC	44.7%	8.1%	58.6%	7.0%	224.3%	31.3%	120.5%	10.2%	56.3%	10.4%
HUN	43.7%	12.2%	56.1%	7.6%	190.7%	33.9%	78.2%	9.2%	51.9%	13.8%
IDN	129.5%		89.5%		926.5%		309.2%		104.6%	
IND	111.2%		87.6%		981.2%		376.2%		134.4%	
IRL	28.6%	5.3%	35.5%	0.0%	97.9%	19.9%	43.6%	1.9%	40.5%	9.6%
ISL	97.3%	27.1%	117.0%	12.8%	451.5%	57.8%	171.6%	16.3%	82.7%	12.4%
ISR	83.7%		66.0%		228.5%		110.1%		102.7%	
ITA	46.2%	14.5%	57.4%	12.8%	129.7%	38.8%	99.0%	12.1%	53.4%	13.9%
JPN	43.4%		28.3%		156.0%		59.9%		37.0%	
KOR	62.7%		30.2%		149.2%		36.8%		104.7%	
LTU	26.2%	5.0%	32.0%	2.1%	113.1%	15.2%	38.7%	1.9%	40.2%	9.5%
LUX	34.2%	12.0%	39.1%	10.6%	134.1%	60.9%	60.9%	10.2%	46.8%	15.1%
LVA	34.1%	13.2%	39.3%	10.7%	123.0%	33.9%	53.3%	9.3%	45.8%	15.6%
MEX	66.8%		56.3%		454.5%		99.1%		80.7%	
MYS	77.0%		68.8%		219.1%		123.4%		77.5%	
NLD	26.5%	5.0%	39.0%	2.7%	117.3%	21.6%	47.0%	14.3%	35.2%	8.9%
NOR	64.7%	24.4%	55.5%	4.2%	235.7%	26.9%	120.5%	11.3%	62.2%	13.6%
NZL	44.8%		47.1%		154.1%		47.6%		45.7%	
POL	37.1%	9.7%	39.2%	7.6%	186.1%	52.0%	68.6%	15.0%	46.8%	13.7%
PRT	31.9%	6.6%	45.9%	4.8%	146.6%	46.2%	83.4%	8.2%	40.8%	11.1%
RUS	90.0%		95.6%		369.1%		175.4%		131.9%	
SVK	32.8%	10.2%	34.6%	7.6%	125.8%	32.7%	48.9%	7.3%	49.1%	14.5%
SVN	33.4%	5.2%	48.1%	2.1%	119.7%	21.3%	60.3%	13.4%	50.7%	13.6%
SWE	43.6%	8.5%	57.5%	4.8%	165.9%	14.9%	87.3%	6.4%	58.4%	13.0%
THA	112.4%		110.7%		754.4%		407.6%		158.6%	
TUR	74.6%		60.4%		212.6%		82.2%		57.0%	
USA	48.9%		34.7%		167.2%		125.7%		55.8%	
ZAF	65.7%		37.7%		321.5%		93.7%		49.2%	

Source: Own estimates.

Table A D.3. AVEs 2016, by country and sector

	Communication		Business services		Financial services		Insurance		Transport	
Country	MFN	EEA	MFN	EEA	MFN	EEA	MFN	EEA	MFN	EEA
AUS	55.5%		41.3%		165.9%		72.1%		37.0%	
AUT	41.8%	13.8%	58.9%	13.5%	175.0%	45.6%	98.3%	13.1%	51.5%	16.7%
BEL	53.4%	15.3%	64.8%	10.6%	197.1%	44.8%	79.6%	12.1%	54.7%	11.8%
BRA	87.4%		69.8%		723.4%		183.3%		65.9%	
CAN	62.8%		33.1%		120.8%		76.9%		39.6%	
CHE	72.3%		77.5%		315.2%		101.8%		62.3%	
CHL	65.9%		33.5%		190.2%		60.7%		31.1%	
CHN	187.8%		81.1%		609.0%		261.3%		72.2%	
COL	49.9%		49.9%		299.3%		98.3%		40.3%	
CRI	44.1%		49.0%		178.0%		74.7%		56.9%	
CZE	32.5%	15.0%	35.4%	10.6%	97.7%	33.0%	46.1%	10.2%	44.5%	16.4%
DEU	28.6%	11.1%	38.2%	11.3%	125.3%	55.2%	48.4%	12.2%	43.1%	14.9%
DNK	29.2%	7.0%	37.5%	2.1%	112.9%	14.5%	56.1%	5.4%	41.1%	8.7%
ESP	35.1%	12.6%	40.2%	10.6%	86.3%	26.8%	70.0%	16.0%	43.8%	13.1%
EST	43.0%	8.2%	56.3%	2.1%	126.3%	20.2%	58.8%	3.6%	49.2%	9.5%
FIN	45.3%	9.1%	58.4%	4.8%	173.0%	14.9%	97.9%	4.6%	58.3%	13.6%
FRA	28.8%	4.8%	37.3%	2.1%	127.2%	32.8%	40.2%	7.3%	43.0%	10.9%
GBR	32.8%	8.7%	34.6%	0.0%	120.8%	19.9%	49.1%	1.9%	40.1%	8.0%
GRC	44.7%	8.1%	58.6%	7.0%	224.3%	31.3%	120.5%	10.2%	56.3%	10.4%
HUN	45.9%	12.2%	61.5%	7.6%	198.5%	33.9%	81.4%	9.2%	53.4%	13.8%
IDN	127.5%		85.6%		926.5%		309.2%		99.9%	
IND	111.2%		87.6%		981.2%		376.2%		129.3%	
IRL	28.6%	5.3%	35.5%	0.0%	97.9%	19.9%	39.9%	1.9%	40.5%	9.6%
ISL	98.3%	26.9%	117.0%	12.8%	451.5%	57.8%	171.6%	16.3%	82.7%	12.4%
ISR	83.7%		66.0%		228.5%		102.9%		102.7%	
ITA	46.2%	14.5%	57.4%	12.8%	129.7%	38.8%	99.0%	12.1%	53.4%	13.9%
JPN	43.4%		28.3%		145.9%		57.0%		37.0%	
KOR	59.5%		26.7%		135.3%		34.3%		100.8%	
LTU	28.2%	5.0%	36.5%	2.1%	118.8%	15.2%	41.2%	1.9%	41.5%	9.2%
LUX	34.2%	12.0%	39.1%	10.6%	134.1%	60.9%	63.9%	10.2%	46.8%	15.1%
LVA	28.5%	8.5%	32.1%	4.9%	102.6%	21.6%	45.5%	3.8%	43.1%	13.5%
MEX	66.8%		56.3%		454.5%		99.1%		80.7%	
MYS	77.0%		68.8%		219.1%		123.4%		77.5%	
NLD	26.5%	5.0%	39.0%	2.7%	117.3%	21.6%	47.0%	14.3%	35.2%	8.9%
NOR	53.6%	11.8%	59.7%	4.2%	252.2%	26.9%	126.4%	11.3%	63.7%	13.6%
NZL	44.8%		47.1%		154.1%		47.6%		45.7%	
POL	37.1%	9.7%	39.2%	7.6%	186.1%	52.0%	68.6%	15.0%	46.8%	13.7%
PRT	31.9%	6.6%	45.9%	4.8%	146.6%	46.2%	83.4%	8.2%	40.8%	11.1%
RUS	90.0%		95.6%		396.6%		175.4%		131.9%	
SVK	32.0%	9.5%	34.6%	7.6%	125.8%	32.7%	48.9%	7.3%	49.1%	14.5%
SVN	36.2%	5.2%	52.0%	2.1%	130.5%	21.3%	55.7%	13.4%	51.5%	13.1%
SWE	39.8%	5.6%	53.3%	2.1%	153.4%	9.5%	82.5%	3.6%	56.9%	11.9%
THA	112.4%		110.7%		707.0%		407.6%		157.2%	
TUR	78.1%		64.8%		231.0%		85.5%		61.3%	
USA	48.9%		34.7%		167.2%		125.7%		55.8%	
ZAF	65.7%		37.7%		321.5%		93.7%		49.2%	

Source: Own estimates.

Table A D.4. AVEs 2017, by country and sector

	Communication		Business services		Financial services		Insurance		Transport	
Country	MFN	EEA	MFN	EEA	MFN	EEA	MFN	EEA	MFN	EEA
AUS	55.5%		41.3%		154.1%		72.1%		37.0%	
AUT	42.5%	14.4%	58.9%	13.5%	175.0%	45.6%	98.3%	13.1%	51.5%	16.7%
BEL	53.4%	15.3%	64.8%	10.6%	197.1%	44.8%	79.6%	12.1%	54.7%	11.8%
BRA	87.4%		69.8%		723.4%		183.3%		65.9%	
CAN	62.8%		33.1%		120.8%		76.9%		39.6%	
CHE	72.3%		77.5%		315.2%		101.8%		62.3%	
CHL	65.9%		33.5%		190.2%		60.7%		31.1%	
CHN	187.8%		81.1%		609.0%		261.3%		72.2%	
COL	46.0%		47.0%		272.5%		91.6%		40.0%	
CRI	44.1%		49.0%		178.0%		74.7%		56.9%	
CZE	32.5%	15.0%	35.4%	10.6%	97.7%	33.0%	46.1%	10.2%	43.5%	15.6%
DEU	26.0%	8.8%	34.5%	8.4%	114.7%	47.9%	44.5%	9.3%	41.8%	13.8%
DNK	29.2%	7.0%	37.5%	2.1%	112.9%	14.5%	56.1%	5.4%	41.1%	8.7%
ESP	34.5%	12.0%	40.2%	10.6%	86.3%	26.8%	70.0%	16.0%	43.8%	13.1%
EST	45.2%	8.2%	61.6%	2.1%	132.4%	20.2%	61.7%	3.6%	51.0%	9.5%
FIN	45.3%	9.1%	58.4%	4.8%	173.0%	14.9%	97.9%	4.6%	58.3%	13.6%
FRA	28.8%	4.8%	37.3%	2.1%	127.2%	32.8%	40.2%	7.3%	43.0%	10.9%
GBR	34.9%	8.7%	39.2%	0.0%	126.7%	19.9%	51.8%	1.9%	41.8%	8.0%
GRC	44.7%	8.1%	58.6%	7.0%	224.3%	31.3%	120.5%	10.2%	55.5%	9.8%
HUN	45.9%	12.2%	61.5%	7.6%	198.5%	33.9%	81.4%	9.2%	53.4%	13.8%
IDN	126.1%		85.6%		926.5%		295.3%		99.4%	
IND	116.2%		95.6%		1072.6%		393.9%		134.5%	
IRL	28.6%	5.3%	35.5%	0.0%	97.9%	19.9%	39.9%	1.9%	40.5%	9.6%
ISL	103.4%	28.2%	125.8%	12.8%	449.1%	57.8%	181.4%	16.3%	82.5%	12.4%
ISR	82.7%		66.0%		210.3%		102.9%		102.7%	
ITA	46.2%	14.5%	57.4%	12.8%	140.3%	45.2%	99.0%	12.1%	53.4%	13.9%
JPN	46.6%		31.9%		160.3%		59.9%		40.0%	
KOR	60.3%		25.9%		131.9%		34.4%		103.9%	
LTU	28.2%	5.0%	36.5%	2.1%	106.7%	15.2%	41.2%	1.9%	41.5%	9.2%
LUX	34.2%	12.0%	39.1%	10.6%	134.1%	60.9%	63.9%	10.2%	46.8%	15.1%
LVA	29.8%	9.6%	32.1%	4.9%	102.6%	21.6%	45.5%	3.8%	43.1%	13.5%
MEX	70.1%		60.5%		481.8%		104.4%		81.5%	
MYS	80.8%		73.4%		234.8%		129.4%		79.1%	
NLD	26.5%	5.0%	39.0%	2.7%	117.3%	21.6%	41.7%	10.1%	35.2%	8.9%
NOR	52.2%	10.8%	56.4%	2.1%	252.2%	26.9%	126.4%	11.3%	60.9%	11.8%
NZL	43.9%		47.1%		154.1%		47.6%		45.7%	
POL	37.1%	9.7%	39.2%	7.6%	186.1%	52.0%	68.6%	15.0%	46.8%	13.7%
PRT	25.8%	6.6%	31.9%	4.8%	127.9%	46.2%	73.7%	8.2%	35.9%	11.1%
RUS	90.0%		95.6%		425.8%		195.7%		131.9%	
SVK	32.0%	9.5%	34.6%	7.6%	125.8%	32.7%	48.9%	7.3%	49.1%	14.5%
SVN	36.2%	5.2%	52.0%	2.1%	130.5%	21.3%	55.7%	13.4%	51.5%	13.1%
SWE	39.8%	5.6%	53.3%	2.1%	165.2%	14.5%	85.7%	5.4%	56.9%	11.9%
THA	101.0%		99.8%		676.1%		373.5%		154.4%	
TUR	78.1%		64.8%		231.0%		85.5%		61.3%	
USA	50.3%		39.3%		167.2%		125.7%		55.8%	
ZAF	69.0%		41.4%		342.2%		98.9%		50.6%	

Source: Own estimates.

Table A D.5. AVEs 2018, by country and sector

	Communication		Business services		Financial services		Insurance		Transport	
Country	MFN	EEA	MFN	EEA	MFN	EEA	MFN	EEA	MFN	EEA
AUS	52.5%		37.4%		140.0%		68.9%		34.1%	
AUT	42.5%	14.4%	58.9%	13.5%	175.0%	45.6%	98.3%	13.1%	51.5%	16.7%
BEL	53.4%	15.3%	64.8%	10.6%	197.1%	44.8%	79.6%	12.1%	54.7%	11.8%
BRA	90.0%		74.5%		823.0%		193.9%		52.3%	
CAN	62.8%		33.1%		120.8%		76.9%		38.1%	
CHE	72.3%		77.5%		315.2%		101.8%		62.3%	
CHL	65.9%		33.5%		165.6%		60.7%		31.1%	
CHN	192.7%		86.0%		602.6%		250.9%		69.6%	
COL	46.0%		47.0%		272.5%		91.6%		40.0%	
CRI	44.1%		49.0%		178.0%		74.7%		56.9%	
CZE	28.5%	11.5%	31.9%	7.6%	88.4%	26.8%	42.3%	7.3%	42.1%	14.5%
DEU	26.0%	8.8%	34.5%	8.4%	114.7%	47.9%	44.5%	9.3%	41.8%	13.8%
DNK	31.2%	7.0%	42.2%	2.1%	118.6%	14.5%	58.9%	5.4%	42.1%	8.3%
ESP	34.5%	12.0%	40.2%	10.6%	86.3%	26.8%	70.0%	16.0%	43.8%	13.1%
EST	43.7%	8.2%	55.2%	2.1%	131.3%	20.2%	60.1%	3.6%	48.9%	9.5%
FIN	45.3%	9.1%	58.4%	4.8%	173.0%	14.9%	97.9%	4.6%	58.3%	13.6%
FRA	26.1%	4.8%	33.7%	2.1%	116.6%	32.8%	36.6%	7.3%	41.7%	10.9%
GBR	34.9%	8.7%	39.2%	0.0%	126.7%	19.9%	51.8%	1.9%	41.8%	8.0%
GRC	44.7%	8.1%	58.6%	7.0%	224.3%	31.3%	120.5%	10.2%	55.5%	9.8%
HUN	45.9%	12.2%	61.5%	7.6%	198.5%	33.9%	81.4%	9.2%	53.4%	13.8%
IDN	126.1%		85.6%		926.5%		295.3%		99.4%	
IND	116.2%		95.6%		1072.6%		393.9%		133.1%	
IRL	28.6%	5.3%	35.5%	0.0%	97.9%	19.9%	39.9%	1.9%	40.5%	9.6%
ISL	103.4%	28.2%	125.8%	12.8%	449.1%	57.8%	181.4%	16.3%	82.5%	12.4%
ISR	83.6%		66.0%		210.3%		102.9%		102.7%	
ITA	46.2%	14.5%	57.4%	12.8%	140.3%	45.2%	99.0%	12.1%	53.4%	13.9%
JPN	46.6%		31.9%		160.3%		59.9%		40.0%	
KOR	60.3%		25.9%		131.9%		34.4%		106.0%	
LTU	28.2%	5.0%	36.5%	2.1%	116.2%	15.2%	41.2%	1.9%	41.5%	9.2%
LUX	34.2%	12.0%	39.1%	10.6%	134.1%	60.9%	63.9%	10.2%	46.8%	15.1%
LVA	29.8%	9.6%	32.1%	4.9%	102.6%	21.6%	45.5%	3.8%	42.8%	13.2%
MEX	70.1%		60.5%		481.8%		104.4%		81.5%	
MYS	80.8%		73.4%		234.8%		129.4%		79.1%	
NLD	26.5%	5.0%	39.0%	2.7%	117.3%	21.6%	41.7%	10.1%	35.2%	8.9%
NOR	52.2%	10.8%	56.4%	2.1%	252.2%	26.9%	126.4%	11.3%	60.2%	11.3%
NZL	43.9%		47.1%		154.1%		47.6%		45.7%	
POL	39.0%	9.7%	43.1%	7.6%	186.1%	52.0%	68.6%	15.0%	47.5%	14.1%
PRT	25.8%	6.6%	31.9%	4.8%	127.9%	46.2%	73.7%	8.2%	35.9%	11.1%
RUS	91.1%		95.6%		425.8%		195.7%		131.9%	
SVK	32.0%	9.5%	34.6%	7.6%	125.8%	32.7%	48.9%	7.3%	49.1%	14.5%
SVN	36.2%	5.2%	52.0%	2.1%	130.5%	21.3%	55.7%	13.4%	51.5%	13.1%
SWE	37.6%	5.6%	48.3%	2.1%	158.3%	14.5%	82.4%	5.4%	54.4%	11.4%
THA	92.8%		89.5%		605.1%		349.3%		151.7%	
TUR	85.0%		72.9%		299.5%		85.5%		67.7%	
USA	50.3%		39.3%		167.2%		125.7%		55.8%	
ZAF	78.0%		49.4%		352.8%		72.1%		57.3%	

Source: Own estimates.

Table A D.6. AVEs 2019, by country and sector

	Communication		Business services		Financial services		Insurance		Transport	
Country	MFN	EEA	MFN	EEA	MFN	EEA	MFN	EEA	MFN	EEA
AUS	52.5%		37.4%		140.0%		68.9%		34.1%	
AUT	42.5%	14.4%	58.9%	13.5%	175.0%	45.6%	98.3%	13.1%	51.5%	16.7%
BEL	53.4%	15.3%	64.8%	10.6%	197.1%	44.8%	79.6%	12.1%	54.7%	11.8%
BRA	90.0%		74.5%		823.0%		193.9%		52.3%	
CAN	61.2%		33.1%		120.8%		76.9%		38.1%	
CHE	72.3%		77.5%		315.2%		101.8%		62.3%	
CHL	65.9%		33.5%		165.6%		60.7%		31.1%	
CHN	183.5%		76.4%		538.3%		233.0%		64.4%	
COL	46.0%		47.0%		272.5%		91.6%		40.0%	
CRI	44.1%		49.0%		178.0%		74.7%		56.9%	
CZE	28.5%	11.5%	31.9%	7.6%	88.4%	26.8%	42.3%	7.3%	42.1%	14.5%
DEU	28.6%	8.8%	38.2%	8.4%	125.3%	47.9%	48.4%	9.3%	43.1%	13.8%
DNK	31.2%	7.0%	42.2%	2.1%	118.6%	14.5%	58.9%	5.4%	42.1%	8.3%
ESP	34.5%	12.0%	40.2%	10.6%	86.3%	26.8%	70.0%	16.0%	43.8%	13.1%
EST	43.7%	8.2%	55.2%	2.1%	131.3%	20.2%	60.1%	3.6%	48.9%	9.5%
FIN	45.3%	9.1%	58.4%	4.8%	173.0%	14.9%	97.9%	4.6%	58.3%	13.6%
FRA	24.0%	4.8%	31.0%	2.1%	108.0%	32.8%	34.1%	7.3%	39.4%	10.9%
GBR	34.9%	8.7%	39.2%	0.0%	126.7%	19.9%	51.8%	1.9%	41.8%	8.0%
GRC	44.7%	8.1%	58.6%	7.0%	182.4%	26.1%	116.5%	8.2%	55.5%	9.8%
HUN	47.7%	12.2%	61.5%	7.6%	216.1%	33.9%	81.4%	9.2%	53.4%	13.8%
IDN	126.1%		85.6%		926.5%		295.3%		99.4%	
IND	116.2%		95.6%		1072.6%		393.9%		133.1%	
IRL	30.2%	5.3%	40.1%	0.0%	97.9%	19.9%	39.9%	1.9%	40.7%	9.6%
ISL	103.4%	28.2%	125.8%	12.8%	449.1%	57.8%	181.4%	16.3%	82.5%	12.4%
ISR	83.6%		66.0%		210.3%		102.9%		102.7%	
ITA	46.2%	14.5%	57.4%	12.8%	140.3%	45.2%	99.0%	12.1%	53.4%	13.9%
JPN	46.6%		31.9%		160.3%		59.9%		40.0%	
KOR	60.3%		25.9%		131.9%		34.4%		106.0%	
LTU	28.2%	5.0%	36.5%	2.1%	116.2%	15.2%	41.2%	1.9%	41.5%	9.2%
LUX	34.2%	12.0%	39.1%	10.6%	134.1%	60.9%	63.9%	10.2%	46.8%	15.1%
LVA	29.8%	9.6%	32.1%	4.9%	102.6%	21.6%	45.5%	3.8%	42.8%	13.2%
MEX	70.9%		60.5%		481.8%		104.4%		81.5%	
MYS	80.8%		73.4%		234.8%		129.4%		79.1%	
NLD	26.5%	5.0%	39.0%	2.7%	117.3%	21.6%	41.7%	10.1%	35.2%	8.9%
NOR	56.5%	10.8%	60.8%	2.1%	272.9%	26.9%	130.6%	11.3%	63.3%	11.3%
NZL	43.9%		47.1%		154.1%		47.6%		45.7%	
POL	45.7%	9.7%	58.3%	7.6%	209.6%	52.0%	78.0%	15.0%	52.8%	14.1%
PRT	25.8%	6.6%	31.9%	4.8%	127.9%	46.2%	73.7%	8.2%	35.9%	11.1%
RUS	91.1%		95.6%		447.6%		195.7%		131.9%	
SVK	32.0%	9.5%	34.6%	7.6%	125.8%	32.7%	48.9%	7.3%	49.1%	14.5%
SVN	36.2%	5.2%	52.0%	2.1%	130.5%	21.3%	55.7%	13.4%	51.5%	13.1%
SWE	37.6%	5.6%	48.3%	2.1%	158.3%	14.5%	82.4%	5.4%	54.4%	11.4%
THA	92.8%		89.5%		605.1%		349.3%		151.7%	
TUR	89.7%		77.8%		323.0%		89.0%		72.4%	
USA	50.3%		39.3%		167.2%		125.7%		55.8%	
ZAF	78.0%		49.4%		352.8%		72.1%		57.3%	

Source: Own estimates.

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