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# The impact of services trade restrictiveness on export flows

*A study on OECD countries' restrictiveness to trade in services*

Bachelor Thesis

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## Abstract

Services trade is increasingly becoming more important in the international economy. However, barriers to trade in services remain more obstructive than those to trade in goods. This paper uses the OECD Services Trade Restrictiveness Index to analyze the relationship between restrictions to trade in services and cross-border service exports. The empirical analysis is carried through with the help of a gravity model with Poisson Pseudo-Maximum Likelihood (PPML) estimation and panel data. All 37 OECD countries are included in this analysis, as well as nine of their most important trading partners Brazil, China, Costa Rica, India, Indonesia, Malaysia, Russian Federation, South Africa and Thailand. Both disaggregated regressions divided into twelve service sectors are investigated along with aggregated data including a pooled sample of all the sectors. Results show that more restrictive countries both import and export less services. However, for some sectors the results tend to be positive or insignificant.

**Keywords:** *Trade in services, Restrictiveness to trade, barriers to trade in services, Gravity model*

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## 1. Introduction

Services are gradually becoming more important in the global economy for both producers, large enterprises and individuals. Today, services account for more than three-quarters of gross domestic product in advanced economies, and the share is rising in developing countries as well (WTO, 2019). The service sector is also responsible for creating most new jobs around the world and hiring the highest proportion of workers (OECD, 2017). As much as 80 percent of global employment consists of jobs within the service sector. Well-developed and competitive service sectors have proven to create more jobs and ensure growth in manufacturing industries (Nordås and Rouzet, 2015). Even for the least developed countries, service industries are continuing to become more important, proving that services are central to ensure economic growth and development to high-income as well as low-income countries (OECD and WTO, 2017).

However, despite the rising importance of services and the fact that trade in services has tripled in the last two decades, impediments to trade in services and the costs generated from them remain much higher than those for trade in goods.

The question this paper will aim to answer is: How do restrictions to trade in services affect services export flows?

The OECD Services Trade Restrictiveness Index (STRI) have been of great importance when performing this study. The STRI collects data on restrictiveness to trade in services for all OECD countries and nine other important economies<sup>1</sup>. Divided into 22 sectors, a score between 0 and 1 is assigned to each country and sector, 0 being complete openness to trade and 1 indicating a closed market.

Based on the index, 12 out of the 22 sectors was then selected in order to make as much of a complete and comprehensive investigation, as comprehensive cross-border services trade data was not available for every sector. The sectors covered in this paper are accounting services, air transport, financial services, computer services, construction services, postal and courier services, insurance services, legal services, sea freight transport, road freight transport, rail freight transport and telecommunications services.

The gravity model of bilateral trade has been widely used when studying trade flows between countries. Recently, it has also proven reliant on more disaggregated data such as sectoral trade

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<sup>1</sup> All countries are listed in Table 5 in the appendix.

flows. Therefore, this is the model that will be used as I try to answer the question of how restrictive regulations to services affect exports. Furthermore, Pseudo Poisson Maximum Likelihood will be preferred over Ordinary Least Squares, as services trade contain many zero trade flows. Ordinary Least Squares would have dropped all zero-observations out of the estimation, as the logarithm of zero is not defined. By using Pseudo Poisson Maximum Likelihood, 17,000 observations are preserved and kept in the estimation.

With respect to earlier research studying restrictiveness to trade in services, my hypothesis is that more restrictive countries import less services.

The paper is structured as follows: succeeding this section comes a background which will bring the reader necessary information about services trade and restrictions to it. An in-depth description of the Services Trade Restrictiveness Index is then provided, as it is an important part of the paper and its empirical strategy. Next, previous research on the field is provided, followed by a shorter theoretical approach consisting of a tariff analysis. Then, the method of choice is presented, the gravity model of bilateral trade. Explanation as to why a PPML method is preferred to a regular OLS regression is then discussed, followed by results and finally – the conclusion.

## 2. Background

During the last couple of decades, many countries have been working on pro-competitive reforms in service markets. Evidence of substantial welfare improvements and growing GDP were a few of the motives behind these reforms, leading to both advanced and developing economies adapting more extensive reforms in their service markets. When the General Agreement on Trade in Services (GATS) was accepted in 1995 in the WTO, international cooperation in service markets had already been accelerating and was well-established in many countries. The establishment of the GATS further enhanced the idea of international cooperation in services by creating guidelines, rules and a transparent environment for firms to operate within. Moreover, a definition of services trade was agreed upon, capturing all possible ways in which services can be supplied across the globe. These are known as the four modes of supply, all of which are described in the GATS (WTO, 2019). The first mode is cross-border supply, which can be interpreted as analogous to trade in goods. Cross-border supply occurs when a service is distributed from the territory of one country to the territory of another. The second mode is defined as consumption abroad and it involves occurrences when a service is supplied to a consumer that for example has travelled as a tourist to another country. Mode

three is called commercial presence, defined as a supplier of one country establishing a commercial presence in the territory of another country. Finally, the fourth mode of supply, movement of natural persons, occurs when a natural person of one country is temporary present in the territory of another country when supplying a service (OECD and WTO, 2017).

Thanks to inventions and the development of technology, the way services are being supplied are changing. Technology have made it easier to supply services in the means of cross-border trade, making it possible for firms to trade more services the same way as goods are traded. As a result, the previously most important mode of supply, commercial presence, have experienced reductions in the last couple of decades (WTO, 2019). It is no longer crucial to establish within the territory of another country in order to be able to supply services to the people of that country.

Although the GATS was designed to help parties join and negotiate services trade agreements and guarantee open service markets, no further services negotiations have been accomplished in the WTO since the late 1990s, thirty years ago. Most negotiations and agreements are concluded within regional trade agreements rather than in the WTO. Both regional and unilateral services trade agreements have established reforms to some degree, but as trade patterns evolve quickly and new opportunities appear, the regional agreements have not contributed to open services markets as one might desire (WTO, 2019). Only a few agreements with deeper integration such as the European Union have successfully opened services markets and allowed for services to freely be traded across countries. The WTO (2019) states a likely explanation for this: that regulations play such an inescapable role in services markets, and that the policies that come from this must be carefully formulated and designed in order to fulfill the ambition of open services markets and increased welfare.

## 2.1 Restrictions to trade in services: Non-tariff barriers

Compared to trade in goods, where impediments mostly appear at the border in the shape of tariffs, most restrictions to trade in services happen behind the border and act as essential barriers to cross-border trade (Nordås, 2016). These restrictions are included in what is called non-tariff barriers (NTBs). A non-tariff barrier (NTB) is defined as an impediment to international trade, these impediments include all barriers that are not tariffs. NTBs are often policy-induced measures and domestic regulations that restrict trade such as import quotas, export subsidies, countervailing duties, rules of origin, sanitary and phytosanitary measures and

technical barriers to trade (Beghin, 2006). As services are not subject to customs tariffs, every barrier services trade can meet is a non-tariff barrier.

The recent trend in multilateral negotiations over the last couple of decades have been reductions on tariffs, resulting in very low tariff levels on manufacturing goods. The average tariff, as reported by the World Bank in 2017, lies at about 2 percent in high-income countries and 10 percent in low-income countries. Because the tariffs have been reduced to relatively low levels, non-tariff barriers have been of rising interest and is now used more prominently than tariffs (Beghin, 2006).

There are some reasonable explanations as to why NTBs are preferred over tariffs. The wide range of rules in the WTO and in national laws is very effective in limiting the use of tariffs. Governments wishing to restrain imports in order to help domestic firms survive can reach better results with NTBs than with tariffs. Companies can also influence the government in their making of policies, what topics matter to them and to what extent a domestic policy should interfere with trade (Deardorff and Stern, 1997). Most non-tariff barriers are inherently protectionist and impede trade, especially when they fail to address externalities and other market failures such as information imbalances between consumers and firms. Other non-tariff barriers that restrict trade may in fact be welfare-enhancing in the presence of externalities. There are also NTBs that improve trading conditions and increase demand of a service with the help from information and quality requirements, or by developing the characteristics of the service traded (Beghin, 2006). It is important to keep the welfare-enhancing characteristics of non-tariff barriers in mind when discussing the impact that restrictions may have on trade in services. Although restrictions impede trade flows, they can benefit the citizens of a country to an extent that overpowers the negative effects of restrictiveness to trade and the harm it does to foreign firms.

That regulations may harm foreign firms does not imply that the imposed regulations are harsh, or too strict to adjust to. Weak regulations to pro-competition, lack of transparency or extensive regulatory burdens can also increase trade costs to foreign firms. Furthermore, if regulations differ widely between countries, the need of adjustment when exporting to several markets can also increase costs to firms. Firms may have to comply with different requirements and procedures that raise costs to them, even if the regulation in itself is not a remarkable one. In extreme circumstances, satisfying a regulation of one country may break the law in another country (Nordås, 2016). It is also important to stress that it is not the number of regulations that

matters, it is the effect that existing regulations have on trade that decides the restrictiveness to services trade of a country.

The heterogenous nature of services is also important to mention when discussing trade costs and regulations. Compared to goods trade, where regulations have become much more standardized, there is significantly more heterogeneity to trade in services (OECD, 2017). OECD (2017) compared relatively liberalized countries with a low STRI score of 0.1 and their average degree of regulatory heterogeneity. Their results, measured in cross-border trade *ad valorem* costs, showed that the degree of regulatory heterogeneity can account for between 20 to 80 percent of trade costs on average across all sectors. More restrictive countries also showed results of regulatory heterogeneity representing between 12 and 45 percent of trade costs. These results highlights the fact that regulatory differences tend to become more costly when countries open up their markets to trade. More markets suggests more regulations to comply with, which becomes complicated and costly to firms due to services heterogeneity. However, the negative effects of heterogeneity do not exceed the benefits liberalization, even if they might be slightly reduced (OECD, 2017).

## 2.2 The Services Trade Restrictiveness Index

Launched in 2014, the Services Trade Restrictiveness (STRI) is an evidence-based tool developed by the OECD that gathers information on impediments to trade in services across 22 services sectors in 46 countries. These are all the 37 OECD countries and important trade partners Brazil, China, Costa Rica, India, Indonesia, Malaysia, the Russian Federation, South Africa and Thailand (OECD Stat)<sup>2</sup>. Together, these countries account for more than 80 percent of global services trade (OECD, 2017).

The STRI tool consists of two instruments: a services trade restrictiveness index and a regulatory database for trade in services. The regulatory database contains information based on national laws and regulations from the countries mentioned above, and they are organized under five policy areas: restrictions on foreign entry, movement of people, barriers to competition, regulatory transparency and other discriminatory measures.

Based on the information in the regulatory database and the five policy areas, the services trade restrictiveness index creates indices that take a value between zero, meaning complete openness to trade, and one, indicating a closed market with no foreign service suppliers. The STRI

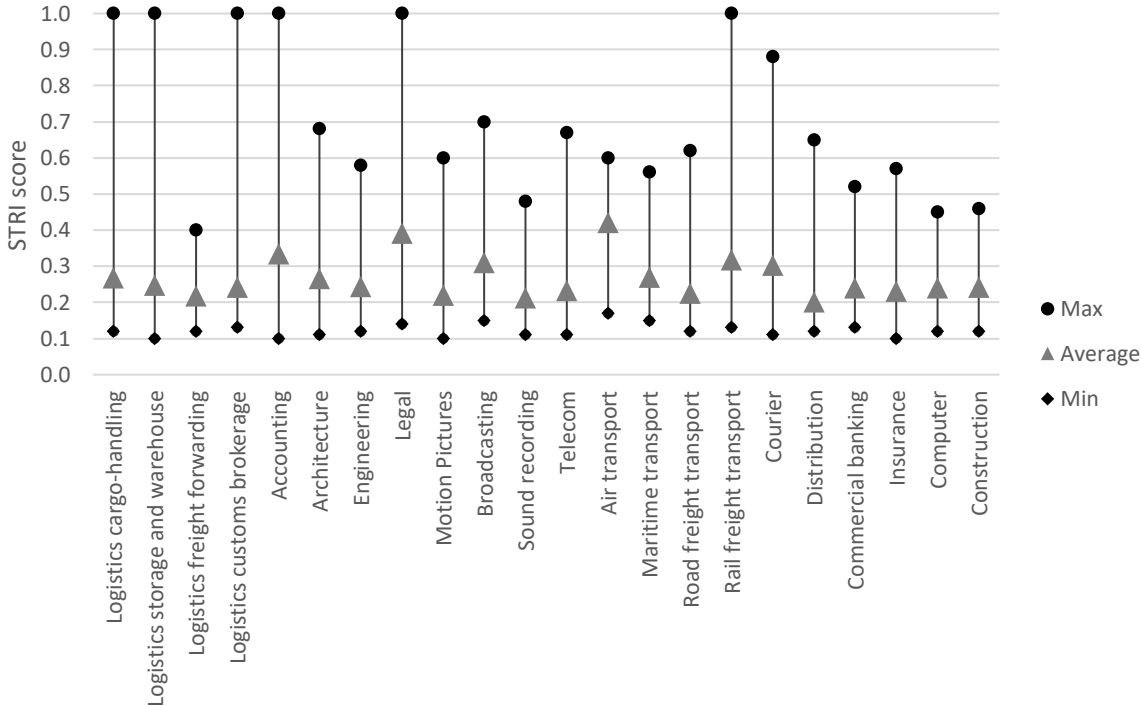


provides wide-ranging information on trade restrictiveness in countries, quantifying the five policy categories mentioned above and making them easy to interpret and compare. Policymakers may find this tool useful when evaluating reform options as it is possible to use the index as a reference when assessing the potential impact of a reform. It could also be helpful to trade negotiators when they need to identify what restrictions hinder trade the most.

Worth mentioning is that the policy measures are applied at a most favored nation basis, such that the index does not account for preferential treatment through free trade agreements. This means that the agreements and regulations through the European Single Market and the European Union’s services directive is not considered here (OECD, 2017).

The restrictiveness of services varies greatly across sectors and countries as well as across sectors within countries. No sector is completely open, and some are fully closed. Looking at figure 1 below showing the STRI average, minimum and maximum value of the index by sector, what is primarily remarkable is how large differences there are to restrictiveness in each sector. The distance between the minimum value and the maximum value is large in several sectors, suggesting that the index can detect important differences in regulations across countries and between sectors. A study made by Nordås and Rouzet (2015) to measure the impact of regulatory trade barriers to trade in services showed that there are large costs to restricting trade in services. In most of the sectors, a higher STRI score is associated with lower imports,

Figure 1. STRI average, minimum and maximum scores by sector



indicating that the imposed regulations are raising costs for foreign suppliers trying to enter and act in a foreign market. This, Nordås and Rouzet means, accentuates how important it is to have an open and pro-competitive market in order to ensure and strengthen international competitiveness of service exporters. Since many services are important inputs in the production of goods, the regulations to services also affects the manufacturing sector and its efficiency and competitiveness (Nordås and Rouzet, 2015).

The three sectors with the highest average STRI score are air transport (0.42), legal services (0.39), and accounting services (0.33). At the other end of the scale are distribution services (0.20) and sound recording services (0.21) which on average have few impediments to trade in services.

### 2.3 Sector descriptions

In order to present a more comprehensive analysis, this section will focus on providing some general information about the 12 sectors that will be analyzed in this paper. This is done to better understand what kind of services that are actually covered by the sectors.

Legal and accounting services are two of the fastest growing business services sectors. In the case of legal services, the most common provided sort of service is when a foreign lawyer gives legal advice in either the law of their home country, a third country or in international law. Both legal and accounting services have experienced increasing demand in the past decades as enterprises have become larger and more international. Typical restrictions to these types of services include limitations on foreign ownership or limitations on entering partnerships. Entering partnerships is especially important to law firms as international clients increasingly demand legal advice of several national jurisdictions (Gelosso Grosso et al., 2014a).

Computer services involve services of databases and data processing as well as software implementation. These services account for a rather small but growing share of trade in services. The most noteworthy barrier to trade in computer services is restrictions on the movement of people. Restrictions may involve a ceiling of how many foreign software engineers are allowed to work in the country or a maximum duration of stay. Barriers to competition can affect computer services if public-owned enterprises are exempted from competition law, as it reduces competition in the sector and therefore it reduces growth (Nordås et al., 2014a).

Construction services typically involves production on a certain location, which means that the second GATS mode of supply, commercial presence, is required to manage trade in services. Firms can enter a foreign market either temporarily to finish a certain project, or they can establish abroad permanently. Regulations that affect construction services can be building standards or restrictions on movement of employees (Gelosso Grosso et al., 2014b).

Insurance and financial services are closely related in services statistics. Financial services are focused on credit institutions and their activities, involving loans, financial leasing and deposit-taking by foreigners. As for insurance services, brokers play a very important role in assisting insurers in calculating risks. They are primarily affected by restrictions on the movement of people, but also by restrictions on market entry (Rouzet et al., 2014).

The transport services and their main obligations are quite straightforward. Restrictions to air, sea freight, rail freight and road freight transports are analyzed in this paper. Passenger air transport is very important to tourism and the integration of countries, while air freight transport is crucial when delivering time-sensitive products quickly. Transport by sea, road or rail takes longer time but can handle significantly more cargo. In relation to transport, postal and courier services have become logistically more important with the rise of online retail, as parcels now need to be delivered in a short and guaranteed amount of time (Gelosso Grosso et al., 2014c). Furthermore, it often takes more than one type of transport in order to deliver the products, which increases the importance of road transport, for example. Restrictions to these types of services are often sector specific. For example, restrictions on foreign entry in sea freight transports may be cargo reservation schemes, or there could be agreements on freight with trading partners that exclude third countries from transporting certain kinds of freight. Discriminatory measures may also occur in these types of services, often in the form of discriminatory taxes or national standards that differ from international ones. Furthermore, it is common in the transport sector that firms are publicly owned (Gelosso Grosso et al., 2014c). With that said, there are barriers to competition that may restrict foreign firms from trading services.

Finally, telecommunications services often contain the transmission of a signal between locations, perhaps when making an international telephone call or – in the case of internet services – an electronic transmission that can be stored in a computer. Telecommunications are primarily capital-abundant, but restrictions on short-term movement of people can block trade by restricting the number of foreign employees allowed to work in the country. Standards are

also important restrictions to trade in the sense of discriminatory measures (Nordås et al., 2014b). Similar to transport services, if standards deviate from international ones, they can act as a meaningful impediment to trade.

### 3. Previous research

Published in 2015, Nordås and Rouzet investigates the relationship between restrictions to trade in services and cross-border services trade. They also estimate the regulatory spillovers from services sectors to manufacturing industries. This paper was one of the first to use the OECD Services Trade Restrictiveness Index, which was launched in 2014, to measure the restrictiveness on cross-border trade in services. For their analysis, cross-border services trade data were available for 12 of the at that time 18 sectors covered by the STRI. These were air, maritime, rail and road transport, accounting, computer services, commercial banking, construction, courier services, insurance, legal services and telecommunications. For this paper, the same sectors have been chosen as there is still little trade data available for all service sectors. Nordås and Rouzet (2015) find that more restrictive countries both import and export less services. The sectors with the largest impact of restrictions on trade in services were commercial banking and insurance. As for regulatory spillovers to manufacturing industries, the paper finds that restrictions to trade in almost all of the sectors covered have a negative effect on manufactured goods trade.

Unlike Nordås and Rouzet, van der Marel and Shepherd (2013) uses the World Bank's Services Trade Restrictiveness Database to answer the question of to what extent regulations and regional integration in services can act as drivers of bilateral trade in services. Their paper focuses on detailed regulations established at the sector level that affect trade in six service sectors. Van der Marel and Shepherd (2013) find, much like Nordås and Rouzet (2015), that regulatory restrictiveness will result in lower trade, but to what extent depends greatly on what sector is concerned. Their findings emphasize how sector-specific regulations along with the general national attitude towards regulations to trade in services are of much importance.

More studies have been made on the OECD STRI by Nordås. By calculating indices of regulatory heterogeneity through the STRI regulatory database, Nordås (2016) presents an analysis of how heterogeneity in services can affect trade. The measure is based on how country pairs differ in regulations, and how heterogeneous regulations create trade costs. Nordås finds that regulatory heterogeneity has a negative impact on services trade flows. More extensive international standards are needed for services to become more harmonized.

More recent research on services trade restrictions has been made by Benz and Jaax (2020). By estimating ad valorem tariff equivalents (AVEs) of the OECD STRI on five service sectors and 46 countries, Benz and Jaax presents evidence on the impact that services trade restrictions have

on trade costs for cross-border trade in services. The ad valorem equivalents are calculated with respect to the restrictiveness index and elasticities of substitution. Based on gravity model regressions, their findings show that services trade costs generated by policy measures are relatively high compared to the total trade value. Ad valorem tariff equivalents are much higher compared to actual ad valorem tariffs. Not surprisingly, they find services trade costs within the EU's Single Market to be significantly lower. Moreover, much like Nordås and Rouzet (2015) as well as van der Marel and Shepherd (2013), Benz and Jaax (2020) find that barriers to trade in services (as measured by the OECD STRI) are very much associated with lower services trade in all five sectors.

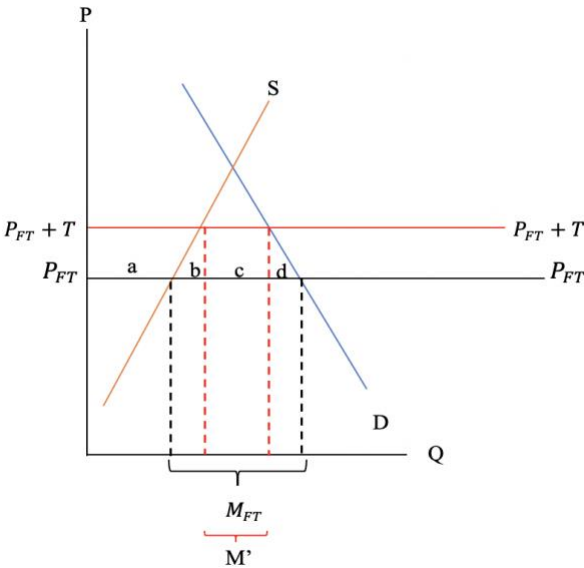
To conclude, all studies have found that services trade restrictiveness and regulations lead to less trade. There are several interesting approaches, such as the heterogeneity index and the ad valorem tariff equivalents, and they all end up with the same conclusion: that more restrictive regulations and barriers to services lead to less trade. Most studies have used the gravity model of trade when assessing their question, but the specification of the model differs. Most related to this paper is Nordås and Rouzet (2015). However, five years have gone by since the publication of their work, so results and specification of the model will be different. When their paper was published, the OECD STRI had only existed for a year. I have the advantage and opportunity to use five whole years of the index.

#### 4. Theoretical approach

A way to comprehend how restrictions to trade in services affect export flows is to see the situation through a tariff analysis. The restrictions are compared to a tariff, in the sense that an imposed tariff will increase the domestic price and reduce the quantity of imports. In the analysis, a small country is assumed to have a high domestic price that is caused by restrictiveness to trade in services. The analysis will demonstrate how, in theory, reducing the restrictions and the costs that come with it, will increase welfare in the country.

The analysis is built up through a demand and supply diagram and builds on the analysis in Persson (2017) where the effects of trade facilitation is studied through a tariff analysis. The starting point of the analysis is at price  $P_{FT} + T$ . The  $T$ , usually interpreted as a tariff, here stands for the unnecessary costs generated from services trade restrictiveness. When restrictions loosen, prices will decrease to  $P_{FT}$  because the unnecessary trade and information costs are taken away, and imports increase from  $M'$  to  $M_{FT}$ .

Figure 2. Tariff Analysis



As for the welfare effects, the consumer surplus will increase with  $a + b + c + d$  and the producer surplus decreases with  $-a$ . If the  $T$  was interpreted as a tariff, the removal of the tariff would result in a reduction in government revenue by  $-(b + d)$ . However, the  $T$  is not a tariff in this situation and therefore there are no government revenues to lose from removing the  $T$ . Government revenue remains unchanged. The net welfare effect will be  $b + c + d$ , an unambiguously positive result from loosening restrictions to trade in services.

## 5. Empirical strategy

### 5.1 The gravity model

It was Jan Tinbergen who introduced the gravity model of bilateral trade in 1962, proving that the size of bilateral trade flows between two countries can be estimated using the gravity equation. The gravity model stems from Isaac Newton's theory of gravitation, such that just as planets are mutually attracted in proportion to their sizes and adjacency, countries tend to trade in proportion to the size of their GDPs and geographical closeness (UNCTAD and WTO, 2012). The original, exponential formulation of the gravity equation has the following appearance:

$$X_{ij} = C + GDP_i^{\beta_1} + GDP_j^{\beta_2} + \pi_{ij}^{\beta_3} + e_{ij}$$

Where  $X_{ij}$  represents the value of exports from country  $i$  to country  $j$ ,  $GDP_i$  and  $GDP_j$  is the gross domestic product of respective countries and  $\pi_{ij}$  denotes trade costs between the two countries, such as geographical distance (Shepherd, 2016).  $\beta_1$ ,  $\beta_2$ , and  $\beta_3$  are unknown parameters and  $e_{ij}$  is an error term.

Given the previous exponential formulation, the most common way to estimate a gravity equation is to take the natural logarithms of all variables, attaining a log-linear model that can be estimated using the ordinary least squares (OLS) regression (UNCTAD and WTO, 2012). This strategy also simplifies estimation in the sense that it is easier to estimate this regression rather than the multiplicative version of the gravity equation. In this equation, all trade costs have been specified. These are visible variables that are assumed to influence trade costs (Shepherd, 2016). The new, log-linearized gravity model has the following form:

$$\ln X_{ij} = c + b_1 \ln GDP_i + b_2 \ln GDP_j + b_3 \pi_{ij} + e_{ij}$$

Taking the natural logarithm of the variables makes for an easy interpretation of the estimated parameters as they can be understood as elasticities. Taking GDP as an example, the logarithm of GDP is interpreted as the elasticity of trade to GDP, indicating the percentage change in trade succeeding a 1 percent increase in GDP (UNCTAD and WTO, 2012).

The gravity model has become an important tool for researchers all over the world, as it has proven to provide consistent information about the effects of trade policies. Moreover, the model has recently also proven to be reliable when researching trade in services, as it has only been used on goods trade in the past. The model comes with some pitfalls, however, and it has



been criticized over the years (Shepherd, 2016). But it nevertheless remains the workhorse model of international trade.

## 5.2 Specification of the gravity model

In an attempt to analyze whether restrictiveness to trade in services affect services export flows on OECD countries, a gravity model has been defined. Exports from the 46 countries in the dataset is the dependent variable, containing observations over a time interval of five years.

$$Exports_{ij,k,t} = \beta_1 + \beta_2 \ln(STRI_{ikt}) + \beta_3 \ln(STRI_{jkt}) + \beta_4 \ln(GDP_{jt}) \\ + \beta_5 \ln(GDP_{it}) + \beta_6 \ln(distance_{ij}) + \beta_7 comlang_{off} + \beta_8 rta + e_{ij}$$

$Exports_{i,j,k,t}$  is the dependent variable, measured in million US dollar. It covers services exports from the 37 OECD countries and their important trade partners Brazil, China, Costa Rica, India, Indonesia, Malaysia, Russian Federation, South Africa and Thailand. Furthermore, the exports are divided into the twelve sectors  $k$  covered by the services trade restrictiveness index, and the time interval  $t$  runs from 2014 to 2018.

The main variable of interest is  $STRI_{ikt}$ . This is the importing country's services trade restrictiveness index score from the OECD, measured as a number between 0 and 1. This variable will be important when assessing the question whether restrictions have an effect on services export flows. The hypothesis is that more restrictive countries import less services, so the STRI variable is assumed to be negative.

Next,  $STRI_{jkt}$  is the exporting country's services trade restrictiveness index score from the OECD, measured the same way as for the importing country. To normalize the logarithmic values, the index variables are multiplied by 100 before taking the logarithm of the value. This is done to both the importer's STRI and the exporter's STRI.

GDP represents the GDP of each country in each year, measured in current million US dollar. A larger GDP of the importing country is expected to have a larger demand, and an exporting country with a large GDP is likely to have a bigger supply. Therefore, the GDP variables is assumed to have a positive effect on services exports.

To account for bilateral trade costs, the variable distance has been added to the equation and stands for the geographical distance between countries  $i$  and  $j$ . Trade costs are expected to increase with geographical distance, such that the coefficient of this variable is expected to be negative.

The rest of the variables are relevant dummy variables, included in the equation to capture the effects that is not already captured by previously mentioned independent variables. These dummy variables are all usually included in the gravity equation to capture transportation or information costs.<sup>3</sup> The assumption that trade decrease with geographical distance indicates that countries that share a common official language should have greater incentives to trade with each other than to trade with another country, thus achieving lower information costs. Countries that share a common language can easily understand each other and there will rarely be any misunderstandings considering business behavior or practices (UNCTAD and WTO, 2012).

Lastly, the dummy variable *RTA* is added to the equation to capture the effects of being members of the same services regional trade agreement. This is expected to be a positive effect for trade, as being a part of the same trade agreement means lower costs. It is worth mentioning however, that the main variable of interest *STRI* only measures restrictiveness on an MFN basis and does not take regional trade agreements in mind.

### 5.3 Econometric strategy: Pseudo Poisson Maximum Likelihood estimation

Estimation will be performed using the Pseudo Poisson Maximum Likelihood estimator, hereafter referred to as PPML.<sup>4</sup> To ensure that PPML is the best strategy, OLS regression will also be performed and compared to the results of PPML. Santos Silva and Tenreyro (2006) presents the PPML estimation as a way of dealing with zero trade flows in the gravity model. Instead of estimating a gravity model with OLS in a log-linearized form, the PPML estimation takes a multiplicative form, estimating the dependent variable in levels rather than in logarithms. In contrast to the OLS estimator, the Poisson estimator includes all zeroes in the estimation – zeroes that would have been dropped from the estimation if OLS was to be used, since the logarithm of zero is not defined (Shepherd, 2016). This is an important property of the PPML. Furthermore, the PPML estimator deals with heteroskedasticity, i.e., when the error term is correlated with one or more explanatory variables. Under weak assumptions, the PPML estimation can present consistent estimators of the original exponential formulation of the gravity model (Santos Silva and Tenreyro, 2006).

However, Santos Silva and Tenreyro uses cross-sectional data, which complicates controlling for bias caused by heterogeneity. Instead, Wilhelmsson and Westerlund (2011) uses panel data

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<sup>3</sup> Dummy variables such as colony were excluded from the regression as they would have compromised the results for the main variable of interest, *STRI*.

<sup>4</sup> STATA is the software program used for this analysis.

when estimating a PPML fixed effects model, which permits one to get rid of the problems zero trade flows, heteroskedasticity and heterogeneity.

There are further advantages for using the PPML estimation in a gravity equation. Firstly, the estimators are consistent with fixed effects, which is an unusual characteristic for nonlinear maximum likelihood estimators (Shepherd, 2016). The fixed effects can be implemented in the model as dummy variables, just as in OLS estimation.

Lastly, Shepherd (2016) stresses the straightforwardness of interpreting the coefficients from the PPML model, as it follows the exact same method as OLS. The only significant difference is that the dependent variable in the PPML model is not expressed in logarithms but in levels. Coefficients of independent variables expressed in logarithms are still to be interpreted as elasticities, as under OLS. However, independent variables expressed in levels should be interpreted as semi-elasticities (Shepherd, 2016).

#### 5.4 Common estimation problems

A common problem to be aware of when using services trade data is, as mentioned above, the issue of zero trade flows i.e., when there is no trade in a certain year between two countries. By using PPML instead of OLS and a log-linearized model, we can keep the zero trade flows in the data. Previous research on sectoral services trade flows such as Nordås and Rouzet (2015) and Benz and Jaax (2020) have used PPML when estimating their gravity model. When using this approach, the dependent variable is expressed in levels, thus not taking the logarithm of the variable and therefore also keeping all zeroes in the estimation.

Another problem with estimating a gravity equation is heterogeneity. The issue is, just as with zero trade flows, more likely to occur when analyzing sectoral trade flows compared to aggregate trade flows. This can be controlled for using exporter- and importer fixed effects (Shepherd, 2016). By using fixed effects, the unobserved heterogeneity that is constant for a given exporter or importer is accounted for across all observations. However, there is a risk that the country fixed effects absorbs the effect of the STRI. Therefore, time fixed effects will be included in the main regression instead, in line with Nordås and Rouzet's (2015) strategy. To ensure that the results are not biased by this problem, robustness tests will be conducted.

Furthermore, endogeneity may particularly be a problem when estimating gravity models with policy variables included in the equation. Endogeneity occurs when an independent variable is correlated with the error term, which can lead to inconsistent estimates of the parameters. The

reason why endogeneity is a problem when policy variables are included in the model is that the policies are often determined by the level of integration that the country has in international markets. By definition, a more liberal economy have tendencies to achieve more liberal policies, thus creating a causal link between implemented policies and trade (Shepherd, 2016). The complicated part is to interpret this link between the independent and dependent variable.

Fixed effects can contribute to solving the problem of endogeneity when using panel data, but omitted variables may still be a problem (UNCTAD and WTO, 2012). Therefore, controlling for endogeneity may be difficult and it is a potential issue to have in mind when interpreting the results.

### 5.5 Data

Data on cross-border services exports for the twelve sectors and the 46 countries between 2014-2018 was collected from the WTO database of trade in commercial services. As the services trade restrictiveness index was not launched until 2014, it was not relevant to choose any previous years. Also, there was no significant trade statistics for 2019, which is why that year has been left out of the dataset.

The index score on services trade restrictiveness was downloaded from the OECD Statistics database. As mentioned, the STRI consists of 22 sectors and 46 countries. Out of these, twelve sectors are included in this paper. Each country is rewarded a score for each sector, a number between zero and one, where zero is complete isolation from foreign actors in a certain sector and one is consistent with an entirely open market.

The data on exports and the STRI are created using different classifications. The services exports data uses EBOPS2010 whereas the STRI is created through ISIC Rev. 4. In order to match the exports data with data from the STRI, a correspondence table was constructed in Microsoft Excel using information from UNCTAD (2015), and the United Nations (2008 & 2015). The correspondence table matches the ISIC Rev. 4 classification for each sector with the EBOPS2010 classification of export flows in each sector. The correspondence table can be found in table 5 in the appendix.

Gross domestic products were downloaded from the World Bank database of World Development Indicators. The GDP is measured in current million US dollar, to match the export data from the WTO database which is also measured in current million US dollar.

The dummy variables were collected from the CEPII gravity dataset. The dataset was filtered in Microsoft Excel to only contain relevant countries, then exported into Stata.

### 5.6 Correlation of variables

	<i>Exports</i>	<i>STRI Importer</i>	<i>STRI Exporter</i>	<i>GDP Exporter</i>	<i>GDP Importer</i>	<i>Distance</i>	<i>Common language</i>	<i>Services RTA</i>
<i>Exports</i>	1.0000							
<i>STRI Importer</i>	-0.0385	1.0000						
<i>STRI Exporter</i>	-0.0115	0.2864	1.0000					
<i>GDP Exporter</i>	0.1662	0.0179	0.0491	1.0000				
<i>GDP Importer</i>	0.1570	0.0628	-0.0005	0.0053	1.0000			
<i>Distance</i>	-0.0419	0.2100	0.0458	0.1507	0.3083	1.0000		
<i>Common language</i>	0.1970	-0.0213	-0.0145	0.1754	0.0893	-0.0284	1.0000	
<i>Services RTA</i>	-0.0075	-0.2485	-0.0893	-0.2110	-0.3668	-0.6977	-0.0216	1.0000

Table 1. Correlation of variables

A correlation of 1 or -1 means a perfect linear relationship between the two variables. Naturally, all variables have a perfect linear relationship with themselves. The STRI variables are interesting to look at. Both the STRI of the exporting country and the STRI of the importing country are negatively correlated with the dependent variable Exports.

## 6. Results

### 6.1 PPML regressions

Below, results from PPML estimations are presented for twelve service sectors. Results for OLS regressions can be found in the appendix in table 7. The results for the pooled regression includes 47,174 observations when estimated with PPML (table 2), but for estimation with OLS the number of observations is only 30,952. In other words, 17,000 observations are dropped from the estimation when using OLS. This confirms my preference for PPML.

In table 2, regressions have been run for each individual sector. There is also estimation for a pooled regression, containing all twelve sectors. As mentioned by the OECD (2017) before, it is important to remember that services are of a very heterogeneous nature, such that the characteristics of each service can vary greatly from other services. Services exports are affected negatively of regulatory heterogeneity, apart from the impact that trade restrictions has. This statement is in comparison to goods trade, where characteristics are more similar, and regulations have become more standardized.

In almost all sectors, the coefficient of the importer's STRI and the exporter's STRI is negative. This suggests that restrictive regulations have a negative effect on exports, both for the importing country and for the exporting country. As expressed earlier, Shepherd (2016) states the straightforwardness of interpreting results from the PPML estimation. Independent variables expressed in logarithms are to be interpreted as elasticities, such that the coefficient of the explanatory variable is the percentage change in the dependent variable when the explanatory variable's coefficient increases with 1 percent. Taking financial services as an example, the STRI Importer variable shows that a 1 percent increase in STRI in the importing country will decrease exports with about 1.1 percent. This effect is significant at the 1% level. Furthermore, results imply that more restrictive regulations in the exporting country will have a negative effect on the country's exports.

The main variable of interest, STRI Importer, presents negative results for nine sectors, however not all are significant. Restrictiveness to trade are suggested to have a negative and significant effect at the 1% level in the following sectors: accounting services, air transport, computer services, financial services and insurance services. Perhaps more surprisingly, restrictive regulations in the exporting country also tend to decrease exports. Accounting services, computer services, financial services, insurance services, legal services, and sea transport show a negative and a significant effect at the 1% level, suggesting that countries that impose restrictive regulations in these sectors tend to export less of the mentioned services.

The pooled sample displays negative estimates of both the importer's and the exporter's STRI. These results are significant at the 1% level, confirming the hypothesis that restrictiveness to trade in services will decrease exports. Interestingly, restrictiveness to trade has a negative effect for both the importing and the exporting country. More liberal and pro-competitive regulations should then have an important positive effect for both the importer and the firms in the exporting country.

As for the other gravity model variables GDP and distance, results are in line with theory. Almost every coefficient is significant at the 1% level. The distance variable is negative and significant, consistent with the gravity assumption that trade decreases with geographical distance. The GDP variables are positive and significant, confirming predictions and suggesting that, taking legal services as an example, a 1 percent increase in GDP in the importing country will increase legal services exports to that country with around 1 percent.

Moreover, having a common language raises exports in seven sectors. The dummy variable for being in the same services RTA does not show any desired results.

There are insignificant and positive coefficients for the STRI Importer in the sectors construction services, rail transport and road transport. As for construction services, this can be explained through the relatively small number of cross-border exports in this sector. Construction services are often characterized by longer projects and therefore not fully measured in data used here.<sup>5</sup> As mentioned in the sector descriptions, most construction exports happen through commercial presence, and not through cross-border supply. The insignificant results in the rail and road sectors are unfortunate.

The lack of significant results in telecommunications services can also be the result of little cross-border exports in this sector. Most telecommunications services are supplied through mode four, the movement of natural persons (Nordås et al., 2014b).

The STRI Exporter coefficient shows positive and significant results in air transport and rail transport. These results suggest that a 1 percent increase in restrictive regulations will increase rail transport exports with 1.5 percent, not aligned with desired expectations.

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<sup>5</sup> In Balance of Payment statistics, projects in construction with a duration up to a year are counted. Longer projects are excluded.

Table 2. PPML Results: STRI and cross-border exports for all sectors

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	Pooled	Accounting	Air	Computer	Construction	Financial	Insurance	Legal	Postal	Rail	Road	Sea	Telecom
<b>STRI Importer</b>	-0.562***	-0.690***	-0.922***	-0.569***	0.305	-1.079***	-0.833***	-0.214	-0.399	0.523	0.234	-0.009	-0.007
	(0.146)	(0.165)	(0.325)	(0.187)	(0.474)	(0.305)	(0.251)	(0.218)	(0.308)	(0.345)	(0.309)	(0.300)	(0.228)
<b>STRI Exporter</b>	-0.731***	-0.493***	1.027**	-0.786***	-0.380	-0.954***	-1.429***	-0.651***	0.328	1.544***	-0.444	-1.396***	0.244
	(0.151)	(0.168)	(0.421)	(0.282)	(0.508)	(0.313)	(0.345)	(0.217)	(0.250)	(0.382)	(0.311)	(0.294)	(0.150)
<b>Exporter GDP</b>	0.629***	0.569***	0.814***	0.558***	0.429***	0.620***	0.897***	1.045***	0.869***	0.020	0.285***	0.444***	0.830***
	(0.043)	(0.044)	(0.046)	(0.035)	(0.070)	(0.096)	(0.090)	(0.064)	(0.076)	(0.114)	(0.045)	(0.068)	(0.044)
<b>Importer GDP</b>	0.758***	0.818***	0.876***	0.840***	0.712***	0.647***	1.005***	1.049***	0.958***	0.610***	0.830***	0.726***	0.752***
	(0.042)	(0.055)	(0.047)	(0.065)	(0.070)	(0.070)	(0.095)	(0.070)	(0.113)	(0.087)	(0.071)	(0.104)	(0.059)
<b>Distance</b>	-0.665***	-0.918***	-0.593***	-0.572***	-1.070***	-0.767***	-0.515***	-0.804***	-0.762***	-1.960***	-1.451***	-0.168	-0.878***
	(0.061)	(0.083)	(0.068)	(0.114)	(0.219)	(0.114)	(0.136)	(0.105)	(0.223)	(0.239)	(0.115)	(0.123)	(0.121)
<b>Common language</b>	0.935***	0.387*	0.539***	0.628***	-0.018	1.427***	1.223***	0.973***	1.120***	-0.445	0.109	-0.163	0.269
	(0.139)	(0.198)	(0.179)	(0.165)	(0.209)	(0.202)	(0.257)	(0.189)	(0.293)	(0.522)	(0.366)	(0.376)	(0.179)
<b>Services RTA</b>	-0.192	0.075	0.071	0.257	-0.393	-0.739***	0.154	-0.488**	0.565	-0.441	0.674**	0.161	0.226
	(0.168)	(0.219)	(0.186)	(0.278)	(0.584)	(0.287)	(0.364)	(0.238)	(0.350)	(0.731)	(0.318)	(0.281)	(0.200)
<b>Observations</b>	47,174	3,793	4,193	4,227	4,348	5,034	4,783	3,896	3,710	2,885	3,693	2,406	3,842
<b>Year FE</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Sector FE</b>	Yes	No	No	No	No	No	No	No	No	No	No	No	No

Note: The dependent variable is Exports in million US dollar. Standard errors are clustered by country pair.

\*\*\*, \*\* and \* signify significance at the 1%, 5% and 10% level.



## 6.2 Robustness tests

Several robustness checks have been conducted to test the reliability of the result. The data has been tested again, but with some manipulation of variables and other assumptions. Regressions have been performed using both OLS and PPML, with a variation of fixed effects. These results can be found in table 3 below.

The most striking thing to notice in table 3 is the number of observations included in the regressions. All OLS regressions have 30,952 observations, whereas the PPML regressions have included 47,174 observations. This confirms that the concerns about zero trade flows are entitled, and that choosing PPML as a method of estimating the model is correct.

In column 1, an OLS regression without any fixed effects has been performed. This is then compared to the OLS regression in column 2, which has both exporter-year, importer-year and sector-year fixed effects included in the model.<sup>6</sup> Estimations of the main variables STRI importer and STRI exporter does not show any desired results when estimating OLS with no fixed effects as in column 1. Column 2 shows progression, but the coefficient for STRI Importer is positive, which is not in line with the main results. The GDP variables were omitted because of collinearity, which is also seen in column 5 where a PPML regression with the same fixed effects have been performed.

Moving on to column 3 and 4 where the country-specific fixed effects have been removed, estimates show significant and desired results. This is also the case for PPML regressions in column 6 and 7. They all have one fixed effect, column 3 and 6 have a sector-year fixed effect whereas column 4 and 7 only have a year fixed effect. However, not including country-specific fixed effects may result in omitted variable bias (Nordås and Rouzet, 2015).

Therefore, an additional robustness test was performed to make sure that this is not an issue.

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<sup>6</sup> Estimations with importer-sector-year and exporter-sector-year fixed effects were also performed, but variables were omitted due to collinearity.

Table 3. Pooled Gravity estimates of different models

	1	2	3	4	5	6	7
	OLS	OLS FE	OLS Sector-Year	OLS Year FE	PPML FE	PPML Sector-Year	PPML Year FE
<b>STRI Importer</b>	-0.041*	0.081***	-0.226***	-0.226***	0.044	-0.563***	-0.562***
	(0.024)	(0.031)	(0.025)	(0.025)	(0.077)	(0.059)	(0.060)
<b>STRI Exporter</b>	0.018	-0.061*	-0.463***	-0.464***	-0.492***	-0.729***	-0.731***
	(0.026)	(0.033)	(0.028)	(0.028)	(0.084)	(0.062)	(0.062)
<b>GDP Importer</b>	0.574***		0.607***	0.586***		0.758***	0.629***
	(0.007)		(0.007)	(0.006)		(0.016)	(0.017)
<b>GDP Exporter</b>	0.560***		0.586***	0.607***		0.629***	0.758***
	(0.007)		(0.006)	(0.007)		(0.017)	(0.016)
<b>Distance</b>	-0.520***	-0.957***	-0.712***	-0.712***	-0.754***	-0.665***	-0.665***
	(0.015)	(0.022)	(0.011)	(0.011)	(0.035)	(0.023)	(0.023)
<b>Common Language</b>	1.025***	0.313***	1.116***	1.116***	0.451***	0.936***	0.935***
	(0.042)	(0.038)	(0.034)	(0.034)	(0.058)	(0.052)	(0.053)
<b>Observations</b>	30,952	30,952	30,952	30,952	47,174	47,174	47,174
<b>Exporter-year FE</b>	No	Yes	No	No	Yes	No	No
<b>Importer-year FE</b>	No	Yes	No	No	Yes	No	No
<b>Sector-year FE</b>	No	Yes	Yes	No	Yes	Yes	No
<b>Year FE</b>	No	No	No	Yes	No	No	Yes

Note: The dependent variable is Exports for PPML regression, and  $\ln(\text{exports})$  for OLS regressions. \*\*\*, \*\* and \* signify significance at the 1%, 5% and 10% level. Column 1 does not have any fixed effects. Column 2 uses exporter-year, importer-year and sector-year to control for multilateral resistances. Column 3 uses sector-year fixed effects. Column 4 only controls for year fixed effects. Columns 5, 6, and 7 use PPML with the same order of fixed effects. Standard errors are reported in parenthesis and clustered by country pair.

This robustness test can be seen in table 4. The sensitivity of the importer's STRI in the presence of exporter fixed effects are tested, and conversely the exporter's STRI and its sensitivity is tested when incorporated with importer fixed effects. As mentioned above, estimates may suffer from omitted variable bias when country specific fixed effects are not included in the gravity model. To examine if this is a serious issue, alternative methods have been used, as presented in table 4. The results of including exporter and importer fixed effects are shown in column 2. The "Importer" column includes the importing country's STRI as well as exporter-year fixed effects, and the "Exporter" column includes the exporting country's STRI and importer-year fixed effects, as advised by Nordås and Rouzet (2015). Standard errors are clustered by importer and exporter, respectively. Column 1 is estimated the same way as column 2, except for changes in fixed effects and standard errors. These two columns are to be compared to ensure that the results are not changing when estimating a gravity model without country-specific effects. As seen in table 3, estimates are quite similar, which leads me to believe that using year fixed effects will not be a serious issue.

Table 4. STRI and cross-border exports of services: Comparing estimates

	(1) PPML		(2) PPML One Way		(3) OLS	
	Importer	Exporter	Importer	Exporter	Importer	Exporter
<b>Pooled</b>	-0.510*** (0.150)	-0.652*** (0.154)	-0.413* (0.236)	-0.654** (0.305)	-0.200*** (0.066)	-0.436*** (0.069)
<b>Accounting</b>	-0.659*** (0.166)	-0.442*** (0.170)	-0.664** (0.269)	-0.488 (0.322)	-0.602*** (0.124)	0.004 (0.047)
<b>Air</b>	-1.084*** (0.319)	1.424*** (0.423)	-0.636 (0.409)	1.097 (0.787)	-0.268 (0.259)	1.410*** (0.457)
<b>Computer</b>	-0.520*** (0.193)	-0.792*** (0.287)	-0.583 (0.375)	-0.740 (0.612)	-0.694*** (0.176)	-0.333* (0.182)
<b>Construction</b>	0.350 (0.471)	-0.272 (0.539)	0.340 (0.388)	-0.212 (0.790)	0.139 (0.201)	-0.674*** (0.222)
<b>Financial</b>	-1.013*** (0.299)	-0.776** (0.320)	-0.793** (0.322)	-0.705 (0.665)	-0.320 (0.210)	-0.480* (0.291)
<b>Insurance</b>	-0.538** (0.240)	-1.238*** (0.336)	-0.592* (0.317)	-1.218* (0.653)	-0.260* (0.137)	-0.405** (0.168)
<b>Legal</b>	-0.189 (0.223)	-0.656** (0.292)	-0.230 (0.298)	-0.651 (0.408)	-0.142 (0.109)	-0.332*** (0.105)
<b>Postal</b>	-0.442 (0.299)	0.422* (0.217)	-0.726** (0.368)	0.095 (0.238)	-0.363** (0.153)	-0.274 (0.183)
<b>Rail</b>	-0.011 (0.319)	1.319*** (0.291)	0.498 (0.406)	1.391*** (0.475)	-0.133 (0.188)	0.330 (0.203)
<b>Road</b>	0.283 (0.305)	-0.479 (0.308)	0.103 (0.310)	-0.735 (0.607)	-0.075 (0.156)	-1.610*** (0.238)
<b>Sea</b>	0.171 (0.329)	-1.321*** (0.275)	-0.158 (0.330)	-1.051 (0.950)	0.164 (0.335)	-1.108*** (0.285)
<b>Telecom</b>	-0.074 (0.218)	0.288** (0.147)	-0.117 (0.340)	0.326 (0.286)	-0.036 (0.133)	-0.051 (0.129)
<b>Year FE</b>	Yes	Yes			Yes	Yes
<b>Importer-Year FE</b>				Yes		
<b>Exporter-Year FE</b>			Yes			
<b>Standard Errors</b>	Country pair	Country pair	Importer	Exporter	Country pair	Country pair

Note: The estimates are the Importer's STRI and the Exporter's STRI, standard errors in parenthesis. \*\*\*, \*\* and \* signify significance at the 1%, 5% and 10% level. The dependent variable is Exports for PPML regression, and  $\ln(\text{exports})$  for OLS regressions. Pooled regressions also include sector fixed effects. Standard errors are clustered by importer, exporter or country pair. Explanatory variables included in regressions:  $\ln(\text{GDP Importer})$ ,  $\ln(\text{GDP Exporter})$ ,  $\ln(\text{distance})$ , common language dummy and Services RTA dummy.

## 7. Conclusion

The aim of this paper has been to analyze how restrictiveness to trade in services affect services export flows in the OECD countries and their important trade partners Brazil, China, Costa Rica, India, Indonesia, Malaysia, the Russian Federation, South Africa and Thailand. The main variable to examine has been the STRI, which provides an index score of how restrictive a country is. The desire has been to be able to find that the coefficients of the STRI variables are negative, such that restrictiveness to trade has a negative effect on exports.

The main aggregate results show that restrictive regulations do have a negative impact on services exports. This is true both for the importing country receiving the service, and for the exporting country offering the service. A 1 percent increase in restrictive regulations in importing countries will decrease exports to that country with 0.56 percent. Furthermore, and interestingly, a 1 percent increase in restrictive regulations in exporting countries will decrease exports from that country with 0.73 percent (Table 2, column 1).

Results on a disaggregated level show that for most sectors, restrictive regulations have a negative effect on exports. As in the pooled sample, this is true for both the importer and the exporter.

These results emphasize the value of having a competition-oriented and liberal government and regulatory system in place in order to compete with international service providers. It is also striking how important a well-regulated and open home market is, both to foreign firms looking to export their services and domestic firms wanting to compete with international providers.

Following results from studies by Nordås and Rouzet (2015), Van der Marel and Shepherd (2013), and Benz and Jaxx (2020), who all found that more restrictive countries trade less services, this study contributes to the field. Much like Nordås and Rouzet (2015), this paper has investigated the impact of restrictive regulations on services trade using the OECD Services Trade Restrictiveness Index. While their study covers services trade in the years 2008-2012, this paper handles more recent data from 2014-2018, hopefully bringing some updated results in this area. When their paper was published, the index had only existed for a year. With this paper, I am able to study five years of restrictiveness to trade in services as reported by the OECD STRI.

To conclude, there is much to do before services can become as tradable as goods. The heterogeneous nature of services complicates the revolution of standardization for services. Although trade in services have been increasing and developing in the past decades, goods trade still dominate the international market. Services need more structured and coordinated standards in order to become more homogenous. With more homogenous services come more standardized regulations as well, making services more tradable to the global community. Nevertheless, services are nothing like goods and comparison between the two should be made with caution.

I hope that this paper brings inspiration to new investigations regarding restrictiveness to trade in services. The fact that barriers to services trade occur behind the border open up many opportunities for researching both different regulations as well as their impact on service sectors. The important value added that services account for in goods trade is also an interesting point of view, as services account for a growing share in the production of goods.

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## 9. Appendix

Table 5. Countries

<b>OECD Countries</b>		<b>Non-OECD Member countries</b>
Australia	Korea, Republic of	Brazil
Austria	Latvia	China
Belgium	Lithuania	Costa Rica
Canada	Luxembourg	India
Chile	Mexico	Indonesia
Colombia	Netherlands	Malaysia
Czech Republic	New Zealand	Russian Federation
Denmark	Norway	South Africa
Estonia	Poland	Thailand
Finland	Portugal	
France	Slovak Republic	
Germany	Slovenia	
Greece	Spain	
Hungary	Sweden	
Iceland	Switzerland	
Ireland	Turkey	
Israel	United Kingdom	
Italy	United States of America	
Japan		

Table 6. Correspondence table EBOPS2010 to ISIC Rev.4.

STRI	EBOPS 2010	EBOPS code	ISIC Rev 4	ISIC code
<b>Accounting</b>	Accounting; auditing; bookkeeping; and tax consulting services	10.2.1.2	Accounting, bookkeeping and auditing activities; tax consultancy	692
<b>Air transport</b>	Space transport	3.5	Passenger air transport	5110
	Air transport - passenger	3.2.1	Passenger air transport	5110
	Space transport	3.5	Freight air transport	5120
	Air transport - freight	3.2.2	Freight air transport	5120
<b>Financial</b>	Financial services	7.1	Financial service activities, except insurance and pension funding	Division 64
<b>Computer</b>	Computer services - other computer services	9.2.2	Computer programming activities	6201
	Computer services - other computer services	9.2.2	Computer consultancy and computer facilities management activities	6202
	Computer services - other computer services	9.2.2	Data processing, hosting and related activities	6311
	Information services - other information services	9.3.2	Web portals	6312
	Information services - news agency services	9.3.1	News agency activities	
<b>Construction</b>	Construction abroad, credits/construction in the reporting economy, debits	5.1/5.2	Construction of buildings/civil engineering	Division 41
	Construction abroad, credits/construction in the reporting economy, debits	5.1/5.2	Civil engineering	Division 42
<b>Postal</b>	Post and courier services	3.4	Postal and courier activities	Division 53
<b>Insurance</b>	Direct insurance - life insurance	6.1.1	Life insurance	6511
	Direct insurance - freight insurance	6.1.2	Non-life insurance	6512
	Direct insurance - other direct insurance	6.1.3	Life insurance	6511
	Reinsurance	6.2	Reinsurance	6520
<b>Legal</b>	Legal services	10.2.1.1	Legal activities	6910
<b>Sea transport</b>	Sea transport - freight	3.1.2	Sea and coastal freight water transport	5012
<b>Rail freight</b>	Rail transport - freight	3.6.2	Freight rail transport	4912
<b>Road freight</b>	Road transport - freight	3.7.2	Freight transport by road	4923
<b>Telecommunications</b>	Telecommunications services	9.1	Wired telecommunications activities	6110
	Telecommunications services	9.1	Wireless telecommunications activities	6120

Table 7. OLS results: STRI and cross-border exports for all sectors

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	Pooled	Accounting	Air	Computer	Construction	Financial	Insurance	Legal	Postal	Rail	Road	Sea	Telecom
<b>STRI Importer</b>	-0.226*** (0.025)	-0.623*** (0.061)	-0.174 (0.131)	-0.711*** (0.086)	0.091 (0.104)	-0.331*** (0.100)	-0.284*** (0.068)	-0.157*** (0.052)	-0.424*** (0.081)	0.133 (0.106)	-0.122 (0.075)	-0.062 (0.158)	-0.062 (0.074)
<b>STRI Exporter</b>	-0.464*** (0.028)	-0.553*** (0.062)	1.346*** (0.232)	-0.345*** (0.091)	-0.703*** (0.118)	-0.472*** (0.143)	-0.440*** (0.084)	-0.342*** (0.052)	-0.367*** (0.098)	0.365*** (0.115)	-1.612*** (0.116)	-1.289*** (0.152)	-0.096 (0.072)
<b>Exporter GDP</b>	0.586*** (0.006)	0.475*** (0.018)	0.708*** (0.016)	0.726*** (0.014)	0.331*** (0.020)	0.688*** (0.024)	0.785*** (0.021)	0.644*** (0.023)	0.565*** (0.021)	-0.018 (0.033)	0.373*** (0.020)	0.470*** (0.033)	0.664*** (0.017)
<b>Importer GDP</b>	0.607*** (0.007)	0.669*** (0.019)	0.758*** (0.018)	0.792*** (0.016)	0.518*** (0.021)	0.562*** (0.024)	0.686*** (0.021)	0.569*** (0.022)	0.580*** (0.024)	0.359*** (0.029)	0.695*** (0.017)	0.418*** (0.033)	0.543*** (0.017)
<b>Distance</b>	-0.712*** (0.011)	-0.857*** (0.029)	-0.600*** (0.032)	-0.754*** (0.027)	-0.860*** (0.039)	-0.565*** (0.040)	-0.446*** (0.034)	-0.594*** (0.033)	-0.643*** (0.042)	-0.852*** (0.070)	-1.560*** (0.029)	-0.151*** (0.058)	-0.881*** (0.031)
<b>Common language</b>	1.116*** (0.034)	0.826*** (0.096)	1.001*** (0.089)	0.952*** (0.081)	0.365*** (0.104)	2.011*** (0.093)	1.346*** (0.096)	1.155*** (0.107)	1.240*** (0.124)	1.095*** (0.143)	0.390*** (0.118)	0.950*** (0.241)	0.806*** (0.081)
<b>Services RTA</b>	0.169*** (0.027)	0.174** (0.073)	0.533*** (0.079)	0.334*** (0.069)	-0.290*** (0.095)	0.273*** (0.090)	0.868*** (0.081)	-0.005 (0.077)	-0.006 (0.094)	-0.433** (0.180)	0.153* (0.080)	0.425*** (0.137)	-0.066 (0.075)
<b>Observations</b>	30,952	2,195	3,614	3,658	2,681	3,728	3,146	2,016	1,665	866	2,645	1,792	2,710
<b>Year FE</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Sector FE</b>	Yes	No	No	No	No	No	No	No	No	No	No	No	No

Note: The dependent variable is Exports in million US dollar. Standard errors are clustered by country pair.

\*\*\*, \*\* and \* signify significance at the 1%, 5% and 10% level.

Table 8. Summarizing table of variables

	<i>Observations</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>
<i>Exports</i>	50,742	81.387	445.068	0	20,423
<i>Ln_STRI Imp</i>	48,966	3.215	0.455	2.303	4.605
<i>Ln_STRI Exp</i>	50,121	3.112	0.386	2.303	4.605
<i>Ln_GDPExp</i>	50,771	26.624	1.572	23.579	30.655
<i>Ln_GDPImp</i>	49,604	27.011	1.541	23.579	30.655
<i>Ln_Distance</i>	50,786	7.896	1.124	5.081	9.879
<i>Com. Lang.</i>	50,786	0.0524	0.223	0	1