The Effect of Bilateral Services Trade Barriers on Goods Trade

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Abstract: The objective of this paper is to investigate the impact of policy-induced trade barriers in finance, knowledge intensive producer services (KIPS), telecom, transport and wholesale and retail (W&R) on goods trade using the World Input-Output Database covering 43 countries over the period 2000-2014. A three-stage analysis is employed. The measures of bilateral services trade barriers calculated in each of the five key services sectors in the first stage are decomposed into its cultural/geographical and policy-induced parts in the second stage. Policy-induced barriers to services trade are used in the structural gravity estimations of intermediate and final goods trade across countries in the final stage. The results demonstrate significant and robust adverse effects of barriers to services trade on goods trade independent of intermediate or final status. However, when the level of development is taken into consideration, there are marked differences in the impact of these barriers on goods trade.

Keywords: bilateral services trade barriers, goods exporting, gravity.
JEL Codes: *F10, F14*

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1. Introduction

The rising international fragmentation of production in the recent decades has created a new trade-investment-services nexus. Core elements in this structure are finance, knowledge intensive producer services (KIPS), telecom, transport and wholesale and retail (W&R) as these services are important inputs in production and a significant part of final consumption.

The objective of this paper is to analyze the impact of policy-induced bilateral barriers to trade in these key services sectors on goods trade. There is an extensive amount of research on the effect of different types of barriers on trade. It has been shown time and again that the measures taken to reduce goods trade were successful in their purpose. Related to this, a rather new line of research finds that the measures to restrict services trade diminish trade in services. Concurrently, the global value chains literature shows strong evidence about goods and services production/trade becoming increasingly intertwined in the second age of globalization due to falling transport and transaction costs (Baldwin and Lopez-Gonzalez, 2014). However, the literature has not yet rigorously established the role of policy-induced bilateral services trade barriers on goods trade, which constitutes the central thrust of the current paper.

Increasing global competition has reduced the margins of error in production and made it necessary to have sophisticated process design, supply chain management, software, high-speed telecommunications, effective transportation, and universal and safe financial services (Nordås and Rouzet, 2015). Therefore, barriers to trade of services are expected to be associated with lower trade volumes not only in services but also in goods.

This paper employs a three-stage approach in analyzing the impact of policy-induced bilateral barriers to services trade on goods trade using data from the World Input Output Database (WIOD) for 43 countries spanning the period 2000-2014.

The first stage of the analysis involves calculating barriers to trade in services. There are survey based measures in the literature that are used as proxies of observable services trade barriers (STBs) such as the OECD Product Market Regulation Database[3], the World Bank Services Trade Restrictiveness Index[4] and the OECD Services Trade Restrictiveness Index[5]. Although these proxies provide useful information, they have several drawbacks. First, data are not available for a long and continuous time span, which hinders the time variation analysis. Second, they reflect services restrictiveness on a unilateral basis lacking important bilateral barrier information. Third, as the data are survey based, subjectivity of the responses may create biased analysis. We use Novy (2013) methodology, which overcomes some of these disadvantages of the survey-based databases in calculating the trade barriers in services.

The second stage of the analysis is to estimate bilateral policy-induced barriers in services trade. As argued by Nordås and Rouzet (2015) as well, measures of STBs designed

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[3] See Kox and Nordås (2009) and Schwellnus (2007)
[4] See Van der Marel and Shepherd (2013)
[5] See Nordås and Rouzet (2015)

and calculated so far are unable to distinguish between natural barriers, such as cultural and geographical barriers (CGBs) and policy-induced barriers in services trade (PIBs). CGBs affect both goods and services trade, though the effect may not be the same. The timely question here is the impact of bilateral PIBs on goods trade in time, i.e. the impact of bilateral liberalization or protection efforts, which leads us to make a novel contribution by decomposing STBs into CGBs and PIBs and analyze the impact of bilateral PIBs separately. As a result, in this stage of the analysis, we decompose services trade barriers into their cultural/geographic and policy-induced components by regressing STBs on CGBs. The residual vector approximates bilateral PIBs, which pro bilateral regulations in services trade, as suggested by Francois et al. (2007).

The third stage of our analysis is to estimate a structural gravity equation of goods trade[6] by including bilateral PIBs to trade in five services sectors (finance, KIPS, telecom, transport and W&R) as explanatory variables.

In the first stage, after calculating STBs we explore if there is a distinction between intermediate and final use. This is motivated by the fact that in the international input-output framework, when a service is produced, it can be used in the domestic and foreign production as well as domestic and final consumption. Our results show that STBs in final services trade is slightly higher than the intermediate ones but correlated at above 95 percent. Therefore, in all the subsequent analysis, we use STBs in all services trade without distinguishing between intermediate or final use.

Our descriptive analysis on bilateral PIBs, which are calculated in the second stage, indicate that advanced countries face lower PIBs compared to emerging countries throughout the sample period. Furthermore, when we shine a light on the change of barriers from 2000 to 2014, we observe that the new members of the EU (Poland, Hungary, Romania, Bulgaria, Estonia and Croatia) witnessed declining PIBs probably due to the improvements of these countries' legal systems and expected economic stability following the EU integration. Emerging countries (Russia, Turkey, Mexico, India and Indonesia), on the other hand, exhibited the opposite trend and experienced higher barriers over time as a possible outcome of the anti-globalization movement which resulted in more restrictive behind the border regulations between advanced and emerging countries, in particular.

In the third and the last stage, our baseline results indicate that bilateral PIBs in all five services sectors adversely affect goods trading when considered individually. Results for intermediate or final goods trade have no marked differences. However, when considered all together, the negative impact of bilateral PIBs in financial services on goods trade disappears both for intermediate and final goods trade.

We then extend our analysis to the effect of policy-induced bilateral services trade barriers by level of economic development. We complement our investigation by offering a counterfactual analysis on the impact of removing PIBs in services trade on goods trade. The results show that (i) PIBs in transport and W&R negatively affect goods trade independent of the development level of the exporter and the importer; (ii) while PIBs in

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[6] See Anderson and van Wincoop (2004) and Bergstrand (1985, 1989).

telecom, transport and W&R have an adverse impact on advanced-advanced country goods trade, PIBs in finance and KIPS do not have an impact on this type of goods trade; (iii) PIBs in finance, transport and W&R negatively affect goods trade between advanced and emerging countries; (iv) PIBs in KIPS and telecom have a negative impact on goods exports from emerging countries to advanced countries, but not on goods exports from advanced countries to emerging countries; (v) the impact of PIBs in KIPS, transport and W&R is negative on goods trade among emerging countries. Depending on the services barrier type and the development level of the traders, counterfactual analysis produces positive effects on goods trade ranging from 8 to 230 percent.

Through its treatment and analysis of services trade barriers in three-stages, our work contributes to the literature in several dimensions: *First*, we calculate the tariff equivalents of bilateral barriers to trade in five services sectors using Novy (2013) method. Obtaining these tariff equivalents or STBs in an indirect way by inferring them from observable trade flows is an advantage particularly in services trading due to data limitations and well-known heterogeneity of domestic and international regulations in services[7]. Another advantage of this method among others is its incorporation of time dimension into the analysis. Since trade flows vary over time, we can compute tariff equivalents in services sectors not only for cross-sectional data but also for time series and panel data.

Second, we decompose STBs into its cultural/geographical and policy components. That way, we obtain a services trade cost measure that can account for bilateral and policy related barriers only. Considering the impact of bilateral liberalization or protection efforts, it is important to have a measure of bilateral PIBs in services trade.

Finally, to the best of our knowledge we are the first to estimate the effect of bilateral PIBs in trade in services on goods trading. Considering the services penetration in manufacturing sector and the intertwined nature of goods and services trading, our analysis may reveal potentially important policy implications.

The paper proceeds as follows. Section 2 lays out the methodology and data followed by a discussion of calculation of services trade barriers in the first stage in Section 3. Next, Section 4 presents the results of second stage complemented with a descriptive analysis of policy-induced barriers. Section 5 outlines the baseline results and the extensions of our analysis. Finally, Section 6 concludes and discusses the directions for future research.

2. Methodology and Data

This section presents the details of the methodology for the purpose of analyzing the impact of bilateral policy-induced services trade barriers on goods trade.

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[7] One drawback of using observable trade flows is the missing trade problem. Some trade is unobserved. In services, this might be more so due to the restrictiveness of domestic or policy barriers. We recognize that there is a selection problem when services trade restrictiveness is derived from observed data.

2.1. First Stage: Services Trade Barriers

The first stage of our analysis involves the calculation of a micro-founded measure of bilateral services trade costs as in Novy (2013) where he derives a trade cost measure[8] from a wide range of leading trade models based on the idea that all those models yield gravity equations in general equilibrium. We start with a short review of this method based on the gravity model of Anderson and van Wincoop (2003, 2004) that can apply to trade in goods or services:

$$x_{ij}^s = \frac{y_i^s y_j^s}{y^s} \left(\frac{t_{ij}^s}{\Pi_i^s P_j^s} \right)^{1-\sigma^s} \quad \forall i,j; \tag{1}$$

$$(\Pi_i^s)^{1-\sigma^s} = \sum_j \left(\frac{t_{ij}^s}{P_j^s} \right)^{1-\sigma^s} \frac{y_i^s}{y^s} \quad \forall i; \tag{2}$$

$$(P_j^s)^{1-\sigma^s} = \sum_i \left(\frac{t_{ij}^s}{\Pi_i^s} \right)^{1-\sigma^s} \frac{y_i^s}{y^s} \quad \forall j. \tag{3}$$

Let x_{ij}^s denote the value of exports of services sector s at destination prices from country i to country j. y_j^s signifies the expenditure on services sector s in country j originated from all countries. y_i^s and y^s denote the sales of services sector s at destination prices from i to all countries and total output of services sector s at those prices, respectively. Next, t_{ij}^s denotes the bilateral trade costs between countries i and j. The trade elasticity of substitution across exporting countries i in services sector s is represented by σ^s. Π_i^s and P_j^s are price indices of exporting and importing countries in services sector s, respectively. These price indices, which are called as outward and inward multilateral resistance by Anderson and van Wincoop (2003), include trade costs with all other partners and can be interpreted as average trade costs.

Due to the difficulty of finding expressions for the multilateral resistance variables, Novy (2013) proposes a method that makes use of the insight that a change in bilateral trade barriers does not only affect international trade but also intranational trade. More precisely, a decline in trade barriers in country i reduces the domestic consumption (intranational trade) of the services sector s because of an increase in shipments of that service to foreign countries after the policy change.

Using equation (1), we can write the gravity equation for intranational trade of country i in services sector s as follows:

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[8] Head and Ries (2001) were the first authors to derive this type of trade cost measure for which they coined the name Head and Ries Index.

$$\Pi_i^s P_i^s = \left(\frac{x_{ii}^s / y_i^s}{y_i^s / y^s} \right)^{1/\sigma^s - 1} t_{ii}^s \tag{4}$$

Suppose that countries i and j are of the same size $y_i^s = y_j^s$ and same level of openness $x_{ii}^s = x_{jj}^s$ in services sector s. However, country i has more stringent domestic regulations in services sector s compared to country j, $t_{ii}^s > t_{jj}^s$. Then, equation (4) shows that multilateral resistance in services sector s is higher for country i.

To solve for the bilateral trade costs in services sector s, we use equation (4) in conjunction with equation (1). Equation (1) includes the product of outward multilateral resistance of the exporting country and inward multilateral resistance of the importing country, $\Pi_i^s P_j^s$ in service sector s. Equation (4) provides a solution for $\Pi_i^s P_i^s$. By multiplying gravity equation (1) by the corresponding gravity equation for trade flows in service sector s in the opposite direction, x_{ij}^s, we can obtain a bidirectional gravity equation with outward and inward multilateral resistance variables of exporting and importing countries in services sector s:

$$x_{ij}^s x_{ji}^s = \left(\frac{y_i^s y_j^s}{y^s} \right)^2 \left(\frac{t_{ij}^s t_{ji}^s}{\Pi_i^s P_i^s \Pi_j^s P_j^s} \right)^{1-\sigma^s} \tag{5}$$

Substituting the solution from equation (4), assuming asymmetry in domestic and bilateral services trade costs, $t_{ij}^s \neq t_{ji}^s$ and $t_{ii}^s \neq t_{jj}^s$, and taking the geometric mean of the barriers in both directions, we arrive at the following tariff equivalent in services sector s:

$$\tau_{ij}^s \equiv \left(\frac{t_{ij}^s t_{ji}^s}{t_{ii}^s t_{jj}^s} \right)^{\frac{1}{2}} - 1 = \left(\frac{x_{ii}^s x_{jj}^s}{x_{ij}^s x_{ji}^s} \right)^{\frac{1}{2(\sigma^s - 1)}} - 1 \tag{6}$$

where τ_{ij}^s measures bilateral trade costs $t_{ij}^s t_{ji}^s$ relative to domestic trade costs $t_{ii}^s t_{jj}^s$ in services sector s. $\sigma^s > 1$ is the elasticity of substitution in services sector s[9].

The trade cost measure in equation (6) has a simple yet elegant logic. If there is an increase in bilateral trade flows $x_{ij}^s x_{ji}^s$ relative to domestic trade flows $x_{ii}^s x_{jj}^s$ in services sector s, it means that trading services sector s products between the two countries must have become easier relative to trading domestically, which is signified by a decline in τ_{ij}^s. In essence, we divide external services trade barriers inclusive of domestic regulation to domestic services barriers inclusive of domestic regulation to obtain the bilateral barriers to trade in services.

We calculate the tariff equivalent in equation (6) for five leading services sector

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[9] σ^s is assumed to be 4.67 in all network serviced sectors in this paper following Francois et al. (2005).

categories: finance, KIPS, telecom, transport and W&R as a measure of services trade barriers (STBs) for years 2000-2014.

2.2. Second Stage: Policy-Induced Barriers in Services Trade

The second stage of our analysis is to estimate bilateral policy-induced barriers (PIBs) in services trade. Our objective is to decompose STBs into its two main components: cultural and geographical barriers (CGBs) and policy-induced barriers in services trade (PIBs).

Trade (goods or services) is affected by cultural barriers such as colonial ties or common language and geographical barriers such as distance, common border or being landlocked. What seems to be more challenging to answer here is the question that whether and how trade is affected by policy induced barriers in services, and in particular by bilateral PIBs.

As a next step, in obtaining the unobservable, residual trade costs (bilateral PIBs) in services trade in each services sector s, we regress STBs obtained in the first stage of our analysis on CGBs proxied by geographical (common border, distance) barriers and cultural (same country, colonial ties, common language, member of the same currency union) barriers as follows:

$$
\begin{aligned}
ln\tau_{ijt}^s = {} & \alpha_0 + \alpha_1 ln(Distance_{ij}) + \alpha_2 Border_{ij} + \alpha_3 Language_{ij} + \alpha_4 Colony_{ij} \\
& + \alpha_5 Same\ Country_{ij} + \alpha_6 Landlocked_i + \alpha_7 Landlocked_j \\
& + \alpha_8 Currency\ Union_{ij} + \varepsilon_{ijt}^s
\end{aligned} \tag{7}
$$

where $ln\tau_{ijt}^s$ is the logarithm of bilateral trade barriers in services sector s between exporting country i and importing country j in year t. Here

$$
ln(Distance_{ij}) = ln\left(\frac{d_{ij}d_{ji}}{d_{ii}d_{jj}}\right)^{\frac{1}{2}} - 1 \tag{8}
$$

to use the same functional form as in the tariff equivalent term, where $d_{ij} = d_{ji}$ is the distance between trading partners and d_{ii} and d_{jj} are internal distances[10]. $Border_{ij}$ takes the value of 1 if there is a common border between i and j and 0 otherwise while $Language_{ij}$ is a dummy to capture the presence of a common language between these countries. $Colony_{ij}$ shows if there are colonial ties between the two countries. $Same\ Country_{ij}$ takes the value of 1 if countries were or are the same state or the same administrative entity for a long period (25-50 years in the twentieth century, 75 year in the ninetieth and 100 years before) and 0 otherwise. $Landlocked_i$ and $Landlocked_j$ are indicator variables equal to 1 if

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10 Internal distance of the exporting country i is calculated as, $d_{ii} = .67\sqrt{Area_i/\pi}$ and for the importing country j, $d_{jj} = .67\sqrt{Area_j/\pi}$ (as a measure of average distance between producers and consumers in a country).

exporting and importing country are landlocked, respectively. Finally, $Currency\ Union_{ij}$ account for a currency union among countries i and j. Note that there is no need to conduct the same transformation that is done for distance variable for the other gravity variables since they are all dummy variables.

First, we estimate five equations with time varying dummy variables for five services sectors under consideration as well as for the entire services sector. Next, we use the residual vector, $\varepsilon_{ijt}^s = v_{ij}^s + e_{ijt}^s$, as a proxy for PIBs, which reflect bilateral regulations in services trade, as suggested by Francois et al (2007). The residual vector in each estimating equation approximates the sector specific policy-induced barriers to services trade in that particular sector[11].

Finally, PIBs are calculated by indexing the residual vector as follows:

$$\phi_{ijt}^s = \frac{\varepsilon_{ijt}^s - \min(\varepsilon_{ijt}^s)}{\max[\varepsilon_{ijt}^s - \min(\varepsilon_{ijt}^s)]} \in [0,1] \tag{9}$$

2.3. Third Stage: Structural Gravity Estimation of Goods Trade

In the final stage, we estimate a structural gravity model of goods trade, which involves the policy-induced services trade barriers in the five sectors as explanatory variables, in the form

$$lnx_{ijt}^g = \beta + \beta_{it} + \beta_{jt} + \beta_{ij} + \sum_s \gamma_s \phi_{ijt}^s + \zeta_{ijt} \tag{10}$$

where $\sum_s \gamma_s \phi_{ijt}^s = \gamma_{FIN}\phi_{ijt}^{FIN} + \gamma_{KIPS}\phi_{ijt}^{KIPS} + \gamma_{TEL}\phi_{ijt}^{TEL} + \gamma_{TRAN}\phi_{ijt}^{TRAN} + \gamma_{W\&R}\phi_{ijt}^{W\&R}$.

In equation (10), lnx_{ijt}^g is the logarithm of the nominal value of goods exports from country i to country j in year t. In order to account for unobserved heterogeneity across time and countries, exporter-year β_{it}, importer-year β_{jt} and exporter-importer β_{ij} fixed effects are included in the estimations. Bilateral PIBs approximated by ϕ_{ijt}^s in services sectors are included in this regression to measure the impact of bilateral barriers in services trade on goods trade.

Our choice of estimation method is Poisson pseudo-maximum-likelihood (PPML) estimator for its success in overcoming heteroskedasticity and zeroes in bilateral trade flows (Santos Silva and Tenreyro, (2006, 2011)).

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[11] The first term is the panel specific error which is constant over time. The second one is the regular error term. We need both of them. The first one gives us the exporter-importer specific trade barriers which we did not control with our observed variables. The second one gives us the exporter-importer-year specific error.

2.4. Data

The analyses in this paper are based on bilateral international trade data from the World Input-Output Database (WIOD) and the gravity data. In the first stage of the analysis, we use bilateral services trade data[12], while in the third stage we utilize bilateral goods trade data.

The WIOD November 2016 Release is composed of World Input Output Tables (WIOT) and Socio-Economic Accounts (SEA). The three improvements that have been incorporated in this new release are (i) addition of data that have become available in recent years, (ii) improvement of the bilateral shares estimation in especially services trade, and (iii) enhancement of the estimation of basic price tables by using information on margins and taxes on exports[13].

The new release of WIOD covers 43 countries in total -28 EU countries and 15 other major countries in the world- for the period from 2000 to 2014[14]. Moreover, NACE Rev. 2 industry and CPA 2008 product classifications are used. The supply and use tables (SUTs) in the database cover 56 industries which are listed in Appendix Table A1.

In the second stage of the analysis, we use standard controls for the gravity model, namely natural trade barriers. The variables that we use are distance between countries, *Distance*; common border between countries, *Border*; common language, *Language*; same historical origins, *Colony* and *Same Country*; being landlocked, *Landlocked*; being under the same currency union, *Currency Union*. *Area* is used for internal distance calculations. All the data are taken from CEPII, except data on currency union which come from De Sousa (2012).

Summary statistics are given in Table 1.

3. Services Trade Barriers

In the framework of the WIOT, when a service is produced, it can be used by (1) domestic agriculture sectors, (2) domestic goods sectors, (3) domestic services sectors, (4) foreign agriculture sectors, (5) foreign goods sectors, (6) foreign services sectors, (7) domestic consumers and (8) foreign consumers. To compute bilateral services trade barriers (STBs), we need to consider the bilateral trade of services between two countries. Therefore, we use (4), (5), (6) and (8).

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[12] Only data on cross-border services trade in GATS modes 1 and 2 are integrated due to data limitations.

[13] See Timmer et al. (2016) for a detailed discussion on the construction of WIOD and improvements of the database.

[14] The list of the 43 countries (plus estimated rest of world) included is: EU-28 Member States (Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Germany, Denmark, Spain, Estonia, Finland, France, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, Latvia, Malta, Netherlands, Poland, Portugal, Romania, Sweden, Slovakia, Slovenia and United Kingdom), Australia, Brazil, Canada, China, Norway, India, Indonesia, Japan, Korea, Mexico, Russia, Switzerland, Taiwan, Turkey, USA and Rest-of-World (estimated).

As a first step in our analysis, we explore if there is a distinction between intermediate and final use in terms of services trade barriers. For the former we use (4) to find τ_{ijt}^{int-a}, (5) to find τ_{ijt}^{int-m}, (6) to find τ_{ijt}^{int-s} and for the latter we use (6) to find τ_{ijt}^{fin}.

On the supply side (inputs) the services sectors are categorized as follows[15]:

- Services: Rows 23-56
    - Finance and Insurance: Rows 41-43
    - Knowledge Intensive Producer Services: Rows 40 and 45-48
    - Telecom and Postal: Rows 35 and 39
    - Transport (inc. logistics): Rows 31-34
    - Wholesale and Retail: Rows 28-30

The use side (output) is categorized as follows:

- Intermediate Use: Columns 1-56
    - Agriculture: Columns 1-4
    - Manufacturing: Columns 4-22
    - Services: Columns 23-56
- Final Use: Columns 57-61

Our calculations of STBs in intermediate services trade –services traded to be used in agriculture, manufacturing and services production- and final services trade –services traded for consumption- exhibit a slight difference as displayed in Figure 1. The kernel density diagram shows that the distributions of the STBs in intermediate services trade are almost the same. However, the distribution of STBs in final services trade is slightly higher than the intermediate ones[16].

However, the correlation coefficients are all above 95 percent showing that these measures are virtually equal when used in regressions,

$$\tau_{ijt}^{int-a} = \tau_{ijt}^{int-m} = \tau_{ijt}^{int-s} = \tau_{ijt}^{final}.$$

Therefore, in the rest of the paper, we calculate the STBs in all services trade without distinguishing between intermediate or final use.

4. Policy-Induced Barriers to Trade

Policy-induced barriers to services trade (PIBs), which reflect bilateral regulations in services trade, are calculated in the second stage for the five services sectors for the period 2000-2014. This section briefly discusses the differences of PIBs among countries for the services sector as a whole and for each five services subsectors.

Figure 2 presents a comparison of PIBs in services sector across countries for 2014. The measure of PIBs for a country is calculated as the simple average of that country's

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[15] Row and column numbers in WIOT which are also presented in Table A.1.

[16] This slight difference is also proved by the Kolmogorov-Smirnov test for the equality of intermediate and final STBs, which is rejected. The results are available upon request.

bilateral PIBs. Note that as PIBs are indexed to change between 0 and 1, country-level PIBs will fall into the same range as well. A change in a country's level of PIBs may be caused by; i) that country altering its barriers towards a set of other countries, ii) other countries changing barriers towards that country or iii) both.

The countries experiencing the lowest PIBs (around 0.35) are small, open economies of the EU; namely, the Netherlands, Belgium and Malta. In contrast, India and Indonesia are the countries with the highest PIBs, almost two-folds of the lowest PIBs countries. The Figure shows that advanced countries face lower PIBs compared to emerging countries. The exceptions are PIBs of Taiwan with around 0.4 and Canada with around 0.5.

Figure 3 provides a comparison of average PIBs between 2000 and 2014 for services sector as a whole and for each subsector. Panel (i) suggests that while some countries experienced a decrease in their PIBs over time, there are countries that encountered an increase in their barriers between 2000 and 2014. Specifically, the countries that became a member of the EU after 2000 enjoyed lower PIBs during 2000-2014 period. Some of those countries with significant decreases are Poland, Hungary, Romania, Bulgaria, Estonia and Croatia. This would be due to the improvements of these countries' legal systems and expected economic stability following the integration to the EU. Moreover, some other members of the EU enjoyed further decreases in their barriers such as Malta, Belgium, Ireland and Luxemburg, which may be an indication of an added benefit of joining the European Monetary Union.

Emerging countries, on the other hand, followed an opposite trend and experienced higher barriers over time. Russia, Turkey, Mexico, India and Indonesia are amongst those countries. This may be the outcome of the anti-globalization movement which resulted in more restrictive behind the border regulations. Evenett and Fritz (2015) present a detailed picture of discriminatory measures implemented and experienced by G20 countries for years 2009-2015. Among these six countries, while Mexico was harmed relatively more by other countries' protectionist measures, India and Indonesia adopted protectionist measures that harm the interests of other countries relatively more intensely. Russia and Turkey, on the other hand, implemented and experienced a plethora of protectionist measures. To be precise, Russia has increased the number of protectionist measures from 71 to 478 while Turkey from 27 to 157 during 2009-2015 period.

As a financial center, the UK is one of the countries with the lowest PIBs in *Finance and Insurance* both in 2000 and 2014 as shown in panel (ii) of Figure 3. Ireland and Malta are the other countries with the lowest barriers. In contrast, the highest trade barriers in the financial and insurance services are observed in Russia, India and Indonesia. These results are in line with the OECD STRI index (2017 release). Indeed, for financial and insurance services, PIBs calculated in this paper and STRI values, both in 2014, are positively correlated at 65 percent level.

PIBs in *Knowledge Intensive Producer Services* is lower almost for all the countries in our sample compared to the services sectors as a whole (Panel iii). Most of the countries demonstrate PIBs around 0.15-0.3 band. The two outlier countries experiencing higher barriers are Mexico and Turkey.

The highest PIBs in the *Transport* are observed in India and Indonesia in 2014. The countries that started to experience significantly higher barriers in *Transport* over time are Turkey, Spain, Japan, India and Indonesia. Similar to the reduction of their PIBs in services sector as a whole, the latest members of the EU also enjoyed decreasing PIBs in *Transport* as presented in Panel (iv) of Figure 3. In addition to these new members of the EU, China also notably experienced a fall in its PIBs in the transport sector following the liberalization efforts in transport sector during the sample period.

Compared to PIBs in services overall, most of the countries did not experience any change in their PIBs in *Telecom and Postal* during our sample period as evident in Panel (v) of Figure 3. The countries facing significantly lower barriers in the *Telecom and Postal* services are among the EU members as it is the case in the overall services sectors. Belgium, Luxemburg, the UK and Italy were the countries with the lowest barriers in 2014, whereas Turkey, Mexico, Greece and Brazil had the highest barriers.

Except Indonesia[17], the countries in our sample impose very low PIBs in *W&R* as expected (Panel vi). Indeed, the OECD STRI index (2017 release) shows that Indonesia is an outlier in imposing high barriers in distribution sectors. Furthermore, in 2014, barriers to trade in wholesale and retail services calculated in this paper as PIBs and STRI values reported by OECD are positively correlated at 80 percent level.

5. Structural Gravity

5.1. Baseline Results

In this section, very similar to Section 3, we start our analysis by categorizing the goods trade according to intermediate and final use in the destination country. Goods that are exported to be used in foreign agriculture, goods and services sectors, altogether make the intermediate goods trade. Obviously, goods are also exported to be used in final consumption in the destination country, which constitutes the final goods trade.

In order to determine whether bilateral policy induced barriers in different services sectors affect exports of intermediate and final goods differently, we estimate the following two variants of the structural gravity regression given in equation (10):

$$lnx_{ijt}^{int-g} = \beta + \beta_{it} + \beta_{jt} + \beta_{ij} + \sum_s \gamma_s \, \varepsilon_{ijt}^s + \zeta_{ijt}. \tag{11a}$$

$$lnx_{ijt}^{final-g} = \beta + \beta_{it} + \beta_{jt} + \beta_{ij} + \sum_s \gamma_s \, \varepsilon_{ijt}^s + \zeta_{ijt}. \tag{11b}$$

Table 2 presents the results of the PPML estimation of bilateral goods trade for the period 2000-2014 for 43 countries composed of advanced and emerging countries in the WIOD database. The estimations include exporter-year, importer year, exporter-importer fixed effects as well as policy induced barriers to services trade in five services sectors.

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[17] Indonesia is removed from the Figure for demonstration purposes.

Table 3 and 4 repeat the same analysis for intermediate goods trade and final goods trade enabling the comparison of the impact of PIBs on them.

As a first step, we analyze the effects of policy induced barriers to trade in five services sectors on goods trade in Table 2. Column 1 reports the impact of PIBs in services sector as a whole on goods trade. The coefficient is negative and significant as expected. Columns 2 to 6 present results related to 5 services sectors, namely *Transport, Telecom and Postal, Finance and Insurance, Knowledge Intensive Producer Services* and *Wholesale and Retail.* Trade barriers in these services sectors negatively and significantly affect goods trade. Finally, the joint effect of all five policy induced services trade barriers are reported in Column 7 and all of them are negative and significant, except PIBs in *Finance and Insurance*. These results are in line with Nordås and Rouzet (2015) and Ariu et al. (2016) who found similar results by using OECD STRI index and OECD PMR index, respectively.

Table 3 and 4 repeat the regressions in Table 2, for final goods trade and intermediate goods trade in Table 3 and 4, respectively. The objective of this exercise is to investigate if there is a marked difference in the impact of PIBs on final and intermediate goods trade. The results indicate that the coefficients in Table 2, 3 and 4 are very close to each other indicating that PIBs have a very similar impact on final goods trade and intermediate goods trade.

Next, we discuss the extensions of our benchmark specifications.

5.2.   Trade Costs by Level of Economic Development

In this section, we investigate whether our results in the benchmark regressions change when we consider trade between countries with different levels of development[18]. The results of the estimations are presented in Table 5, while counterfactual analysis regarding the effect of removing PIBs in *Finance*, *KIPS, Telecom, Transport* and *W&R,* one at a time, on goods trade is shown in Table 6.

The first result from the Table 5 is that PIBs in *Transport* and *W&R* negatively affect goods trade independent of the development level of the exporter and the importer. Therefore, any country imposing high barriers in *Transport* and *W&R* has the possibility of reducing goods trade in a significant way as these are vital services sectors that act as inputs in goods production.

First column of Table 5 reports the impact of PIBs in services on bilateral goods trade between advanced countries. The coefficients of PIBs in *Telecom, Transport* and *W&R* are negative and significant indicating the importance of reducing barriers in services sectors in boosting goods trade between advanced countries. The counterfactual analysis results suggest that removing PIBs in *W&R* would increase goods trade between advanced countries by 229 percent, while removing barriers in *Telecom* and *Transport* would enhance goods trade by 32 percent and 52 percent, respectively, as shown in Table 6. On

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[18] Advanced and emerging country classifications are made using the World Bank income taxonomy. Advanced countries are high income countries in the World Bank classification while emerging ones are all the rest in our database.

the other hand, PIBs in *Finance* and *KIPS* do not have an impact on bilateral goods trade. This may be due to the already low barriers in *Finance* and *KIPS* among advanced countries.

Goods trade between advanced countries and emerging countries is negatively affected by PIBs in *Finance*, *Transport* and *W&R*. The estimated increase in goods trade ranges from 8 percent to 122 percent as reported in Table 6. Furthermore, PIBs in *KIPS* and *Telecom* have a negative impact on goods exports from emerging countries to advanced countries, but not on goods exports from advanced countries to emerging countries.

The value of services trade between advanced countries is much higher compared to that between advanced and emerging countries. Owing to this scale effect, barriers in *KIPS* and *Telecom* between advanced and emerging countries do not have a significant effect on goods exports of advanced countries. On the other hand, as emerging countries may rely more on advanced countries in their procurement of international services, barriers in these sectors reduce emerging countries' goods exports. As a result, reductions in barriers in *KIPS* and *Telecom* may increase goods exports of emerging countries by 25 percent and 30 percent, respectively (Table 6). However, for such reductions to take place, the prerequisite may very well be the improvements in the quality of services supplied by these sectors, such as engineering, legal and accounting services, in emerging countries.

The last columns of Table 5 is for bilateral trade among emerging countries. The impact of PIBs in *KIPS, Transport* and *W&R* is negative on goods trade among emerging countries. The counterfactual analysis produces positive effects on goods trade of removing services trade barriers ranging from 100 to 227 percent as presented in Table 6.

6. Conclusion

In this paper, we investigated the impact of policy-induced trade barriers in finance, telecom, transport, wholesale and retail (W&R) and knowledge intensive producer services (KIPS) on goods trade using the World Input-Output Database covering 43 countries over the period 2000-2014.

We employed a three-stage approach: (i) In the first stage, we calculated barriers to trade in services using Novy (2013) methodology. The advantage of obtaining these tariff equivalents or STBs in an indirect way by inferring them from observable trade flows is to overcome the difficulties related to data limitations and heterogeneity of domestic and international regulations in services. Another benefit is to be able compute tariff equivalents in services sectors not only for cross-sectional data but also for time series and panel data. (ii) In the second stage, we decomposed services trade barriers into their cultural/geographic and policy-induced components by regressing STBs on well-known gravity variables. We calculated policy-induced barriers from the residual vector of this regression. In essence, we obtained a services trade cost measure that account for bilateral barriers only. (iii) In the third stage, we estimated a structural gravity equation of goods trade by including bilateral PIBs to trade in five services sectors as explanatory variables, namely finance, telecom, transport, W&R and KIPS.

Our results show that STBs calculated in the first stage using Novy (2013) are not different for intermediate and final use. Therefore, in the decomposition of STBs into CGBs and PIBs in the second stage, we employed no such distinction.

Next, in the second stage analysis, for the services sector as a whole, we found that advanced countries have lower bilateral PIBs on average compared to emerging countries throughout the sample period. While the new members of the EU (Poland, Hungary, Romania, Bulgaria, Estonia and Croatia) witnessed declining PIBs over time, emerging countries (Russia, Turkey, Mexico, India and Indonesia) experienced higher barriers over time.

Finally, in the structural gravity estimations in the third stage, the results show that bilateral PIBs in all five services sectors adversely affect goods trading both for intermediate and final goods trade. When we extended our analysis to goods trade between countries of different development levels the results exhibit meaningful variations in the regression coefficients.

First of all, the impediments to trade in the most traditional services sectors such as Transport and W&R, independent of the level of development of the exporter or the importer had a significant role in adversely affecting the goods trade. Therefore, policy measures that reduce the services trade barriers in these sectors will have an important role in boosting goods trading in all countries.

Second, we found that while PIBs in Telecom, Transport and W&R have an adverse impact on advanced-advanced goods trade, PIBs in Finance and KIPS do not have an impact on this type of goods trade. This means that there is still room for bilateral reductions in barriers to the trade of telecommunications, distribution and transportation services in advanced economies in order to increase the level of goods trade between these countries.

Third, PIBs in Finance, Transport and W&R negatively affect goods trade between advanced and emerging countries. Some of these barriers, particularly in transport, are imposed by advanced countries to emerging countries. However, the results suggest that reducing these barriers would enhance the goods exports in emerging countries as well as advanced countries.

Fourth, PIBs in KIPS and Telecom have a negative impact on goods exports from emerging countries to advanced countries, but not on goods exports from advanced countries to emerging countries. What this result may imply in the policy arena is that reductions in barriers to the trade of KIPS and Telecom will increase goods exports of emerging countries. However, for advanced countries to get involved in such a concession, improvements in the quality of services supplied by emerging to advanced countries in these sectors may be in order.

Finally, the impact of PIBs in *KIPS, Transport* and *Wholesale and Retail* is negative on goods trade among emerging countries. These barriers may be imposed due to the possibility of low quality of these services in emerging countries. Improving the quality and reliability of these services in emerging countries may enhance the goods trade among them.

Considering the anemic growth of world trade in the better part of the last decade, the results of this paper may lend themselves to be of use by policymakers. It is true that there is no consensus about what caused the trade slowdown; the underlying reasons may be cyclical, structural or protection related (Hoekman, 2015). However, it cannot be true that we hit a peak trade constraint.

First of all, most of the world trade is dominated by a few advanced countries which are heavily affected by the 2008 financial crisis. Once these countries fully recover, demand weaknesses -which is a factor for trade slowdown- will disappear and cause the blossoming of trade once again. There are emerging economies with big populations (not only China and India) that can create demand in international markets.

Secondly, we have witnessed revolutionary developments in information technology. Only between 2013 and 2014 data flows between countries doubled and reached 290 terabytes per second. There is a never-seen-before increase in the volume of digital products ranging from e-books to internet games. Each day more nontradables become tradables.

In conclusion, for both of these forces to help recover the anemic world trade, we need a better grasp of the factors that inhibit this recovery. This paper, therefore, can be considered as an attempt to pave the road for our understanding of how service trade barriers affect global trade in today's world.

References

Anderson, J., van Wincoop, E. (2003). Gravity with gravitas: a solution to the border puzzle. American Economic Review 93, 170–192.,

Anderson, J. E., & Van Wincoop, E. (2004). Trade costs. Journal of Economic literature, 42(3), 691-751.

Ariu, A., Breinlich, H., Corcos, G., & Mion, G. (2016). Interconnections Between Services and Goods Trade at the Firm Level. Technical report, Mimeo.

Baldwin, R., & Lopez- Gonzalez, J. (2014). Supply-chain Trade: A Portrait of Global Patterns and Several Testable Hypotheses. The World Economy.

Bergstrand, J. H. (1985). The gravity equation in international trade: some microeconomic foundations and empirical evidence. The review of economics and statistics, 474-481.

Bergstrand, J. H. (1989). The generalized gravity equation, monopolistic competition, and the factor-proportions theory in international trade. The review of economics and statistics, 143-153.

De Sousa, J. (2012), "The currency union effect on trade is decreasing over time", Economics Letters, 117(3), 917-920

Evenett, S., & Fritz, J. (2015). The tide turns? Trade, protectionism, and slowing global growth. 18th Global Trade Alert Report, Centre for Economic Policy Research.

Francois, J., Van Meijl, H., & Van Tongeren, F. (2005). Trade liberalization in the Doha development round. Economic Policy, 20(42), 350-391.

Francois, J., Hoekman, B., & Woerz, J. (2007). Does gravity apply to intangibles? Measuring openness in services. Center for Economic and Policy Research, Johannes Kepler Universitat, World Bank, and Vienna Institute for International Economic Studies. Unpublished manuscript.

Head, K., & Ries, J. (2001). Increasing returns versus national product differentiation as an explanation for the pattern of US-Canada trade. American Economic Review, 858-876.

Hoekman, B. (2015). The global trade slowdown: A new normal. *VoxEU. org eBook (London, Centre for Economic Policy Research (CEPR))*.

Nordås, H. K., & Kox, H. (2009). Quantifying regulatory barriers to services trade.

Nordås, H. K., & Rouzet, D. (2015). The Impact of Services Trade Restrictiveness on Trade Flows: First Estimates, OECD Trade Policy Paper No. 178, Paris: OECD.

Novy, D. (2013). Gravity redux: measuring international trade costs with panel data. Economic Inquiry, 51(1), 101-121.

Silva, J. S., & Tenreyro, S. (2006). The log of gravity. The Review of Economics and statistics, 88(4), 641-658.

Silva, J. S., & Tenreyro, S. (2011). Further simulation evidence on the performance of the Poisson pseudo-maximum likelihood estimator. Economics Letters, 112(2), 220-222.

Schwellnus, C. (2007). The effect of domestic regulation on services trade revisited (No. 2007-08).

Timmer, M. P., Los, B., Stehrer, R., & de Vries, G. J. (2016). An anatomy of the global trade slowdown based on the WIOD 2016 release (No. GD-162). Groningen Growth and Development Centre, University of Groningen.

Van der Marel, E., & Shepherd, B. (2013). International tradability indices for services. World Bank Policy Research Working Paper, (6712).

Figure 1. Kernel Density Diagram of Intermediate and Final STBs
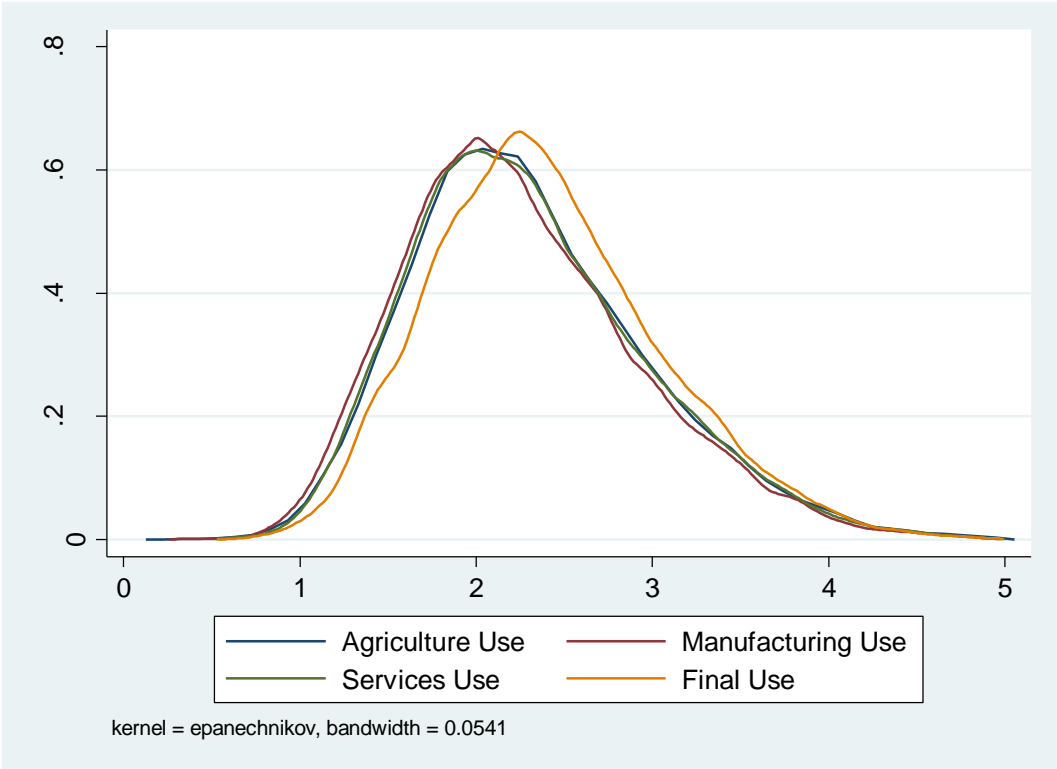
kernel = epanechnikov, bandwidth = 0.0541
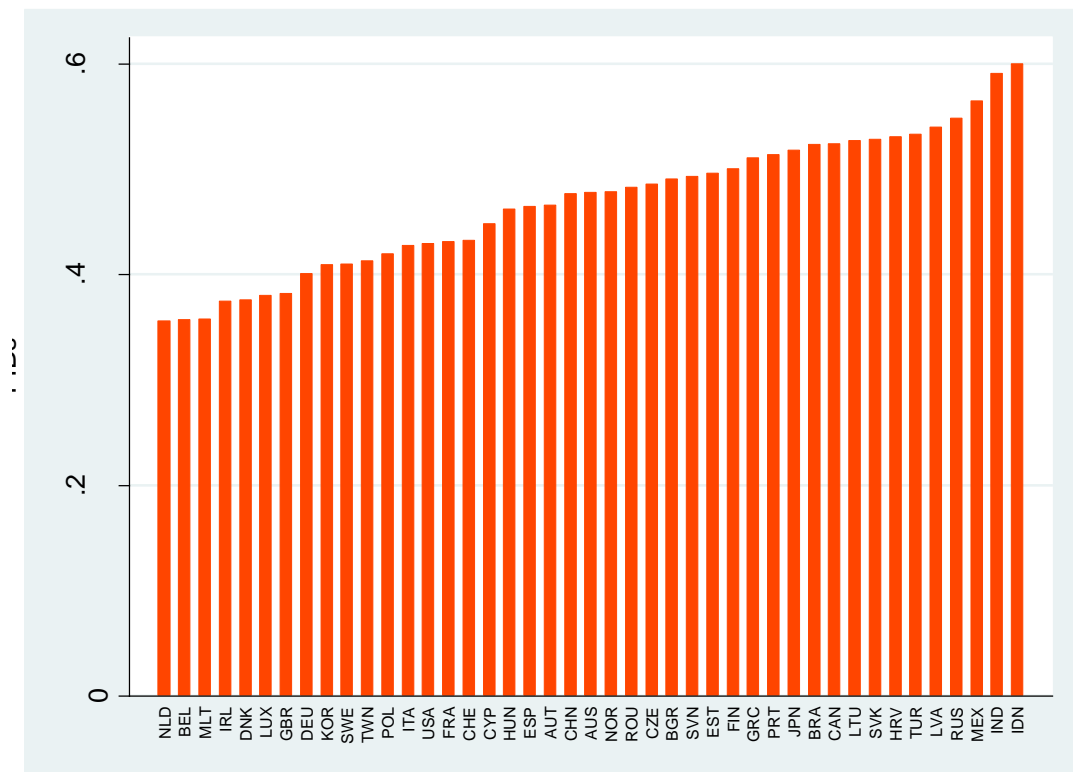
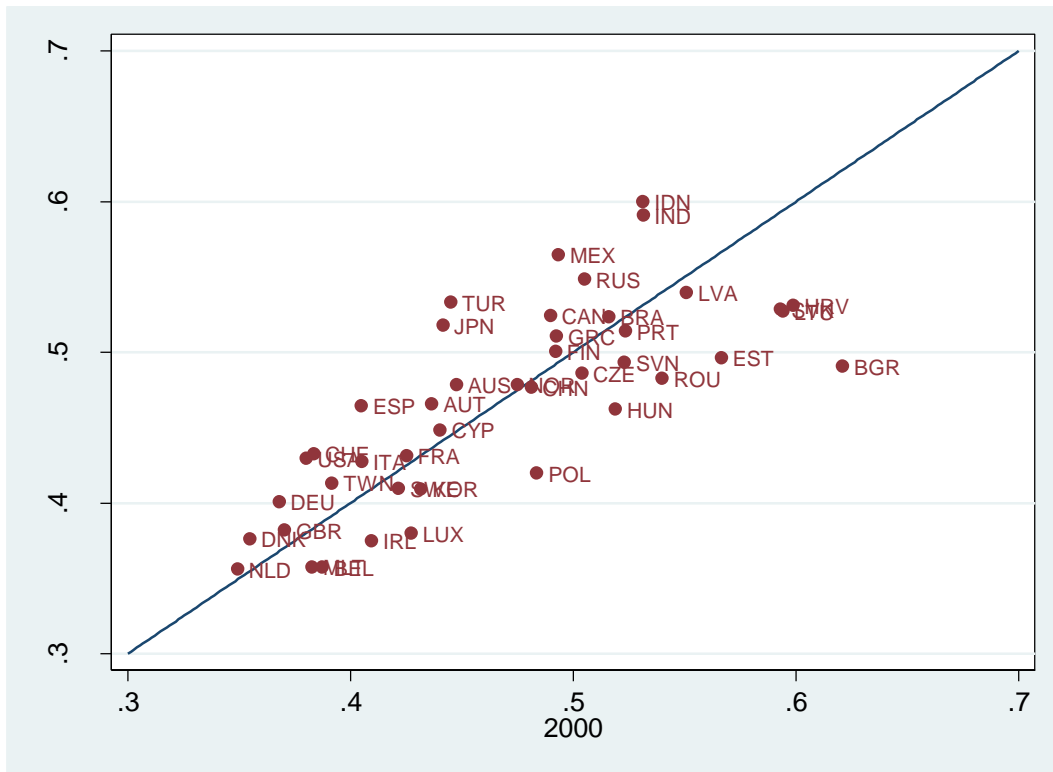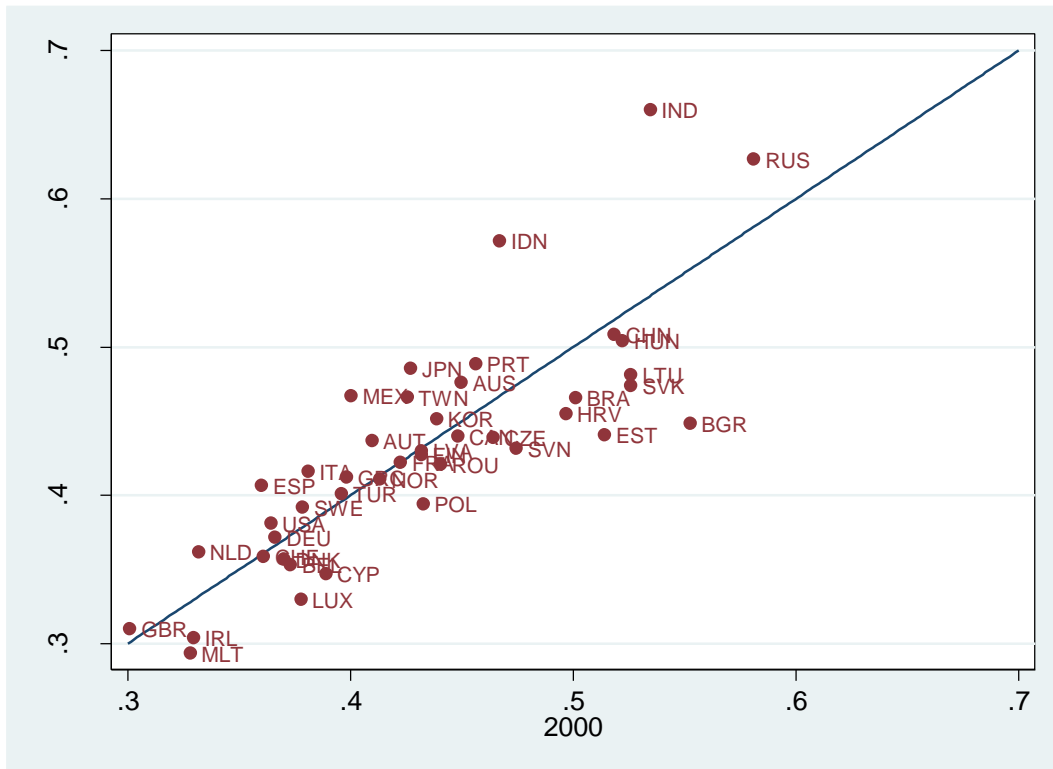Figure 2. Comparison of Average PIBs across Countries

Figure 3. Comparison of Average PIBs across Countries between 2000 and 2014

i. PIBs in Services

ii. PIBs in Finance and Insurance

iii. PIBs in Knowledge Intensive Producer
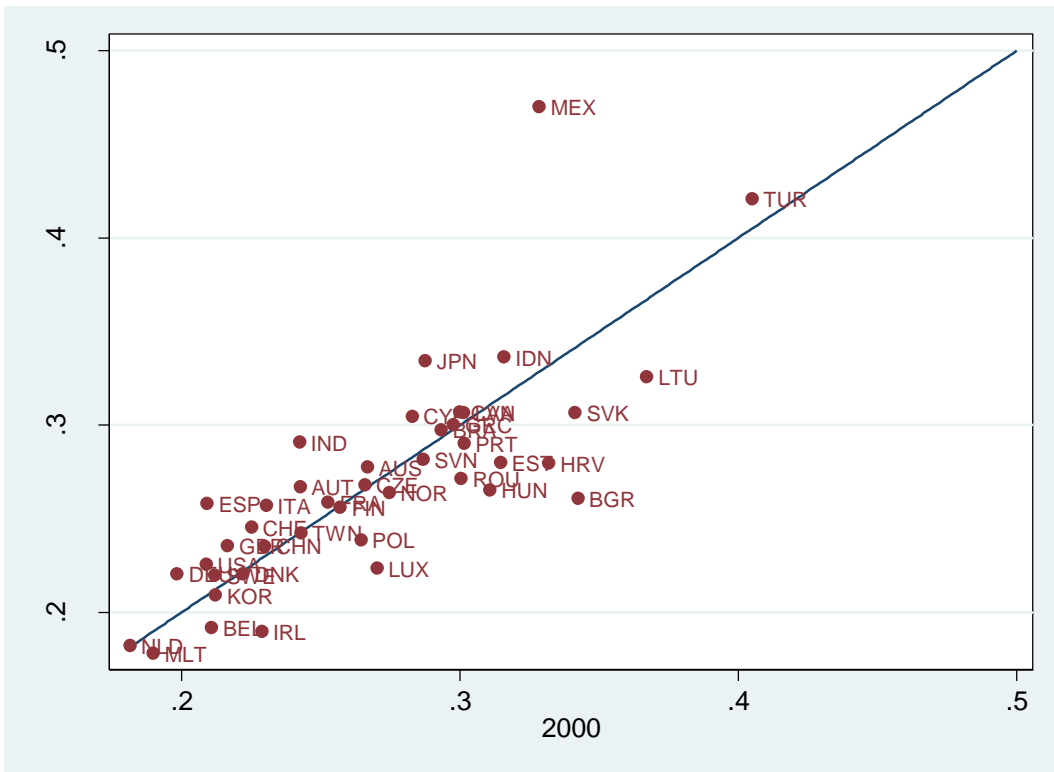
iv. PIBs in Telecom and Postal
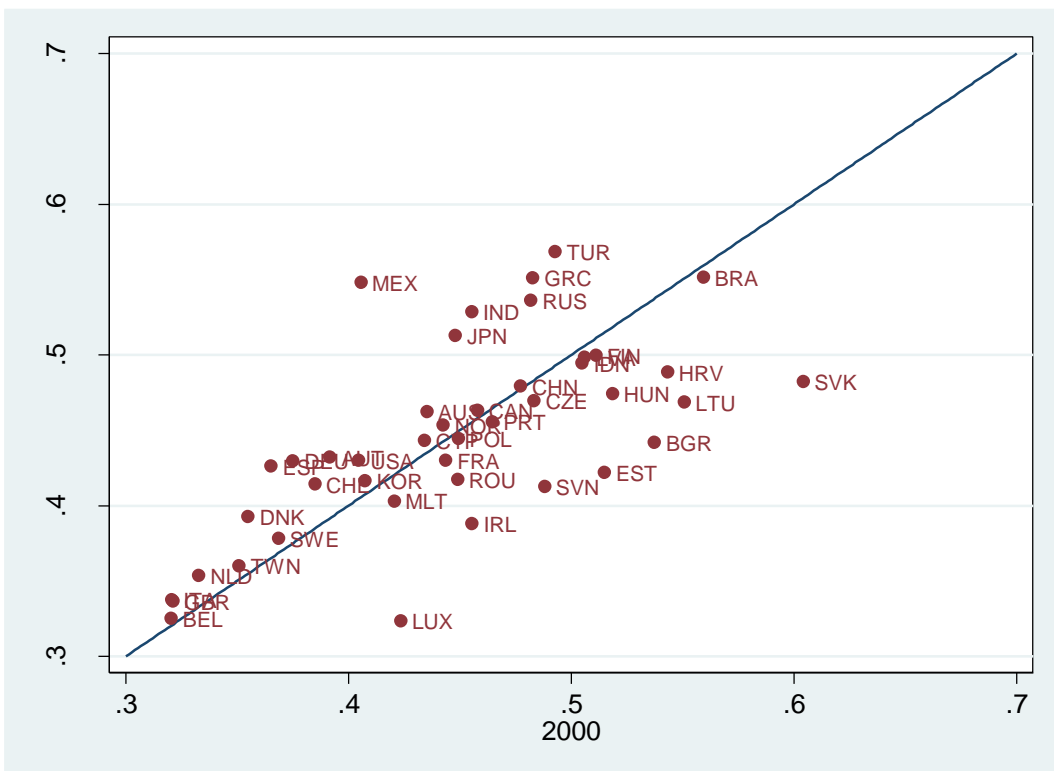
v. PIBs in Transport
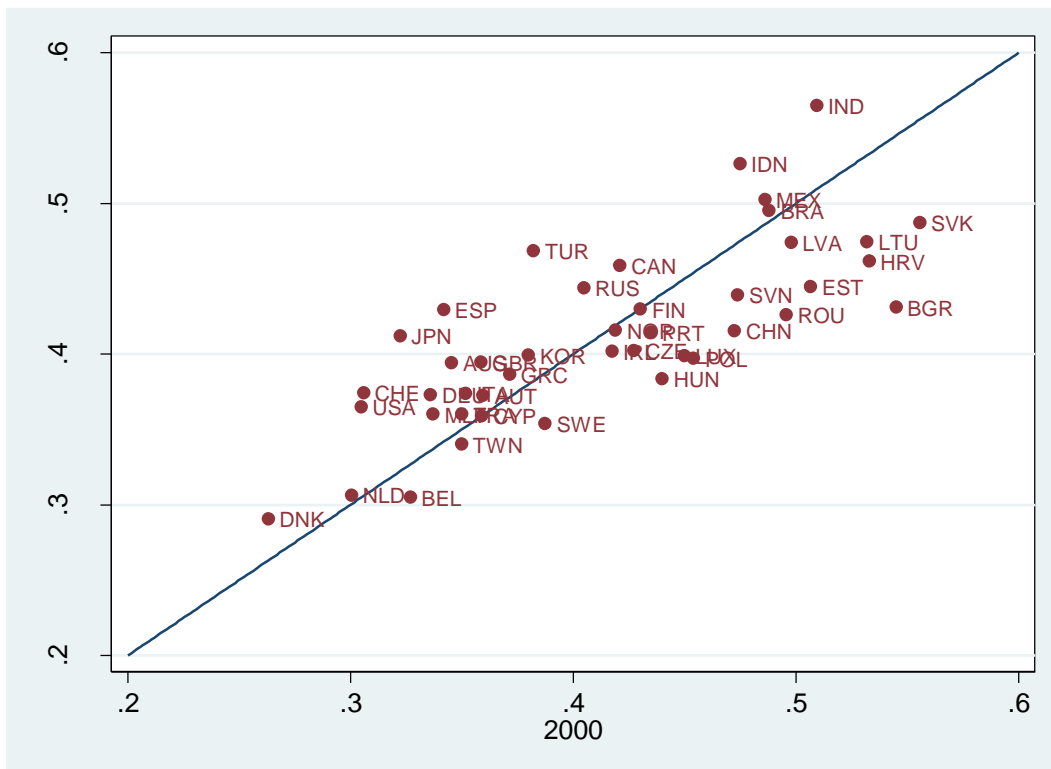
vi. PIBs in Wholesale and Retail
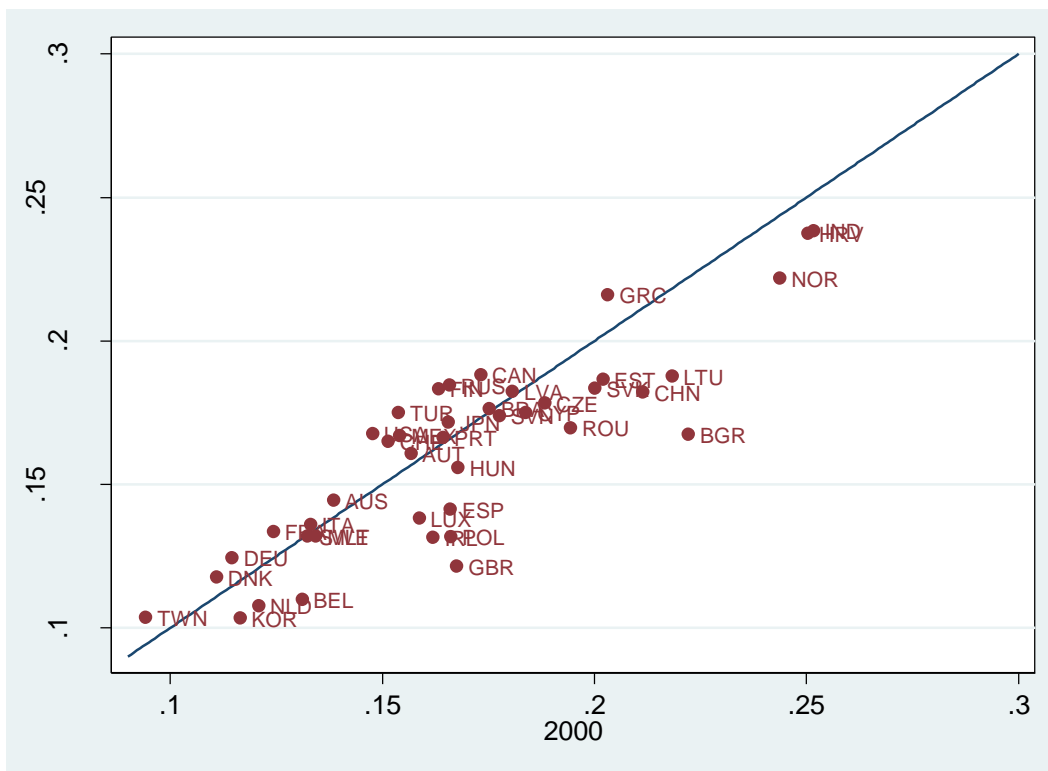
Table 1. Summary Statistics

Variable	Mean	Std. Dev.	Min	Max
Trade Variables				
lnx_{ijt}^{int-g}	5.144	2.433	0.000*	11.85
$lnx_{ijt}^{final-g}$	4.839	2.422	0.000*	12.29
lnx_{ijt}^{g}	5.734	2.447	0.000*	12.72
lnx_{ijt}^{s}	4.700	2.319	0.002	11.012
Gravity Variables				
Distance	4913.7	4430.8	59.62	18821
Border	0.059	0.237	0	1
Language	0.051	0.220	0	1
Colony	0.034	0.182	0	1
Same Country	0.022	0.147	0	1
Land Locked	0.140	0.347	0	1
Currency Union	0.106	0.308	0	1
Area	1757782	3713285	316	17100000

* Minimum trade is rounded to 0.

Table 2. Baseline PPML Estimation of Bilateral Goods Trade, 2000-2014

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
PIBS (total)	-0.676***						
	(0.035)						
PIBS (finance)		-0.226***					-0.025
		(0.025)					(0.025)
PIBS (KIPS)			-0.573***				-0.221***
			(0.037)				(0.038)
PIBS (telecom)				-0.214***			-0.075***
				(0.020)			(0.021)
PIBS (transport)					-0.530***		-0.325***
					(0.032)		(0.032)
PIBS (W&R)						-0.825***	-0.639***
						(0.046)	(0.044)
Constant	0.100	1.224***	2.158***	1.445***	1.603***	1.740***	1.477***
	(0.075)	(0.294)	(0.052)	(0.089)	(0.039)	(0.083)	(0.089)
Observations	27,090	27,010	25,748	27,060	27,090	26,490	25,124
R^2	0.981	0.981	0.982	0.981	0.981	0.982	0.983
Log Likelihood	-47665	-47538	-45183	-47629	-47669	-46604	-44074

Note: Standard errors are reported in brackets. *** ** and * denotes significance at 1% 5% and 10%, respectively. All regressions include exporter-year importer-year and exporter-importer fixed effects.

Table 3. Baseline PPML Estimation of Bilateral Intermediate Goods Trade, 2000-2014

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
PIBS (total)	-0.765***						
	(0.042)						
PIBS (finance)		-0.275***					-0.038
		(0.031)					(0.030)
PIBS (KIPS)			-0.699***				-0.293***
			(0.044)				(0.046)
PIBS (telecom)				-0.259***			-0.089***
				(0.025)			(0.025)
PIBS (transport)					-0.653***		-0.432***
					(0.038)		(0.039)
PIBS (W&R)						-0.849***	-0.620***
						(0.052)	(0.050)
Constant	-0.460***	2.206***	2.202***	1.242***	1.631***	1.634***	1.382***
	(0.123)	(0.409)	(0.070)	(0.119)	(0.050)	(0.099)	(0.100)
Observations	27,090	27,010	25,748	27,060	27,090	26,490	25,124
R^2	0.979	0.979	0.980	0.979	0.979	0.979	0.981
Log Likelihood	-45888	-45764	-43464	-45855	-45891	-44858	-42384

Note: Standard errors are reported in brackets. *** ** and * denotes significance at 1% 5% and 10%, respectively. All regressions include exporter-year importer-year and exporter-importer fixed effects.

Table 4. Baseline PPML Estimation of Bilateral Final Goods Trade, 2000-2014

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
PIBS (total)	-0.703***						
	(0.044)						
PIBS (finance)		-0.252***					-0.057*
		(0.032)					(0.033)
PIBS (KIPS)			-0.526***				-0.174***
			(0.046)				(0.049)
PIBS (telecom)				-0.233***			-0.094***
				(0.025)			(0.026)
PIBS (transport)					-0.479***		-0.227***
					(0.040)		(0.041)
PIBS (W&R)						-0.994***	-0.805***
						(0.060)	(0.061)
Constant	-0.353***	-0.686*	1.747***	1.271***	1.040***	1.622***	0.387**
	(0.084)	(0.395)	(0.052)	(0.125)	(0.052)	(0.152)	(0.167)
Observations	27,090	27,010	25,748	27,060	27,090	26,490	25,124
R²	0.977	0.977	0.978	0.977	0.977	0.977	0.979
Log Likelihood	-44861	-44748	-42536	-44830	-44865	-43875	-41516

Note: Standard errors are reported in brackets. *** ** and * denotes significance at 1% 5% and 10%, respectively. All regressions include exporter-year importer-year and exporter-importer fixed effects.

Table 5. PPML Estimation of Bilateral Goods Trade between Country Groups 2000-2014

Exporter Importer	Advanced Advanced	Advanced Emerging	Emerging Advanced	Emerging Emerging
PIBS (finance)	0.066*	-0.223***	-0.163***	0.234***
	(0.040)	(0.044)	(0.052)	(0.077)
PIBS (KIPS)	-0.084	-0.012	-0.169**	-0.539***
	(0.060)	(0.058)	(0.066)	(0.152)
PIBS (telecom)	-0.125***	0.004	-0.127***	-0.051
	(0.027)	(0.037)	(0.045)	(0.076)
PIBS (transport)	-0.204***	-0.281***	-0.403***	-0.618***
	(0.046)	(0.059)	(0.064)	(0.112)
PIBS (W&R)	-1.245***	-0.587***	-0.240***	-0.963***
	(0.136)	(0.064)	(0.060)	(0.133)
Constant	2.109***	2.642***	2.017***	4.169***
	(0.035)	(0.030)	(0.072)	(0.135)
Observations	7,590	6,137	6,482	4,659
R²	0.990	0.986	0.979	0.971
Log Likelihood	-14018	-10671	-11349	-7627

Note: Standard errors are reported in brackets. *** ** and * denotes significance at 1% 5% and 10%, respectively. All regressions include exporter-year importer-year and exporter-importer fixed effects.

Table 6. Counterfactual Analysis: Impact of Removing PIBs between Country Groups (percentage increase)

Exporter Importer	Advanced Advanced	Advanced Emerging	Emerging Advanced	Emerging Emerging
PIBS (finance)	-12.72*	57.76***	39.33***	-32.25***
PIBS (KIPS)	12.33	1.521	24.78**	100.4***
PIBS (telecom)	31.96***	-0.750	29.55***	9.694
PIBS (transport)	52.13***	73.86***	121.7***	226.5***
PIBS (W&R)	229.1***	73.92***	8.14***	133.6***

Note: Standard errors are reported in brackets. *** ** and * denotes significance at 1% 5% and 10%, respectively. PIBS for finance, KIPS, telecom, transport, W&R are removed one at a time in regressions and the results indicate the increase in goods trade as a percentage.

Table A1. Sectors in WIOD Release 2016 (NACE.Rev2)

Nr	Sector	
1	A01	Crop and animal production, hunting and related service activities
2	A02	Forestry and logging
3	A03	Fishing and aquaculture
4	B	Mining and quarrying
5	C10-C12	Manufacture of food products, beverages and tobacco products
6	C13-C15	Manufacture of textiles, wearing apparel and leather products
7	C16	Manufacture of wood and of products of wood and cork, except furniture; etc.
8	C17	Manufacture of paper and paper products
9	C18	Printing and reproduction of recorded media
10	C19	Manufacture of coke and refined petroleum products
11	C20	Manufacture of chemicals and chemical products
12	C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
13	C22	Manufacture of rubber and plastic products
14	C23	Manufacture of other non-metallic mineral products
15	C24	Manufacture of basic metals
16	C25	Manufacture of fabricated metal products, except machinery and equipment
17	C26	Manufacture of computer, electronic and optical products
18	C27	Manufacture of electrical equipment
19	C28	Manufacture of machinery and equipment n.e.c.
20	C29	Manufacture of motor vehicles, trailers and semi-trailers
21	C30	Manufacture of other transport equipment
22	C31_C32	Manufacture of furniture; other manufacturing
23	C33	Repair and installation of machinery and equipment
24	D	Electricity, gas, steam and air conditioning supply
25	E36	Water collection, treatment and supply
26	E37-E39	Sewerage; waste collection, treatment and disposal activities; materials recovery; etc.
27	F	Construction
28	G45	Wholesale and retail trade and repair of motor vehicles and motorcycles
29	G46	Wholesale trade, except of motor vehicles and motorcycles
30	G47	Retail trade, except of motor vehicles and motorcycles
31	H49	Land transport and transport via pipelines
32	H50	Water transport
33	H51	Air transport
34	H52	Warehousing and support activities for transportation
35	H53	Postal and courier activities
36	I	Accommodation and food service activities
37	J58	Publishing activities
38	J59_J60	Motion picture, video and television program production, sound recording and music publishing activities; etc.
39	J61	Telecommunications
40	J62_J63	Computer programming, consultancy and related activities; information service activities
41	K64	Financial service activities, except insurance and pension funding
42	K65	Insurance, reinsurance and pension funding, except compulsory social security
43	K66	Activities auxiliary to financial services and insurance activities
44	L	Real estate activities
45	M69_M70	Legal and accounting activities; activities of head offices; management consultancy activities
46	M71	Architectural and engineering activities; technical testing and analysis
47	M72	Scientific research and development
48	M73	Advertising and market research
49	M74_M75	Other professional, scientific and technical activities; veterinary activities
50	N	Rental and leasing activities, Employment activities, Travel services, security and services to buildings
51	O	Public administration and defense; compulsory social security
52	P	Education
53	Q	Human health and social work activities
54	R-S	Creative, Arts, Sports, Recreation and entertainment activities and all other personal service activities
55	T	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
56	U	Activities of extra-territorial organizations and bodies