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Quantifying Barriers to Movement of Service Suppliers and Examining their Effects:

Implications for COVID-19

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Abstract

The importance of services trade and “servicification” of economic activity has grown in countries overtime. However, regulatory and administrative barriers to the movement of service suppliers have meant that “Mode 4” accounted for only 2.1% of total services trade in 2005 and 2.9% in 2017. While trade costs for services have been computed in the literature, barriers specific to Mode 4 services trade have not yet been quantified. We contribute by constructing an index to quantify regulatory barriers to the movement of service suppliers, using qualitative information embedded in OECD data on services trade restrictions, and examining its relationship with services trade by “mode” of supply. Results show that the Mode 4 restrictiveness index is negatively correlated with services imports in three of the four modes of services delivery that require proximity between buyers and sellers. Notably, services delivered by these modes are already adversely affected by COVID-19. These findings thus further underline the need for countries to refrain from imposing prohibitive restrictions on service suppliers during this pandemic.

Key words: *Services trade, Mode 4, services suppliers, STRI, COVID-19*

JEL classification: *F1, F10, F13*

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Quantifying Barriers to Movement of Service Suppliers and Examining their Effects: Implications for COVID-19

Anirudh Shingal*

1. Introduction

Trade in services is important for countries across the world. According to data from the WTO, between 2010 and 2018, trade in commercial services grew by 42% for developed economies, by 60% for developing and emerging economies and by 49% for LDCs, while global trade in commercial services grew by 48%. In fact, exports of commercial services alone witnessed a 90% increase for LDCs over this period.

Services matter not just because they are a potentially important source of foreign exchange revenue and associated employment and household income. Services are important for economic growth and development by virtue of their role as inputs into production in all sectors of economic activity (“servicification”). In fact, the share of services in global trade nearly doubles from 25% once services trade in value-added terms is accounted for (WTO, 2019). Moreover, realization of many sustainable development goals (SDGs) also depends on the performance of a range of specific services sectors (Fiorini and Hoekman, 2018).

The quality, price and availability of services inputs is determined by a mix of factors, including infrastructure connectivity network investments, the restrictiveness of trade and investment policies for goods and services, and the investment climate/business environment. There is substantial empirical evidence that services trade and FDI in services fosters productivity growth by inducing greater competition in domestic markets and providing manufacturing firms access to higher-quality, more varied, and cheaper services inputs, which benefits producers of both goods and services (Arnold et al. 2011, 2016; Beverelli et al. 2017). However, trade costs for services are higher than trade costs for goods, and the rate of decline observed for services trade costs since the early 2000s has been much less than that for goods (Miroudot et al. 2013).

These costs are especially salient for services delivered by the “temporary movement of natural persons” or “Mode 4” trade in WTO GATS parlance, which inter alia explains the low share of Mode 4 trade in total services trade.¹ According to WTO’s Trade in Services by Modes of Supply (TiSMoS) dataset, in 2017², 59.3% of global trade in services was delivered by Mode 3, 27.6% by Mode 1, 10.2% by Mode 2 and only 2.9% by Mode 4. In fact,

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¹ There are four different ways in which services are traded internationally: Mode 1 (“cross-border services trade”) that includes the entire range of services transacted via the internet e.g. online medical transcription services; Mode 2 (“consumption abroad” where the buyer travels overseas to consume a service e.g. tourism); Mode 3 (“commercial presence” by a foreign affiliate in the domestic economy and the affiliate’s transactions e.g. international retail banking services); and Mode 4 (“movement of natural persons” where the seller travels abroad to deliver a service e.g. IT professionals working onsite abroad and intra-corporate transferees).

² This is the latest year for which the WTO provides services trade data disaggregated by modes of supply.

irrespective of the level of economic development, the share of Mode 4 in services trade hovers around 3%³ though it was even lower at 2.1% in 2005 and 2.5% in 2010.

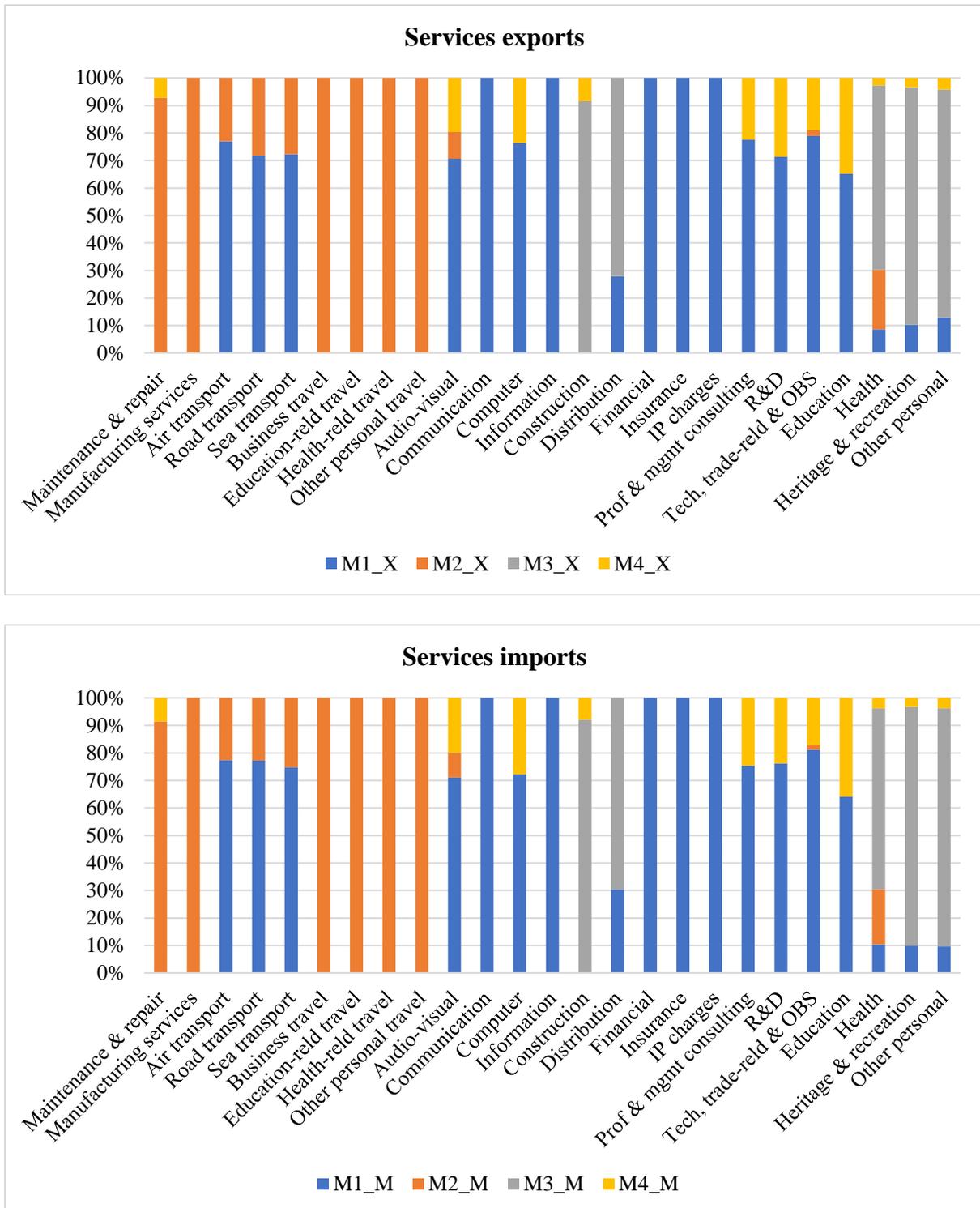
By definition, Mode 4 trade is not feasible in all sectors (for instance, financial and insurance services and charges towards the use of intellectual property are completely delivered cross-border while travel services are wholly delivered by Mode 2). But even in sectors where Mode 4 trade is feasible, there is significant variation in Mode 4 shares, which suggests the presence of policy impediments.

Figure 1 shows considerable heterogeneity in the modal distribution of services trade by sector in the year 2017. Services were delivered by Mode 4 in only 11 of the 25 sectors reported in Figure 1, but there was significant variation in Mode 4 shares even in these sectors. The Mode 4 dominant sectors include education, computer, other business and audio-visual services; in contrast, Mode 4 shares were much lower in maintenance & repair, construction, health and personal services.⁴

³ While the average Mode 4 share (2.9%) is the same for the group of upper-middle income countries, it is higher for the group of high income (3.1%) and lower-middle income countries (3.2%) but lower for the group of low-income countries (2.7%), according to the World Bank's income classification of countries.

⁴ Mode 4 accounted for 36 percent of all modes of delivery in the import of education services; about a quarter in imports of computer and other business services; and a fifth in audio-visual services imports. The sectoral distribution of Mode 4 was similar for services exports. Meanwhile, maintenance & repair; manufacturing services and travel were almost completely delivered by Mode 2, while construction, distribution and personal services were largely delivered by Mode 3. Services trade in the remaining sectors was largely transacted cross-border.

Figure 1: Distribution of services trade by mode of supply and sector (2017)



Source: WTO TiSMoS; own calculations

Note: R&D = Research and development; OBS = Other business services; IP = Intellectual property

In general, barriers to services trade do not take the form of border measures such as tariffs, but are rather embedded in regulatory frameworks. However, barriers to Mode 4 trade also

include border measures such as visas, work permits and quotas and are therefore more distinct. At the same time, labour market tests for work permits for service providers, and nationality/citizenship/permanent residency requirements for license to practice are examples of “behind-the-border” regulatory barriers constraining Mode 4 trade.

Trade costs for services, for intermediate vs final services, and for disaggregated services sectors, have been computed “top-down” by Miroudot et al. (2013) and Miroudot and Shepherd (2016) using the theory-based methodology of Novy (2013) as well as estimated in a structural gravity framework (WTO, 2019). Measures of regulatory impediments to services trade – the services trade restrictiveness indices (STRI) put together independently by the World Bank and the OECD – have also been used to examine the effects of regulatory incidence and heterogeneity on services trade, investment, integration into global value chains, and the membership and depth of preferential trade agreements (Kox and Nordås, 2007, 2009; Nordås, 2016; Miroudot and Cadestin, 2017; Nordas and Rouzet, 2017; Rouzet and Spinelli, 2016; Rouzet et al. 2017; Andrenelli et al. 2018; Shingal et al. 2018; Egger and Shingal, 2020). However, barriers specific to Mode 4 services trade have not yet been quantified.

Against this background, we contribute by constructing an index⁵ to quantify regulatory barriers to the movement of service suppliers, using qualitative information from the OECD’s STRI data, and examining its relationship with services trade by mode of supply. Note that the OECD’s STRI database only provides qualitative responses to measures that affect Mode 4 trade. We thus add value by quantifying these responses and constructing an index that can be used in empirical analysis (see Section 3 for details).

Results show that the constructed Mode 4 restrictiveness index is negatively correlated with services imports in three of the four modes of services delivery that require proximity between buyers and sellers. Notably, services delivered by these Modes 2, 3 and 4 are already adversely affected by COVID-19 (Shingal, 2020a) and accounted for over 70% of global services trade in 2017 according to WTO data. These findings thus further underline the need for countries to refrain from imposing prohibitive restrictions on service suppliers during this pandemic.

These results also confirm complementarities between different ways in which services trade is transacted. In particular, a 10% increase in Mode 4 restrictiveness is found to be associated with a proportionate decline in Mode 4 services imports on average and a 7.6 and 5.0% decline in services imports delivered by Modes 2 and 3, respectively. Disaggregated analysis suggests that the overall results may be driven by computer; maintenance & repair;

⁵ While our “bottom up” approach explicitly focuses on regulatory restrictions, we also control for all other trade costs affecting services trade in our estimating equation via the multilateral resistance term (see Section 4 for details). Our approach thus differs from “top down” trade cost measures that infer trade costs from observed patterns of trade and production and cover both observed and unobserved factors affecting trade in services. However, one notable limitation of “top down” measures, emanating from data availability constraints, is that the services trade data used to compute “top down” trade cost measures only cover Modes 1 and 2 and exclude Mode 3, which accounts for 60% of global trade in services.

professional & management consulting; and technical, trade-related and other business services.

The rest of the paper is structured as follows. Section 2 provides a brief review of the growing literature on the effects of services regulation and trade barriers. Section 3 describes the construction of the Mode 4 restrictiveness index. Section 4 discusses the empirical model used to examine the relationship between the constructed index and services imports by mode of supply. Section 5 describes the data and its sources while Section 6 presents and discusses results from estimation, including those from sensitivity analysis. Section 7 concludes.

2. Related literature: effects of services regulation and trade barriers

Services regulatory measures affect cross-border trade and investment in services by increasing both the fixed cost of entering a market and the variable cost of servicing it. The importance and potentially trade- and investment-inhibiting impact of domestic regulation on service sector performance has received some attention in the literature (for instance see Kox and Nordås, 2007, 2009; Nordås, 2016). Regulatory heterogeneity has also been shown to exert a significantly negative impact on bilateral services trade delivered via “commercial presence” or Mode 3 (Kox and Nordås, 2009; Nordås, 2016). In fact, regulatory heterogeneity has been found to account for 21 percent of total trade costs in services along with trade policy barriers (WTO, 2019). Regulatory incidence and heterogeneity have also been shown to be significant determinants of countries’ propensities to negotiate preferential services trade agreements (Egger and Shingal, 2020) and of their deeper commitments in such agreements relative to their WTO GATS commitments (Shingal et al. 2018).

Barriers to trade in services have been found to adversely affect trade, investment and value-chain integration, including at the firm level. Rouzet and Spinelli (2016) find regulatory restrictions in broadcasting, construction, storage, and air and maritime transport sectors to enable firms in these sectors to charge higher mark-ups, pointing to the potential for pro-competitive gains from regulatory liberalization. Nordas and Rouzet (2017) find higher regulatory restrictiveness to be associated with lower imports in the importing country across several sectors including legal services, telecommunications, commercial banking, insurance, maritime transport and courier services. Rouzet et al. (2017) find services firms’ exports at both the extensive and intensive margin to be inversely related to regulatory restrictions in importing countries. Miroudot and Cadestin (2017) find larger services-trade restrictiveness to be inversely related to bilateral flows of service value-added within GVCs. Andrenelli et al. (2018) and De Backer et al. (2018) show how the restrictiveness of trade and investment in services sectors affects production of MNEs that use such services for organizing their value chains besides influencing their export versus FDI decision in accessing foreign markets. Data restrictiveness has also been associated with adverse effects both on the productivity of domestic firms (Ferracane et al. 2018) and on imports of services (Ferracane and van der Marel, 2018) in countries imposing data-restrictive policies.

Thus, while there is a growing literature studying the impact of services trade restrictions along different dimensions, barriers specific to Mode 4 trade have not yet been quantified or their relationship with services trade examined. This paper contributes in both directions.

3. Constructing the Mode 4 restrictiveness index

We construct an index of regulatory measures constraining Mode 4 trade. The data on these Mode 4 measures is in the form of qualitative information, which has been put together by the OECD for 45 countries as a part of their STRI database. These data comprise information on 27 measures (across 29 sectors and sub-sectors) of which 24 measures include a “Yes/No” answer and the remaining three⁶ measures include quantitative information. The information is available for the years 2014 to 2017. Details on the coverage of countries, sectors and measures are included in Annex A and Tables 1 and 2, respectively.

Note that the OECD’s STRI database only provides qualitative responses to measures that affect Mode 4 trade. We thus add value by quantifying these responses and constructing an index that can be used in empirical analysis. In constructing the index, we convert the Yes/No response to 24 of the 27 qualitative measures into a binary quantitative index where N=0 and Y=1⁷, such that the value of the index ranges from 0 (least) to 1 (most) restrictive. For the three remaining measures that include data on limitations on the duration of stay for services providers, we convert these data into an index with values lying between 0 and 1 as follows:⁸

$$r_index_{jkt}^s = \frac{Dur_{kt}^{Max} - Dur_{jkt}}{Dur_{kt}^{Max}} \quad (1)$$

where Dur_{jkt} is the duration (in number of months) in sector k in country j in year t and Dur_{kt}^{Max} is the maximum duration of stay in sector k across countries in year t . The numerator of equation (1) thus measures the “gap” to “best practice” (amongst the 45 countries for which these data are available) at the sector-level such that the larger the gap, the more restrictive is the country imposing the measure. The ratio in equation (1) ensures that the index value lies between 0 and 1.

We then compute simple averages of the constructed index across measures and sectors by country such that the higher the score, the more restrictive is the country (including in a particular sector or for a particular measure). Illustratively, for the measure “foreign providers have to completely re-do the university degree, practice and exam in the domestic country”,

⁶ These measures pertain to limitations (in number of months) on duration of stay for (i) contractual service suppliers (CSSs); (ii) independent service suppliers (ISSs); and (iii) intra-corporate transferees (ICTs).

⁷ Note that two measures in the STRI data relate to laws or regulations that establish a process for recognizing qualifications gained abroad. These measures support Mode 4 trade and have thus been reversecoded (i.e. N=1 and Y=0) in constructing the index.

⁸ There is considerable heterogeneity in the duration of stay across countries, on average, ranging from only one year for Switzerland, Costa Rica, Finland, Israel and Turkey (across service professionals) to four years in the case of Australia and Denmark (but only two years for ISSs); four-five years for the UK; and five years in the case of China, Japan, Latvia (but only one year for ISSs) and South Africa (though only four years for ICTs). The sample maxima point to the ground that the remaining countries in the STRI database can cover in extending the duration of stay to these services professionals (if not eliminating limitations on these stay durations altogether), thereby greatly reducing costs imposed on Mode 4 trade.

Switzerland has an average score of 0.33 across sectors in 2017 compared to an average score of 0.5 for Estonia and 0 for Australia. Thus, while this particular measure was not a requirement in Australia in 2017, it was applicable to more sectors in Estonia than in Switzerland.

Since simple averages mask sectoral differences, we also use weighted averages to construct the aggregate index where the weights are sector shares in total services import value by country and year. Thus:

$$r_index_{jt}^w = \frac{k \sum r_index_{jkt}^s * \left(\frac{M_{jkt}}{M_{jt}}\right)}{k \sum \left(\frac{M_{jkt}}{M_{jt}}\right)} \quad (2)$$

where $r_index_{jt}^w$ is the aggregate weighted average index for country j at time t ; $r_index_{jkt}^s$ is the simple average index for country j at time t at sector-level k ; M_{jkt} is the import value in sector k of country j at time t ; and M_{jt} is the total services import value in country j at time t .

4. Empirical strategy

The constructed index captures regulatory restrictions on the movement of service providers in the implementing jurisdiction. We thus assess the relationship between the index and services imports by mode of supply by estimating the following augmented import demand⁹ function using fixed effects specifications:

$$\ln M_{jt}^i = \alpha \ln(1 + r_index_{jt}^w) + \beta_z Z_{zjt} + \delta_j + \delta_t + \varepsilon_{jt} \quad (3)$$

where M_{jt}^i is the services imports of country j in year t delivered by Mode i ; $r_index_{jt}^w$ is the constructed aggregate weighted average Mode 4 restrictiveness index; Z_{zjt} is a vector of country-time varying controls; δ_j and δ_t are country and year fixed effects; and ε_{jt} is the error term. Note that we prefer using the weighted index in our main specification as it accounts for the relative importance of individual sectors in services trade but also report results using the simple average index in sensitivity analysis.

The empirical specification and choice of explanatory variables are motivated in existing literature (Cali and Te Velde, 2011; Martínez-Zarzoso et al. 2017; Hoekman and Shingal, 2020). The control vector, Z_{zjt} , comprises a measure of country size – the log of population (POP_{jt}); a measure of geographic distance to global markets – the log of market penetration (MP_{jt}) computed as a distance (d_{ij}) weighted measure of other countries' GDP (GDP_{it}) i.e. $MP_{jt} = \sum_i (GDP_{it}/d_{ij})$; a measure of domestic prices – (log of) the consumer price index (CPI_{jt}); a measure of government effectiveness (GE_{jt}) to reflect institutional strength; and the log of inward foreign direct investment (FDI_{jt}). We expect each of these variables to be positively correlated with services imports by mode of supply, justifying their choice as controls.

⁹ Note that unlike WTO (2019) we cannot estimate a structural gravity model to examine the effect of Mode 4 restrictiveness because services trade data by modes of supply are only available with the world as a partner and not bilaterally.

While explicitly focusing on Mode 4 restrictions, we also control for all other trade costs affecting services trade via the inward multilateral resistance (IMR) term as defined in Anderson and van Wincoop (2003). The IMR terms are constructed from a structural gravity model of bilateral services trade over 2014-2017, which is estimated using the Poisson Pseudo-Maximum Likelihood (PPML; Silva and Tenreyro, 2006) with three-way fixed effects. The estimated time-varying destination fixed effects are then used to construct the IMR terms following Larch and Yotov (2016).

Following Anderson and van Wincoop (2003), the structural gravity model takes the following form:

$$X_{ijt} = \frac{E_{jt}Y_{it}}{Y_t} \left(\frac{\tau_{ijt}}{P_{jt}\Pi_{it}} \right)^{1-\sigma} \quad (4)$$

where X_{ijt} is the value of nominal bilateral exports of services between origin i and destination j at time t , E_j is the expenditure on services in the destination market from all origins, Y_i is the sale of services at destination prices from i to all destinations, Y is world output at delivered prices, τ_{ij} are the bilateral trade costs, σ is the elasticity of substitution amongst services and P_j , Π_i are the (inward and outward, respectively) multilateral resistance (MR) terms as defined in this literature. Since these terms are difficult to construct directly, applications of the gravity model have resorted to using dummy variables to control for them instead.

Trade costs in ϕ_{ijt} arise from different sources such as geographical distance between trading partners [$\ln(\text{DIST}_{ij})$]; cultural distance proxied by dummy variables identifying whether the trading partners share a common border (CNTG_{ij}), had a colonial relationship, (CLNY_{ij}) and share a common language (LANG_{ij}); and membership of preferential trade agreements (PTA_{ij}).

Recent advancements in the estimation of structural gravity advocate the use of three-way fixed effects to mitigate endogeneity-induced biases in estimation (for instance see Baier and Bergstrand, 2007; Baier et al. 2014; Piermartini and Yotov, 2016). The dyadic trade cost variables ($\ln\text{DIST}_{ij}$, CNTG_{ij} , CLNY_{ij} and LANG_{ij}) are thus subsumed in bilateral pair-wise fixed effects (α_{ij}), leading to the following equation:

$$X_{ijt} = \exp[\beta_1 \text{PTA}_{ijt} + \alpha_{ij} + \mu_{it} + \gamma_{jt}] + \epsilon_{ijt} \quad (5)$$

where μ_{it} and γ_{jt} are the time-varying exporter and importer fixed effects that proxy the outward and inward MRTs, respectively, and ϵ_{ijt} is the error term.

5. Data sources and description

Since the Mode 4 restrictiveness index is constructed for 45 countries in the OECD's STRI database over 2014-2017, the dependent and control variables span the same country and time period. Services import data by mode of supply are sourced from WTO TiSMoS. The control variables are sourced as follows: the consumer price index (CPI_{jt}), foreign direct

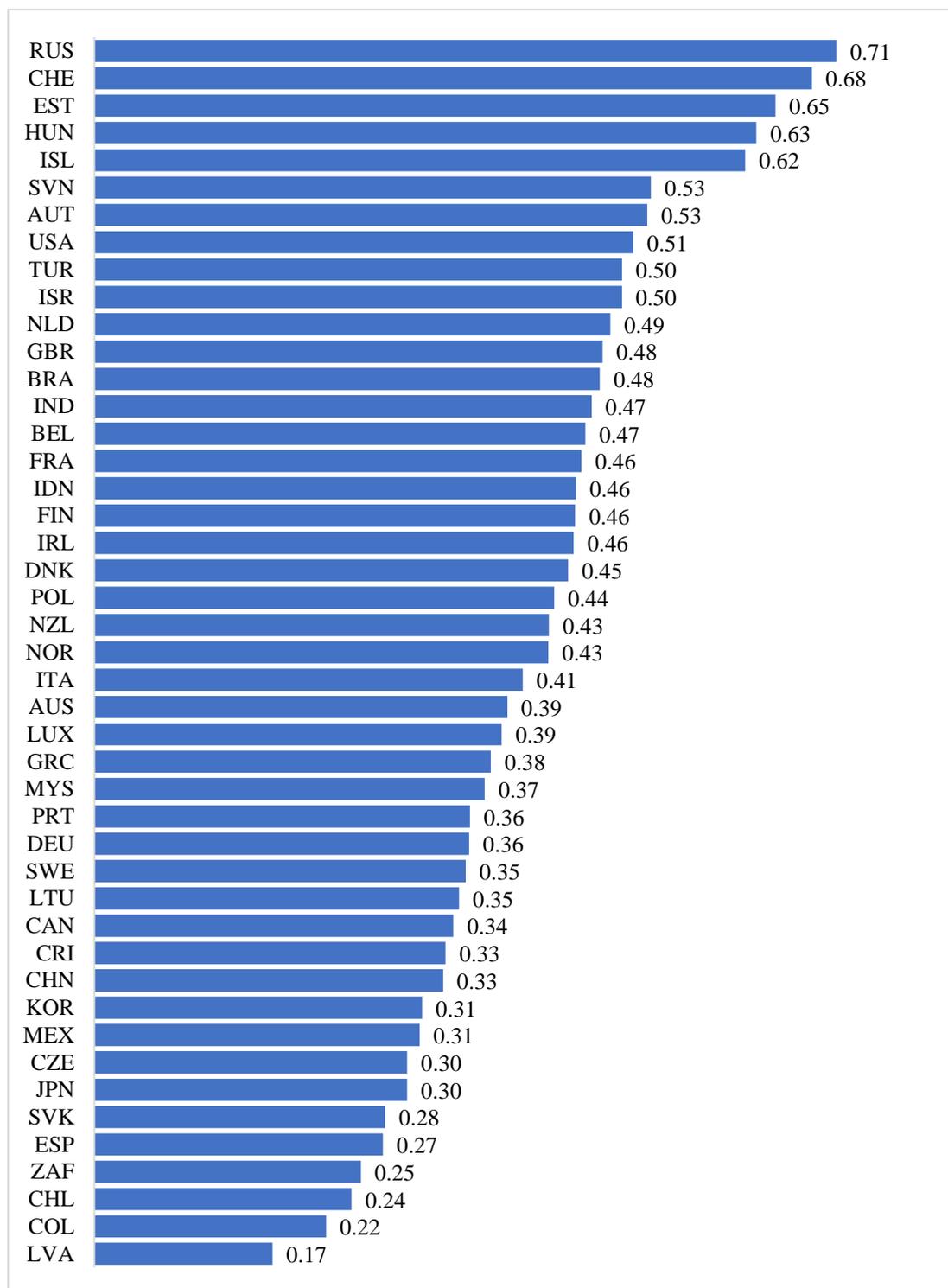
investment (FDI_{jt}) and population (POP_{jt}) are taken from the World Bank's World Development Indicators; market penetration (MP_{jt}) is computed using bilateral distance data from CEPII (Head et al. 2010); GDP data come from the World Development Indicators and government effectiveness (GE_{jt}) is sourced from the Worldwide Governance Indicators (Kaufmann et al. 2011). PTA membership dummy was constructed using data from the WTO RTA-IS database, for services agreements notified under Article V of the GATS. Bilateral services trade data for the gravity model are sourced from the OECD ITSS (International Trade in Services Statistics by Partner Country) database, covering 33 reporting and 250 partner countries¹⁰; the ITSS reports services trade data according to the EBOPS 2010 classification.

The empirical analysis is carried out on 45, primarily OECD, countries over 2014-2017, leading to a sample of 180 observations. Summary statistics are reported in Annex Table 1.

Figures 2A and 2B present the average Mode 4 restrictiveness in 2017 based on simple and weighted averages, respectively. The two distributions are broadly similar; the average scores range from 0.17/0.19 for Latvia (at the bottom end of the distribution) to 0.71/0.74 for Russia (at the top end). The average score for non-OECD countries (0.38/0.39) is found to be lower than that for the OECD (0.43/.45) as Latvia, Colombia, and South Africa are amongst the least restrictive countries in the sample while nine of the top ten most restrictive Mode 4 countries (barring Russia at the top) belong to the OECD.

¹⁰ Total services exports of these reporters in the year 2018 was 74 percent of global service exports in that year; the comparable share for services imports was 67 percent. Thus, while the OECD ITSS does not include all potential services trading reporters in the world, it provides bilateral services trade data among a sufficiently "large" sample of reporting and partner countries up to 2018, which makes it suitable to undertake the gravity analysis required to construct the IMR terms. An alternative data source, the OECD-WTO BaTiS (Balanced Trade in Services database), covers a much larger sample of reporting and partner countries but does not report bilateral services trade data beyond 2012.

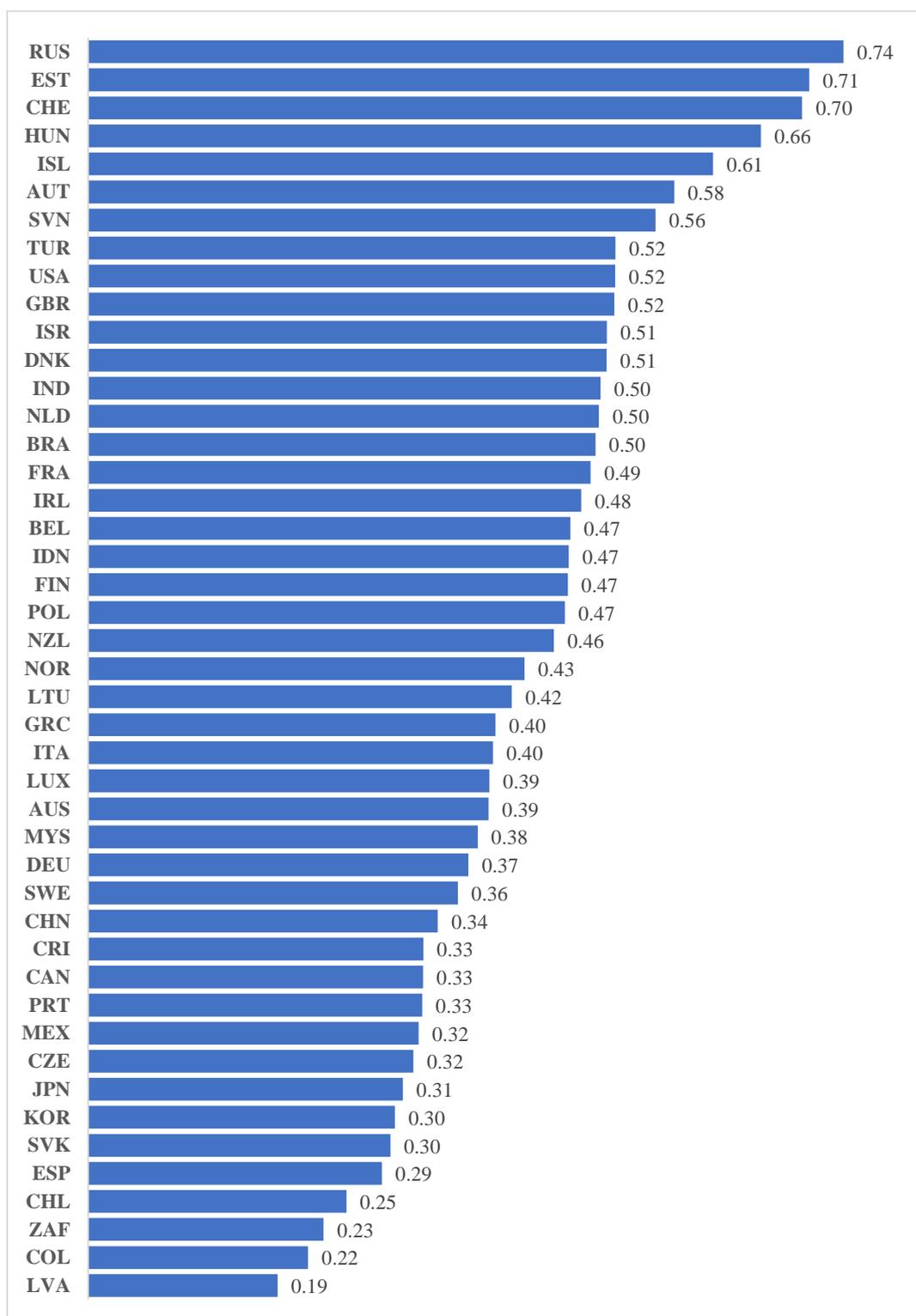
**Figure 2A: Simple average restrictiveness towards the movement of service providers
(2017)**



Source: OECD STRI; own calculations

Note: The aggregate index by country is constructed using simple averages of the constructed index across sectors

**Figure 2B: Weighted average restrictiveness towards the movement of service providers
(2017)**



Source: OECD STRI; own calculations

Note: The aggregate index by country is constructed using weighted averages of the constructed index across sectors, where the weights are sectoral shares in total services imports by value for each country

Table 1 reports the average Mode 4 restrictiveness score by sector in 2017 and the count of countries for which the (simple) average score at the sector-level was more than the sectoral mean. The most Mode 4 restrictive sectors include transport, insurance, audiovisual, banking, construction, distribution and logistics services. In contrast, engineering and architecture services were amongst the least restrictive, which seems to support these sectors being amongst the more Mode 4 dominant services trading sectors in Figure 1.

Table 1: Count of countries for which the simple average Mode 4 restrictiveness by sector exceeds the sectoral mean (2017)

Sector	Sectoral average	Count of countries
Accounting and auditing services	0.449	21
Accounting services	0.247	16
Air transport	0.455	22
Architecture services	0.370	23
Audiovisual - Broadcasting	0.436	25
Audiovisual - Motion pictures	0.461	22
Audiovisual - Sound recording	0.396	25
Auditing services	0.395	21
Commercial banking	0.455	23
Computer services	0.395	25
Construction - Engineering	0.337	21
Construction services	0.455	22
Courier services	0.396	25
Distribution services	0.453	22
Engineering services	0.346	20
Insurance	0.428	24
Insurance - Actuaries	0.422	16
Insurance - Broking and agency services	0.472	33
Legal services	0.439	22
Legal services - Domestic law	0.449	18
Legal services - International law	0.164	23
Logistics cargo-handling	0.453	22
Logistics customs brokerage	0.422	22
Logistics freight forwarding	0.453	22
Logistics storage and warehouse	0.453	22
Maritime transport	0.486	18
Rail freight transport	0.503	18
Road freight transport	0.485	18

Source: OECD STRI; own calculations

Table 2 reports the average Mode 4 restrictiveness score by STRI measure in 2017 and the count of countries for which the (simple) average score by measure exceeded the mean. The most Mode 4 restrictive measures include: labour market tests and limitations on duration of stay for CSSs, ISSs and ICTs; need for a temporary licensing system; and license requirement for at least one engineer for issuing construction permits. In contrast, the least Mode 4

restrictive measures were professional association memberships closed to foreigners; and nationality/citizenship requirement for construction engineers.¹¹

Table 2: Count of countries for which the simple average Mode 4 restrictiveness by STRI measure exceeds the STRI measure mean (2017)

STRI measure	Average by STRI measure	Count of countries
A temporary licensing system is in place	0.391	25
Appointed actuaries must be nationals or residents	0.178	8
At least one engineer must be licensed for the issuance of construction permits	0.667	30
Domicile required for Licence to practice	0.300	23
Foreign construction engineers are required to practice locally for at least 1 year	0.178	8
Foreign construction engineers are required to take a local examination	0.356	16
Foreign professionals are required to practice locally for at least 1 year	0.258	18
Foreign professionals are required to take a local examination	0.440	17
Foreign providers have to completely re-do the university degree, practice and exam in the domestic country	0.093	14
Labour market tests: contractual services suppliers	0.751	34
Labour market tests: independent services suppliers	0.662	30
Labour market tests: intra-corporate transferees	0.756	34
Laws or regulations establish a process for recognising qualifications gained abroad	0.353	21
Laws or regulations establish a process for recognising qualifications in engineering gained abroad	0.178	8
Limitation on duration of stay for contractual services suppliers (months)	0.630	23
Limitation on duration of stay for independent services suppliers (months)	0.601	32
Limitation on duration of stay for intra-corporate transferees (months)	0.484	19
Membership in the professional association is closed to foreigners	0.067	3
Memo: Licence or authorisation is required to practice	0.583	24
Nationality or citizenship required for construction engineers	0.089	4
Nationality or citizenship required for Licence to practice	0.139	12
Other restrictions to movement of people	0.148	7
Prior or permanent residency is required for Licence to practice	0.185	14
Quotas: contractual services suppliers	0.174	8
Quotas: independent services suppliers	0.196	9
Quotas: intra-corporate transferees	0.133	6
Residency is required to practice	0.207	21

Source: OECD STRI; own calculations

¹¹ More granular information underlying the data reported in Tables 1 and 2 is available in Annex Tables 1-3 of Shingal (2020b). The focus of that paper is trade facilitation in services as it pertains to the movement of service providers.

6. Results from estimation

6.1 Main results

6.1.1 Aggregate analysis using the weighted average index

Table 3 reports the results from the OLS estimation of equation (3), for aggregate services imports delivered by each mode of supply, with standard errors clustered by country-year in each case.¹²

Table 3: Relationship between the weighted Mode 4 restrictiveness index and aggregate services imports

VARIABLES	(1) Ln(M ^{M1} _{jt})	(2) Ln(M ^{M2} _{jt})	(3) Ln(M ^{M3} _{jt})	(4) Ln(M ^{M4} _{jt})
Ln(1+r_index ^w _{jt})	-0.3571 (0.2261)	-0.7595** (0.3425)	-0.5039** (0.2367)	-0.9959** (0.5020)
Ln(POP _{jt})	0.5478 (0.6166)	-0.3223 (1.0021)	-0.9393 (0.8367)	0.2220 (1.5788)
Ln(MP _{jt})	-0.0016 (0.0026)	0.0062* (0.0034)	0.0012 (0.0031)	-0.0044 (0.0058)
Ln(FDI _{jt})	0.0081 (0.0072)	0.0136 (0.0134)	-0.0069 (0.0106)	0.0179 (0.0157)
Ln(CPI _{jt})	-0.8740*** (0.3044)	-1.1169** (0.4898)	-0.5079 (0.4212)	-1.1508* (0.6906)
IMR _{jt}	0.5491 (2.7602)	-3.9229 (5.1893)	-5.7507 (4.6359)	-0.7040 (6.4436)
GE _{jt}	-0.0738 (0.0956)	-0.0483 (0.1319)	0.1352 (0.1264)	-0.1850 (0.2194)
Constant	13.1241*** (2.1056)	16.2189*** (2.8194)	17.1090*** (2.5312)	13.1939*** (4.9786)
Observations	152	152	152	152
R2	0.9987	0.9967	0.9976	0.9944

*Note: All estimations include country and year fixed effects. Robust standard errors, clustered by country-year, included in parentheses. Levels of significance: *10%, **5%, ***1%.*

The Mode 4 restrictiveness index is found to be negatively associated with imports of services delivered by Modes 2-4; the estimated coefficient for Mode 1 services imports is found to be statistically indifferent from zero. Given that the index captures regulatory barriers to the movement of service providers, one would expect the estimated elasticity to be the largest for Mode 4 imports. Encouragingly, this is what we find: a 10% increase in Mode 4 restrictiveness is associated with a proportionate decline in services imports delivered by

¹² We experimented with GMM specifications to control for potential endogeneity in the Mode 4 restrictiveness-services import relationship but these results lacked statistical significance. We also used index values (both simple and weighted averaged) for the year 2014 as instruments in IV regressions using 2017 data on the sample of 45 countries. Interestingly, the exogeneity of the relationship between Mode 4 imports and the Mode 4 restrictiveness index was not rejected in the diagnostic statistics, but the IV estimates lacked statistical significance for all modes of supply. We thus refrain from attributing any causality to our findings; the results are best expressed as conditional correlations.

the movement of service providers in these results, *ceteris paribus* and on average. Given that the STRI measures listed in Table 2 also include labour market tests, quotas and limitations on duration of stay for CSSs, ISSs and ICTs, one would also expect the estimated elasticities to be high for Mode 2 and 3 services imports. This is also found to be the case: a 10% increase in Mode 4 restrictiveness is associated with a 7.6 and 5.0% decline in services imports delivered by Modes 2 and 3, respectively, *ceteris paribus* and on average.

These findings also confirm complementarities between different ways in which services trade is transacted. They also illustrate how barriers in one mode of service delivery can affect another. Such complementarities are obvious, for instance, when establishing commercial presence abroad (Mode 3 trade) leads to intra-corporate transfers (Mode 4 trade) from the home country to the host country. In such a scenario, any restrictions on the movement of ICTs is also likely to have an adverse effect on foreign affiliate transactions. Similarly, a short-duration professional visit abroad (Mode 4 trade) can also generate an appetite for exploring a new country as a tourist (Mode 2 trade), possibly with family. Thus, any curbs on the movements of CSSs and ISSs could also result in a decline in tourism.

Finally, while the R-squared values are close to 1 across specifications in the results reported in Table 3, the estimates of only the consumer price index and the market potential variable report statistical significance, which suggests that the fixed effects capture most of the variation in the dependent variable at the aggregate level.

6.1.2 Sector-level analysis using the aggregate weighted average index

The WTO TiSMoS database also includes services trade data by mode of supply for individual services sectors. Since the Mode 4 restrictiveness index is aggregated across sectors by construction, we do not expect disaggregated sectoral imports to show much correlation with it. Even so, replicating the analysis using the aggregate weighted index at the sector level shows that the overall Mode 4 results may be driven by computer; maintenance & repair; professional & management consulting; and technical, trade-related and other business services while the overall Mode 2 results may be driven by education-related travel services.

Mode 4 restrictiveness is found to be negatively correlated with both Mode 4 and Mode 1 computer and professional and management consulting services imports in the sectoral results reported in Table 4. This suggests that restrictions on the movement of these professionals may also have an adverse bearing on these sectors' online commercial interests, once again confirming complementarities in the two modes of services delivery that are specific to both these sectors.

Similarly, both Mode 2 and Mode 4 services imports in maintenance & repair; and technical, trade-related and other business services are found to be negatively associated with Mode 4 restrictiveness. This finding is also attributable to the presence of labour market tests, quotas and limitations on duration of stay for independent and contractual service suppliers amongst STRI measures affecting Mode 4 trade in Table 2.

Table 4: Relationship between the aggregate weighted Mode 4 restrictiveness index and sectoral services imports

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	$m^{\text{Comp_M1}}_{jt}$	$m^{\text{Comp_M4}}_{jt}$	$m^{\text{Edu_Tvl_M2}}_{jt}$	$m^{\text{M\&R_M2}}_{jt}$	$m^{\text{M\&R_M4}}_{jt}$	$m^{\text{Prof_MC_M1}}_{jt}$	$m^{\text{Prof_MC_M4}}_{jt}$	$m^{\text{TTOBS_M2}}_{jt}$	$m^{\text{TTOBS_M4}}_{jt}$
Ln(1+r_index ^w _{jt})	-1.9078*	-1.9078*	-2.0172***	-1.8458*	-2.0036*	-0.8379*	-0.8379*	-1.7992*	-0.8553*
	(1.0155)	(1.0155)	(0.6199)	(1.0252)	(1.0545)	(0.4646)	(0.4646)	(0.9481)	(0.4877)
Ln(POP _{jt})	-1.5363	-1.5363	3.4310	-8.2380*	-8.2349*	2.1111	2.1111	-7.6842	-3.5302**
	(2.3023)	(2.3023)	(2.5368)	(4.6069)	(4.6120)	(2.1168)	(2.1168)	(5.3495)	(1.3881)
Ln(MP _{jt})	-0.0210	-0.0210	0.0107	0.0247**	0.0262**	0.0010	0.0010	0.0016	-0.0041
	(0.0138)	(0.0138)	(0.0101)	(0.0123)	(0.0128)	(0.0073)	(0.0073)	(0.0194)	(0.0067)
Ln(FDI _{jt})	0.0083	0.0083	0.0103	0.0233	0.0213	0.0202	0.0202	0.1081*	0.0185
	(0.0312)	(0.0312)	(0.0372)	(0.0509)	(0.0545)	(0.0235)	(0.0235)	(0.0650)	(0.0219)
Ln(CPI _{jt})	3.1925	3.1925	-0.8613	-0.0338	0.3371	-1.0760	-1.0760	2.7230*	-0.5309
	(2.9851)	(2.9851)	(0.7826)	(1.1796)	(1.2076)	(0.8655)	(0.8655)	(1.5265)	(0.7081)
IMR _{jt}	3.1331	3.1332	-6.7352	-6.0792	18.5358	-9.4373	-9.4373	-4.9326	-0.8517
	(11.2435)	(11.2435)	(10.1222)	(16.0289)	(28.0556)	(5.9522)	(5.9522)	(24.5966)	(6.8125)
GE _{jt}	-0.3269	-0.3269	0.2245	-0.6696*	-0.6148	-0.0205	-0.0205	1.0988***	-0.0285
	(0.3702)	(0.3702)	(0.2336)	(0.3621)	(0.3722)	(0.2036)	(0.2036)	(0.4013)	(0.1987)
Constant	-1.6753	-2.7739	-1.7901	33.2013**	29.1510*	6.5414	5.4428	14.0766	20.8074***
	(13.3405)	(13.3405)	(7.4796)	(15.0213)	(15.2790)	(6.5988)	(6.5988)	(13.9145)	(5.1889)
Observations	149	149	138	147	135	144	144	140	152
R2	0.9796	0.9817	0.9894	0.9855	0.9835	0.9919	0.9920	0.9826	0.9952

*Note: All estimations include country and year fixed effects. Robust standard errors, clustered by country-year, included in parentheses. Levels of significance: *10%, **5%, ***1%. Comp = Computer services; Edu_Tvl = Education-related travel services; M&R = Maintenance & repair services; Prof_MC = Professional & management consulting services; TTOBS = Technical, trade-related and other business services. m = Ln(M).*

Though most coefficient estimates in Table 4 are only weakly significant, the estimated elasticities of aggregate Mode 4 restrictiveness on sectoral imports are larger than that on aggregate imports. The elasticities range from -2.0 for education-related travel to -1.9 for computer to -1.8/-2.0 for maintenance & repair to -0.8 for professional and management consulting to -1.8/-0.9 for technical, trade-related and other business services delivered by Modes 2 and 4, respectively.

The estimated coefficients on the aggregate Mode 4 restrictiveness index were found to be statistically indifferent from zero for all other sectors and sub-sectors including construction, distribution and audio-visual services. Moreover, unlike the results reported in Table 3, more control variables exhibit statistical significance now across sectors, though the negative coefficient on the population variable is counter-intuitive.

6.1.3 Sector-level analysis using sector-level restrictiveness indices

Since we also compute Mode 4 restrictiveness indices at the sector-level, it is worthwhile to assess their relationships with sector-level imports for the sectors where such an empirical analysis is possible.¹³ The results from this analysis are reported in Table 5 and suggest negative correlations between sectoral Mode 4 restrictiveness and imports of accounting and legal services delivered by Modes 1 and 4 (again confirming inter-modal complementarities) as well as Mode 3 construction imports.¹⁴

As expected, the sectoral elasticities are much higher in magnitude and range from -1.6 for Mode 3 construction services imports to -3.6/-12.6 accounting and legal services imports delivered by Modes 1 and 4, respectively.

¹³ This includes the following sectors: Accounting & legal services; architecture; audio-visual; computer; construction; courier; distribution; engineering; financial; insurance; and transport services.

¹⁴ We also used index values for the year 2014 as instruments in IV regressions using 2017 data on a larger country-sector sample than in the aggregate analysis. The IV estimates lacked statistical significance for all sectors and modes of supply, with the exception of computer services imports delivered by Mode 1. While this result was also weakly significant at the 10% level, it suggests that an increase in Mode 4 restrictiveness has an adverse effect on Mode 1 computer services imports. This again confirms complementarities between ways in which business is conducted in this sector as well as the findings from using the weighted average index in the preceding sub-sub-section. All IV results are available upon request.

Table 5: Relationship between sectoral Mode 4 restrictiveness indices and sectoral services imports

VARIABLES	(1) Ln(M ^{Acc&Leg} _M1 _{jt})	(2) Ln(M ^{Acc&Leg} _M4 _{jt})	(3) Ln(M ^{Constrn} _M3 _{jt})
Ln(1+r_index ^s _{jkt})	-3.5705** (1.7894)	-12.5863* (7.0244)	-1.6300** (0.6995)
Ln(POP _{jt})	6.7469*** (2.2251)	15.1448** (5.9348)	6.8590*** (1.0077)
Ln(MP _{jt})	-0.0129* (0.0073)	0.0360** (0.0175)	-0.0169*** (0.0036)
Ln(FDI _{jt})	0.1256*** (0.0331)	-0.0597* (0.0311)	-0.0078 (0.0205)
Ln(CPI _{jt})	-3.3585*** (0.9687)	-5.9293** (2.5309)	0.4951 (0.4522)
IMR _{jt}	11.9571 (14.7709)	28.3069 (30.5483)	-3.1976 (3.6098)
GE _{jt}	0.5968*** (0.1931)	-0.7629* (0.4541)	-0.1142 (0.1238)
Constant	1.3166 (5.3790)	-8.8101 (12.8154)	3.0754 (2.1980)
Observations	1,920	1,920	706
R2	0.9982	0.9951	0.9984

*Note: All estimations include country and year fixed effects. Robust standard errors, clustered by country-year, included in parentheses. Levels of significance: *10%, **5%, ***1%. Comp = Computer services; Edu_Tvl = Education-related travel services; Acc&Leg = Accounting & legal services; Constrn = Construction services.*

The extremely high elasticity for accounting and legal services professionals is not unfounded. The sector has amongst the most stringent regulation such as the requirement that foreign service providers need to take a local exam or completely re-do the university degree, practice and exam in the domestic country. These results demonstrate how relaxing such onerous regulation is likely to go a long way in liberalizing trade in the sector.

Finally, again unlike the aggregate results reported in Tables 3 and 6 (see below), more control variables are found to be statistically significant in sector-level analysis.

6.1.4 Relationship between Mode 4 restrictiveness and services exports

Given complementarities between services exports and imports, we also replicated the analysis above using both aggregate and sector-level data on services exports by modes of supply. However, the relationship between Mode 4 restrictiveness and services exports was found to be statistically insignificant across sectors and modes of supply. It is possible that such a relationship is more likely observed in services value-added data and not in the gross services trade data that the WTO TiSMoS database covers and which is analyzed in this study.

6.2 Sensitivity analysis

6.2.1 Aggregate analysis using the aggregate simple average index

As a robustness check, Table 6 reports the results from the OLS estimation of equation (3) using the aggregate index constructed using simple averages, with standard errors again clustered by country-year for aggregate imports delivered by each mode of supply.

Table 6: Relationship between the simple average Mode 4 restrictiveness index and aggregate services imports

VARIABLES	(1) Ln(M ^{M1} _{jt})	(2) Ln(M ^{M2} _{jt})	(3) Ln(M ^{M3} _{jt})	(4) Ln(M ^{M4} _{jt})
Ln(1+r_index ^s _{jt})	-0.2588 (0.1931)	-0.7178** (0.3477)	-0.6237** (0.2664)	-0.9025* (0.4916)
Ln(POP _{jt})	0.6014 (0.6291)	-0.2564 (1.0043)	-0.9381 (0.8298)	0.3195 (1.5966)
Ln(MP _{jt})	-0.0017 (0.0026)	0.0061* (0.0034)	0.0011 (0.0031)	-0.0045 (0.0058)
Ln(FDI _{jt})	0.0075 (0.0073)	0.0131 (0.0134)	-0.0067 (0.0104)	0.0170 (0.0160)
Ln(CPI _{jt})	-0.8699*** (0.3057)	-1.1139*** (0.4930)	-0.5110 (0.4221)	-1.1455 (0.6936)
IMR _{jt}	0.4671 (2.7743)	-4.0727 (5.1983)	-5.8285 (4.6090)	-0.9060 (6.5011)
GE _{jt}	-0.0736 (0.0964)	-0.0490 (0.1332)	0.1338 (0.1263)	-0.1856 (0.2211)
Constant	12.9088*** (2.1000)	15.9897*** (2.8224)	17.1581*** (2.5250)	12.8404** (4.9507)
Observations	152	152	152	152
R2	0.9987	0.9967	0.9976	0.9944

*Note: All estimations include country and year fixed effects. Robust standard errors, clustered by country-year, included in parentheses. Levels of significance: *10%, **5%, ***1%.*

Since simple averages mask sectoral differences, the use of this index results in smaller coefficient estimates relative to those reported in Table 3, though the overall results remain qualitatively similar. The simple average index is also found to be negatively correlated with services imported using Modes 2, 3 and 4, but not with Mode 1 services imports. A 10% increase in the simple average Mode 4 restrictiveness index is associated with a 7%, 6% and 9% decline in services imports delivered by Modes 2, 3 and 4 in these results, ceteris paribus and on average. Though the Mode 4 results are now found to be weakly significant, as with the weighted average index, the largest coefficient estimates pertain to Mode 4, which is a reassuring finding.

6.2.2 *Using an alternative estimator*

Given heteroskedasticity-related concerns in estimation, we also replicated the analysis in Section 6.1 using the PPML (Silva and Tenreyro, 2006). The results from using the PPML are qualitatively similar to those from using OLS and are available upon request.

7. Conclusion

The world is going through an unprecedented health and economic crisis emanating from COVID-19. Services trade will be more severely affected and will also take longer to recover in this crisis than it did during the 2008 global financial crisis because over 70% of global services trade is transacted via the three modes of supply (Modes 2, 3 and 4) that require some form of physical proximity between buyers and sellers and the latter is the first casualty of social distancing and related practices in the wake of COVID-19 (Shingal, 2020a).

The need for social distancing and continued fear of the pandemic until a vaccine is available has resulted in countries imposing restrictions on international travel. Meanwhile, our findings underline the need for countries to refrain from imposing prohibitive restrictions on service suppliers. Such restrictions are found to be negatively correlated with precisely those modes of supply that are already more adversely affected by COVID-19, suggesting that imposing them would be doubly detrimental. Moreover, given the importance of services for economic activity in general, de-restricting this sector would also be a crucial determinant of economic recovery in the aftermath of this pandemic.

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