Office of Industry and Competitiveness Analysis
Working Paper ICA-107

Estimating Trade Costs of Non-Tariff Measures in Services: A Comparison of Methods and Measures

June 2024

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Abstract

This paper considers the effectiveness of recent methodologies proposed by Heid, Larch, and Yotov (2021) and Herman (2022) to estimate tariff equivalent trade costs for non-tariff measures (NTMs) in cross-border services trade. Both estimation methods show that for most services trade categories across four indices measuring services NTMs, tariff equivalent trade costs are significantly higher for exporters to countries with stricter NTMs, suggesting that both methodologies are successful at capturing variation in trade costs across different markets. Additionally, for transportation, banking, and insurance services, the difference in estimated tariff equivalent trade costs between the Heid et al. (2021) and Herman (2022) methods were smaller than 5 percentage points, suggesting that the Herman (2022) methodology could be useful in cases where collection of domestic trade data required for the Heid et al. (2021) method are unfeasible.

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The author would like to thank Fernando Gracia, Peter Herman, Ross Jestrab, Martha Lawless, and Heather Wickramarachi for their helpful comments and David Lahrmer and Fara Ndiaye for their production support.

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Introduction

A major challenge in understanding the impact of trade policy on cross-border trade in services is the difficulty observing and measuring policy-related trade costs. In goods trade, exporters face policy-related trade costs in the form of tariffs and quotas, which are straightforward taxes or limits on imports, and non-tariff measures (NTMs), which cover policies such as safety standards and technical specifications for imported products. In contrast, services trade is not subject to tariffs, both due to the logistical difficulties of collecting tariffs on intangible products and because of policies like the WTO moratorium on customs duties for electronic transmissions, which prohibits introducing tariffs on online services products such as software. As a result, the trade policies that limit trade in services are exclusively NTMs and relate to a much wider range of policy issues than goods-trade NTMs.

There are two main reasons why estimating trade costs associated with NTMs is less straightforward than estimating trade costs associated with tariffs. First, NTMs faced by services exporters globally cover a wide variety of policies, such as licensing requirements, data protection measures, and limits on foreign investment, for example. This makes comparison of the degree of trade restrictiveness across different markets difficult. While a 20 percent tariff is clearly more trade restrictive than a 10 percent tariff, it is less clear whether, for example, one country's limits on foreign investment in a service sector imply a more restrictive environment than another country that has no limits on foreign investment, but has data localization requirements.[1] As such, existing measures of NTMs in services trade typically rely on the creation of an index for each type of trade flow that assigns weights to different policies relevant to trade in services. Generally, the scale of these indices ranges from 0–100, where 0 represents a market completely open to foreign trade and 100 represents a completely closed market.

Another challenge with estimating trade costs in services is that NTMs are typically set by importing governments at the national level, rather than bilaterally. However, the trade models typically used in the literature control for importer-level characteristics to account for multilateral resistance, so that it is not possible to disentangle the effect of NTMs on trade from other importer characteristics, such as market size. Recent papers have proposed two methods to account for this issue. Heid et al. (2021) suggest that trade models should include both international and domestic trade, and measures of NTMs be interacted with an indicator for domestic trade. This allows the trade cost effect of NTMs to be estimated relative to the domestic market and addresses the issue of collinearity of NTMs with importer

[1] Relatedly, as many regulations related to services trade have some consumer protection element, such as the requirement that lawyers are licensed, is also important to separate the consumer protection element of a policy (need for license) from a policy that restricts the ability of lawyers who want to export legal services to obtain a license even if appropriately credentialed.

fixed effects.[2] Herman (2022) proposes an alternative two-stage methodology, where importer-specific trade costs are calculated in the first stage, then decomposed into NTM and other effects in the second stage. One benefit of the Herman (2022) method is that it does not require domestic trade to be included in either regression stage and thus has fewer data requirements than the Heid et al. (2021) methodology.

The main goal of this paper is to determine whether, using the same data sample, the Herman (2022) methodology and the Heid et al. (2021) methodology produce similar estimates of trade costs related to services NTMs. Given that other recent papers have used the Heid et al. (2021) methodology to calculate tariff equivalent trade costs in services (see for example, Benz and Jaax (2022)), the primary contribution of this paper is to assess whether the less data intensive method for calculating trade costs proposed in Herman (2022) is appropriate for services trade analysis where data on domestic trade is unavailable. One challenge associated with the variety of indices used to measure services NTMs is that they are often inconsistent in terms of country and year coverage, average index values, and distribution. As a result, rather than relying on a particular services NTM index to measure services trade costs, I compare the two methods across a variety of services NTM indices.

Overall, the results of using different indices of services NTMs show that for most specifications, NTM indices are effective at differentiating between high and low restrictive services trade environments as tariff equivalent trade costs are usually negative and significant across both methodologies. Comparing the two methodologies show that both are feasible for estimating trade costs in services, but the value of the estimated tariff equivalent trade costs can differ between methodologies. In particular, it appears that for more aggregated services sectors, such as other business services, the Heid et al. (2021) and Herman (2022) methods diverge in their estimates more often than for more disaggregated services export groups, such as insurance. This finding suggests that the Herman (2022) method may be especially useful to assess the relationship between NTMs and trade costs in disaggregated services trade flows, like architectural services, where domestic trade data is not readily available.

The remainder of this paper is divided into 4 sections. Section 2 provides a brief overview of the methodologies developed by Heid et al. (2021) and Herman (2022). Section 3 describes the data inputs, including trade data, elasticities, and the differences in three indices covering services trade restrictions, and section 4 describes the results of the comparisons of methodologies and trade restriction indices. Section 5 concludes.

Methodology Overview

Both methodologies considered in this paper are built from the demand-side version of the structural gravity model (Anderson and van Wincoop, 2003), which is defined by a set of three equations, described briefly below. For each product *s,* equation 1 defines total exports X_{ij}^{s} from exporter *i* to importer *j* for all potential exporter-importer pairs, including trade within the domestic market (*i = j)*:

[2] In particular, without estimating the effect relative to domestic trade, there is no variation NTMs by importer, meaning that their effect cannot be separated from other importer-specific characteristics. By adding domestic trade as a "import" that faces no NTMs, there is variation in NTMs by importer, allowing for estimation of an NTM effect that is separate from other importer-specific characteristics.

$$X_{ij}^{s} = \frac{Y_i^s E_j^s}{Y^s}\left(\frac{t_{ij}^s}{\Pi_i^s P_j^s}\right)^{(1-\sigma_s)} \ \forall\, i, j. \quad (1)$$

The first term in equation 1 accounts for the product-specific production from the exporter and consumption from the importing country. Y_i^s represents the total sales of product s by exporter *i* in all importer destinations, while E_j^s similarly represents total spending in sector s by importer *j,* capturing demand for the product from both imported and domestic sources. These terms are both weighted by total world output of product *s,* Y^s. The second term in equation 1 accounts for the trade costs associated with exporting a product internationally. First, the focus of this paper, t_{ij}^s, captures trade costs between exporter *i* and importer *j*. The types of costs included in t_{ij}^s term include the tariffs (for goods) and NTMs, as well as characteristics of the individual importer-exporter pairs, like distance between the markets, that can increase the costs of delivery. These costs are measured relative to the domestic market for product s, such that $t_{ij}^s = 1$ when *i = j*. $\Pi_i^s \ and \ P_j^s$, known as the multilateral resistance terms, aggregate all of the exporter-specific trade costs faced by exporter *i* when it exports to all other markets *(Π_i^s)* and the importer-specific trade costs faced by importer *j* when it imports from all other markets *(P_j^s)*. These multilateral resistance terms are further defined in equations 2 and 3 and are usually proxied by importer and exporter fixed effects in empirical estimations:

$$(\Pi_i^s)^{(1-\sigma_s)} = \sum_j \left(\frac{t_{ij}^s}{P_j^s}\right)^{(1-\sigma_s)} \frac{E_j^s}{Y^s} \ \forall\, i; \ (2)$$

$$(P_j^s)^{(1-\sigma_s)} = \sum_i \left(\frac{t_{ij}^s}{\Pi_i^s}\right)^{(1-\sigma_s)} \frac{Y_i^s}{Y^s} \ \forall\, j. \ (3)$$

Finally, the trade cost term in equation 1 is raised to $1 - \sigma_s$, which is a parameter that measures the elasticity of substitution between different import sources for product *s*.

The main challenge in isolating the impact of NTMs on trade in the framework described in equations 1–3 is that unlike tariffs, NTMs are typically set in the domestic market for all imports, rather than differing across import sources. This means that NTMs are typically colinear with the importer fixed effects used to control for multilateral resistance, and therefore cannot be estimated separately from other importer-specific characteristics that make up P_j^s. Both the Heid et al. (2021) and Herman (2022) methodologies seek to overcome this challenge.

Heid et al. (2021)

The Heid et al. (2021) method for approximating the trade costs associated with NTMs builds of the definition of the trade cost term, t_{ij}^s, which is measured relative to the domestic market. The authors note that although NTMs are set for all imported products, domestic sales of that product are not subject to NTMs. For example, cabotage restrictions in the air transportation services sector only prohibit foreign-owned firms from operating flights between destinations within the importing country. This distinction means that if data on domestic sales of each product are included in the gravity model, the costs associated with NTMs can be estimated relative to domestic trade in that product by interacting the NTM measure with an indicator of whether the trade flow is domestic or an import. This assigns a value of 0 for the NTM measure for domestic sales. This is consistent with the idea that a "fully open market" is one where there is no difference between the regulations for imports of a service and

domestic services providers.[3] The general empirical specification for the Heid et al. (2021) approach is given by equation 4:

$$X_{ijt}^{s} = \exp(\beta_1 \text{International}_{\text{ij}} + \beta_2 \text{ServicesNTM}_{\text{jt}}^{s} \times \text{International}_{\text{ij}}$$

$$+\boldsymbol{\gamma}\mathbf{G}_{\text{ijt}} + \mu_{\text{jt}} + \rho_{\text{it}}) + \varepsilon_{\text{ijt}} \; \forall \text{ i, j.} \quad (4)$$

X_{ijt}^{s} represents exports of service s from country i to country j in year t. The primary variable of interest, $ServicesNTM_{jt}^{s}$, represents the measure of services trade NTMs for a given importing market *j* in time *t*, interacted with an indicator $International_{ij}$, which equals 0 for domestic sales *(i = j)* and 1 for international imports *(i ≠ j)*. $\mathbf{G}_{\text{ijt}}$ is a vector of bilateral characteristics of the exporting and importing market, including non-time varying controls like (log) distance between markets, common language, shared borders, and colonial relationship, and time-varying controls like EU membership and the presence of a preferential trade agreement with services provisions between exporter *i* and importer *j*.[4] Finally, μ_{jt} and ρ_{it} are importer and exporter-year fixed effects, which control for the multilateral resistance terms defined in equations 2 and 3. Following Santos Silva and Tenreyro (2006), equation 4 is estimated using a Poisson Pseudo Maximum Likelihood (PPML) estimator.

In equation 4, the estimated coefficient $\widehat{\beta_2}$ represents the estimated trade costs associated with the services NTMs present for services product s. However, for ease of interpretation, it is helpful to convert $\widehat{\beta_2}$ into a tariff-rate equivalent cost, using equation 5:

$$\text{TariffEquivalent}^{\text{s}} = -\exp\left(\frac{\widehat{\beta_2}}{\sigma_{\text{s}}} - 1\right) \times 100. \quad (5)$$

As in equation 1, σ_s is a product-specific parameter measuring the elasticity of substitution between different country import sources. Overall, the benefits of the Heid et al. (2021) method are that it is consistent with the theoretical model, and relatively straightforward to estimate. However, the requirement that domestic trade data be part of the empirical specification can limit the usefulness of this approach where data are limited, time consuming to collect, or only available for highly aggregated services trade flows.

[3] For example, in banking services, an open market is one where foreign and domestic banks have the same reserve requirements, not one where there is no reserve requirement at all.

[4] These bilateral characteristics can also be replaced with a country-pair fixed effect, to fully account for both observed and unobserved characteristics of the relationship between country i and j. However, in practice, the relatively small sample size of each type of service export in this analysis meant that regressions estimations using country-pair fixed effects did not consistently converge.

Herman (2022)

In contrast, the Herman (2022) method is more computationally complicated than Heid et al. (2021) but does not require the use of domestic trade data if such data is unavailable. Rather than estimating the trade cost term t_{ij}^{s} relative to the domestic market, Herman (2022) measures trade cost relative to the most open importer market for a particular product s. This model has two stages. The first stage, defined by equation 6, is designed to isolate the components of importer multilateral resistance P_j^s that capture unobserved trade costs and NTMs from the components of P_j^s that are related to market size.

$$\frac{X_{ijt}^{s}}{E_{jt}^{s}} = \exp\left(\beta_1 \text{International}_{ij} + \boldsymbol{\gamma}\mathbf{G}_{ijt} + \mu_{jt} + \rho_{it}\right) + \epsilon_{ijt}. \quad (6)$$

Here, the dependent variable divides the trade flows in product s between exporter *i* and importer *j* in time *t* by the importer's total expenditures on product *s*. This means that the dependent variable represents the share of total consumption of product *s* that is supplied by exporter *i* in importer *j*. When domestic trade data are available, the expenditure term is calculated as total imports and domestic expenditures by product *s*. However, Herman (2022) suggests that when this data are not available, importer GDP can be used as a proxy for E_{jt}^{s}, an approach I follow in this paper.[5] The dependent variables in equation 6 are nearly identical to equation 5, except that the $ServicesNTM_{jt}^{s}$ interaction term is excluded and the $International_{ij}$ is only included if data are available. As in the Heid et al. (2021) paper, this regression is estimated using PPML.

The next step in the Herman (2022) methodology is to calculate average trade costs for each importer in each year in the data sample. First for each services product, the estimated values of μ_{jt}, the importer fixed effect less the expenditure component, are ranked from smallest to largest in each year, and the country with the largest value of $\widehat{\mu_{jt}}$ (indicating smallest aggregate import costs) is designated the benchmark country $\widehat{\mu_t^*}$. Following the methodology proposed by Fontagné et al. (2011), this benchmark country is used as a proxy for free trade in that services product, and calculating the tariff rate equivalent trade costs $\hat{\tau}_{jt}^{s}$ as the difference between the benchmark and the estimated fixed effects for each market:

$$\hat{\tau}_{jt}^{s} = \exp\left(\frac{\left(\widehat{\mu_{jt}} - \widehat{\mu_t^*}\right)}{1-\sigma}\right) - 1. \quad (7)$$

The main downside of estimating tariff equivalents relative to the most open international market instead of the domestic market is that the size of the value of $\widehat{\mu_t^*}$ is driven by both differences in trade costs and differences between the characteristics of the importing and exporting country. As such, the second stage regression, presented in equation 8, includes both the measure of services NTMs and controls aimed at controlling for these specific characteristics of the importing country.

$$\widehat{\tau_{jt}^{s}} = \alpha + \theta_1 \text{ServicesNTM}_{jt}^{s} + \boldsymbol{\delta}\mathbf{D_{jt}} + \theta_2 \widehat{\mu_t^*} + \boldsymbol{\vartheta}\mathbf{Year_t} + \omega_{jt}^{s}. \quad (8)$$

[5] Herman (2022) finds that using GDP instead of expenditures as the denominator in the dependent variable yields more theoretically consistent first-stage regression results for trade in goods. Specifically, in this specification, Herman (2022) finds that a 1 percent increase in tariffs decreases trade by 1 percent.

As in equation 4, $\text{ServicesNTM}_{jt}^{s}$ is a measure of services trade NTMs for a given importing market j in time t, while the vector $\boldsymbol{\delta \mathbf{D}_{jt}}$ includes importer-specific controls such as GDP per capita, domestic production or GDP, and WTO membership. The regression also includes year dummies, as well as a control for the benchmark country importer fixed effects. Finally, the tariff equivalent trade cost can be directly inferred as the value of θ_1 in equation 8.

Data

As noted in the introduction, this paper considers several indices that categorize and index policy measures that can limit services trade, summarized in table 1. All four indices are normalized to a range from 0-100, with 0 representing a market where imported and domestic services face identical regulations and 100 representing a services market completely closed to international trade. While the average value of the services NTMs indices depend on the specific index used, comparing the countries with available data for all of the indices shows that each index has a similar ranking of restricted versus unrestricted countries.

First, the OECD Services Trade Restrictions Index (MFN STRI) and the Intra-European Economic Area STRI (EEA STRI) are complementary datasets that together can help disentangle NTMs within and outside the European Economic Area. The OECD STRI considers services trade NTMs on a most-favored nation (MFN) basis and does not consider specific policy measures in free trade agreements. The index is subdivided into five categories: restrictions on foreign entry, restrictions on the movement of people, other discriminatory measures, barriers to competition, and regulatory transparency (Geloso Grosso et al., 2015). The EEA STRI uses the same scoring methodology as the MFN STRI but considers trade policy measures that apply specifically to European Economic Area members.[6] The index covers both EU-wide laws and NTMs set by individual EEA member countries (Benz and Gonzales 2019). To understand the contribution of the EEA STRI to the accurate measurement of services NTMs and associated costs, I consider both a specification using only the MFN STRI and combining the two indices so that EEA member pairs face EEA-specific services NTMs.

Second, while the OECD indices together provide helpful variation in services trade NTMs, they are primarily focused on OECD member countries and their major services trading partners, limiting coverage of developing markets. The World Bank-WTO Services Trade Restrictions Index has more comprehensive coverage of both developed and developing country markets, covering 129 countries (World Bank and WTO, 2023). However, this dataset is limited because it only covers restrictions for a single year in each country. This means that while the World Bank-WTO Index can be useful to compare different levels of NTMs across different countries, it is not able to measure the impact of changes to services trade policy over time.

A final index considered in this paper, the OECD FDI Regulatory Restrictiveness Index (Kalinova et al., 2010), is not explicitly aimed at trade in services, instead cataloging broader NTMs related to foreign direct investment (FDI). The primary disadvantage of this index is that it covers a smaller set of NTMs than the other indices, covering only NTMs related to the establishment of affiliates in foreign markets. In contrast, the OECD STRI and World Bank-WTO indices include both restrictions related to foreign direct investment and restrictions related directly to cross-border trade in services. Despite this more

[6] The European Economic Area includes EU members as well as Iceland, Liechtenstein, and Norway.

limited coverage of potential NTMs related services trade, a major advantage of this index is coverage over time, as it covers observations going back to 1997. Additionally, recent work by Khachaturian and Oliver (2023) find that restrictions on establishment of foreign affiliates, such as those captured in the FDI Regulatory Restrictiveness Index, significantly decrease cross-border services trade, suggesting that this index may capture the indirect effect of a more restrictive regulatory environment for services in general, despite not being directly related to cross-border trade.

Table 1: Coverage of services trade restriction indices

Dataset	Countries	Available Years	Services trade categories
OECD STRI/EEA STRI	50 intra and inter-EEA values	2014 – 2022	22
World Bank-WTO STRI	129	2016, 2017, 2018, 2019, 2020 or 2021 (one year per country)	34
OECD FDI Index	84	1997, 2003, 2006, 2010 – 2020	22

Source: Borchert et al. (2021), Benz and Gonzales (2019), Geloso Grosso et al. (2015), Kalinova et al. (2010), and World Bank and WTO, (2023).

To compare estimates of trade costs across indices and methods, I rely on cross-border services trade data from the International Trade and Production Database for Estimation (ITPD-E), which includes both international and domestic flows (Borchert et al., 2021). For consistency across different services NTM indices, I focus on trade flows from 2014—2019, and 7 services trade categories: transport, construction, insurance and pension services, financial services, telecommunication, computer, and other information services (hereafter ICT services), other business services, and trade-related services. One limitation of the ITPD-E is that services trade categories are at a more aggregated level than the NTMs that govern services trade. For example, the ITPD-E could not be used to isolate the trade costs associated with mutual recognition of credentials in accounting services, because accounting services are part of the larger “other business services” category of trade.

Each of these services categories is matched to the services trade categories present in each index. Where categories in the index are more disaggregated than in ITPD-E (such as in transport services, where air, road, rail, and maritime transport all have their own index values) a simple average of all sub-categories is matched with the ITPD-E data. Table 2 compares the number of matched observations across the 7 services trade flows considered in this paper. For most services, the OECD FDI and World Bank/WTO indices have better coverage than the OECD STRI indices. However, coverage in the World Bank/WTO index of construction services is considerably more limited than any other index.

Table 2: Coverage by services trade category and dataset-number of matched observations, 2014–2019

Services Trade Category	Sector ID	OECD STRI/EEA STRI	OECD FDI Index	World Bank/WTO
Transport	156	14,459	15,295	15,863
Construction	158	12,228	13,686	859
Insurance and pension services	159	13,212	14,962	14,553
Financial services	160	13,108	14,637	14,261
Telecommunications, computer, and other information services (ICT services)	162	14,771	16,629	16,176
Other business services	163	14,717	16,494	16,039
Trade-related services	169	11,137	12,517	12,177

Additional controls in the regression specifications, including bilateral trade determinants and GDP measures come from the Dynamic Gravity Dataset (Gurevich and Herman 2018). Finally, elasticity of substitution values for each category of services exports are calculated using data on the composition of gross service sector output by industry (BEA, 2023) following the methodology used in Gervais and Jensen (2019). In particular, sector-specific elasticities are calculated as:

$$\sigma^s = Average_{(t=2014-2019)}\left[\frac{Total\ Output^s_{USA,t}}{Gross\ Operating\ Surplus^s_{USA,t}}\right]$$

The elasticity estimates are presented in table 3.

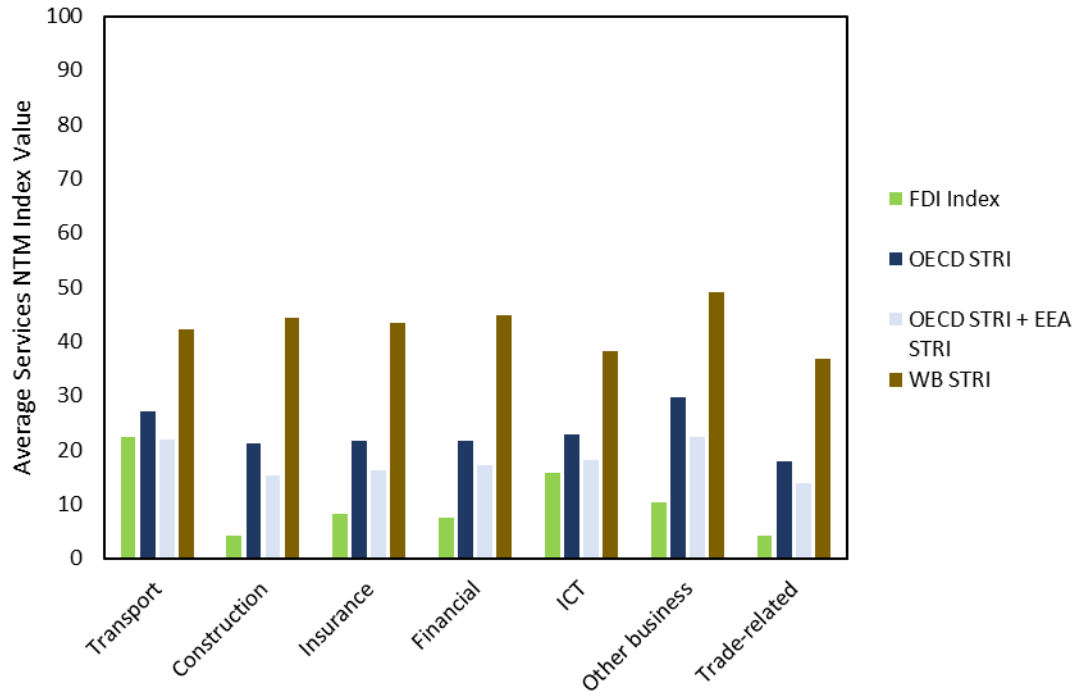
Table 3: Elasticity estimates by services export category, 2014–2019

Service Type	Elasticity estimate
Transport	5.6
Construction	5.9
Insurance and pension services	4.4
Financial services	2.5
ICT services	6.2
Other business services	3.0
Trade-related services	5.6
Average	**4.7**

Source: author's calculations following Gervais and Jensen (2019)

Before assessing the impact of the different services NTM indices on estimates of trade costs, it is helpful to assess how similar the different NTM indices are over the merged data sample. Figure 1 plots the average NTM index value by services trade category for the ITPD-E sample (table A1 provides a full set of summary statistics). What is immediately apparent is that across all sectors, there are systematic differences in the scaling of the average value of the NTM Indices. The World Bank-WTO STRI always has the largest average value of the NTM Index, while the OECD FDI Index is typically the smallest, driven by a large number of zero values in the data (indicating completely open markets for FDI). The OECD STRI combined with the EEA STRI always has a smaller value than the OECD STRI, but this reflects that members of the European Economic Association typically impose fewer NTMs on other EEA members, rather than a difference in the scale of these two indices.

Figure 1: Average Services NTM Index value by services trade category, 2014–2019

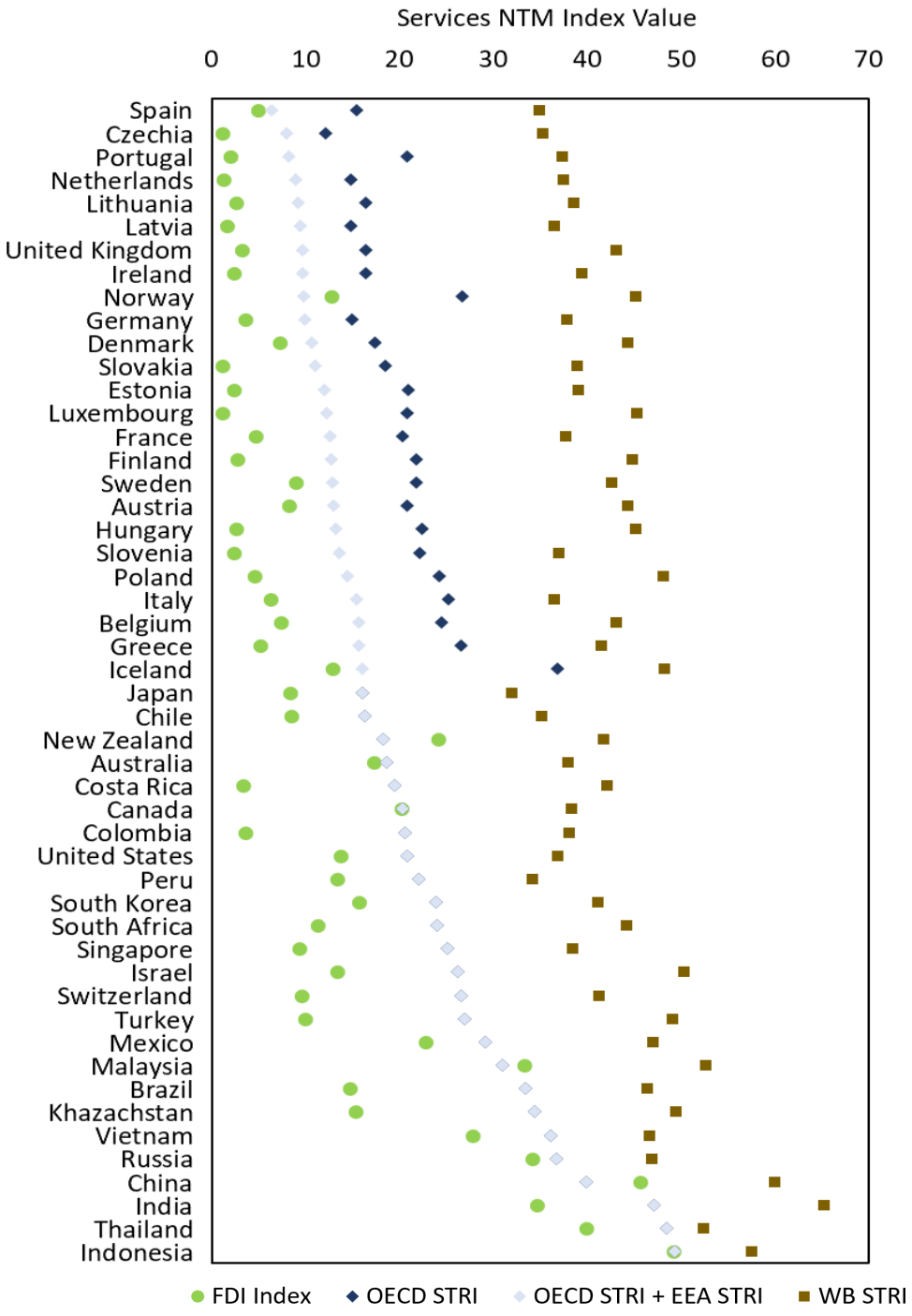


Source: Author's calculations using data from Borchert et al. (2021), Benz and Gonzales (2019), Geloso Grosso et al. (2015), Kalinova et al. (2010), and World Bank and WTO, (2023).

One potential reason for the differences in scale across different services NTM indices is the differences in market coverage across different indices. To assess whether there are systematic differences across indices for the same import market, figure 2 plots the average services NTM Index value for each of the 50 countries that appear in every index.[7] There are two main takeaways from figure 2. First, at the importer level, the World Bank-WTO STRI continues to have the highest average NTM Index value, suggesting that the high average values by sector shown in Figure 1 are driven by a different scale in that index, rather than the presence of more developing country importers. Second, while the level of the NTM Indices appear to be systematically different, the relative ranking of countries by restrictiveness of NTMs are fairly similar across different measures. This suggests that even though they differ in magnitude, the indices all likely successful in capturing relative stringency of services related NTMs across different import markets.

[7] Figure 2 excludes construction services from the average values due to the limited coverage of that trade flow in the World Bank-WTO STRI.

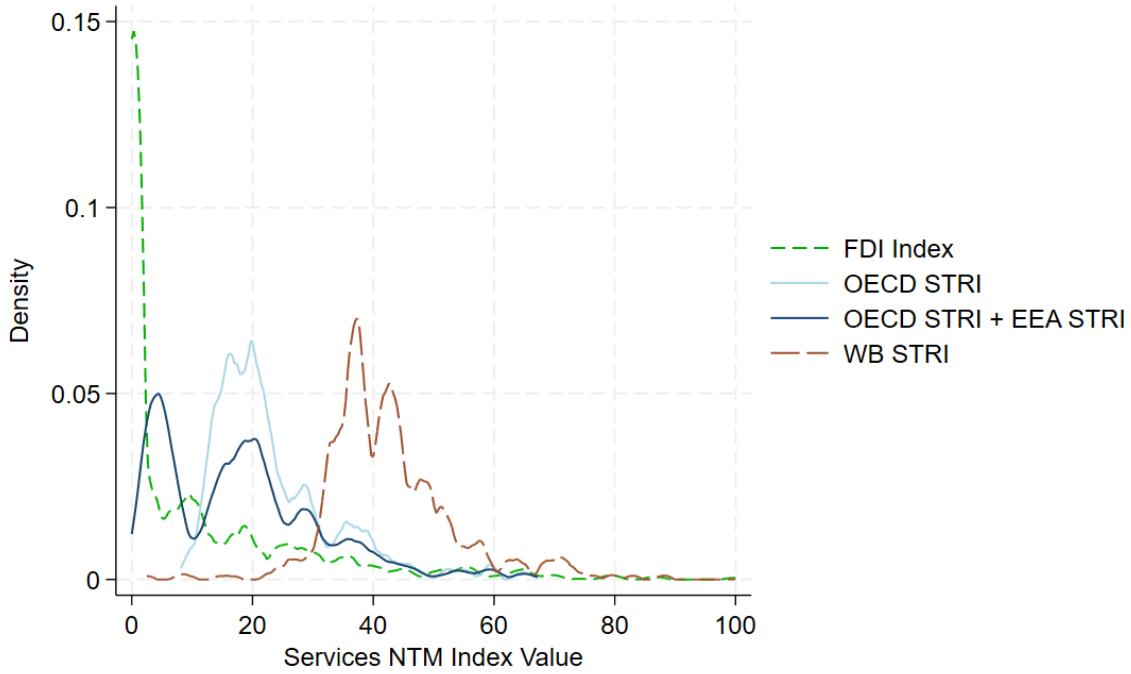
Figure 2: Average Services NTM Index Value by country, 2014–2019



Notes: Average values exclude construction services, due to limited observations for the World Bank/WTO STRI. Countries listed in the figure include those with data available across all four indices.
Source: Author's calculations using data from Borchert et al. (2021), Benz and Gonzales (2019), Geloso Grosso et al. (2015), Kalinova et al. (2010), and World Bank and WTO, (2023).

Finally, figure 3 plots the distribution of NTM Index values across the sample. As noted above, the FDI index has a large concentration of zero values, leading to a more skewed distribution than the other indices. The distributions of the World Bank-WTO and the OECD STRI have similar shapes, but consistent with the averages presented in figures 1 and 2, the World Bank-WTO NTM values tend to be more concentrated at higher values than the other indices.

Figure 3: Kernel Density Plot for Services NTM Index Values, 2014–2019



Source: Author's calculations using data from Borchert et al. (2021), Benz and Gonzales (2019), Geloso Grosso et al. (2015), Kalinova et al. (2010), and World Bank and WTO, (2023).

Overall, comparing the average values and distributions of the four measures of the NTM index suggest that estimates of services trade costs are likely to be sensitive to the choice of index. As a result, when estimating trade costs for trade in services, focusing on the relative differences in trade costs across countries and over time for a specific index may be more informative than comparing estimates of the specific values of tariff equivalent trade costs.

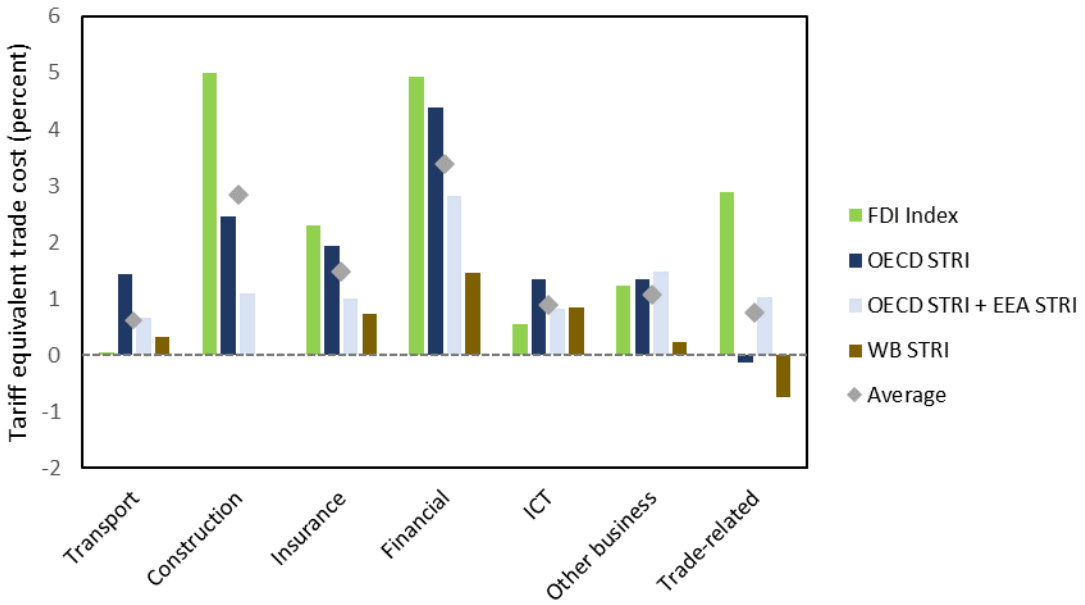
Results

To compare the differences in trade cost estimates for the Heid et al. (2021) and Herman (2022) approaches, I calculate estimates of trade costs using both methods for all sectors and four combinations of NTM Indices described above. Given the volume of results associated with these different specifications, I provide a summary here, with full regression results in the Appendix. Overall, I find that the Heid et al. (2021) and the Herman (2022) approaches produce similar results in transportation, insurance, and financial service sectors, but diverge considerably in ICT, other business, and trade-related services.

Figure 4 summarizes regression results using the Heid et al. (2021) approach for calculating trade costs relative to domestic trade, with full regression results presented in tables A1–A4. All but three estimates using this approach are statistically significant, suggesting that regardless of choice of NTM index, all support a negative relationship between the stringency of NTMs in services and services exports.[8] Specifically, a one standard deviation increase (11.8 points on a scale of 0 to 100 on average) in the stringency of NTMs related to services represents a 16.8 percent tariff equivalent trade cost on average. Financial services tend to have the highest trade costs on average, at 36.8 percent tariff equivalent trade cost for a one standard deviation increase in the stringency of NTMs.

Comparing the estimated trade costs across different indices shows that while the magnitude of the tariff equivalent trade cost varies across the choice of index, there is not a consistent pattern. The relatively large values of the FDI Index in construction, financial, and trade-related services likely reflect the distribution of that index, which has high levels of zero values but also includes some very restricted outliers. Given the lower levels of NTMs faced by intra-EEA members, the marginal effect of the combined OECD STRI and EEA STRI is smaller than the OECD STRI alone for transport, construction, insurance, financial and ICT services.

Figure 4: Summary of Trade Cost Estimates using Heid et al. (2021) method



Notes: This figure summarizes regression results estimated using the methodology proposed in Heid et al. (2021) and plots the tariff equivalent trade cost associated with a one unit increase in each of Services NTM Indices considered. The values in this figure are converted to tariff equivalent trade costs using the formula $\text{TariffEquivalent}^{s} = -\exp\left(\frac{\widehat{\beta_2}}{\sigma_s} - 1\right) \times 100$, *with sector-specific elasticity estimates taken from table 3. Construction services tariff equivalent trade costs were not estimated for the World Bank STRI due to small sample size.* Corresponding regression results are available in tables A.1–A.4.

[8] Consistent with Khachaturian and Oliver (2023), the negative and significant relationship between the FDI Index and cross-border trade suggests that FDI and cross-border trade are complimentary for services trade, rather than substitutes.

It is also useful to compare these results to other recent estimates of tariff equivalent trade costs from Benz and Jaaz (2022), which calculates tariff equivalent trade costs for 5 comparable services trade sectors using a similar set of years and the combined OECD STRI and EEA STRI index as a measure of services NTMs. Table 4 compares the two tariff equivalent trade cost estimates for a one unit increase in the services NTM index. For ease of comparison, I re-calculate the tariff equivalent trade costs in Benz and Jaax (2022) using the elasticity values presented in table 3.[9] The results from Benz and Jaax (2022) and this paper are strikingly similar, differing in less than 1 percentage point for each one unit increase in the STRI across all services.

Table 4: Comparison of trade cost estimates with Benz and Jaax (2022), by services export category.

Export Category	Tariff equivalent trade cost (percent), Benz and Jaax (2022)	Tariff equivalent trade costs (percent), OECD STRI+EEA STRI Estimates
Transport	0.28	0.65
Insurance	1.65	0.99
Financial	2.57	2.82
ICT	0.25	0.82
Other business	0.55	1.48

Notes: The tariff equivalent trade costs in this table represent a one unit increase in each of Services NTM Indices considered. The values in this table are converted to tariff equivalent trade costs using the formula $TariffEquivalent^{s} = -exp\left(\frac{\hat{\beta}_2}{\sigma_s} - 1\right) \times 100$, with sector-specific elasticity estimates taken from table 3.

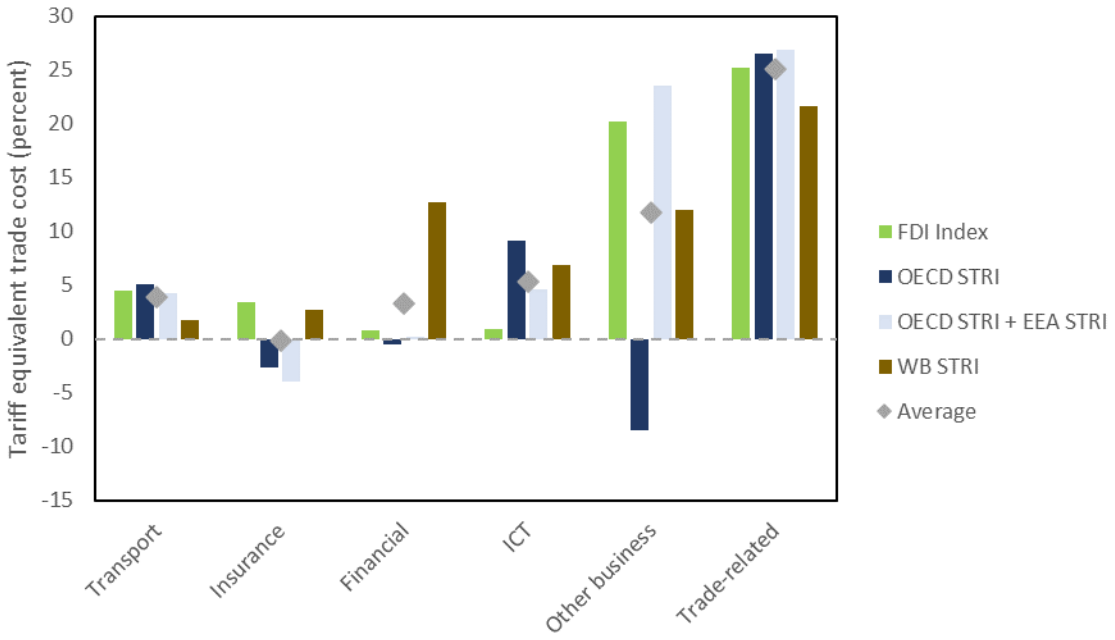
Next, Figure 4 summarizes regression results estimating trade costs using the Herman (2022) method, with full regression results available in tables A.5–A.9.[10] One challenge with measuring trade costs relative to the importer with the smallest aggregate import trade costs in services is the presence of small open economies that have high volumes of a specific type of services trade, including transportation services in the Marshall Islands (likely due to their open registry for vessels), financial services in the Cayman Islands, and trade-related services in Singapore and thus have considerably smaller trade costs than the rest of the sample.[11] As a result, for the Herman (2022) approach, I exclude the top 5 percent of the estimated importer fixed effects ($\widehat{\mu_{jt}}$) *from the estimation of trade costs and second stage regression.*

Using the Herman (2022) method, all estimates of tariff equivalent trade costs are statistically significant. On average, tariff equivalent trade costs are larger, with a one standard deviation increase in the stringency of a NTM index (11.8 points) representing an 81.5 percent tariff equivalent trade cost. Trade-related services have the highest estimated average tariff equivalent trade costs at 240.5 percent per one standard deviation increase in the stringency of a NTM index, a result that is consistent across each of the measures of services NTMs. However, there is not a clear pattern of the size of estimates across the different NTM indices. Additionally, for some estimates, including for financial, insurance and other business services using the OECD STRI and for insurance using the combined OECD STRI and EEA STRI are negative, suggesting more stringent NTMs decrease trade costs, which may reflect omitted variables or

[9] Benz and Jaax (2022) use smaller elasticity values in their original estimates of tariff equivalent trade costs for most services export categories, ranging from 2.54 to 3.67, compared to a range of 2.5 to 6.2 in this paper.
[10] Due to extremely large estimates of trade costs in construction, this sector was excluded from estimates of NTM trade costs using the Herman (2022) method.
[11] Specifically, the difference between the value of the importer fixed effects in these small economies and other markets are so large that the value of equation 7 approaches infinity.

an estimation sample where more restricted countries are larger exporters. For other business services, these counterintuitive results are likely due to mismeasurement of NTMs between EEA members, as the combined OECD STRI and EEA STRI has the expected sign using the same sample of countries and years.

Figure 5: Summary of Trade Cost Estimates using Herman (2022) method



Notes: This figure summarizes regression results estimated using the methodology proposed in Herman (2022) and plots the tariff equivalent trade cost associated with a one unit increase in each of Services NTM Indices considered. Construction services tariff equivalent trade costs were not estimated due *to* extremely large estimates of trade costs in construction. Corresponding regression results are available in tables A.5–A.9.

Finally, table 5 compares the difference between tariff equivalent trade costs calculated by the Heid et al. (2021) and Herman (2022) methods. For the purposes of comparison, I define close (light green) estimates of tariff equivalent trade costs as those that are within 5 percentage points of each other, while very close (dark green) estimates as those that are within 1 percentage point of each other. For transport, insurance and financial services, the majority of tariff equivalent trade cost estimates are within 5 percentage points of each other, while for ICT services two of the four estimates are close or very close. However, the estimates of tariff equivalent trade costs for other business services and trade related services are not close to one another for any of the NTM indices. One reason for this discrepancy could be variation in unobserved trade costs within these broad services sectors. For example, while the "other business services" trade category includes a wide variety of activities (research and development, accounting, legal, advertising, business and management consulting, architectural, engineering, scientific and other technical, waste treatment and operating leasing services), the OECD STRI only has information on accounting, architecture, engineering, and legal services.

Table 5: Difference between estimated tariff equivalent trade costs across methodologies

Export category	FDI Index	OECD STRI	OECD STRI +EEA STRI	WB STRI	Average
Transport	-4.4	-3.7	-3.6	-1.4	-3.3
Insurance	-1.1	4.5	5.0	-2.0	1.6
Financial	4.1	4.9	2.6	-11.3	0.1
ICT	-0.4	-7.8	-3.8	-6.0	-4.5
Other business	-19.0	9.8	-22.1	-11.8	-10.8
Trade Related	-22.3	-26.6	-25.9	-22.4	-24.3

Notes: Excludes construction services. Differences calculated as: Tariff equivalent (Heid et al. 2021) – Tariff equivalent (Herman 2022). Light green highlights indicate a gap between estimates of ≤ 5 percentage points, while dark green highlights indicate a gap of ≤ 1 percentage points.

Overall, the results of both methodologies show that choice of measure of services trade restrictions affects the magnitude of estimated tariff equivalent trade costs. While all indices seem to succeed in their intended purpose of measuring differences in NTMs in services across different markets, differences in the average values, distribution, and presence of highly restricted import markets that act as outliers mean that the magnitude in the estimated tariff equivalent trade costs are inconsistent. However, for a given NTM index, a comparison of results across methodologies shows that using the Herman (2022) method to overcome limited data on domestic trade in services may produce comparable estimates than the more data intensive Heid et al. (2021) method, particularly for more disaggregated services trade flows like finance and insurance.

Conclusion

Despite the recent proliferation of sources cataloging non-tariff measures related to trade in services, understanding the role and economic impact of NTMs in services continues to pose a challenge for research. Given that services trade is typically not the main focus of economic literature, it is helpful to consider whether methodologies developed with trade in goods in mind, such as Heid et al. (2021) and Herman (2022) are also useful tools for trade in services. The primary finding of this paper is that both of these recent methods are feasible to use to estimate the effect of services-related NTMs on cross-border services trade and produce similar estimates for more disaggregated services sectors. The similarity of estimates for more disaggregated service sectors is a helpful finding for future analysis, particularly in the case where domestic production data is not readily available.

However, this paper also shows that estimates of the tariff equivalent trade costs of cross-border services exports are very sensitive to the choice of NTM index. This suggests that the existing NTM indices may be better suited to measuring relative differences in services trade costs rather than for constructing tariff equivalent trade costs. Focusing on the presence of specific services NTMs provisions or changes to NTM policies may be a way to mitigate the impact of differences in NTM indices.

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Appendix

Table A.1 Summary Statistics

Services trade category	Services NTM Index	Obs.	Mean	St. Dev	Min	25%	Median	75%	Max
Transport	FDI Index	16,295	22.3	14.8	1.0	9.2	18.2	29.2	74.5
Transport	OECD STRI	14,459	27.0	11.2	13.8	19.5	23.4	29.0	60.0
Transport	OECD STRI + EEA STRI	14,459	22.0	15.0	3.3	7.2	20.8	27.9	60.0
Transport	WB STRI	15,863	42.3	8.9	7.9	37.2	41.1	44.9	69.6
Construction	FDI Index	13,686	4.2	10.0	0.0	0.0	0.0	2.5	92.6
Construction	OECD STRI	12,228	21.3	7.5	8.6	15.8	19.8	26.4	46.9
Construction	OECD STRI + EEA STRI	12,228	15.3	11.3	0.0	3.7	15.8	22.3	46.9
Construction	WB STRI	859	44.3	14.3	15.7	38.1	45.8	49.0	68.9
Insurance	FDI Index	14,962	8.4	18.1	0.0	0.0	0.0	6.0	100.0
Insurance	OECD STRI	13,212	21.6	10.3	9.3	14.2	19.2	25.8	58.3
Insurance	OECD STRI + EEA STRI	13,212	16.2	13.8	0.7	2.6	14.5	23.2	58.3
Insurance	WB STRI	14,553	43.5	9.9	14.7	36.0	40.2	51.6	100.0
Financial	FDI Index	14,637	7.5	13.5	0.0	0.0	0.5	10.0	81.0
Financial	OECD STRI	13,108	21.7	8.8	8.1	16.5	19.0	23.7	48.9
Financial	OECD STRI + EEA STRI	13,108	17.2	11.9	1.0	6.1	16.8	22.3	48.9
Financial	WB STRI	14,261	44.9	8.8	26.9	38.0	43.9	47.7	68.6
ICT	FDI Index	16,629	15.9	19.6	0.0	0.0	10.0	23.4	87.0
ICT	OECD STRI	14,771	22.9	8.4	12.4	16.6	20.8	26.9	56.4
ICT	OECD STRI + EEA STRI	14,771	18.1	12.1	1.7	5.2	17.7	26.4	56.4
ICT	WB STRI	16,176	38.2	7.2	9.4	33.9	37.9	41.4	70.1
Other business	FDI Index	16,494	10.3	16.6	0.0	0.0	3.0	16.5	100.0
Other business	OECD STRI	14,717	29.7	11.6	12.0	19.8	29.3	38.0	66.0
Other business	OECD STRI + EEA STRI	14,717	22.5	15.3	2.5	7.5	19.8	31.4	66.0
Other business	WB STRI	16,039	49.2	13.1	23.2	41.6	46.2	52.0	88.2
Trade-related	FDI Index	12,517	4.2	10.9	0.0	0.0	0.0	2.3	100.0
Trade-related	OECD STRI	11,137	18.0	8.4	8.8	13.4	15.2	20.5	67.2
Trade-related	OECD STRI + EEA STRI	11,137	13.9	10.1	2.7	6.6	13.4	16.8	67.2
Trade-related	WB STRI	12,177	36.7	9.2	2.5	33.1	36.5	37.9	100.0

Source: Author's calculations using data from Borchert et al. (2021), Benz and Gonzales (2019), Geloso Grosso et al. (2015), Kalinova et al. (2010), and World Bank and WTO, (2023).

Table A.2 Regression results: Heid et al. (2021), OECD FDI Index

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
DV: Exports (millions $)	Transport	Construction	Insurance	Financial	ICT	Other business	Trade-related
International	-4.087***	-7.498***	-4.909***	-3.678***	-2.985***	-4.219***	-7.393***
	[0.0855]	[0.216]	[0.172]	[0.211]	[0.117]	[0.106]	[0.186]
FDI Index X International	-0.00158	-0.282***	-0.106***	-0.126***	-0.0364***	-0.0320***	-0.156***
	[0.00191]	[0.0215]	[0.0106]	[0.00828]	[0.00372]	[0.00313]	[0.0196]
Services PTA	0.125***	1.016***	-0.246***	-0.367***	-0.461***	-0.0845*	0.437***
	[0.0471]	[0.118]	[0.0897]	[0.0741]	[0.0636]	[0.0472]	[0.0885]
EU membership	0.634***	0.801***	0.834***	1.495***	1.175***	0.432***	-0.381**
	[0.0869]	[0.230]	[0.174]	[0.146]	[0.106]	[0.120]	[0.161]
Log (Distance)	-0.466***	-0.560***	-0.632***	0.0849	-0.655***	-0.338***	-0.684***
	[0.0246]	[0.0725]	[0.0643]	[0.0740]	[0.0273]	[0.0286]	[0.0694]
Common Language	0.214***	0.349***	0.383***	0.651***	0.475***	0.250***	0.150**
	[0.0379]	[0.102]	[0.0790]	[0.0800]	[0.0442]	[0.0651]	[0.0707]
Colonial Relationship	0.538***	0.715***	1.008***	0.883***	0.482***	0.473***	-0.0928
	[0.0585]	[0.122]	[0.107]	[0.107]	[0.0649]	[0.0886]	[0.177]
Common Border	0.425***	0.207*	0.201	0.783***	-0.0557	0.488***	0.697***
	[0.0500]	[0.113]	[0.142]	[0.139]	[0.0599]	[0.0658]	[0.107]
Constant	14.88***	15.73***	16.42***	10.60***	16.45***	15.28***	18.00***
	[0.181]	[0.506]	[0.462]	[0.502]	[0.195]	[0.209]	[0.494]
Observations	15,729	12,999	14,365	14,189	15,503	15,452	11,861
Pseudo R-squared	0.985	0.998	0.997	0.976	0.994	0.990	0.999

Notes: This table uses the estimation strategy proposed by Heid et al. (2021) and the OECD FDI Regulatory Restrictiveness Index as a measure of services non-tariff measures. Tariff-equivalent trade costs are calculated as: $TariffEquivalent^{s} = -exp\left(\frac{Index}{\sigma_s} - 1\right) \times 100$. Regressions estimated using PPML. Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1

Table A.3 Regression results: Heid et al. (2021), OECD MFN STRI

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
DV: Exports (millions $)	Transport	Construction	Insurance	Financial	ICT	Other business	Trade-related
International	-2.088***	-4.623***	-2.621***	-2.501***	-2.072***	-3.174***	-7.522***
	[0.135]	[0.341]	[0.266]	[0.221]	[0.174]	[0.161]	[0.303]
OECD MFN STRI X International	-0.0777***	-0.155***	-0.0963***	-0.116***	-0.0860***	-0.0432***	-0.0101
	[0.00404]	[0.0107]	[0.00776]	[0.00688]	[0.00631]	[0.00307]	[0.00938]
Services PTA	-0.0200	1.033***	-0.589***	-0.104	-0.187***	-0.101**	0.576***
	[0.0520]	[0.108]	[0.0986]	[0.0679]	[0.0557]	[0.0475]	[0.0900]
EU membership	0.693***	0.523**	1.078***	1.434***	0.828***	0.340***	-0.441**
	[0.0913]	[0.242]	[0.201]	[0.159]	[0.113]	[0.124]	[0.197]
Log (Distance)	-0.428***	-0.613***	-0.650***	0.205***	-0.609***	-0.407***	-0.709***
	[0.0249]	[0.0682]	[0.0531]	[0.0770]	[0.0273]	[0.0311]	[0.0732]
Common Language	0.438***	0.622***	0.718***	0.561***	0.503***	0.133**	-0.0115
	[0.0362]	[0.108]	[0.0904]	[0.0787]	[0.0478]	[0.0600]	[0.0783]
Colonial Relationship	0.399***	0.697***	0.881***	0.808***	0.327***	0.405***	0.0495
	[0.0561]	[0.120]	[0.110]	[0.109]	[0.0617]	[0.0895]	[0.188]
Common Border	0.351***	0.00595	-0.0362	0.892***	-0.00838	0.459***	0.618***
	[0.0455]	[0.116]	[0.122]	[0.142]	[0.0581]	[0.0658]	[0.117]
Constant	14.45***	15.94***	16.15***	9.916***	16.26***	15.91***	18.38***
	[0.185]	[0.477]	[0.380]	[0.530]	[0.194]	[0.224]	[0.520]
Observations	15,729	12,999	14,365	14,189	15,503	15,452	11,861
Pseudo R-Squared	0.987	0.998	0.997	0.976	0.994	0.991	0.999

Notes: This table uses the estimation strategy proposed by Heid et al. (2021) and measures services non-tariff measures using the OECD MFN Services Trade Restrictiveness Index. Tariff-equivalent trade costs are calculated as: $TariffEquivalent^{s} = -exp\left(\frac{\overline{Index}}{\sigma_s} - 1\right) \times 100$.
Regressions estimated using PPML. Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1

Table A.4 Regression results: Heid et al. (2021), Combined OECD STRI

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
DV: Exports (millions $)	Transport	Construction	Insurance	Financial	ICT	Other business	Trade-related
International	-3.459***	-7.039***	-4.036***	-3.500***	-3.012***	-3.427***	-6.681***
	[0.0913]	[0.270]	[0.189]	[0.199]	[0.119]	[0.156]	[0.246]
Combined STRI X International	-0.0315***	-0.0588***	-0.0467***	-0.0755***	-0.0460***	-0.0416***	-0.0642***
	[0.00228]	[0.00619]	[0.00432]	[0.00458]	[0.00318]	[0.00346]	[0.00870]
Services PTA	-0.154***	0.708***	-0.758***	-0.455***	-0.564***	-0.571***	0.259**
	[0.0569]	[0.146]	[0.111]	[0.0762]	[0.0611]	[0.0718]	[0.107]
EU membership	0.532***	0.396*	0.647***	1.003***	0.707***	0.118	-0.830***
	[0.0902]	[0.233]	[0.191]	[0.152]	[0.106]	[0.134]	[0.172]
Log (Distance)	-0.398***	-0.524***	-0.629***	0.227***	-0.576***	-0.341***	-0.729***
	[0.0250]	[0.0707]	[0.0558]	[0.0769]	[0.0272]	[0.0293]	[0.0682]
Common Language	0.358***	0.372***	0.588***	0.622***	0.501***	0.293***	0.181**
	[0.0385]	[0.116]	[0.0855]	[0.0800]	[0.0482]	[0.0657]	[0.0789]
Colonial Relationship	0.442***	0.804***	0.932***	0.786***	0.385***	0.399***	-0.122
	[0.0580]	[0.120]	[0.110]	[0.109]	[0.0638]	[0.0892]	[0.180]
Common Border	0.427***	0.151	0.109	0.870***	0.0308	0.474***	0.594***
	[0.0470]	[0.115]	[0.127]	[0.138]	[0.0584]	[0.0617]	[0.106]
Constant	14.39***	15.66***	16.26***	9.835***	16.08***	15.41***	18.46***
	[0.185]	[0.490]	[0.402]	[0.526]	[0.191]	[0.211]	[0.483]
Observations	13,967	11,652	12,689	12,705	13,754	13,879	10,621
Pseudo R-Squared	0.986	0.998	0.997	0.976	0.994	0.991	0.999

Notes: This table uses the estimation strategy proposed by Heid et al. (2021) and measures services non-tariff measures using the OECD MFN Services Trade Restrictiveness Index for trade outside of the European Economic Area, and the OECD EEA Services Trade Restrictiveness Index for trade within the European Economic Area. Tariff-equivalent trade costs are calculated as: $TariffEquivalent^{s} = -exp\left(\frac{1\bar{n}\bar{d}\bar{e}\bar{x}}{\sigma_s} - 1\right) \times 100$. Regressions estimated using PPML. Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1

Table A.5 Regression results: Heid et al. (2021), WB/WTO STRI

	(1)	(3)	(4)	(5)	(6)	(7)
DV: Exports (millions $)	Transport	Insurance	Financial	ICT	Other business	Trade-related
International	-3.765***	-4.090***	-3.259***	-2.309***	-4.218***	-9.164***
	[0.174]	[0.239]	[0.353]	[0.233]	[0.190]	[0.312]
WB/WTO STRI X International	-0.00967**	-0.0296***	-0.0359***	-0.0433***	-0.00252	0.0448***
	[0.00401]	[0.00573]	[0.00704]	[0.00556]	[0.00290]	[0.00641]
Services PTA	0.147***	-0.0724	0.0826	-0.124**	-0.0944**	0.448***
	[0.0461]	[0.0966]	[0.0686]	[0.0515]	[0.0457]	[0.0865]
EU membership	0.589***	0.674***	1.297***	0.881***	0.462***	-0.224
	[0.0850]	[0.195]	[0.155]	[0.103]	[0.124]	[0.180]
Log (Distance)	-0.459***	-0.605***	0.143**	-0.603***	-0.367***	-0.711***
	[0.0247]	[0.0619]	[0.0730]	[0.0274]	[0.0290]	[0.0660]
Common Language	0.199***	0.370***	0.407***	0.352***	0.167***	-0.0341
	[0.0355]	[0.0812]	[0.0829]	[0.0482]	[0.0613]	[0.0764]
Colonial Relationship	0.517***	1.084***	1.141***	0.491***	0.531***	0.0737
	[0.0576]	[0.121]	[0.115]	[0.0659]	[0.0909]	[0.185]
Common Border	0.422***	0.184	0.836***	0.0342	0.461***	0.664***
	[0.0499]	[0.141]	[0.142]	[0.0611]	[0.0646]	[0.108]
Constant	14.89***	16.31***	10.50***	16.34***	15.55***	18.33***
	[0.182]	[0.449]	[0.500]	[0.197]	[0.211]	[0.467]
Observations	15,314	13,991	13,832	15,068	15,024	11,557
Pseudo R-Squared	0.985	0.996	0.974	0.994	0.990	0.999

Notes: This table uses the estimation strategy proposed by Heid et al. (2021) and measures services non-tariff measures using the World Bank and WTO Services Trade Restrictions Index. Tariff-equivalent trade costs are calculated as: $TariffEquivalent^{s} = -exp\left(\frac{\widehat{Index}}{\sigma_s} - 1\right) \times 100$. Construction services excluded from the table due to insufficient observations. Regressions estimated using PPML. Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1

Table A.6 Regression results: Herman (2022), First Stage

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
DV: Exports/GDP (percent)	Transport	Construction	Insurance	Financial	ICT	Other business	Trade-related
International	-4.969***	-6.516***	-5.920***	-5.838***	-4.148***	-4.766***	-7.557***
	[0.134]	[0.237]	[0.159]	[0.244]	[0.125]	[0.119]	[0.281]
Services PTA	0.520***	0.640***	0.0645	-0.0271	0.0542	0.0975*	-0.182
	[0.0580]	[0.152]	[0.0916]	[0.105]	[0.0472]	[0.0525]	[0.121]
EU membership	0.371***	0.367	0.955***	1.340***	0.677***	0.476***	1.258***
	[0.141]	[0.380]	[0.153]	[0.152]	[0.0981]	[0.165]	[0.226]
Log (Distance)	-0.279***	-1.155***	-0.529***	0.220***	-0.687***	-0.401***	-0.393***
	[0.0550]	[0.109]	[0.0496]	[0.0486]	[0.0494]	[0.0440]	[0.106]
Common Language	0.618***	0.399***	0.645***	0.0923	0.348***	0.343***	0.456***
	[0.0406]	[0.105]	[0.0747]	[0.107]	[0.0423]	[0.0761]	[0.0799]
Colonial Relationship	0.468***	-0.270	0.875***	0.572***	0.653***	0.616***	-0.365
	[0.107]	[0.225]	[0.128]	[0.182]	[0.0743]	[0.116]	[0.262]
Common Border	0.716***	0.200*	0.665***	1.592***	0.201***	0.532***	0.738***
	[0.0809]	[0.116]	[0.108]	[0.156]	[0.0712]	[0.0975]	[0.151]
Observations	16,293	12,960	14,774	14,113	15,860	15,810	11,532
Pseudo R-squared	0.986	1.000	1.000	0.900	0.995	0.980	1.000

Notes: This table presents the first stage results of the non-tariff measure estimation strategy proposed by Herman (2021). Regressions estimated using PPML. Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1

Table A.7 Regression Results: Herman (2022), Second Stage, FDI Index

	(1)	(2)	(3)	(4)	(5)	(6)
DV: Trade costs	Transport	Insurance	Financial	ICT	Other business	Trade-related
FDI Index	0.0447***	0.0341***	0.00802***	0.00955***	0.202***	0.252***
	[0.00117]	[0.00255]	[0.000344]	[0.00174]	[0.00878]	[0.0109]
Log (GDP per Capita)	0.251***	0.808***	-0.0218***	-0.0187	-5.294***	-0.482***
	[0.0207]	[0.0575]	[0.00654]	[0.0339]	[0.250]	[0.170]
Domestic production	-4.99e-07***	-6.50e-07***	-8.29e-08***	-3.35e-07***	-6.50e-07	1.04e-07
	[9.61e-08]	[1.86e-07]	[3.06e-08]	[9.31e-08]	[4.05e-07]	[2.50e-07]
Benchmark country	1.034***			-1.630***		3.478***
	[0.0313]			[0.119]		[0.233]
WTO member	0.182**	0.876***	0.131***	0.430***	0.603	5.146***
	[0.0785]	[0.161]	[0.0272]	[0.112]	[1.118]	[0.709]
Constant	-9.864***	7.399***	2.832***	32.03***	102.2***	-44.04***
	[0.420]	[0.579]	[0.0702]	[1.792]	[2.693]	[4.437]
Observations	13,044	11,496	11,300	12,837	12,532	9,374
Adjusted R-squared	0.177	0.237	0.258	0.149	0.341	0.098

Notes: This table is the second-stage regression using the estimation strategy proposed by Herman (2022) and the OECD FDI Regulatory Restrictiveness Index as a measure of services non-tariff measures. Regressions estimated using OLS. Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1

Table A.8 Regression Results: Herman (2022), Second Stage, OECD MFN STRI

	(1)	(2)	(3)	(4)	(5)	(6)
DV: Trade costs	Transport	Insurance	Financial	ICT	Other business	Trade-related
OECD MFN STRI	0.0513***	-0.0260***	-0.00552***	0.0912***	-0.0850***	0.265***
	[0.00220]	[0.00457]	[0.00102]	[0.00454]	[0.0189]	[0.0156]
Log (GDP per Capita)	0.327***	0.213***	-0.133***	0.118**	-8.688***	-0.0152
	[0.0323]	[0.0701]	[0.0112]	[0.0466]	[0.318]	[0.179]
Domestic production	-4.16e-07***	-8.63e-07***	-9.94e-08***	-3.67e-07***	-5.57e-07	3.55e-07
	[1.10e-07]	[2.14e-07]	[3.74e-08]	[1.04e-07]	[4.33e-07]	[2.59e-07]
Benchmark country	1.023***			-0.184*		3.516***
	[0.0339]			[0.100]		[0.243]
WTO member	-0.184*	-0.119	-0.0997***	-0.0301	-6.205***	-0.155
	[0.100]	[0.235]	[0.0370]	[0.142]	[1.294]	[0.867]
Constant	-9.864***	7.399***	2.832***	32.03***	102.2***	-44.04***
	[0.420]	[0.579]	[0.0702]	[1.792]	[2.693]	[4.437]
Observations	11,621	10,255	10,264	11,467	11,238	8,360
Adjusted R-squared	0.135	0.165	0.201	0.165	0.312	0.076

Notes: This table is the second-stage regression using the estimation strategy proposed by Herman (2022) and the OECD MFN Services Trade Restrictiveness Index as a measure of services non-tariff measures. Regressions estimated using OLS. Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1

Table A.9 Regression Results: Herman (2022), Second Stage, Combined STRI

	(1)	(2)	(3)	(4)	(5)	(6)
DV: Trade costs	Transport	Insurance	Financial	ICT	Other business	Trade-related
Combined STRI	0.0430***	-0.0396***	0.00270***	0.0465***	0.236***	0.269***
	[0.00154]	[0.00334]	[0.000587]	[0.00283]	[0.0142]	[0.0126]
Log (GDP per Capita)	0.364***	0.0347	-0.0774***	-0.000649	-5.738***	0.430**
	[0.0312]	[0.0698]	[0.00957]	[0.0428]	[0.330]	[0.180]
Domestic production	-5.62e-07***	-7.34e-07***	-1.12e-07***	-4.68e-07***	-8.51e-07*	4.43e-08
	[1.09e-07]	[2.16e-07]	[3.74e-08]	[1.04e-07]	[4.38e-07]	[2.60e-07]
Benchmark country	1.030***			-1.531***		3.463***
	[0.0335]			[0.127]		[0.241]
WTO member	0.00971	-0.368	-0.0708*	0.152	-4.902***	1.008
	[0.102]	[0.238]	[0.0371]	[0.146]	[1.319]	[0.874]
Constant	-10.74***	16.99***	3.566***	29.97***	108.9***	-51.99***
	[0.544]	[0.779]	[0.109]	[1.944]	[3.749]	[4.709]
Observations	11,621	10,255	10,264	11,467	11,238	8,360
Adjusted R-Squared	0.146	0.171	0.199	0.147	0.323	0.088

Notes: This table is the second-stage regression using the estimation strategy proposed by Herman (2022) and measures services non-tariff measures using the OECD MFN Services Trade Restrictiveness Index for trade outside of the European Economic Area, and the OECD EEA Services Trade Restrictiveness Index for trade within the European Economic Area. Regressions estimated using OLS. Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1

Table A.10 Regression Results: Herman (2022), Second Stage, WB/WTO STRI

	(1)	(2)	(3)	(4)	(5)	(6)
DV: Trade costs	Transport	Insurance	Financial	ICT	Other business	Trade-related
WB/WTO STRI	0.0172***	0.0271***	0.0127***	0.0683***	0.120***	0.217***
	[0.00200]	[0.00419]	[0.000682]	[0.00436]	[0.0174]	[0.0136]
Log (GDP per Capita)	0.113***	0.517***	-0.0431***	0.0118	-6.819***	-1.567***
	[0.0250]	[0.0503]	[0.00757]	[0.0342]	[0.264]	[0.150]
Domestic production	-5.30e-07***	-7.56e-07***	-9.12e-08***	-3.98e-07***	-5.91e-07	8.01e-08
	[1.02e-07]	[1.97e-07]	[3.44e-08]	[9.82e-08]	[4.12e-07]	[2.55e-07]
Benchmark country	1.013***			-1.458***		3.651***
	[0.0332]			[0.124]		[0.239]
WTO member	0.307***	0.852***	0.120***	0.391***	1.113	5.015***
	[0.0849]	[0.174]	[0.0289]	[0.112]	[1.163]	[0.717]
Constant	-10.74***	16.99***	3.566***	29.97***	108.9***	-51.99***
	[0.544]	[0.779]	[0.109]	[1.944]	[3.749]	[4.709]
Observations	12,626	11,182	11,080	12,441	12,106	9,059
Adjusted R-squared	0.101	0.197	0.229	0.152	0.335	0.086

Notes: This table is the second-stage regression using the estimation strategy proposed by Herman (2022) and measures services non-tariff measures using the World Bank and WTO Services Trade Restrictions Index. Regressions estimated using OLS. Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.