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THE WTO TRADE COST INDEX AND ITS DETERMINANTS[‡]

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Abstract

This study provides a decomposition of the WTO Trade Cost Index into five policy-relevant components: transport and travel costs; information and transaction costs; ICT connectedness; trade policy and regulatory differences; and governance quality. The WTO Trade Cost Index is based on a new methodology by Egger et al. (2021) that delivers directional trade cost estimates and sector-specific elasticities which are crucial for inferring trade costs from trade flows data. The resulting measure of trade costs includes all factors that burden foreign sales more than domestic ones. In this study, we run a sectoral regression analysis to determine what drives trade costs variation across partners and use the results to decompose the variation in trade costs in each sector.

We show that transport and travel costs play the most important role in overall trade costs both for goods and services. Trade policy and regulatory differences are the second major component of trade costs in most sectors, accounting for at least 14%. The importance of this component is particularly striking for trade among lower-income economies. Moreover, our results also show that trade policy in services sectors matters for trade costs in goods, and vice versa. Finally, we find that access to information and communication technology is especially important for trade costs in services where its importance has increased over time, highlighting the role that digital delivery plays in this sector.

Keywords: Trade costs; gravity model; non-tariff barriers; trade integration; trade elasticity

JEL classification codes: F10; F14; F15

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1. INTRODUCTION

Trade frictions determine the location of economic activity, the efficiency of global production, and ultimately economic growth. Gauging the size of trade frictions and their main determinants is thus high on the policy research agenda. Traditionally, researchers use the gravity model of international trade to estimate the impact of specific, measurable, trade frictions. This approach can tell us the extent to which such frictions are relevant for international trade. However, it does not help in gauging the overall magnitude of trade frictions nor the relative contribution of their specific determinants. Egger, Larch, Nigai and Yotov (2021) [ELNY] propose a consistent estimation of overall trade frictions to build a global trade costs indicator that captures all frictions that make international transactions costlier than domestic ones. These estimates in turn lend themselves to a consistent estimation of the impact of observable trade frictions on overall trade costs and to an assessment of their relative importance.

This research builds on ELNY methodology to estimate bilateral trade costs for 43 countries and 33 sectors between 2000 and 2018. The estimated trade costs reflect all factors that burden foreign sales more than domestic ones.[1] These include transportation costs, trade policy barriers, costs to comply with foreign regulations, communication costs, transaction costs and costs of obtaining information. In a second step, we thus regress the estimated trade costs measures on their observable determinants to understand what drives their variation across partners. We use the results to decompose the variation in trade costs in each sector into five main components: transport and travel costs; information and transaction costs; ICT connectedness; trade policy and regulatory differences; and governance quality.

The closest to our approach is a study by Chen and Novy (2011) who build a top-down index of trade costs and decompose it along four regressor categories: geography and transport costs; policy-related factors; other costs such as fixed costs of exporting and productivity; and a set of control variables that are meant to capture whether the trade costs in question relate to inter-industry trade or to trade driven by comparative advantage. Looking at 163 manufacturing industries in 11 European Union (EU) countries between 1999 and 2003, their main model specification explains 72% of the variation in EU trade integration, with 9% of the variation attributable to geography and transport costs and 5% to policy-related factors. Arvis et al. (2016) extend the work of Chen and Novy (2011) by calculating and decomposing measures of trade costs for a larger number of countries and by including several other potential sources of trade costs. They stress the importance of transport infrastructure and logistics services in driving costs of trade in goods, especially in developing countries.

Our study goes further along several dimensions. We employ the methodology of ELNY who propose a unified theory-based framework for estimating partial trade costs. The approach is conceptually close to the trade cost index proposed in Head and Ries (2001) that Chen and Novy (2011) build upon. It nevertheless departs from the previous literature in that it does not fit the data perfectly. Using a gravity model with dummies and appropriate constraints, it estimates, instead of calculates, bilateral trade costs, thus allowing for noise in the data. Moreover, ELNY propose an estimation of sector-specific demand and dispersion parameters for all sectors, including services. These are crucial for inferring trade costs from trade flows data and allow us to provide more realistic estimates of trade costs at

[1] The indirect approach to estimating trade cost implies that the estimates may also reflect a broader set of factors related to demand shifters, such as taste similarity, or supply side determinants such as marginal cost/mark-ups that vary across destinations (Gervais, 2019). We address this issue in Section 4.

sector level as compared to other studies that typically use the same elasticities for each sector.[2] As a result, our estimates of trade costs cover all broad sectors, including services, in both developed and developing economies. Finally, we provide a break-down of overall trade costs by components that are relevant for current policy discussions. To quantify the contribution of different factors to the variation in overall trade costs we use R-squared decomposition proposed by Huettner and Sunder (2012) which has more appealing qualities compared to the partial R-squared method used by some previous studies.

2. LITERATURE REVIEW: DRIVERS OF TRADE COSTS

Many factors affect the ease of international trade between countries. Some of them are related to policies and regulations, others are driven by geography, culture, formal and informal institutions. A vast body of literature has used the gravity model to estimate the impact of various drivers of trade costs on trade flows (Anderson and van Wincoop, 2004). In this chapter we summarize studies that provide motivation for our choice of variables that explain trade costs.

Transport and travel costs

The inverse relationship between the intensity of trade and physical distance between trading partners is at the heart of the gravity model. The more distant the partners the weaker are their trade links. Both the cost of freight and the length of transit act as trade barriers. Hummels and Schaur (2013) use variation in the premium paid for air freight to reveal U.S. firms' willingness-to-pay to avoid transit time-related trade costs. They show that each day in transit acts like an ad valorem tariff between 0.6 and 2.1%. Moreover, Ansón et al. (2020) use data on international parcel flows to show that the uncertainty about shipment time also hampers trade. They note that uncertainty matters relatively more to trade between high-income countries, while median transit time plays a bigger role in trade between low-income countries. Landlocked countries face further costs that arise from movement-to-port costs and uncertainty about delays (Christ and Ferrantino, 2011). Djankov et al. (2010) quantify the impact of transit delays using product-specific data on how long it takes to move containers from the factory gate to a shipping dock. They demonstrate that, on average, one day of delay lowers trade by 1%, and that this impact is larger for time-sensitive products.

The cost of freight and time spent in transit related to physical distance are not the only determinants of transport and travel costs. There exist several papers demonstrating that improving transport infrastructure, streamlining customs procedures, and removing administrative hurdles is necessary to reduce trade costs. An analysis by Clark et al. (2004) emphasizes seaport efficiency as an important determinant of maritime transport costs; shipping costs fall by 12% if seaport efficiency improves from the 25th to the 75th percentile. Focusing on the effects from a policy reform-induced decline in the rate of customs inspections in Albania, Fernandes et al. (2015) find that the resulting reduction in the amount and in the variability of time spent at customs increased import values significantly. Vijil et al. (2019) emphasize that the uncertainty about import times can be particularly damaging for international supply chains in which exporters tend to rely on imported inputs. They find that uncertainty in import clearance times lowers new exporters' survival rates and thus has a distinctive influence on the export performance of developing countries. Still, Freund and Rocha (2011) find that the impact of inland transit delays in Africa is far more significant than that of bureaucratic delays and customs and port delays.

[2] Chen and Novy (2011) estimate industry-specific elasticities to derive their trade costs measures. However, their approach relies on data on quantities and prices of imported products and thus is not suitable for estimating elasticities in services sectors.

Information and transaction costs

Searching for information about trade partners and products is more difficult in countries that speak a different language and have a different culture. Contracting frictions and transaction costs also increase with cultural differences and differences in legal systems. Various proxies for cultural, social, and legal system differences are therefore standard controls in gravity models of trade. An extensive body of literature also shows that migrant networks help overcome some of these frictions by facilitating contract enforcement, the provision of market information, matching and referral mechanisms, and the removal of cultural barriers (Greif, 1993; Gould, 1994; Rauch, 2001; Rauch and Trindade, 2002; Nunn and Trefler, 2014). Moreover, the impact of migrant networks is greatest for countries with the weakest legal institutions (Dunlevy, 2006; Briant et al., 2016).

ICT connectedness

Broad access to competitive ICT services improves access to information, lowers transaction and communication costs, and improves efficiency of services that underpin international trade (such as transport, logistics, and finance). Fink et al. (2005) use bilateral calling prices to proxy for communication costs. They reveal a significant negative influence of those costs on international trade and show that they have a greater impact on trade in differentiated products compared to trade in homogenous products. This finding is echoed in Abeliansky and Hilbert (2017) who find that cross-country differences in both the quantity of per capita data subscriptions and in the average bandwidth data speed have a larger effect on the trade patterns of differentiated goods. Nath and Liu (2017) focus on services trade between 49 countries between 2000 and 2013. They show that ICT development stimulates exports and/or imports in several services sectors – namely financial and business services, insurance, transportation and telecommunications. Finally, in a paper which finds that improvements in internet penetration in Chinese provinces increased manufacturing exports, Fernandes et al. (2017) explain that this impact is due in part to a decline in communication and information frictions between buyers and input suppliers. These authors suggest that internet access reduces such costs by helping firms advertise their products, search for buyers and suppliers, and establish trade connections.

Trade policy and regulatory differences

As import tariffs have considerably declined over recent decades, non-tariff measures have become more prominent. Yet the trade impact of regulatory standards, such as technical barriers to trade (TBT) and sanitary and phytosanitary (SPS) measures, is not clear-cut. On one hand, regulations may help overcome information frictions in trade between countries with different levels of public standards. On the other hand, they may serve protectionist purposes and act as barriers to trade. To single out measures that are perceived as trade restrictive, Fontagné et al. (2015) use specific trade concerns raised at WTO committees. Regulatory measures are even more prevalent in services. Nordås (2016) uses the OECD's Services Trade Restrictiveness Index (STRI) to calculate, for each sector and country pair, indices of regulatory heterogeneity based on the share of measures for which two countries have the same regulation. She finds that the lower the level of trade restrictiveness, the greater the positive effect on trade flows from reductions in regulatory heterogeneity. In other words, two countries benefit more from harmonising their regulatory frameworks as their levels of trade restrictiveness decline.

Countries' services trade policy may also affect their goods trade. Hallaert et al. (2011) find that regulatory issues in landlocked countries' transport sectors affect trade performance more than the quality of their transport infrastructure. Building on this work, Borchert et al. (2017) use an STRI scoring method and emphasize the importance of domestic policies to enhance landlocked countries' access to two key infrastructure services: telecommunications and air transport services. The authors show that landlocked countries employ relatively more restrictive policies in these sectors, which stifles

competition between service providers. Similarly, Arvis et al. (2010) point to poor competitiveness in transport services to explain part of landlocked countries' high logistics costs and Fink et al. (2002) find that private anticompetitive conducts increase maritime transport costs.

Governance quality

There is a large body of work focusing on the impact of institutions on trade through their effect on transaction and contract enforcement costs. Recently, Beverelli et al. (2018) investigate the direct impact of formal institutions on international trade costs. They find that the quality of institutions has a large, positive effect on international trade compared to domestic trade, corroborating similar findings in previous studies (Anderson and Marcouiller, 2002; Yu, 2010). Other studies have further found that the impact of formal institutions on trade flows is bigger for complex, differentiated goods, that it increases with distance and that bilateral trade volumes are also enhanced by institutional similarity between trade partners (Ranjan and Lee, 2003; Lanz et al., 2019; Groot et al., 2004).

3. METHODOLOGY

3.1. Gravity estimation

To estimate partial-equilibrium trade costs, we use international and domestic trade data from the 2016 edition of the World Input-Output Database (WIOD) for the years 2000-2014, and from an experimental dataset by the Asian Development Bank (ADB-MRIO) for the years 2015-2018.

For each source sector and year, we estimate a constrained gravity model proposed by ELNY:

$$\ln\left(\frac{X_{ij,t}^{sr}}{X_{jj,t}^{sr}}\right) = e_{i,t}^{s} + d_{ij,t}^{s} - e_{j,t}^{s} + \epsilon_{ij,t}^{sr} \text{ such that } e_{i,t}^{s} = e_{j,t}^{s}\ \forall i = j \text{ and } s \neq r, \qquad (1)$$

where *s* indexes the source industry, *r* the using industry, *i* the source country, *j* the using country and *t* the year. $X_{ij,t}^{sr}$ is then a trade flow from industry *s* in country *i* to industry *r* in country *j* in year *t*. Country fixed effects are denoted $e_{i,t}^{s}$ and $e_{j,t}^{s}$. An idiosyncratic stochastic term is denoted $\epsilon_{ij,t}^{sr}$.

The coefficients on directional country-pair dummies ($\widehat{d_{ij,t}^{s}}$) represent estimates of partial-equilibrium trade openness at the exporter-importer-sector-year level which serve as a basis for our trade costs measure. They reflect all factors that increase sales to foreign partners relative to domestic sales.

To obtain a measure of trade costs ($TC_{i,t}^{s}$) we transform this index using a sectoral elasticity (θ^{s}):

$$\ln\left(TC_{i,t}^{s}\right) = -\frac{1}{\theta^{s}} \cdot \widehat{d_{ij,t}^{s}}.$$

The parameter θ is estimated according to the methodology introduced in ELNY. A higher θ means a higher responsiveness of trade to trade frictions. Generally, θ takes on lower values for services than for goods, implying that trade in services reacts less to changes in trade costs. The use of sector-specific elasticities also means that the estimated size of trade costs differs from conventional estimates that typically use one uniform elasticity of substitution for all sectors. The estimates of θ are reported in Table 2 of the Appendix.

3.2. **Determinants of trade costs**

To investigate what drives trade costs, we regress the log of bilateral trade cost estimates in each sector on their observable determinants and importer and exporter fixed effects.[3] We then use the results to decompose bilateral variation in trade costs in each sector into five main categories: transport and travel costs; information and transaction costs; ICT connectedness; trade policy and regulatory differences; and governance quality. Computing the contribution of each group of variables to R-squared is not straightforward when explanatory variables are correlated (as is very likely in our case). We employ a method proposed by Huettner and Sunder (2012) that takes into account possible correlation among explanatory variables by averaging incremental R-squared over all possible orderings through which one could add variables to a specification. The resulting values provide an R-squared decomposition with some good intuitive properties.[4]

The use of importer and exporter fixed effects precludes identification of factors that do not vary across partners. However, we are still able to include several country-specific variables in a form that is likely to drive bilateral trade costs. For instance, even if my internet connection is fast, the quality of our call over the internet will be poor if your connection is slow. Hence bilateral communication costs will be determined by the minimum between the importer's and the exporter's internet connection. Furthermore, previous literature suggests that formal institutions tend to be more important for partners with very different culture, language or informal institutions. As these differences tend to increase with distance, this would imply that the impact of formal institutions on trade costs increases with distance. We find a similar amplifying effect for the role of transport infrastructure.

In our model we group the determinants of trade costs into five main components. Transport and travel costs are captured by geographical distance, being landlocked, and the quality of transport infrastructure. Information and transaction costs are determined by common history, culture or language; all these factors proxy for path-dependent social and political factors that facilitate exchange. ICT connectedness is captured by broadband and mobile coverage. It affects trade costs by facilitating communication and search for foreign partners and products. In that way it plays a similar role to common language, but unlike language it is policy actionable. Trade policy and regulatory differences are captured by applied tariffs, non-tariff measures, international economic integration through regional trade agreements, and deeper agreements such as the European Union or the Eurozone. They also include the level and heterogeneity of services trade restrictiveness. Finally, measures of governance quality capture the impact of formal institutions on transaction costs of doing business with a foreign partner.

The estimated equation is[5]

$$\begin{aligned}\ln(TC_{ij}) = \alpha + \boldsymbol{\beta} \cdot Transport\ and\ travel_{ij} + \boldsymbol{\gamma} \cdot Information\ and\ transaction\ costs_{ij} + \\ \boldsymbol{\delta} \cdot ICT\ connectedness_{ij} + \boldsymbol{\varphi} \cdot Trade\ policy\ and\ regulatory\ differences_{ij} + \\ \boldsymbol{\rho} \cdot Governance\ quality_{ij} + \boldsymbol{v}_i + \boldsymbol{\theta}_j + \epsilon_{ij}. \qquad (3)\end{aligned}$$

Transport and travel costs

To capture the impact of transportation and travel costs on bilateral trade frictions, the set of variables in $Transport\ and\ travel_{ij}$ includes the log of population-weighted bilateral distance, a binary variable

[3] This two-step approach to the identification of partial effects of observable gravity variables on total trade costs is akin to the method proposed in Egger and Nigai (2015).

[4] This method has been used in a similar context by Gervais (2019).

[5] For simplicity, we omit the subscript *t* and superscript *s* in what follows.

indicating if the trading partners share a border and a binary variable indicating if either of the trading partners is landlocked.[6] Additionally, it includes the interaction between importer's quality of transport and trade-related infrastructure and bilateral distance, and the interaction between exporter's quality of transport and trade-related infrastructure and bilateral distance.

Information and transaction costs

To capture the impact of information and transaction costs, the set of variables in $Information\ and\ transaction\ costs_{ij}$ includes having common ethnic language, having common religion, having common legal origin, previously being in a colonial relationship, previously being the same country, and the log of the 1970 stock of migrants from the importing in the exporting country, and vice versa. These variables proxy for the ease of communication and the similarity of path-dependent institutions.

ICT connectedness

$ICT\ connectedness_{ij}$ consists of the minimum between the exporter's and the importer's broadband coverage per capita and mobile phone subscriptions per capita. This group of variables could be considered part of information and transaction costs, but, unlike variables in the previous group, it is policy actionable and therefore we single it out.

Trade policy and regulatory differences

To capture trade policy barriers and regulatory differences, the set of variables in $Trade\ policy\ and\ regulatory\ differences_{ij}$ includes being in a free trade agreement, being part of the European Union and being part of the Eurozone. It also includes applied bilateral tariffs, specific trade concerns raised by the exporter on sanitary and phytosanitary (SPS) and technical barriers to trade (TBT) measures imposed by the importer, and the OECD's Services Trade Restrictiveness Index (STRI) of the importer and its heterogeneity between the importer and the exporter.

Several components of trade policy, such as tariffs, SPS, TBT or services trade restrictiveness are sector specific. However, competitive environment and openness in service sectors such as transport, logistics and telecommunications may have an important impact on the ease of trading goods. Similarly, tariffs on goods may affect service sectors that are related to goods trade such as retail and wholesale trade, and transport. Therefore, we allow for cross-sectoral trade policy spillovers. That is, in the goods regressions we include the simple average of the STRI variables across all service sectors. In the services regressions we include the average bilateral applied tariff, SPS and TBT.

Governance quality

$Governance\ quality_{ij}$ includes differences in the control of corruption between the importer and the exporter, as well as the interaction of its level with distance for both the importer and the exporter.

Finally, it is possible that part of our estimated trade costs reflects determinants of bilateral trade flows other than trade frictions per se. For instance, countries with similar preferences are more likely to trade with each other. Differences in factor endowments may also drive bilateral trade in certain sectors. To address this concern, we include in our estimation a measure of income per capita differences and

[6] Data sources are listed in Table 3 in the Appendix.

differences in human capital (tertiary education). We partial out the variation accounted for by these determinants and do not include them in the decomposition.

Our main decomposition results are based on OLS regressions run for 26 sectors on a cross-section of 37 countries in 2016. This is a sample that includes only service sectors for which STRI measures are available and excludes major re-exporters and tax havens. 2016 is a year that maximizes available data for all explanatory variables. The decomposition results are aggregated to broad sectors using weighted averages with weights proportional to the variance of sector's trade costs.

4. RESULTS

4.1. Trade costs summary statistics

Figure 1 and Figure 2 show the distribution of the natural logarithm of our trade costs estimates, *ln(TC)*. At zero, international trade costs are the same as domestic trade costs. At one, international trade costs are 2.7 times higher than domestic ones. Figure 1 shows that international trade costs are the lowest for manufactured goods, followed by agriculture. Trade costs in services are on average the highest but also vary the most. Figure 2 then shows a clear hierarchy in trade costs by country income group. Trade costs between high-income economies are on average the lowest, followed by trade costs between high- and lower-income economies. Trade between lower-income economies faces the highest costs.

Figure 1: Distribution of estimated trade costs by broad sector

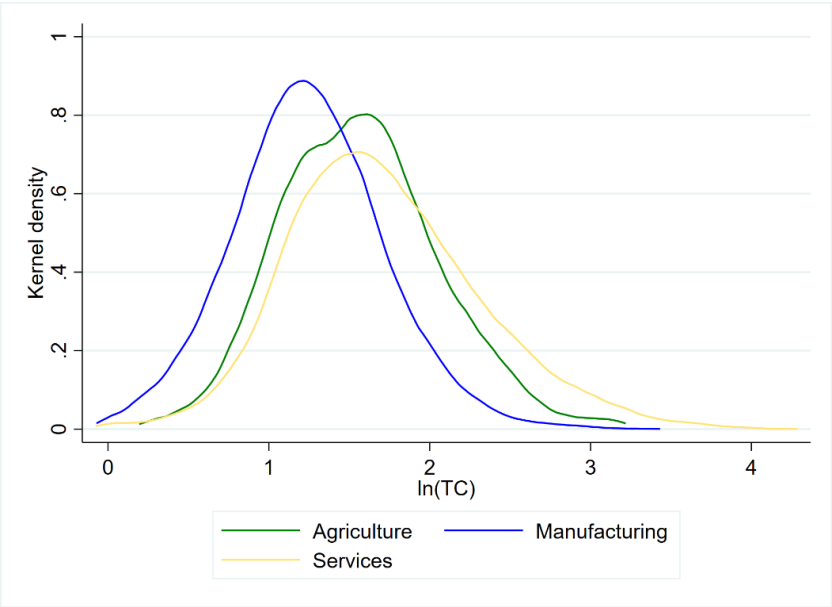
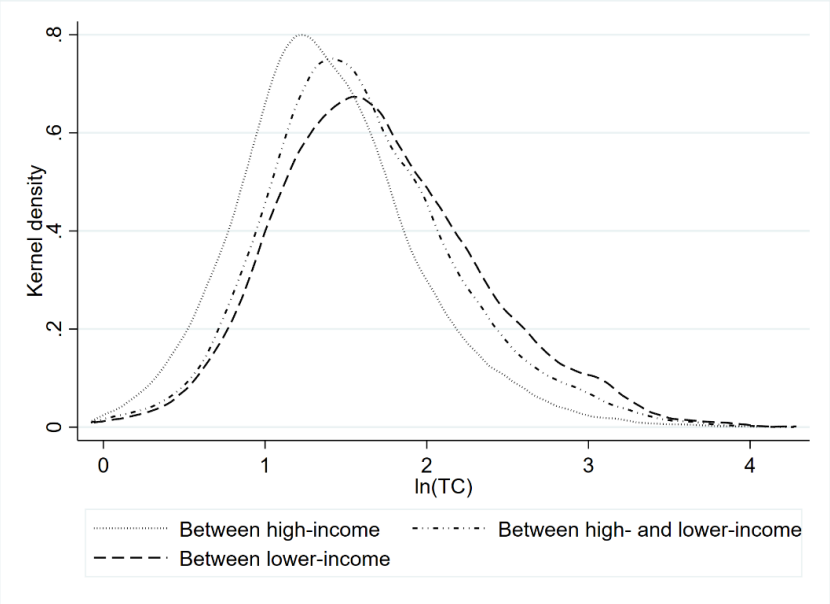


Figure 2: Distribution of estimated trade costs by country income group in 2016



Note: Income groups are defined according to the World Bank classification in 2016.

4.2. **Regression results**

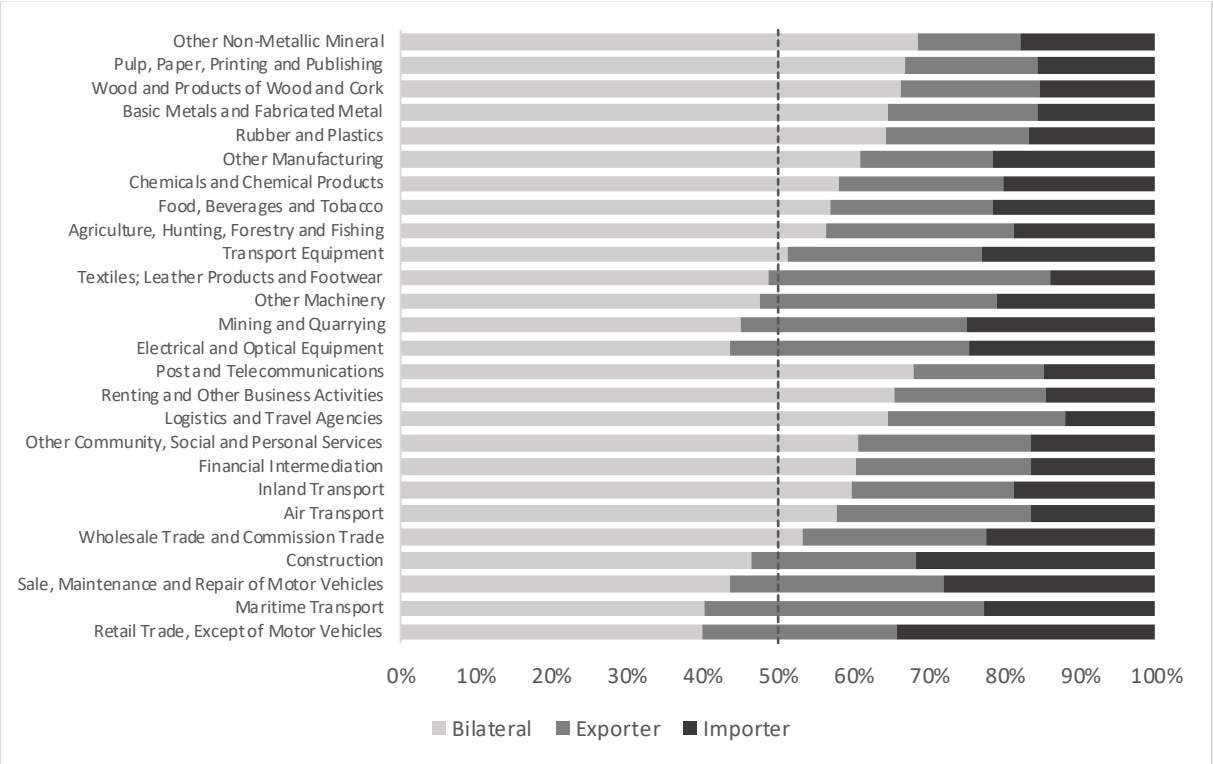
Trade costs variation within a sector can be split into three components – factors that vary at the exporter-level, importer-level, and bilateral level. In what follows we focus on explaining bilateral variation which accounts for the largest share of trade costs variation in most sectors (Figure 3). It is the part of trade costs that for a given country varies across its trade partners, such as transport and communication costs, preferential trade policy or regulatory differences.

For an easier exposition of our findings we first discuss results from two regressions - one pooled across all goods sectors and another one pooled across all services sectors. Table 1 shows results from these two regressions. Shading indicates the different groups of trade costs determinants. The results are quite similar for goods and services, especially for the transport and travel, information and transaction costs, and governance quality groups.

Longer distance and being landlocked increases trade costs for both goods and services while having a common border and good infrastructure is associated with lower trade costs. Most variables from the group of information and transaction costs also have the expected sign. Better broadband and mobile coverage decrease trade costs in services while only the latter is a significant determinant of trade costs in goods sectors.

When it comes to trade policy and regulations, tariffs and technical barriers to trade are consistently associated with higher trade costs in goods sectors. Trade with partners that have on average higher services trade restrictiveness also faces higher costs in goods sectors, possibly capturing the impact of lower competition in transport and infrastructure services. Also as expected, services trade costs are higher with partners that have more dissimilar services trade regulations (higher STRI heterogeneity). Average technical barriers to trade in goods also matter for trade in services, suggesting that policy spillovers work in both directions. Regional trade agreements are associated with lower trade costs in goods but not in services. Interestingly, being part of the European Union is not systematically associated with trade costs. However, note that since we control for tariffs, non-tariff barriers (TBT and SPS) and services regulation, the coefficients on RTA and EU variables reflect only additional trade liberalizing factors. We discuss this result further in the robustness section that follows.

Figure 3: Factors that vary across partners account for more than half of the variation in trade costs in most sectors



Note: Decomposition of variance in trade costs into factors that vary across partners (Bilateral), factors that vary at the exporter level (Exporter) and factors that vary at the importer level (Importer). Manufacturing sectors are listed first, services sectors are listed second. Based on regression results reported in Table 6 and Table 7 of the Appendix.

Results for the governance quality indicators are very similar between goods and services. As expected, differences in the control of corruption, that we use as a proxy for differences in governance quality, are strongly associated with higher trade costs. The positive results associated with the governance quality interacted with distance are, on the other hand, at odds with Lanz et al. (2019). One reason could be that our sample of countries does not cover many of the developing countries included in Lanz et al. (2019) and therefore our estimates capture different mechanisms. We verify that in regressions without country fixed effects the coefficient on the control of corruption alone is negative (not reported). Therefore, as expected, better governance quality is associated with lower trade costs. The positive coefficient on the interaction with distance thus suggests that the importance of governance quality for trade costs declines with the distance between trade partners. One explanation for this finding could be that institutions matter more for trade driven by production networks which are more prevalent among geographically closer countries.

Table 1: Pooled regression results

Dependent: *Trade Costs*	Goods	Services		Goods (contd.)	Services (contd.)
Distance	1.071***	1.179***	*RTA*	-0.026**	0.000
	(0.0391)	(0.0559)		(0.0105)	(0.0173)
Common border	-0.079***	-0.042***	*European Union*	0.015	0.042*
	(0.0079)	(0.0110)		(0.0164)	(0.0252)
Landlocked	0.077***	0.055***	*Common currency*	0.005	-0.001
	(0.0128)	(0.0155)		(0.0069)	(0.0119)
I - Infrastructure x Dist	-0.119***	-0.109***	*I - Tariffs*	0.078***	0.314
	(0.0088)	(0.0133)		(0.0295)	(0.2738)
E - Infrastructure x Dist	-0.141***	-0.173***	*I - SPS STCs*	0.017	-0.689***
	(0.0089)	(0.0137)		(0.0105)	(0.1068)
Common language	-0.023***	-0.005	*I - TBT STCs*	0.016***	0.140***
	(0.0066)	(0.0122)		(0.0058)	(0.0215)
Colonial relationship	-0.024***	-0.032**	*STRI heterogeneity*	-0.042	0.162**
	(0.0077)	(0.0132)		(0.0695)	(0.0813)
Common religion	-0.058***	-0.045***	*I - STRI*	0.464***	-0.058
	(0.0106)	(0.0135)		(0.1033)	(0.1537)
Previously same country	0.066***	-0.002	*I - Corruption x Dist*	0.031***	0.018**
	(0.0152)	(0.0187)		(0.0045)	(0.0077)
Common legal origin	-0.024***	-0.043***	*E - Corruption x Dist*	0.007	0.008
	(0.0044)	(0.0054)		(0.0049)	(0.0081)
Migrants from E in I	-0.005***	-0.005***	*Diff. in corruption*	0.536***	0.742***
	(0.0011)	(0.0016)		(0.1080)	(0.1607)
Migrants from I in E	-0.007***	-0.007***	*Diff. in GDP p.c.*	-0.157***	-0.167***
	(0.0012)	(0.0014)		(0.0345)	(0.0469)
Broadband	-0.011	-0.074**	*Diff. in human capital*	0.090***	0.092**
	(0.0199)	(0.0324)		(0.0208)	(0.0441)
Mobile	-0.162***	-0.230***			
	(0.0331)	(0.0611)	Observations	16,053	12,791
			R-squared	0.874	0.856

Standard errors clustered at the exporter-sector and importer-sector level in parentheses.
*** p<0.01, ** p<0.05, * p<0.1
Note: Each regression includes importer-sector and exporter-sector fixed effects. "I" refers to the importer and "E" to the exporter. Shading separates the different groups of trade costs components – transport and travel costs, information and transaction costs, ICT infrastructure, trade policy and regulatory differences, and governance quality. The last group are additional control variables. Tariffs and STCs are sector specific in goods regressions and country averages in services regressions. STRI variables are sector specific in services regressions and country averages in goods regressions.

4.3. **Robustness**

The identification of trade costs in our methodology relies on certain assumptions, for instance that the demand parameters do not vary across partners. Chen and Novy (2011) also suggest that the estimated trade costs under intra-industry trade may be lower than trade costs estimated for trade driven by comparative advantage. To take into account these factors that may be possibly captured by our trade costs index but do not relate to trade frictions, we include differences in GDP per capita and differences in tertiary education attainment. If there is indeed a component of our estimated trade costs that is driven by these factors and if these factors are correlated with some of the other determinants, their omission would bias our results.

In general, we find that larger differences in income per capita are associated with lower estimates of trade costs. This is in contrast with Gervais (2019) who finds a positive correlation. Large differences in tertiary education attainment, on the other hand, are associated with higher estimated trade costs. This

would be consistent with the argument of taste similarity. Moreover, in Table 4 of the Appendix we also show regressions for goods sectors where we further control for the average unit value of exports from the exporter to the importer in the given sector to proxy for variable mark-ups or differences in quality across markets, as suggested in Gervais (2019).

To gauge the importance of these additional controls we also run regressions without them (Table 4 of the Appendix). We find that the inclusion of the additional controls has almost no impact on the estimated coefficients of trade costs determinants. An exception is the coefficient on the difference in governance quality in the goods regression which turns insignificant if we do not control for the difference in income per capita. Since the two differences are positively correlated, the omission of the latter leads to a downward bias of the coefficient on the former. The same applies for the coefficient of broadband coverage in the services regression. We do not include unit values in our baseline specification because their inclusion has virtually no effect on the other estimated coefficients (and because we do not have an equivalent measure for services at hand).

In our baseline model we cluster standard errors at the level of fixed effects, that is at the exporter-sector and the importer-sector level. In a robustness check we cluster standard errors at the pair level (non-directional). This clustering leads to larger standard errors but most coefficients remain statistically significant at conventional levels, with the exception of common language, colonial relationship and regional trade agreement (not reported).

Finally, variables based on the OECD's STRI are available only for a subset of economies in our sample. In Table 5 of the Appendix, we show results from a regression model that does not include these variables, columns (2) and (5) retain the same sample as our baseline while columns (3) and (6) expand the sample to economies for which STRI is not available. While most results remain unchanged, there is one notable difference for goods sectors (column 3). The coefficient on EU membership becomes highly significant, both economically and statistically. This suggests that the effect of this variable may not be sufficiently identified in the baseline regression.

4.4. **Trade costs decomposition**

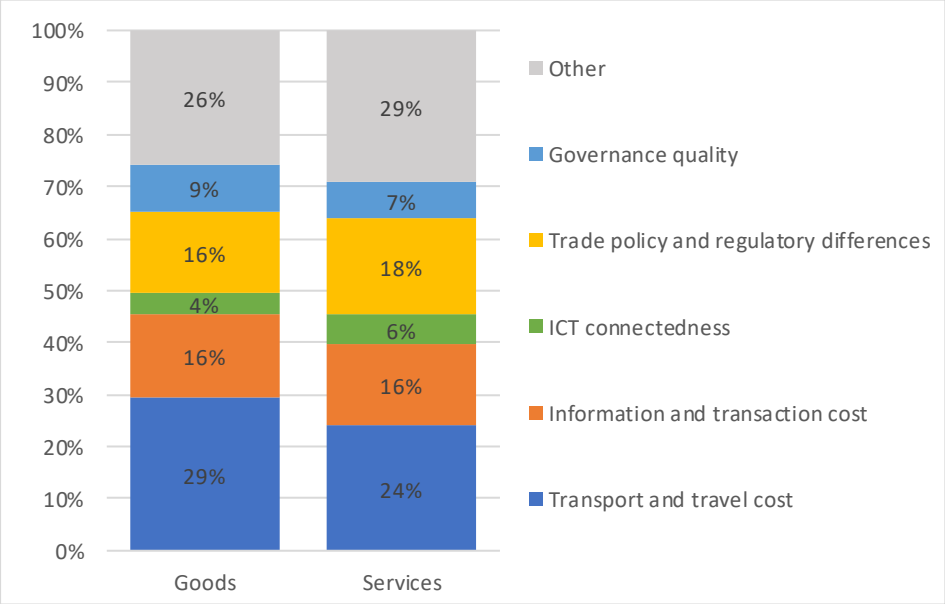
Figure 4 shows the decomposition of trade costs in goods and services derived from our baseline estimation. This decomposition shows to what extent the five main determinants – transport and travel cost, information and transaction cost, ICT connectedness, trade policy and regulatory differences, and governance quality - contribute to explaining the bilateral variation in trade costs. Our observable determinants cannot fully explain the variation in trade costs across partners and hence the figure also includes a category "Other" which represents this unexplained component (see Table 6 and Table 7 of the Appendix for the regression results). The remaining part of total trade costs is explained by exporter-specific factors whose effects do not vary across importers (exporter fixed effects) and importer-specific factors whose effects do not vary across exporters (importer fixed effects).

The figure shows that there are only small differences in the importance of various factors for trade costs in goods and services. Even though transport and travel costs play a lesser role in the variance of trade costs in services than in goods, they still explain the largest share.[7] The reason may be that many services still require face-to-face communication, even when a large part is delivered cross-border. Information and transaction costs are also responsible for a large share of trade cost variation. The third

[7] Anderson and van Wincoop (2004) estimate that border-related trade barriers are almost twice as large as transportation costs. In our estimates transport and travel costs account for close to 30% of bilateral trade costs while other observable barriers account for 46%. Hence our estimates suggest that observable border-related barriers are 65% higher than transportation costs.

most important component is trade policy and regulatory differences. The explanatory power is larger in services than in goods which suggests that in services sectors there is relatively more space to reduce trade costs through this component. Governance quality accounts for a smaller but non-negligible share of the bilateral variation in trade costs. Finally, ICT connectedness accounts for the smallest share but it is much more important for services than for goods. This may point towards the importance of digital delivery for cross-border services trade.

Figure 4: Determinants of trade costs, percentage of bilateral variation

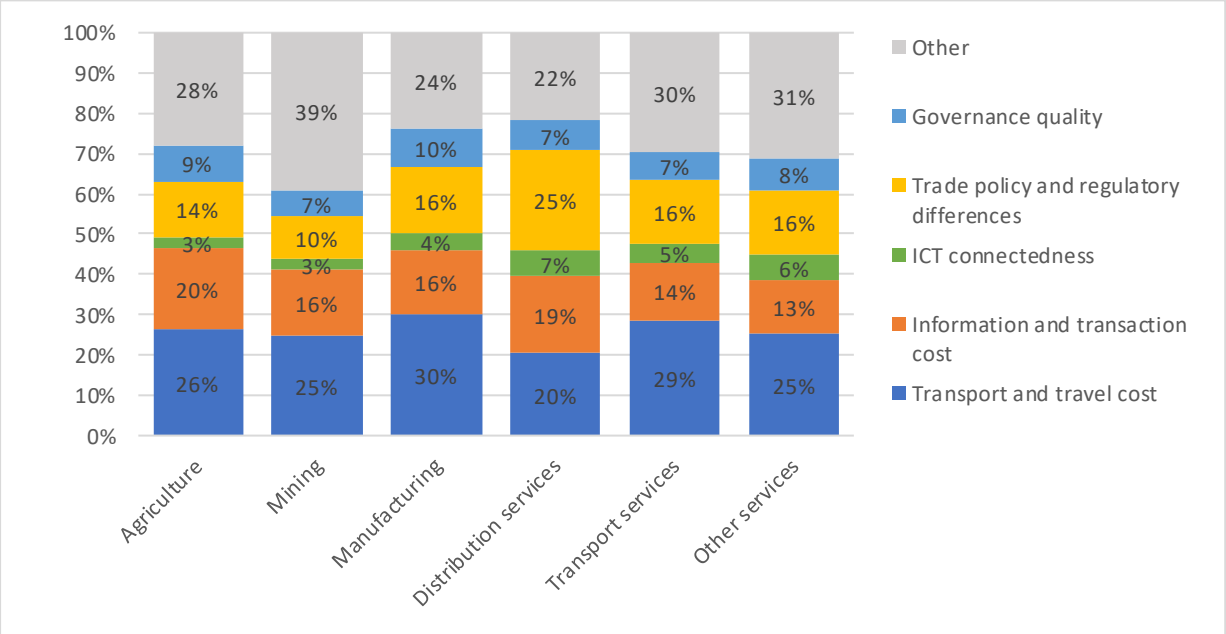


Note: Results of the underlying regressions are included in Table 6 and Table 7 of the Appendix. Sector-specific results are aggregated to the two categories using a weighted average where the weights are determined by the variance of trade costs in each sector.

Figure 5 presents the results at a more disaggregated sectoral level. It shows that differences within goods and within services are often more pronounced than between goods and services.

Transport costs play the largest role for manufactured goods and the smallest one for wholesale and retail services (distribution services). Information and transaction costs stand out for trade in agriculture while they are much less important for the category of business, ICT, professional, personal and cultural services (other services). The latter, together with distribution services, register the highest importance of ICT connectedness. Trade policy and regulatory differences stand out for distribution services. Finally, governance quality affects the most trade in manufactured goods.

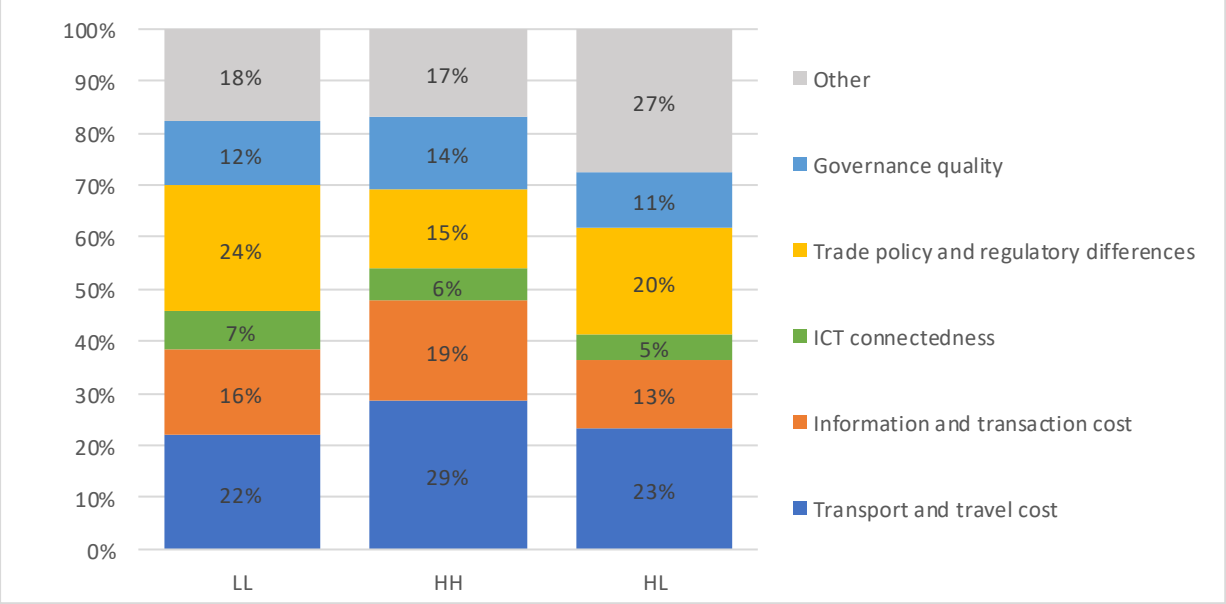
Figure 5: Determinants of trade costs by broad sector, percentage of bilateral variation



Note: Results of the underlying regressions are included in Table 6 and Table 7 of the Appendix. Sector-specific results are aggregated to broader categories using a weighted average where the weights are determined by the variance of trade costs in each sector.

Using the same underlying regressions, in Figure 6 we present the decomposition of overall trade costs by country income group. The contributions of various factors differ markedly. Transport and travel costs can explain the largest share of trade costs variation among high-income economies and between high- and lower-income economies. For trade among lower-income economies, on the other hand, trade policy and regulatory differences explain the largest share of trade costs. This highlights the high potential for trade policy to boost trade among developing countries. The same group of determinants also plays an important role for trade costs between high- and lower-income economies, even though these costs are relatively poorly explained by our observable factors.

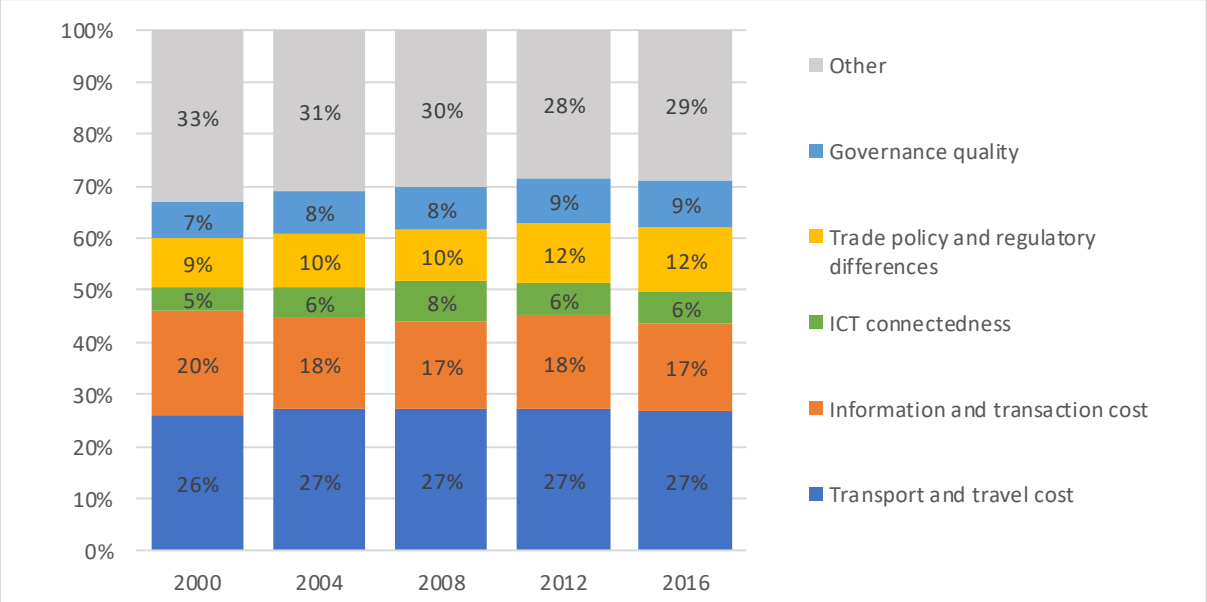
Figure 6: Determinants of trade costs by country income group



Note: LL refers to trade flows between lower-income economies, HH to trade between high-income economies, and HL to flows between high-income and lower-income economies. Results of the underlying regressions are available upon request.

Finally, we show how the importance of different components changed over time. First, the shrinking component of "Other" shows that over time our observable determinants have become better in explaining overall trade costs. Second, the importance of distance and infrastructure has remained stable. Third, policy-related components have become increasingly more important in explaining trade costs, at the expense of information and transaction costs driven by political and cultural differences.

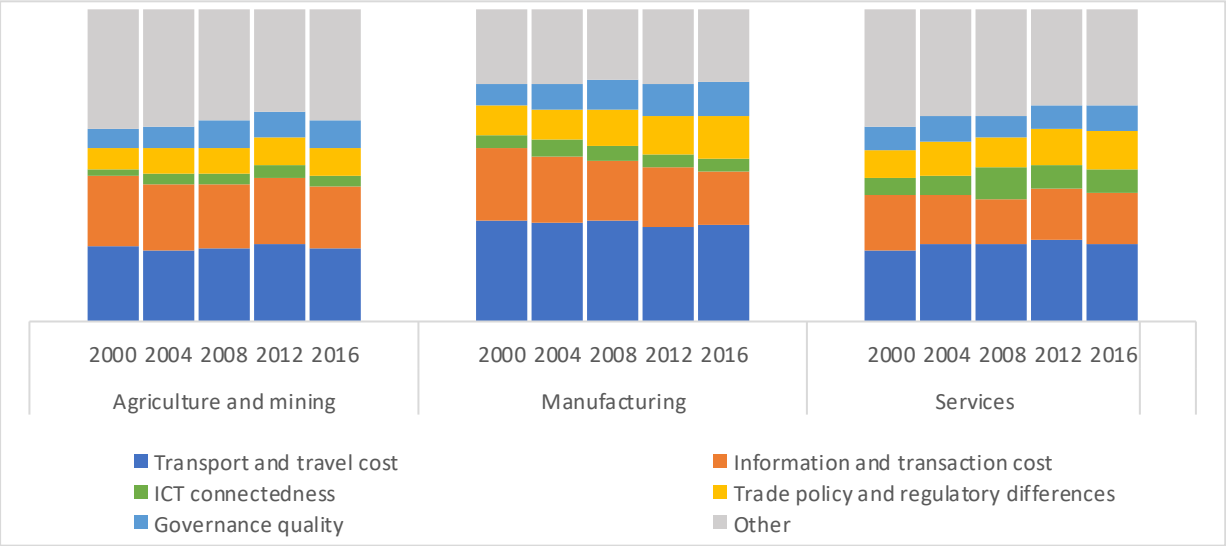
Figure 7: Decomposition of overall trade costs, evolution over time



Note: The underlying regressions do not include STRI variables which are not available for the entire period (results available upon request). Furthermore, they are based on a balanced panel of observations. Consequently, the results for 2016 are not directly comparable to the results presented in previous figures.

Figure 8 dives into more detail and presents the evolution over time by broad sectors. It shows that the increase in explanatory power of our observable factors is driven mainly by the services sector. Moreover, the declining importance of information and transaction costs and the increasing role of trade policy and governance quality lies in manufactured goods. Finally, the increasing role of ICT connectedness is driven by service sectors.

Figure 8: Decomposition of trade costs by broad sector, evolution over time



Note: Based on the same set of regression results as Figure 8.

5. CONCLUSIONS

A consistent estimation of the costs of international trade is an important ingredient to policy assessment. The WTO Trade Cost Index offers insights about the evolution of overall trade costs over time and their comparison across countries and sectors. This index is derived from trade flows and captures all the frictions that impact international transactions more than domestic ones. It is thus equally important to understand the extent to which policy actionable factors drive these costs and how trade costs composition differs across sectors and country groups.

Leveraging well established gravity model techniques and a large body of literature on the various determinants of trade frictions, we propose a policy-relevant decomposition of trade costs. We follow a methodology by Egger et al. (2021) which allows for a consistent estimation of the impact of observable factors on trade costs. This estimation serves as a basis for the decomposition of the overall WTO Trade Cost Index into five main groups of its underlying determinants.

We estimate that transport and travel costs associated with distance and infrastructure quality play the most important role in overall trade costs both for goods and services. Trade policy and regulatory differences are the second major component of trade costs in most sectors, accounting for at least 14%. Importantly, this component in fact explains the largest share of trade costs among lower-income economies, pointing towards the large potential for trade policy to boost South-South trade. Moreover, our results also suggest that there are trade policy spillovers across sectors. We find that trade policy and regulations in service sectors matter for trade costs in goods, and vice versa. This is in line with previous literature arguing that regulatory measures that restrict competition in infrastructure services, such as logistics, transport, ICT or financial services, may have direct impact on trade in goods. In a similar manner, tariffs and non-tariff barriers to trade in goods affect trade in distribution and transport services. Finally, we find that access to information and communication technology is especially important for trade costs in services where its importance has also increased over time, highlighting the role that digital delivery plays in this sector.

While we show how the contribution of the various factors changed over time, our exercise is essentially static – it focuses on explaining the variation in trade costs across partners in a given year. Further research will focus on quantifying the contribution of various factors to changes in trade costs over time. It will also explore other types of trade costs determinants, such as policy uncertainty.

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APPENDIX

Table 2: Estimated trade costs elasticities

Sector	Elasticity θ
Agriculture, Hunting, Forestry and Fishing	4.86
Mining and Quarrying	5.06
Food, Beverages and Tobacco	4.93
Textiles; Leather Products and Footwear	4.79
Wood and Products of Wood and Cork	4.87
Pulp, Paper, Printing and Publishing	4.89
Agriculture, Hunting, Forestry and Fishing	4.52
Coke, Refined Petroleum and Nuclear Fuel	5.09
Chemicals and Chemical Products	4.79
Rubber and Plastics	4.49
Other Non-Metallic Mineral Products	4.68
Basic Metals and Fabricated Metal	4.61
Other Machinery	4.85
Electrical and Optical Equipment	4.71
Transport Equipment	4.59
Other Manufacturing; Recycling	4.62
Construction	4.18
Sale, Maintenance and Repair of Motor Vehicles and Fuel	4.37
Wholesale Trade and Commission Trade	4.10
Retail Trade; Repair of Household Goods	4.39
Hotels and Restaurants	5.27
Inland Transport	4.40
Maritime Transport	3.66
Air Transport	5.04
Logistics and Travel Agencies	5.30
Post and Telecommunications	4.84
Financial Intermediation	4.40
Real Estate Activities	4.42
Business and Professional Activities	4.90
Education	4.91
Health and Social Work	4.24
Other Community, Environmental, Cultural and Personal Services	5.01

Note: These elasticities correspond to the parameter θ in Egger et al. (2020).

Table 3: Data sources

Variables	Source
Population-weighted distance, having common border, being landlocked, having common ethnic language, having common religion, having common legal origin, previously being in a colonial relationship, previously being the same country	Centre d'études prospectives et d'informations internationales (CEPII)
Quality of transport and trade-related infrastructure	World Bank, World Development Indicators
Bilateral stock of migrants in 1970	World Bank, Global Bilateral Migration Database
Broadband coverage per capita and mobile phone subscriptions per capita	International Telecommunications Union
Having a regional trade agreement, being part of the European Union and having common currency	Mario Larch's Regional Trade Agreements Database from Egger and Larch (2008), 2018 update
Services Trade Restrictiveness Index (STRI) and STRI heterogeneity	Organization for Economic Cooperation and Development (OECD)
Applied bilateral tariffs	World Integrated Trade Solution (WITS)
SPS and TBT specific trade concerns	World Trade Organization, Integrated Trade Intelligence Portal (I-TIP) and WIIW, https://wiiw.ac.at/wiiw-ntm-data-ds-2.html[8]
Control of corruption	World Bank, Worldwide Governance Indicators (WGI)

[8] See Ghodsi et al. (2017) for details on the WIIW database.

Table 4: Pooled regressions - robustness – additional controls

	(1)	(2)	(3)	(4)	(5)
	Goods			Services	
Dependent: *Trade Costs*	Baseline	With price	No other controls	Baseline	No other controls
Distance	1.071***	1.052***	1.076***	1.179***	1.184***
	(0.0391)	(0.0388)	(0.0394)	(0.0559)	(0.0563)
Common border	-0.079***	-0.077***	-0.072***	-0.042***	-0.035***
	(0.0079)	(0.0079)	(0.0080)	(0.0110)	(0.0109)
Landlocked	0.077***	0.072***	0.080***	0.055***	0.058***
	(0.0128)	(0.0125)	(0.0129)	(0.0155)	(0.0158)
I - Infrastructure x Dist	-0.119***	-0.117***	-0.122***	-0.109***	-0.111***
	(0.0088)	(0.0088)	(0.0089)	(0.0133)	(0.0132)
E - Infrastructure x Dist	-0.141***	-0.139***	-0.143***	-0.173***	-0.176***
	(0.0089)	(0.0089)	(0.0091)	(0.0137)	(0.0139)
Common language	-0.023***	-0.022***	-0.022***	-0.005	-0.005
	(0.0066)	(0.0064)	(0.0066)	(0.0122)	(0.0116)
Colonial relationship	-0.024***	-0.026***	-0.029***	-0.032**	-0.036***
	(0.0077)	(0.0077)	(0.0078)	(0.0132)	(0.0134)
Common religion	-0.058***	-0.058***	-0.060***	-0.045***	-0.047***
	(0.0106)	(0.0105)	(0.0107)	(0.0135)	(0.0132)
Previously same country	0.066***	0.063***	0.064***	-0.002	-0.003
	(0.0152)	(0.0149)	(0.0150)	(0.0187)	(0.0187)
Common legal origin	-0.024***	-0.023***	-0.025***	-0.043***	-0.044***
	(0.0044)	(0.0044)	(0.0045)	(0.0054)	(0.0057)
Migrants from E in I	-0.005***	-0.005***	-0.004***	-0.005***	-0.004**
	(0.0011)	(0.0011)	(0.0011)	(0.0016)	(0.0016)
Migrants from I in E	-0.007***	-0.007***	-0.006***	-0.007***	-0.007***
	(0.0012)	(0.0012)	(0.0011)	(0.0014)	(0.0014)
Broadband	-0.011	-0.011	0.017	-0.074**	-0.044
	(0.0199)	(0.0198)	(0.0145)	(0.0324)	(0.0317)
Mobile	-0.162***	-0.164***	-0.161***	-0.230***	-0.231***
	(0.0331)	(0.0334)	(0.0331)	(0.0611)	(0.0613)
RTA	-0.026**	-0.024**	-0.021*	0.000	0.006
	(0.0105)	(0.0104)	(0.0106)	(0.0173)	(0.0173)
European Union	0.015	0.016	0.014	0.042*	0.041
	(0.0164)	(0.0162)	(0.0165)	(0.0252)	(0.0255)
Common currency	0.005	0.004	0.009	-0.001	0.003
	(0.0069)	(0.0068)	(0.0070)	(0.0119)	(0.0121)
I - Tariffs	0.078***	0.070**	0.080***	0.314	0.341
	(0.0295)	(0.0279)	(0.0295)	(0.2738)	(0.2754)
I - SPS STCs	0.017	0.017	0.017	-0.689***	-0.683***
	(0.0105)	(0.0103)	(0.0105)	(0.1068)	(0.1061)
I - TBT STCs	0.016***	0.015***	0.015***	0.140***	0.137***
	(0.0058)	(0.0058)	(0.0058)	(0.0215)	(0.0219)
STRI heterogeneity	-0.042	-0.044	0.000	0.162**	0.184**
	(0.0695)	(0.0692)	(0.0679)	(0.0813)	(0.0812)
I - STRI	0.464***	0.472***	0.438***	-0.058	-0.068
	(0.1033)	(0.1030)	(0.1032)	(0.1537)	(0.1545)
I - Corruption x Dist	0.031***	0.030***	0.034***	0.018**	0.020***
	(0.0045)	(0.0045)	(0.0047)	(0.0077)	(0.0076)

	(1)	(2)	(3)	(4)	(5)
	Goods			Services	
Dependent: *Trade Costs*	Baseline	With price	No other controls	Baseline	No other controls
E - Corruption x Dist	0.007	0.006	0.009*	0.008	0.011
	(0.0049)	(0.0049)	(0.0049)	(0.0081)	(0.0081)
Diff. in corruption	0.536***	0.512***	0.122	0.742***	0.311**
	(0.1080)	(0.1076)	(0.0890)	(0.1607)	(0.1269)
Diff. in GDP p.c.	-0.157***	-0.148***		-0.167***	
	(0.0345)	(0.0343)		(0.0469)	
Diff. in human capital	0.090***	0.088***		0.092**	
	(0.0208)	(0.0210)		(0.0441)	
Price		0.017***			
		(0.0027)			
Observations	16,053	15,973	16,053	12,791	12,791
R-squared	0.874	0.875	0.873	0.856	0.855

Standard errors clustered at the exporter-sector and importer-sector level in parentheses.
*** p<0.01, ** p<0.05, * p<0.1
Notes: Each regression includes importer-sector and exporter-sector fixed effects. "I" refers to the importer and "E" to the exporter. Shading separates the different groups of trade costs components – transport and travel costs, information and transaction costs, ICT infrastructure, trade policy and regulatory differences, and governance quality. The last group are additional control variables. Tariffs and STCs are sector specific in goods regressions and country averages in services regressions. STRI variables are sector specific in services regressions and country averages in goods regressions.

Table 5: Pooled regressions – robustness - STRI

	(1)	(2)	(3)	(4)	(5)	(6)
	Goods			Services		
Dependent: *Trade Costs*	Baseline	No STRI	No STRI full sample	Baseline	No STRI	No STRI full sample
Distance	1.071***	1.077***	0.948***	1.179***	1.189***	1.025***
	(0.0391)	(0.0387)	(0.0314)	(0.0559)	(0.0546)	(0.0414)
Common border	-0.079***	-0.076***	-0.086***	-0.042***	-0.041***	-0.067***
	(0.0079)	(0.0079)	(0.0076)	(0.0110)	(0.0111)	(0.0108)
Landlocked	0.077***	0.073***	0.091***	0.055***	0.058***	0.098***
	(0.0128)	(0.0127)	(0.0151)	(0.0155)	(0.0153)	(0.0182)
I - Infrastructure x Dist	-0.119***	-0.123***	-0.104***	-0.109***	-0.110***	-0.096***
	(0.0088)	(0.0090)	(0.0076)	(0.0133)	(0.0131)	(0.0114)
E - Infrastructure x Dist	-0.141***	-0.143***	-0.125***	-0.173***	-0.175***	-0.159***
	(0.0089)	(0.0089)	(0.0087)	(0.0137)	(0.0135)	(0.0124)
Common language	-0.023***	-0.022***	-0.028***	-0.005	-0.006	0.012
	(0.0066)	(0.0066)	(0.0079)	(0.0122)	(0.0121)	(0.0105)
Colonial relationship	-0.024***	-0.026***	-0.025***	-0.032**	-0.033**	-0.014
	(0.0077)	(0.0077)	(0.0087)	(0.0132)	(0.0131)	(0.0148)
Common religion	-0.058***	-0.056***	-0.020**	-0.045***	-0.044***	0.008
	(0.0106)	(0.0104)	(0.0102)	(0.0135)	(0.0135)	(0.0124)
Previously same country	0.066***	0.064***	0.083***	-0.002	0.001	0.046**
	(0.0152)	(0.0149)	(0.0217)	(0.0187)	(0.0184)	(0.0228)
Common legal origin	-0.024***	-0.024***	-0.018***	-0.043***	-0.043***	-0.039***
	(0.0044)	(0.0044)	(0.0039)	(0.0054)	(0.0055)	(0.0047)
Migrants from E in I	-0.005***	-0.005***	-0.007***	-0.005***	-0.005***	-0.009***

	(1)	(2)	(3)	(4)	(5)	(6)
	Goods			Services		
Dependent: *Trade Costs*	Baseline	No STRI	No STRI full sample	Baseline	No STRI	No STRI full sample
	(0.0011)	(0.0011)	(0.0010)	(0.0016)	(0.0016)	(0.0015)
Migrants from I in E	-0.007***	-0.006***	-0.006***	-0.007***	-0.007***	-0.008***
	(0.0012)	(0.0012)	(0.0011)	(0.0014)	(0.0014)	(0.0013)
Broadband	-0.011	-0.011	-0.029*	-0.074**	-0.084**	-0.090***
	(0.0199)	(0.0189)	(0.0174)	(0.0324)	(0.0328)	(0.0307)
Mobile	-0.162***	-0.156***	-0.200***	-0.230***	-0.229***	-0.435***
	(0.0331)	(0.0328)	(0.0321)	(0.0611)	(0.0607)	(0.0593)
RTA	-0.026**	-0.033***	-0.031***	0.000	-0.004	-0.021
	(0.0105)	(0.0101)	(0.0106)	(0.0173)	(0.0169)	(0.0165)
European Union	0.015	-0.021	-0.045***	0.042*	0.035	-0.009
	(0.0164)	(0.0151)	(0.0161)	(0.0252)	(0.0237)	(0.0226)
Common currency	0.005	0.002	-0.003	-0.001	-0.002	0.011
	(0.0069)	(0.0069)	(0.0069)	(0.0119)	(0.0119)	(0.0101)
I - Tariffs	0.078***	0.074**	0.099*	0.314	0.309	0.530
	(0.0295)	(0.0311)	(0.0564)	(0.2738)	(0.2720)	(0.3352)
I - SPS STCs	0.017	0.017	0.015	-0.689***	-0.673***	-0.668***
	(0.0105)	(0.0106)	(0.0121)	(0.1068)	(0.1062)	(0.1081)
I - TBT STCs	0.016***	0.018***	0.016**	0.140***	0.144***	0.143***
	(0.0058)	(0.0058)	(0.0061)	(0.0215)	(0.0214)	(0.0218)
STRI heterogeneity	-0.042			0.162**		
	(0.0695)			(0.0813)		
I - STRI	0.464***			-0.058		
	(0.1033)			(0.1537)		
I - Corruption x Dist	0.031***	0.035***	0.029***	0.018**	0.018**	0.018**
	(0.0045)	(0.0047)	(0.0047)	(0.0077)	(0.0077)	(0.0076)
E - Corruption x Dist	0.007	0.009*	0.008	0.008	0.009	0.013*
	(0.0049)	(0.0049)	(0.0050)	(0.0081)	(0.0080)	(0.0077)
Diff. in corruption	0.536***	0.541***	0.717***	0.742***	0.783***	1.040***
	(0.1080)	(0.1070)	(0.1039)	(0.1607)	(0.1580)	(0.1535)
Diff. in GDP p.c.	-0.157***	-0.159***	-0.194***	-0.167***	-0.175***	-0.249***
	(0.0345)	(0.0340)	(0.0271)	(0.0469)	(0.0465)	(0.0393)
Diff. in human capital	0.090***	0.087***	0.129***	0.092**	0.091**	0.122***
	(0.0208)	(0.0208)	(0.0225)	(0.0441)	(0.0443)	(0.0373)
Observations	16,053	16,053	21,025	12,791	12,791	17,220
R-squared	0.874	0.873	0.854	0.856	0.855	0.841

Standard errors clustered at the exporter-sector and importer-sector level in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Notes: Each regression includes importer-sector and exporter-sector fixed effects. "I" refers to the importer and "E" to the exporter. Shading separates the different groups of trade costs components – transport and travel costs, information and transaction costs, ICT infrastructure, trade policy and regulatory differences, and governance quality. The last group are additional control variables. Tariffs and STCs are sector specific in goods regressions and country averages in services regressions. STRI variables are sector specific in services regressions and country averages in goods regressions.

Table 6: Determinants of trade costs by sector in 2016, signs and statistical significance of the estimated regression coefficients.

Dependent variable: *Trade costs*	*Expected sign*	**Goods Sectors**													
		Agri	Mining	Food	Textiles and Leather	Wood	Paper	Chemic.	Plastics	Mineral	Metal	Other machinery	Electro	Transport	Other manuf.
Distance	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Common border	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Landlocked	+	+	+	+	+	+		+	+	+	+	+	+	+	-
I - Infrastructure x Dist	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E - Infrastructure x Dist	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Common language	-	-	-	+	-	-	-	-	+	-	-	-	+	-	-
Colonial relationship	-	+	+	-	-	-	+	-	-	-	-	-	-	-	-
Common religion	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Previously same country	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+
Common legal origin	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
Migrants from E in I	-	+	-	-	-	+	-	-	-	-	-	-	-	-	-
Migrants from I in E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Broadband	-	+	-	-	-	-	+	+	-	-	-	-	+	-	+
Mobile	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
Regional Trade Agreement	-	+	-	-	-	-	-	+	-	-	-	-	-	-	+
European Union	-	-	-	+	+	+	+	-	-	+	-	+	+	+	+
Common currency	-	+	+	-	-	-	+	+	+	+	-	-	+	+	+
I - Tariffs	+	+	+	+	+	+	-	+	+	-	-	-	-	-	+
Average STRI heterogeneity	+	-	-	-	+	-	+	-	-	+	-	-	+	+	+
I - Average STRI	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
I – SPS STCs	+	+		+	+	-	-	-	-	-	-				
I – TBT STCs	+	-	+	+	+	+	+	+	+	+	-	+	+	+	+
I - Corruption x Dist	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+
E - Corruption x Dist	-	+	+	+	+	+	-	-	+	+	-	-	-	+	-
Difference in corruption	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+
Number of observations		1,149	1,122	1,159	1,115	1,152	1,157	1,154	1,157	1,156	1,159	1,118	1,142	1,154	1,159
R-squared		0.836	0.830	0.853	0.897	0.824	0.815	0.886	0.867	0.839	0.860	0.893	0.913	0.865	0.822

Notes: Highlighted cells contain results that are statistically significant at 90% confidence level, based on standard errors clustered at exporter and importer level. "I" refers to the importer and "E" to the exporter. Each regression includes exporter fixed effects, importer fixed effects, differences in GDP per capita and differences in tertiary education attainment.

Table 7: Determinants of trade costs by sector in 2016, signs and statistical significance of the estimated regression coefficients.

Dependent variable: *Trade costs*	*Expected sign*	**Services Sectors**											
		Construc	Car sales	Retail	Whole-sale	Inland	Maritime	Air	Logistics	Telecom	Finance	Profess.	Cultural
Distance	+	+	+	+	+	+	+	+	+	+	+	+	+
Common border	-	-	-	-	-	-	-	-	-	-	-	-	-
Landlocked	+	+	+	+	+	+		-	-	+	+	+	+
I - Infrastructure x Dist	-	-	-	-	-	-	-	-	-	-	-	-	-
E - Infrastructure x Dist	-	-	-	-	-	-	-	-	-	-	-	-	-
Common language	-	-	-	-	+	-	+	-	-	+	-	-	+
Colonial relationship	-	+	-	-	-	-	-	-	-	+	-	+	-
Common religion	-	-	-	-	-	-	-	-	-	-	-	+	+
Previously same country	-	+	-	+	-	-	+	-	-	+	-	+	+
Common legal origin	-	-	-	-	-	-	-	-	-	-	-	-	-
Migrants from E in I	-	-	-	-	-	-	+	-	-	-	-	-	-
Migrants from I in E	-	-	-	-	-	-	-	-	-	-	-	-	-
Broadband	-	-	+	-	-	-	+	-	-	-	-	-	-
Mobile	-	-	-	-	-	-	-	-	-	+	-	+	-
Regional Trade Agreement	-	+	+	-	+	-	+	-	-	-	-	+	-
European Union	-	+	+	+	+	+	-	+	+	-	-	-	-
Common currency	-	+	-	-	-	+	+	+	+	+	+	-	-
I - STRI	+	+	-	+	-	+	+	-	+	-	+	-	+
STRI heterogeneity	+	+	+	+	+	-	+	+	-	+	+	+	+
I - Average tariff	+	+	+	+	+	+	+	+	+	-	-	-	+
I - Average SPS STCs	+	-	-	-	-	-	-	-	-	-	-	-	-
I - Average TBT STCs	+	+	+	+	+	+	+	+	+	+	+	+	+
I - Corruption x Dist	-	-	+	+	+	+	-	-	-	+	+	+	+
E - Corruption x Dist	-	-	+	-	-	-	+	-	+	+	+	+	+
Difference in corruption	+	+	+	+	+	+	+	+	+	+	+	+	+
Number of observations		957	973	1,095	985	1,146	793	1,151	1,143	1,155	1,130	1,152	1,111
R-squared		0.804	0.908	0.872	0.924	0.844	0.891	0.808	0.801	0.742	0.822	0.776	0.844

Notes: Highlighted cells contain results that are statistically significant at 90% confidence level, based on standard errors clustered at exporter and importer level. "I" refers to the importer and "E" to the exporter. Each regression includes exporter fixed effects, importer fixed effects, differences in GDP per capita and differences in tertiary education attainment.