Trade frictions in European public procurement *

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Abstract

30 years after the establishment of the European single market, cross-border trade in public procurement is still only a small fraction of all public procurement. We estimate structural gravity equations for regular trade and public procurement trade separately for goods and services distinguishing between border and distance effects. We perform counterfactuals based on the Eaton and Kortum (2002) model investigating the importance of geography-related and communications-related trade costs. Public procurement imports would increase 17-fold and consumption by 31% if public procurement trade costs in were similar to those in regular trade. Using English language procurement documents in all Member States would increase imports by 130% and consumption by 2%.

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1 Introduction

The European single market[1] was established 30 years ago. The long process towards the single market received a decisive impetus from the so-called Cecchini report on "costs of non-Europe" (Cecchini et al. 1988) which outlined and provided ex ante estimates of the benefits of a single market. While political views on the desirability of the single market differ, research (e.g. Mayer et al. 2019; Head and Mayer 2021) has established sizeable trade-related benefits of it. Cecchini et al. (1988) saw particular promise in the single market improving the efficiency of public procurement. Their assessment of the situation in the 1980s was bleak and blunt (Cecchini et al. 1988, pp. 18): "*In public procurement, the divide between economic reality and political appearances is so deep as to be almost hallucinatory*" and "[there exists a]...*gap between liberal appearance and protectionist reality*". Cecchini et al. (1988) estimated that open public procurement would add 0.5% to the region's GDP. This is a large number given that Strand et al. (2011) estimate that public procurement accounts for 3.5% of the region's GDP. Recent policy reports (Strand et al. 2011; Sylvest et al. 2011; European Commission 2017) have established that intra-EU trade in public procurement is still low and recent research (Herz and Varela-Irimia 2020; Mulabdic and Rotunno 2022; García-Santana and Santamaría 2022) has investigated the determinants of trade frictions using reduced form gravity (-type) models. The objective of this paper is to study the reasons and potential remedies for the low level of intra-EU public procurement trade by estimating structural gravity models for regular and public procurement intra-EU trade for goods and services and by performing counterfactual policy experiments.

While it is well-established that public procurement trade flows are an order of magnitude smaller than those of regular trade, our descriptive analysis reveals some new stylized facts: Within EU, public procurement goods and services trade, as a fraction of GDP, are positively correlated, unlike regular trade; trade flows within a country-pair are predominantly unidirectional for both regular and public procurement trade; but regular and public procurement trade flow in the same direction.

The results of the intra-EU regular trade gravity models gives us a benchmark against which to compare how well-established determinants of trade flows differentially affect public procurement trade flows. We find that i) distance matters less in public procurement trade in goods than in regular trade, but that this is not the case (to the same extent) in services; ii) contiguity of trading partners plays much more of a positive role in public procurement than in regular trade, as does iii) a common language. Being a member of the euro-zone iv) has a positive impact on regular trade but no impact (negative but insignificant point estimates) on public procurement trade and finally, that border crossing has a much larger negative effect on public procurement than regular trade.[2] The absence of international trade in public procurement is more due to border than distance effects, suggesting that regulatory costs, or fixed transaction costs more generally (of dealing with different jurisdictions), are more important than transportation costs.

We embed our estimates into the Eaton and Kortum (2002) model of trade which has for our purposes the attractive feature that it matches the institutional set-up of public procurement which mostly takes place via (first-price or scoring, sealed-bid) auctions. To understand how sensitive trade is to trade costs, we first compare how regular and public procurement trade would react to a 10% reduction in trade costs. This exercise reveals that import quantity of goods would increase by over 40% at the

[1] Today, the EU single market consists of the 27 EU member states and Norway, Iceland and Liechtenstein through the European Economic Area which entered into force January 1, 1994. Bilateral agreements ensure that Switzerland has partial access to the single market.

[2] We discuss the similarities and differences to results obtained by Mulabdic and Rotunno (2022) below.

EU-level in both regular and public procurement trade and overall consumption by 4 (regular trade) and 0.6% (public procurement).[3] Public procurement prices would react more strongly than regular trade prices with a 2 as opposed to 0.3% decrease. In services, the differences between regular and public procurement trade are more substantial: Import quantities would increase by 60% on average in regular service trade, but by only half of that in public procurement. Regular trade service prices would actually increase somewhat ($< 1\%$) while public procurement service prices would decrease by 1.4%. Overall consumption quantity of services would increase by 1.2% in regular trade and by 0.6% in public procurement. There is substantial heterogeneity across countries in the responses: Measured by change in consumption quantity, Luxembourg would benefit by far the most ($> 10\%$ in consumed quantity) in relative terms from a 10% reduction of regular trade costs in goods, Spain and Poland ($> 75\%$) from a similar reduction in trade costs of services. In public procurement, the largest relative gains in quantity of goods would accrue to Switzerland and Malta (5%) whereas in services, Austria and Belgium (100%) would tally the largest consumption gains.

We proceed by asking: What would public procurement trade look like if its trade costs were 1:1 those of regular trade? While unrealistic as a policy reform, this counterfactual helps one understand to what extent the differences in trade flows in regular and public procurement trade are driven by difference in trade costs. It turns out that gains would be substantial: On average, public procurement goods imports would increase almost 17-fold and services imports over 4-fold in the EU. At 30 (goods) and almost 8% (services), gains in consumption quantity would be large, too. While goods prices would decrease by some 2%, service prices would decrease by 8%. Spain, the UK and Germany would be the countries with the largest relative changes in public procurement goods imports ($> 4\,000\%$ in quantity) ; Spain, Belgium and the Netherlands ($> 2\,000\%$) the top beneficiaries in terms of relative changes of quantity of service imports. However, in terms of consumption, the largest gains would go to Ireland, Luxembourg and Hungary in goods ($> 100\%$ in quantity) and Luxembourg, Malta and Cyprus ($> 75\%$) in services.

Our final counterfactual concerns a reform that arguably could be implemented. Survey evidence in Strand et al. (2011) suggests that language barriers are a formidable trade barrier: They report that 3 firms out of 4 mention that language barriers are a high (50.3%) or a medium (24.4%) barrier to public procurement trade. Only lack of experience at almost 90% scores higher. Current EU legislation allows for but does not enforce the use of other than native languages.[4] We therefore study what would happen to public procurement trade if all procurement notices were available in English (we denote this an *in English also* - policy). We find substantial beneficial effects: In EU-countries, import quantity of public procurement would increase by over 100% on average in both goods and services while importer prices would decrease by 16-17%. Consumption of domestic goods and services would decrease by 3 and 1% but overall public procurement consumption of both goods and services would increase by circa 2%. We find substantial heterogeneity in the responses across Member States which is only weakly related to the level of trade costs. Unsurprisingly, the outcomes of English-speaking countries are hardly affected. The largest relative import increases in goods (over 240%) would be experienced by

[3] These figures are weighted averages of country-specific changes.

[4] For example, the Finnish Ministry of Trade and Employment's language instructions for public procurement state that: *Furthermore, the Act on Public Contracts does not include provisions on the language of the con- tract notice or the invitation to tender. However, the preparatory work for the Act states that the invitation to tender may be written in Finnish or Swedish or in any other official European Union language (Government Proposal 50/2006 vp, p. 87). The Ministry of Justice is therefore of the opinion that the contracting authority may, in the light of the Language Act and the Act on Public Contracts, generally decide the language(s) of the contract notice or the invitation to tender.*

the Switzerland, Germany, HRV (?) and Spain; the lowest (excluding the English-speaking countries; $< 75\%$) by Slovenia, Estonia, Greece and Latvia. In services, the largest increases ($> 700\%$) would be found in Austria, Belgium and Italy, the lowest ($< 80\%$) in Luxembourg, Cyprus and Denmark.

The objective of creating and fostering a single market motivates us to concentrate on within-EU trade. This is not overly restrictive as, according to **?** (Table 3), intra-EU trade accounts for more than 60% of trade by Member States in 2010-2015 and the share of non-EU countries in public procurement is marginal. According to the same report, import penetration in public sector use round 2010 was, at 7.9%, less than half of that in the private sector (18.8%), and it has not been growing (Table 9). Using data from 2009-2015, the report finds (see Table 12) that the share of public procurements won by a cross-border bidder is only slightly above 1%, accounting for some 3% of value.[5]

It is by now well-established that public procurement trade costs are high in general and within Europe in particular. Mulabdic and Rotunno (2022) establish, using the Trade in Value-Added-database of the OECD and defining public sector expenditure as the sum of "General Government expenditure", "Public administration", "Health" and "Education" in a canonical gravity model, that trade costs are significantly higher in public procurement than regular trade. Herz and Varela-Irimia (2020) use data from EU's Tender Electronic Daily (TED) database and a gravity-style specification to find that the probability of awarding a public procurement to a local firm is some 900 times larger than the probability of awarding it to a foreign firm. While Mulabdic and Rotunno (2022) study the effects of preferential trade agreements, neither of these papers embeds their results in a theoretical model or conducts policy-relevant counterfactual analyses. Building on these analyses, our main contribution is the counterfactual analysis which demonstrates the heterogenous and large costs of higher public procurement trade costs, the sensitivity of public procurement to changes in trade costs and finally and most policy-relevant, the sizeable but heterogenous gains from implementing and "in English also" - policy for public procurement documents.

We build on four literatures and contribute to three of them. The first literature is the one providing us the theoretical basis and empirical tools for our estimations and in particular, our counterfactual analyses. Head and Mayer (2014) provide a survey of the theoretical basis, including the seminal paper by Eaton and Kortum (2002) that we build our counterfactuals on, and the empirical implementation of gravity equations; Yotov et al. (2016), whose techniques we borrow, bring together theory and empirics of gravity equations and explain the implementation of counterfactual trade policy exercises.

The second literature, and the first we contribute to, studies the impact of the EU on trade. Cecchini et al. (1988) contained an ambitious ex ante evaluation exercise; Baldwin and Venables (1995) bring together and summarize nicely a large number of studies that sought to quantify the gains one could expect from the single market. An example of an early ex post study is Fontagné et al. (1998) whose emphasis is on within-industry adjustments. More recent studies include the complementary studies of Felbermayr et al. (2018) and Mayer et al. (2019). Felbermayr et al. (2018), like us, build on the Ricardian trade model of Eaton and Kortum (2002) but use data disaggregated to 50 sectors. Their counterfactual exercises are concerned with different EU disintegration scenarios. They estimate the gains to be mostly due to the single market, though the Schengen area and eurozone membership are important for some Member States. Mayer et al. (2019) work with more aggregate data, but are able to distinguish between customers union and single market effects. Their results suggest that the single

[5]These figures include *direct* cross-border procurement where the winner is a firm from another country. They exclude *indirect* cross-border procurement which takes into account procurements won by a local subsidiary of a foreign firm. These account for 21.9 and 20.4% of procurement awards and value.

market has a much more profound effect than a regional trade agreement alone would have. They also find considerable heterogeneity across countries in the effects of EU. Besides providing some new stylized facts of within-EU public procurement trade, we contribute to this literature by conducting counterfactual policy exercises on trade in public procurement.

The empirical literature on public procurement trade is relatively sparse.[6] The above-mentioned studies by Herz and Varela-Irimia (2020), Mulabdic and Rotunno (2022) and García-Santana and Santamaría (2022) are of particular relevance to this study. Herz and Varela-Irimia (2020) use the same Tenders Electronic Daily (TED) public procurement data as we and estimate reduced form gravity equations using both the number of awards and the value of them within a country-pair as their outcome variable.[7] They are the first to find sizeable border effects, also within countries, in public procurement trade. Mulabdic and Rotunno (2022) construct public procurement data from country-level trade data and sectoral inter-country input-output tables. Like us, they compare the impact of regular gravity equation variables - border, contiguity, common language, colony and of course distance - on public procurement trade to those on regular trade. Like Herz and Varela-Irimia (2020), they find significant border, contiguity effects and common language effects. According to their results, the impact of distance is less on public procurement than regular trade and larger for goods than services. They are the first to provide a comparison between determinants of regular and public procurement trade costs using a gravity equation framework. García-Santana and Santamaría (2022) main interest is in comparing the impact of national and sub-national governments on public procurement trade. For this purpose they use the same public procurement database as Herz and Varela-Irimia (2020) and us, but concentrate on France and Spain and use data from the period 2009–2019. Using a multi-region static trade model based on Chaney (2008), they can estimate the within- and between-country bias of governments, controlling for origin-destination fixed effects. They find evidence for both types of bias. Unlike Herz and Varela-Irimia (2020) and Mulabdic and Rotunno (2022), García-Santana and Santamaría (2022) embed their estimates in a calibrated structural model and perform a counterfactual exercise where they abolish within-country and/or between-country bias. Abolishing within-country bias would increase the value of procurements awarded to non-local domestic firms by 20%. Abolishing between-country bias yields even higher relative (but smaller absolute) changes. Also the recent study by Deltas and Evenett (2020) is relevant for us: They utilize variation in the use of English in Georgian public procurement documents and find that while English doubles participation of foreign firms in public procurement of low value items and increases it in procurement of higher value items, the effect on prices is around one per cent due to the low (initial) level of foreign participation. They are to our knowledge the first to conduct a counterfactual analysis of public procurement trade. Our first contribution to this literature is to conduct counterfactual exercises that shed light on how differences in trade costs and in the sensitivity to changes in trade costs between regular and public procurement trade explain the much lower level of public procurement versus regular trade. Our second contribution is the policy-relevant counterfactual of imposing the "in English also" - policy on public procurement within the EU.

In contrast to the public procurement trade, the empirical literature on public procurement is large. Issues that have been studied include the saving from centralization (Lotti et al. 2023), the effect of more formal procurement rules (Hyytinen et al. 2018; Decarolis et al. 2020) and bureaucratic competence (**?**,

[6]There is also a theoretical literature on international public procurement, see e.g. Branco (1994).

[7]Kutlina-Dimitrova and Lakatos (2016) are the first to use the TED data to study within-EU trade in public procurement; however, they do not use a gravity equation approach, but explain the probability of cross-border participation by the value of the contract, number of bids and country characteristics.

active versus passive waste (Bandiera et al. 2009) and participation in public procurement (Branzoni and Decarolis 2015; Jääskeläinen and Tukiainen 2019). We contribute to this literature through our counterfactual analyses.

Following this introduction, we describe the institutional setting in the section 2. In section 3 we detail our data and provide a descriptive analysis of the trade patterns in both regular and public procurement trade. Section 4 is devoted to the estimation of the reduced form gravity equations and section 5 to the structural Eaton and Kortum (2002) model and our counterfactual analyses. We offer our conclusions in Section 6.

2 Institutional setting

Much of the impact of government spending on the economy takes place through the public procurement process. Its importance varies across countries, but according to OECD statistics quoted in Cernat and Kutlina-Dimitrova (2015), it ranges from 10% of GDP in the United States to 19% in the EU. In 2015, governments, public authorities, and publicly-owned companies in the EU spent 2.02 trillion Euros, approximately 14% of EU GDP, on the purchase of goods and services.

Protectionism and discrimination in procurement will hamper competition and potentially have a large negative welfare effect. Several studies have documented a home bias in government procurement, e.g., Crozet and Trionfetti (2002), Shingal (2015), Mulabdic and Rotunno (2022). However, studies of regular trade flows also document sizeable border effects that suggest important impediments to market access for foreign firms, e.g., McCallum (1995), de Sousa et al. (2012). The procurement home bias even appears at sub-national levels, e.g., Herz and Varela-Irimia (2020), García-Santana and Santamaría (2022), but that is also the case for regular trade, e.g., Santamaría et al. (2023), Wrona (2018).

To stimulate cross-border trade in this area, the GATT, and later the WTO, has coordinated multilateral negotiations to liberalize government procurement leading in 1979 to the signing of the "Tokyo Round Code on Government Procurement." This agreement has been amended in 1987, 1994, and 2014, when the latest "Agreement on Government Procurement" has come into force, gradually bringing additional government entities and new services and public procurement activities under the Agreement.

Bilateral negotiations that lead to Free Trade Agreements (FTA) are also increasingly likely to include a stand-alone chapter or article on public procurement. None of the 13 FTAs signed by the EU before 2000 included such provisions, while 13 of the 24 FTAs the EU signed between 2000 and 2015 did.

Within the EU, the Commission has implemented several policies to increase cross-border public procurement, which include uniform tendering procedures, compulsory registration, and advertising of outcomes. Public procurement is covered by specific directives that guarantee that all EU firms are allowed to compete in all EU member states without discrimination. This mirrors the situation for regular trade where, by the EU's nature as a custom's union, all internal tariffs and non-tariff barriers have been abolished. The 1992 Single Market program further aimed at harmonizing regulations that often impede trade in services.

For all public contracts above a minimum threshold, the tender needs to be published in a standard format in the EU's tenders electronic daily (TED), an online supplement to the *Official Journal of the EU*. Most tenders are 'open', which means all firms can participate. However, contracting agencies can opt for the restricted procedure, where all firms can request to participate, but only those invited can submit a bid. These restricted procedures, such as 'negotiated' tenders, can only be used in special circumstances. Award decisions are also published online to promote transparency.

The Chief Economist's unit of the EU Commission's DG Trade has also written several reports to study barriers to cross-border competition in procurement and the likely benefits of tackling them. **?** find that countries with high volumes of regular trade, also interact more in terms of international procurement. Tenders that attract a lot of bids, also have a higher probability of cross-border awards. This pattern holds even after controlling for the value of the contract, which is itself a positive predictor of cross-border awards. It underscores that more international competition is likely to generate more competitive outcomes and welfare gains (Kutlina-Dimitrova, 2017).

3 Data

3.1 Data sources

For public procurement, we employ data from Tenders Electronic Daily (TED), which is an online version of "Supplement to the Official Journal" published by the EU.

Contracting authorities in the EU (and in a few other countries[8]) are obliged to publish contract notices in TED if the expected value of the purchase exceeds a threshold value specified by the EU directives. From the contract notices, companies can find out relevant information about the X, such as what the authority wants to buy, the technical details about the x, what is the award criterion, where the authority is located, and so on. Based on the information, companies can make bids, from which the authority selects the winner(s) based on the award criterion. Finally, the authority publishes a contract award notice, which includes, among other things, information about what was bought, at what price, who won the tender, where the winner is located, where the authority locates, and so on.

In addition to contract notices, TED publishes data on the result of the procurement process, captured in contract award notices. These contain information among other on the final value of the award, buyer's location, winning firm's location, date of the award and the CPV code which identifies the type of commodity and enables us to distinguish between goods and services. Our outcome variable $value\_ijt$ is calculated as the sum of contract award values tendered by contracting authorities locating in country j and won by a firm locating in country i in year t and thus describes the value of procurement exports from country i to country j in year t. The final procurement data set contains 8 820[9] bilateral procurement trade-year observations covering the period from 2009–2018 for 30 countries including all current EU countries, Norway, Switzerland and United Kingdom.

Since the obligation to publish a tender that might have cross-border interest is based on a threshold value, which applies to the expected value of the contract notice, part of the data is missing for the winners of tenders below the threshold. This, however, is not a binding threshold, since EU considers is as a good practice to report also tenders below that value. Although this condition excludes some number of tenders from the sample, we expect the effect on the total value of procurement to be small, since the largest tenders in value are included.

Missing data in general<-add

The advantage of concentrating on procurement within EU (+a few other countries) is that we can use actual contract level data to calculate government procurement and aren't thus forced to estimate it from government expenditure which necessarily is not procured. Our data thus compares to data used

[8]This applies also to members of European Economic Area (EEA)

[9]$30 \times 30 \times 10 - 6 \times 30$, since we lack importer observations for Malta and Croatia before 2010 and 2014 respectively.

by Herz and Varela-Irimia (2020) in estimating border effects within EU and distinguishes from other studies studying worldwide public procurement such as Mulabdic and Rotunno (2022).

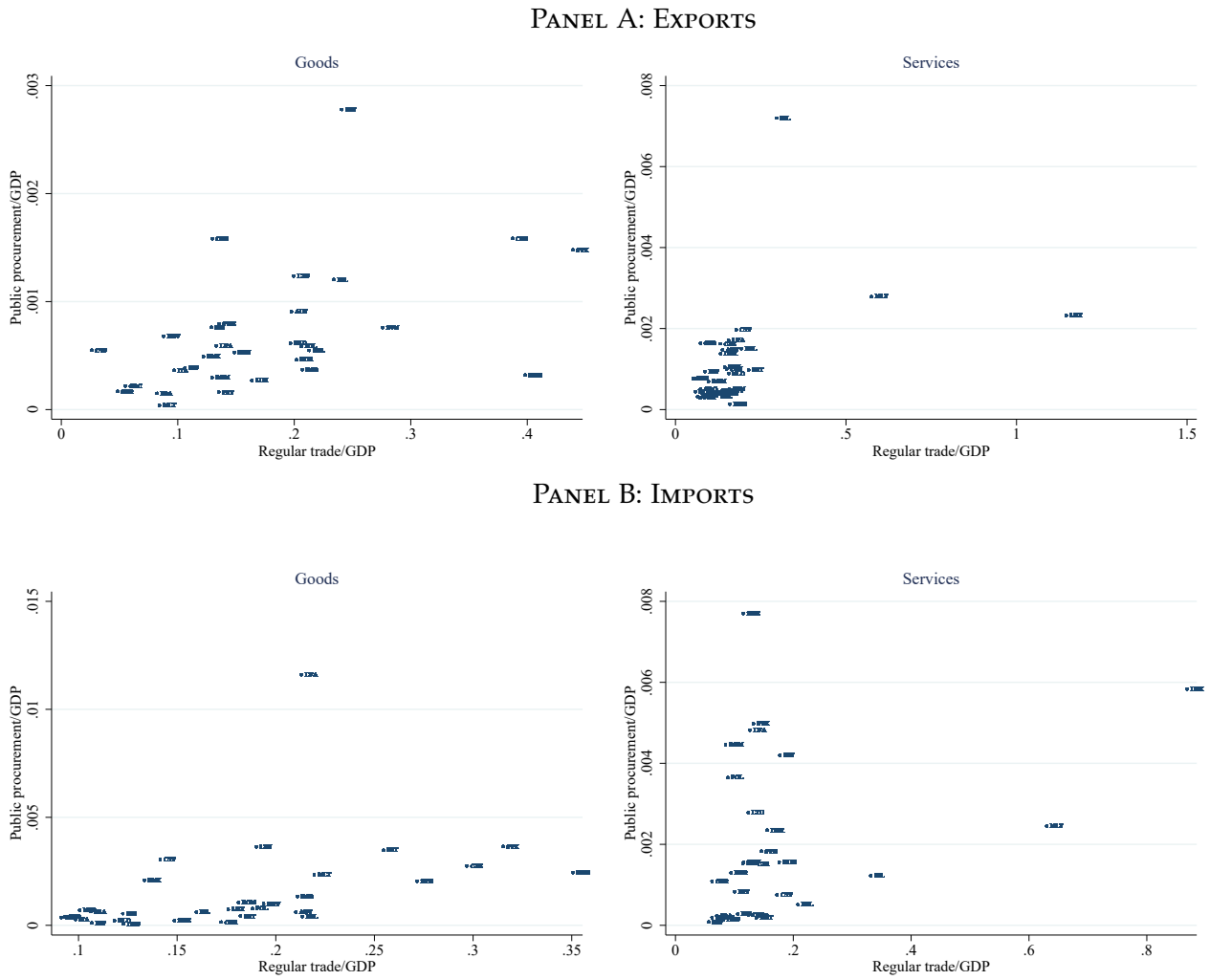
For regular trade, we employ data from Trade in Value Added (TiVA) database published by OECD. We construct our output variable *value_ijt* as in procurement: *value_ijt* measures regular trade exports from country i to country j in year t from TiVA's ICIO-tables (inter-country-input-output -tables). We measure *value_ijt* separately for goods and services. We keep only observations for which we have corresponding procurement data. As a result, both regular trade and procurement trade data have 8 820 bilateral trade observations for the years 2009–2018 for 30 European countries.

Our trade cost variables are extracted from CEPII. We use common gravity variables: Distance, contiguity and common official primary language. Information on eurozone membership is retrieved from the European Central Bank. In addition to these, we employ data from TED's contract notices, which offer information on the language in which the tender was provided. From it, we create an importer-year -level variable measuring the share of contract notices available in English.

3.2 Descriptive analysis

To illustrate the importance of regular and public procurement (PP) trade we plot them relative to GDP in Figure 1. The top left panel shows that regular goods exports varies from lows of less than 10% to more than 40% of GDP and the top right panel that the respective numbers for services exports are mostly below 30% except for Malta and Luxembourg. PP trade shares are substantially lower. Regular and PP exports are positively correlated. The scale differences between regular and PP imports are similar (bottom panel), but the correlation between regular and PP imports is lower than that for exports. Overall, there is substantial heterogeneity across countries in both regular and PP export and import intensity.

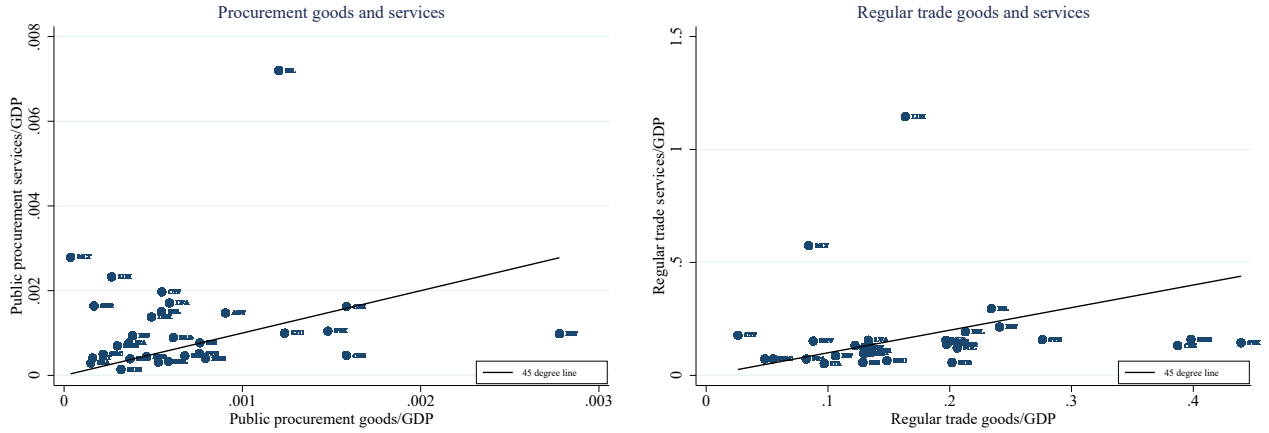
Figure 1: Regular trade and procurement procurement exports per GDP



Notes: An observation is a country-pair observation based on averaging data over the years.

Figure 2 juxtaposes goods and services exports a share of GDP for both PP (left-hand) and regular (right-hand) trade exports. For a majority of the countries in our data, the trade intensity is higher for services in PP and in goods in regular trade.

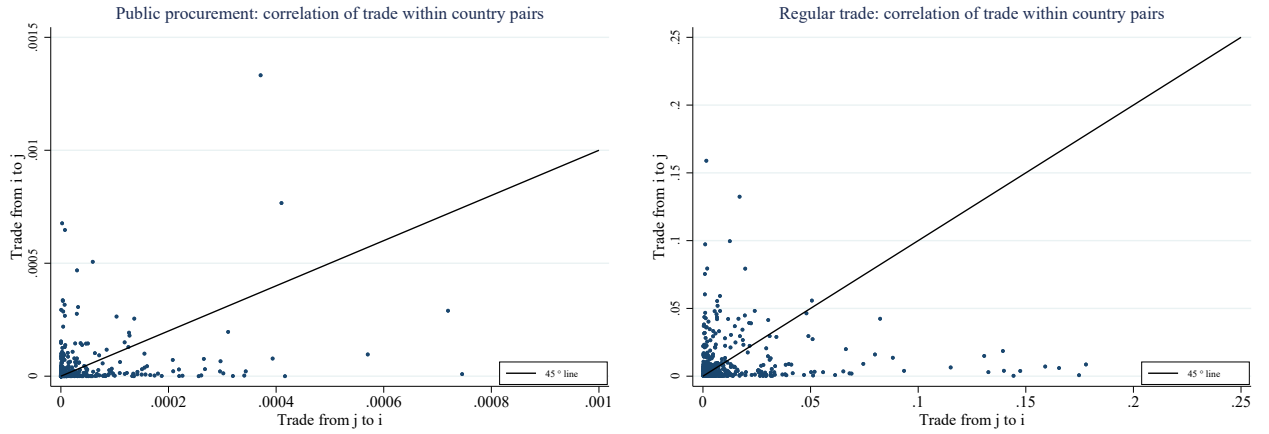
Figure 2: Goods vs. services exports



Notes: An observation is a country-pair observation based on averaging data over the years.

To investigate the direction of trade we plot exports between country pairs in both directions (from j to i on the x- and vice versa on the y-axis) for PP and regular trade. Figure 3 reveals that neither type of exports is reciprocal as the dots do not align on the 45^o-line. Rather, both regular trade and PP exports between a given pair of countries seems to flow predominantly in one or the other direction.

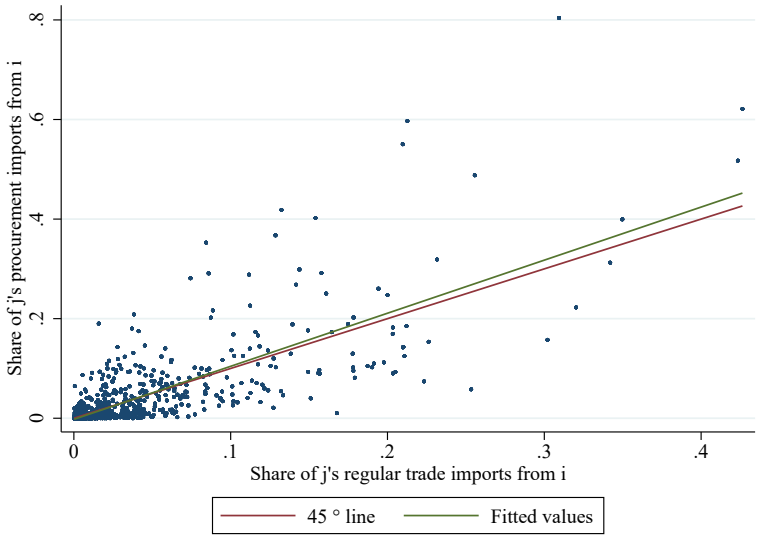
Figure 3: Exports from j to i and vice versa



Notes: An observation is a country-pair-year observation.

One would also want to know whether the regular and PP trade flows are in the same direction. We plot regular trade from country i to country j on the x-axis and PP trade from country i to country j on the y-axis in Figure 4. We calculate the average share of imports from country i to country j over the years in the sample. What is apparent is that regular and PP trade indeed flow in the same direction: The linear fit is very close to the 45^o-line.

Figure 4: Imports from i to j and vice versa



Notes: An observation is a country-pair observation based on averaging data over the years..

To summarize, PP trade flows are an order of magnitude smaller than the corresponding regular trade flows as a fraction of GDP, but the PP and regular trade shares, especially exports, are correlated. Goods and services trade GDP shares are positively correlated for public procurement, but not so for regular trade. Both regular and PP trade flows within country pairs are predominantly unidirectional, but the two types of trade flow in the same direction.

4 Estimation of the gravity equation

4.1 Gravity equation specification

We estimate the following specification of the gravity model:

$$Trade_{ijt} = \exp\left(\beta_1 \ln(Distance_{ij}) + \sum_{k=2}^{4} \beta_k \, Dummy_{ijt}^{k} + \beta_5 Border_{ij} + \gamma_{it} + \mu_{jt}\right) + \epsilon_{ijt}. \quad (1)$$

The summation includes three bilateral dummies that capture reasons for higher trade between exporter i and importer j. These are: (i) an indicator of contiguity for neighboring countries, (ii) a shared official language, and (iii) use of the Euro currency by both countries.

We estimate equation (1) with and without including domestic trade transactions $Trade_{iit}$, i.e., consumption of country i that is produced domestically. If national flows are included in the sample, we follow McCallum (1995) and add a $Border_{ii}$ dummy that takes value one if goods need to cross a border.

To capture the multilateral resistance terms, see Anderson and van Wincoop (2003), it is customary in the gravity literature to include exporter and importer fixed effects. As changing market conditions and trading costs might induce variation in trade resistance over time, we include exporter-year and importer-year fixed effects. In the structural analysis below, we supplement the estimating equation

Table 1: Excluding domestic consumption

	Public procurement		Regular trade		English	
	Goods	Services	Goods	Services	Goods	Services
Log of distance	-0.532***	-0.619***	-0.473***	-0.574***	-0.532***	-0.619***
	(0.085)	(0.169)	(0.020)	(0.022)	(0.085)	(0.169)
Contiguity	1.199***	1.495***	0.514***	0.406***	1.199***	1.495***
	(0.128)	(0.214)	(0.024)	(0.029)	(0.128)	(0.214)
Common official language	0.466*	0.746*	0.459***	0.162***	0.466*	0.746*
	(0.229)	(0.333)	(0.040)	(0.046)	(0.229)	(0.333)
Eurozone	0.133	0.266	0.0679	0.0719*	0.133	0.266
	(0.227)	(0.290)	(0.038)	(0.033)	(0.227)	(0.290)
English					10.70***	15.66***
					(1.432)	(1.644)
Observations	8414	8388	8526	8526	8414	8388
Pseudo R^2						

Notes: All specifications are estimated on years from 2009 to 2018 and 30 countries, and include exporter-time and importer-time fixed effects. Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

with an equilibrium model of supply and demand in order to recover the structural outgoing and incoming multilateral resistance terms from the estimated fixed effects. These are only needed when we perform counterfactual analyses.

Following Santos Silva and Tenreyro (2006) we estimate equation (1) with the Poisson pseudo-maximum likelihood method. This approach performs much better than OLS in the presence of heteroskedasticity and allows for zeros in bilateral flows. Intra-EU trade flows are sufficiently dense such that only a few country pairs do not trade, but the large differences in country size makes heteroskedasticity quite likely. We estimate the gravity specification separately for trade flows of regular trade and public procurement and further distinguish between flows of goods and services.[10]

4.2 Regular and public procurement trade

Results in Table 1 are for estimates based only on international trade data, i.e., excluding domestic consumption. While distance deters trade somewhat more for public procurement than for regular trade, the differences are minor and not statistically significant. The point estimates on the distance coefficients are 0.059 lower for goods and 0.045 lower for services which amounts to only 8 to 12 percent higher trade costs in absolute value. Differences are much more pronounced for the contiguity dummy. The stronger trade relationship between neighboring countries is much more pronounced for public procurement, especially for trade in services. A common official language also facilitates trade. For goods trade the effect is similar for publicly procured and regular trade, while the point estimate

[10]Construction is included in service trade.

Table 2: Including domestic consumption

	Public procurement		Regular trade	
	Goods	Services	Goods	Services
Log of distance	-0.361***	-0.517***	-0.646***	-0.545***
	(0.075)	(0.148)	(0.018)	(0.016)
Contiguity	1.218***	1.256***	0.498***	0.264***
	(0.128)	(0.186)	(0.034)	(0.030)
Common official language	0.563**	1.472***	0.255***	0.536***
	(0.185)	(0.360)	(0.045)	(0.037)
Eurozone	-0.124	-0.671*	0.112***	0.165***
	(0.120)	(0.285)	(0.027)	(0.024)
Border crossing	-6.314***	-6.902***	-2.787***	-4.644***
	(0.171)	(0.340)	(0.039)	(0.034)
Observations	8820	8820	8820	8820
Pseudo R^2				

Notes: All specifications are estimated on years from 2009 to 2018 and 30 countries, and include exporter-time and importer-time fixed effects. Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

is almost five times higher for publicly procured services compared to regular service trade. The larger size is not surprising, as firms might be more attentive to procurement tenders in foreign countries with a shared language, but the size of the difference is remarkable. The indicator for trade within the Eurozone has only a minor impact on trade.

Results with domestic trade flows included in the sample are reported in Table A-1. The effects of distance change quite substantially with public procurement now showing a less pronounced negative effect of distance for both goods and services. For goods the difference is large and highly significant; for services the effect of distance is slightly lower for public procurement, but not significantly different.

The differences in estimates are even more pronounced for the border dummy that is introduced. For both types of trade there is a home bias, i.e., a negative coefficient on the border, but this is far more important for public procurement. For goods trade the coefficient is more than twice as large in absolute value for public procurement and even for services it is 1.5 times larger. For regular trade, the home bias is much more pronounced for services, which is not surprising as many services can only be delivered locally. For public procurement, the home bias is approximately equally strong for goods and services and in both cases it far exceeds the effect on regular trade in services.

The differences on the contiguity dummy and the common language indicator have the same sign as

before and are heightened somewhat when domestic transactions are included. The Eurozone indicator is estimated more precisely now and has the expected positive effect on regular trade. Surprisingly, it has a negative effect on public procurement of services, which might be driven by the importance of the United Kingdom as an exporter of services.

The point estimates are useful to compare the relative effects between public procurement and regular trade or to compare the effects on goods and services. To get a sense about the absolute importance of a particular coefficient value for trade volumes or prices, we perform counterfactual analyses below.

4.3 Public procurement trade and language

One factor that can facilitate cross-border public procurement is publishing tenders in English (Deltas and Evenett, 2020). Because the share of tenders published in English is constant for an importer in any year, and applies similarly to all potential exporters, any potential effect is absorbed by the included importer-year fixed effects μ_{jt}. In order to isolate the importance of English language tenders and perform a counterfactual on the potential effect of publishing all tenders in English, we need a different approach to identify this effect.

Because the benefit of sharing a common language might have changed over time, for example with the rising importance of translation software, we purge its effect from the importer-year fixed effects as flexibly as possible. We replace the β_3 coefficient, which measures the effect of the 'Common official language' dummy, by a full set of year-fixed effects:

$$\beta_3 \, Language_{ij} \quad \rightarrow \quad \sum_{\tau} \beta_\tau \, 1[\tau = t] \times Language_{ij}.$$

In a first stage, we re-estimate the augmented gravity specification on the public procurement sample without domestic transactions and recover the importer-year fixed effects $\hat{\mu}_{jt}$. These coefficients measure how each country's value of cross-border procurement has evolved over time.

In a second stage, we identify the effect of publishing tenders in English from

$$\hat{\mu}_{jt} \quad = \quad \beta_6 \, English_{jt} + \mu_j + \mu_t + \epsilon_{jt}. \tag{2}$$

The coefficient β_6 captures the extent to which a change in country j's value of international procurement is associated with changes in the fraction of tenders it publishes in English. This effect is measured relative to importer and year fixed effects that capture the overall trend and cross-country differences in the importance of cross-border procurement. Results are reported in columns 2 and 4 of Table 1.

5 Structural analysis

5.1 Overview of Eaton-Kortum (2002) model

To perform counterfactual analysis, the estimating gravity equations must be theoretically founded, thereby allowing structural interpretation for estimated coefficients and fixed effects terms. As shown by Arkolakis et al. (2012) theoretical foundations that lead to the same gravity framework is shared by a large class of international trade models, including a *'demand-side model'* with nationally differentiated

varieties in a monopolistically-competitive setting by Anderson and van Wincoop (2003) and a *'supply-side model'* such as the Ricardian trade model developed by Eaton and Kortum (2002) that features perfectly-competitive firms. We interpret our estimates of gravity equations and calculate counterfactual trade flows for the Eaton and Kortum (2002) model, which we describe briefly below. In addition to having a small number of parameters, this choice is justified by the fact that the selection of suppliers in public tenders is typically based on best-offer criteria like the lowest price or the maximum score.

Consumers in country j (where $j = 1, ..., N$ and N is the number of countries) are assumed to pursue (globally) identical CES objective function defined over a continuum of goods: $U_j = \left[\int_0^1 q_j(g)^{\frac{\sigma-1}{\sigma}} dg\right]^{\frac{\sigma-1}{\sigma}}$, subject to a standard budget constraint $X_j = \int_0^1 p_j(g) q_j(g) dg$, where $p_j(g)$ and $q_j(g)$ denote the price and quantity of good $g \in [0,1]$ consumed, and X_j denotes expenditures on all goods. $\sigma > 0$ is the elasticity of substitution between these goods. Firms from all N countries compete with prices in perfectly competitive markets and sell their goods to country j if they offer the lowest price.

Any firm in country i can produce good g with efficiency $z_i(g)$ and face a cost of inputs c_i, which implies that a unit cost of good is $c_i/z_i(g)$. Assuming iceberg bilateral trade costs, $d_{ij} > 1$ for $i \neq j$ and $d_{ii} = 1$, the price of delivering good to country j is $p_{ij}(g) = \frac{c_i}{z_i(g)} d_{ij}$. The country's efficiency is a random draw from a Fréchet cumulative distribution function $F(z_i(g) \leq z) = e^{-T_i z^{-\theta}}$, where $T_i > 0$ is a country-specific technology parameter that governs the location of distribution and drives the share of goods for which country i is the low-cost supplier, and θ is a shape parameter (common across countries) that determines heterogeneity in the productivity distribution. Note that larger values of θ imply lower dispersion of productivity.

By combining the pricing equation and the CDF for efficiency yields the distribution of prices at which country i can supply a good to country j: $G_{ij}(p) = Pr[p_{ij}(g) \leq p] = 1 - e^{-T_i (c_i d_{ij})^{-\theta} p^{\theta}}$. While $p_{ij}(g)$ is the price consumers in country j would pay if they decided to purchase good from country i, the actual price that consumers pay is the lowest price obtained in competitive markets, i.e. $p_j(g) = \min\{p_{ij}(g); i = 1, ...N\}$. The price distribution in country j is then $G_j(p) = Pr[p_j \leq p] = 1 - \Pi_{i=1}^{N}(1 - G_{ij}(p)) = 1 - e^{-\Phi_j p^{\theta}}$, where $\Phi_j = \sum_{i=1}^{N} T_i (c_i d_{ij})^{-\theta}$. The term Φ_j summarizes how the states of technology, input costs around the world, and geographic barriers affect prices in country j. The exact price index for assumed CES utility function, defined as $p_j = \gamma \Phi_j^{-1/\theta}$, increases when Φ_j decreases.[11]

The probability that country i supplies good g to country j (i.e. country charges the lowest price) is given by $\pi_{ij} = \frac{T_i (c_i d_{ij})^{-\theta}}{\Phi_j}$, which is – due to a continuum of goods – also the fraction of goods that country j buys from country i. Moreover, the share of expenditure of country j on goods from country i, X_{ij}, in total expenditure of country j, X_j, is also equal to this probability ($X_{ij}/X_j = \pi_{ij}$). This is an implication of firms adjusting to better technology, and lower input and trade costs only along extensive margin – by selling wider range of goods at the same average price. Combining these two expressions yields the expenditure of country j on goods from country i: $X_{ij} = \frac{T_i (c_i d_{ij})^{-\theta}}{\Phi_j} X_j$. As the total sales of country i to all countries is equal to income of that country, $Y_i = \sum_{m=1}^{N} X_{im}$, the cost-efficiency index of country i can be expressed as $T_i c_i^{-\theta} = Y_i / (\sum_{m=1}^{N} d_{im}^{-\theta} X_m / \Phi_m)$. Replacing the cost-efficiency index in the

[11] Here $\gamma = [\Gamma((\theta + 1 - \sigma)/\theta)]^{1/(1-\sigma)}$ and Γ denotes the Gamma function. We assume that the elasticity of substitution between goods is $\sigma < 1 + \theta$.

expression for X_{ij} gives the gravity equation:

$$X_{ij} = \frac{Y_i X_j}{\Omega_i \Phi_j} d_{ij}^{-\theta}, \tag{3}$$

where the terms in denominator

$$\Omega_i = \sum_{m=1}^{N} \frac{d_{im}^{-\theta} X_m}{\Phi_m}, \tag{4}$$

$$\Phi_j = \sum_{l=1}^{N} \frac{d_{jl}^{-\theta} Y_l}{\Omega_l}. \tag{5}$$

denote the outward and inward multilateral resistance terms (henceforth OMR and IMR), respectively. These two general equilibrium trade cost terms are weighted-average aggregates of all bilateral trade costs for the producers of goods in country i (OMR) and consumers of goods in country j (IMR) and capture ease of market access. When these two terms decrease, trade flows tend to increase.

The gravity equation (3) provides structural interpretation for our reduced-form parameter estimates of eq. (1) presented in Table A-1. Namely, the bilateral trade costs $d_{ijt}^{-\theta}$ are represented with geographic (distance, contiguity, common language, international border) and trade-policy (Euro area) variables and corresponding regression coefficients[12]:

$$d_{ijt}^{-\theta} = \exp(\beta_{dist} \ln dist_{ij} + \beta_{cont} D_{ij}^{cont} + \beta_{clang} D_{ij}^{clang} + \beta_{euro} D_{ijt}^{euro} + \beta_{border} D_{ij}^{border}) \tag{6}$$

whereas the exporter-time fixed effects $\gamma_{it} = \ln Y_{it} - \ln \Omega_{it}$ capture the OMRs and exporters' outputs, and importer-time fixed effects $\mu_{jt} = \ln X_{jt} - \ln \Phi_{jt}$ reflect the IMRs and expenditures.

5.2 Counterfactual analysis with GEPPML procedure

Conducting a comparative statics analysis requires solving a large system of equations comprising the gravity equation (3), the two equations for multilateral resistance terms (eq.'s (4) and (5)), the factory-gate price-setting equation and a trade balance equation (for all countries). For this purpose, we employ the General Equilibrium Poisson Pseudo-Maximum Likelihood (GEPPML) procedure proposed by Anderson et al. (2018). This method relies on the estimation of (constrained) gravity equations using PPML and does not require a nonlinear solver to find a solution to the system of equations. The authors show that this methodology yields identical results to those obtained with solvers of nonlinear gravity systems, particularly in their analysis of abandoning international borders. In the following discussion, we outline the key steps of this procedure for a 'full-endowment' economy,[13] which excludes dynamic effects pertaining to capital accumulation. Subsequently, we provide an illustrative example by considering a counterfactual scenario where the distance elasticity decreases by 10 percent for public procurement trade flows with goods.

As outlined in Anderson et al. (2018), the GEPPML procedure is conducted in three steps. In the first

[12] The regression coefficient for distance β_{dist} can be interpreted as the product of $-\theta$ and the elasticity of trade costs with respect to distance.

[13] A full endowment economy within the supply-side framework can be closed in a simple way by assuming that labour (L)) is the only production factor ($q_i(g) = z_i(g)L_i(g)$) that is supplied exogenously. This assumption implies that the cost of inputs is equal to the wage rate ($c_i = w_i$) and that the aggregate income is $Y_i = w_i L_i$.

step the gravity model is solved under the baseline scenario. In this step the parameters of trade costs and time-varying exporter- and importer-fixed effects are estimated.[14] To construct the multilateral resistance terms the estimated fixed effects are combined with country-level incomes and expenditures, where the latter are obtained as sums of trade flows over all trading partner countries (including within-country flows). As multilateral resistance terms are not unique, normalization of these terms is needed by setting one of them to 1. At this stage, all baseline values are calculated to serve as reference values for the calculation of changes in key variables of interest. In our case, these variables include trade flows, multilateral resistance terms, real incomes, factory-gate prices, and expenditure-to-income ratios. Leveraging estimates of trade parameters from the baseline scenario, the partial effects stemming from changes of trade costs on trade flows are calculated.

In the next step, a counterfactual scenario on trade costs is conceived and the model is re-estimated under the restrictions imposed by this scenario. The resulting estimates are then utilized to characterize the conditional general equilibrium, where conditional denotes the maintenance of aggregate incomes and expenditures of countries. The estimation of OMRs and IMRs involves combination of fixed effects and the original values of incomes and expenditures. The trade flows for the conditional general equilibrium are obtained using the predicted values. Note that these values reflect both the counterfactual scenario for trade costs and the new estimates of fixed effects that capture corresponding OMRs and IMRs.

In the last step 'full-endowment' general equilibrium effects are calculated, allowing for the endogenous response of incomes and expenditures. This step involves an iterative procedure that repeats the following four steps. Initially, the factory-gate prices (or wages) are calculated for new multilateral resistance terms and expenditure. Subsequently, new income and expenditure values are determined under the restriction of unchanged expenditure to income ratio, thus maintaining fixed trade balance ratio. Then multilateral resistance terms are calculated using these new values of incomes and expenditures. Finally, new trade flows are determined using changes in trade costs, multilateral resistance terms, and incomes and expenditures. These steps are repeated until convergence is achieved in factory gate prices.

To illustrate the GEPPML procedure, we present the results of a counterfactual experiment in Table 3. This experiment involves a 10 percent reduction in distance-related trade costs, achieved by lowering the regression coefficient for distance, utilizing the 2018 data on public-procurement trade with goods. In the first two steps, we use the point estimates of our reduced-form model obtained with PPML on a sample that includes within-country trade flows, while in calculations of full endowment general equilibrium effects here (and in all counterfactual experiments discussed below) we use also an estimate of parameter $\theta = 3.6$, a value reported in Eaton and Kortum (2002) (see Table 5, p. 1763).[15]

In columns (1) and (2) of Table 3 are shown the direct or partial effects of reduction of distance-related costs on exports and imports. As reduction of these trade costs affects all trade flows, all countries exhibit significant increases in both exports and imports, amounting to 26.7 percent at the EU

[14] To avoid multicolinearity the fixed effects for one of the countries are dropped.

[15] This value is an estimate of (conditional) wage elasticity of a measure of country competitiveness defined by Eaton and Kortum (2002). While they report as preferred estimate $\theta = 8.28$ obtained by relating normalized import shares to relative prices, Simonovska and Waugh (2014) argue that their estimator suffers from a small-sample bias and provide an alternative simulated method of moments estimator that gives $\theta = 4$, and provide a range of values for θ between 2.79 and 4.46 using various data sets and conduct several robustness exercises. In their counterfactual analysis of the effects of EU freedoms Head and Mayer (2021) use $\theta = 5$ for both trade with goods and services. For robustness we also present selected results using $\theta = 8.28$, see Appendix ADD.

level (including non-EU members Switzerland and Norway). There are, however, notable differences across countries: the countries with larger increases of trade flows are those that are also more sensitive to distance-related trade costs – those located at the periphery of Europe like Cyprus, Malta, Greece, Spain and Portugal.

Columns (3) and (4) of Table 3 report the changes in trade flows for conditional GE, which reflect both direct and indirect change (through multilateral resistance terms), while keeping incomes and expenditures unchanged. In comparison to the partial equilibrium results, these changes of trade flows are now significantly lower (2.9 percent at the European level), implying that overall changes in multilateral resistance terms tend to supress trade flows.

The 'full-endowment' GE effects that allow for endogenous adjustment of factory-gate prices (or wages), incomes and expenditures are reported in columns (5)–(10) of Table 3. In addition to changes in exports and imports (columns (5) and (6)), we also report changes in real GDP (as a measure of welfare, column (7)), producer and consumer prices captured in multilateral resistance terms (columns (8) and (9)) and factory-gate prices (column (10)). At the European level, the effect on trade flows is now 8.9 percent, where the range of changes in exports (imports) is between 6.5 percent (7 percent) and 25.8 percent (15.9). All countries also exhibit a significant boost to real output, which increases at the European level by 5.5 percent, the largest benefits accruing to some of the largest countries like France, Spain, and Germany, and the Nordic countries. Overall, as changes in producer prices (OMRs) tend to be larger than the changes in consumer prices (IMRs), the benefits tend to accrue to producers. Namely, the producer prices decrease by as much as 6.4 percent at the European level. In contrast, countries tend to exhibit a modest decline in consumer prices reflected in IMR (0.2 percent decline at the EU level), where most countries exhibit small declines and some even modest increases. Note that the countries with larger declines in OMRs tend to expand exports less, whereas the countries with higher changes in consumer prices tend to increase imports relatively more. Finally, note that factory-gate producer prices (or wages) move mostly in line with real output and amount to 5.3 percent at the European level.

5.3 Counterfactual analysis with trade-cost reduction: public procurement vs. regular trade

In this section, we broaden the scope of our counterfactual analysis in several directions. Beyond examining the impact of reduced trade costs associated with distance, we investigate the consequences of lowering other components of trade costs such as contiguity, common language, international borders, and membership in the eurozone. Our analysis encompasses both goods and services trade, allowing us to highlight distinctions between public procurement and regular trade. The summarized outcomes related to the 'full-endowment' general equilibrium for the year 2018 are outlined in Table 4 at the European level. Additionally, results for a select group of peripheral countries (Cyprus, Greece, Malta, Portugal, and Spain) are presented. Detailed country-level results can be found in the Appendix (Tables 7–**??**). The presentation of results focuses on exports, imports, output, and factory-gate prices, excluding OMRs and IMRs. Columns (1)–(4) depict the effects of a 10 percent reduction in distance-related trade costs, while columns (5)–(8) showcase the effects of reducing all trade-cost coefficients by 10 percent.

The effects of all counterfactual experiments shown in Table 4 share the same qualitative features. The decrease in trade costs results in larger trade volumes, real output and factory-gate prices for both public procurement trade and regular trade. The reduction of all trade costs (rather than distance-related costs alone) leads to significantly larger increases in trade flows, illuminating the importance

Table 3: Effects of reducing distance-related trade costs on public procurement trade with goods

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Direct effects		Conditional GE		Full endowment GE					
Country	Exports	Imports	Exports	Imports	Exports	Imports	Output	OMR	IMR	Price
AUT	24.1	26.6	5.6	1.4	10.0	7.7	4.9	-5.4	-0.4	4.4
BEL	24.0	22.4	4.5	1.1	9.2	7.2	4.4	-5.8	0.4	4.8
BGR	27.6	29.5	6.2	4.9	11.2	11.1	5.1	-5.6	-0.4	4.6
CHE	26.1	25.6	0.5	9.4	6.5	15.9	4.4	-7.1	1.4	5.9
CYP	31.9	32.9	13.1	8.9	17.3	15.7	4.0	-5.1	0.2	4.2
CZE	25.6	26.4	4.1	4.1	9.4	10.1	4.8	-5.9	0.1	4.9
DEU	25.8	25.0	1.2	4.0	7.6	9.3	5.6	-6.7	0.0	5.6
DNK	27.8	27.2	11.3	1.0	14.8	7.9	4.5	-5.0	-0.4	4.1
ESP	30.1	29.4	3.6	7.8	10.4	13.2	5.8	-6.9	-0.1	5.7
EST	27.8	29.5	12.0	1.6	15.2	8.5	4.6	-4.7	-0.8	3.8
FIN	27.8	28.5	6.8	2.5	11.7	8.4	5.6	-5.7	-0.9	4.7
FRA	26.9	25.6	3.3	2.3	9.5	7.8	5.8	-6.5	-0.3	5.4
GBR	27.8	26.4	2.2	6.2	8.9	11.5	5.4	-6.7	0.2	5.6
GRC	30.0	30.9	14.3	1.1	17.5	8.0	5.1	-4.7	-1.2	3.8
HRV	25.1	27.6	3.3	6.0	8.7	12.1	4.7	-5.9	0.2	4.9
HUN	25.0	27.4	5.6	2.8	10.2	8.9	4.9	-5.4	-0.5	4.4
IRL	28.1	26.4	5.6	5.0	11.3	11.1	4.9	-6.3	0.4	5.2
ITA	28.4	28.4	5.1	4.1	10.9	10.0	5.5	-6.2	-0.4	5.1
LTU	27.5	28.5	7.6	4.3	12.2	10.5	4.8	-5.5	-0.3	4.5
LUX	24.0	22.9	5.8	3.5	10.4	9.4	3.6	-5.5	0.9	4.5
LVA	27.7	29.0	11.1	1.5	14.6	8.2	4.8	-4.8	-0.8	3.9
MLT	30.5	30.9	27.0	1.2	25.8	10.2	2.1	-2.5	-0.1	2.0
NLD	25.0	23.2	1.0	6.0	7.1	11.9	4.5	-6.7	1.1	5.6
NOR	28.4	28.5	7.7	2.1	12.6	8.2	5.6	-5.7	-0.9	4.7
POL	27.3	28.2	4.0	4.9	9.9	10.6	5.5	-6.3	-0.3	5.2
PRT	30.9	29.3	7.2	7.1	13.1	13.3	5.0	-6.3	0.2	5.2
ROM	28.6	29.8	8.3	3.5	13.1	9.6	5.4	-5.6	-0.8	4.6
SVK	23.2	25.6	6.8	0.7	10.5	7.0	4.6	-5.0	-0.5	4.1
SVN	25.7	26.4	10.9	0.9	13.9	7.7	4.2	-4.6	-0.4	3.8
SWE	27.3	28.9	3.1	5.2	9.0	10.8	5.7	-6.3	-0.5	5.2
Europe	26.7	26.7	2.9	2.9	8.9	8.9	5.5	-6.4	-0.2	5.3

Notes: This table shows the effects (percentage changes) of reduction of distance-related trade costs (distance coefficient) by 10 percent. The values for Europe are obtained as weighted averages. Columns (1)-(2) show the direct effects of counterfactual scenario on exports and imports. Columns (3)-(4) report the conditional GE effects on exports and imports. Columns (5)-(10) show the exports, imports, real output, outward and inward multilateral resistance terms (OMR and IMR) and factory-gate prices for the full-endowment GE. Full endowment GE values are obtained using an estimated parameter $\theta = 3.6$ from Eaton and Kortum (2002).

Table 4: Effects of reducing distance-related and all trade costs: Public procurement vs. regular Trade

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Country	10 % reduction in distance coefficient				10 % reduction of all trade costs			
group	Exports	Imports	Output	Price	Exports	Imports	Output	Price
Panel A. Public procurement trade with goods								
Europe	8.9	8.9	5.5	5.3	67.5	67.5	5.9	3.8
Periphery	10.9	10.8	5.7	5.5	81.7	78.1	6.1	4.4
Panel B. Regular trade with goods								
Europe	17.3	17.3	10.7	10.5	38.1	38.1	13.3	12.1
Periphery	21.7	20.5	11.4	10.6	46.7	44.1	13.6	11.8
Panel C. Public procurement trade with services								
Europe	11.4	11.4	7.9	8.2	47.5	47.5	8.0	10.0
Periphery	12.4	19.7	8.2	9.1	43.0	121.7	8.1	15.2
Panel D. Regular trade with services								
Europe	17.2	17.2	8.4	8.7	74.2	74.2	9.7	10.9
Periphery	19.7	23.1	8.8	9.2	68.2	104.1	10.0	14.0

Notes: This table shows the 'full-endowment' GE results (percentage changes) for scenarios of reducing (i) distance-related trade costs by 10 percent (columns (1)-(4)) and (ii) all trade cost by 10 percent (columns (5)-(8)). The changes reported for Europe and peripheral countries (Cyprus, Greece, Malta, Portugal and Spain) are obtained as weighted averages. The estimates are obtained using an estimated parameter $\theta = 3.6$ from Eaton and Kortum (2002).

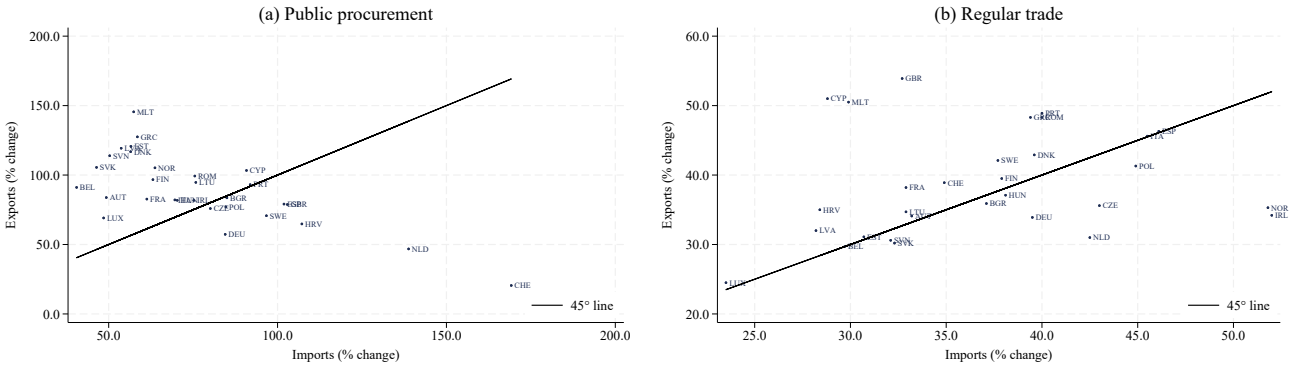
of international border. There are some notable quantitative differences among the various trade flows that merit discussion.

Focusing first on trade flows with goods (panels A and B of Table 4), we see that the same relative reduction of trade costs leads to significantly different changes in trade volumes, output and prices. A 10 percent reduction in distance-related costs results in an 8.9 percent increase in trade volumes (at the European level) for public procurement trade and a more substantial 17.3 percent for regular trade. Likewise, the effects on output and prices are also almost double for regular trade. In contrast, when all bilateral trade costs are reduced by 10 percent, public procurement trade exhibits a large surge of 67.5 percent, surpassing the 38.1 percent increase observed for regular trade.

Another difference between the two types of trade flows can be spotted in Figure 5, which shows the country-level changes in values of trade with goods between public procurement (left panel) and regular trade (right panel) in response to a reduction of all trade costs. Notably, the changes in exports and imports tend to be negatively correlated for procurement trade, whereas the changes for regular trade tend to be positively correlated.

While the effects on trade flows with services (panels C and D of Table 4) broadly mirror those for trade with goods, there are again important quantitative differences. For example, a 10 percent reduction in the distance coefficient increases public procurement trade with services by 11.4 percent,

Figure 5: Effects of reducing all trade costs on trade flows with goods: Public procurement vs. regular trade



Notes: These figures show the 'full-endowment' GE percentage changes in trade flows for scenario reducing all trade cost parameters by 10 percent. The estimates are obtained using an estimated parameter $\theta = 3.6$ from Eaton and Kortum (2002).

while a comparable reduction in all trade cost parameters yields a 47.5 percent boost (both at the European level). Hence public procurement trade with services exhibits 20 percent higher effect for lowering distance and 30 percent lower effect for lowering all trade costs. The latter suggests that international borders present a lesser hurdle for trade with services.

How do these effects on public procurement trade with services compare to those for regular trade with services (panel D of Table 4)? Somewhat surprisingly, public procurement trade displays weaker responsiveness to both distance-related and all components of trade costs. Namely, a 10 percent reduction in the distance-related and all trade costs increase regular trade with services by 17.2 percent and 74.2 percent (both for Europe), respectively, exceeding the effects for public procurement trade with services by more than 50 percent. In comparison to regular trade the international border (as the main hurdle to trade) seems to hamper public procurement trade with goods relatively more than public procurement trade with services.

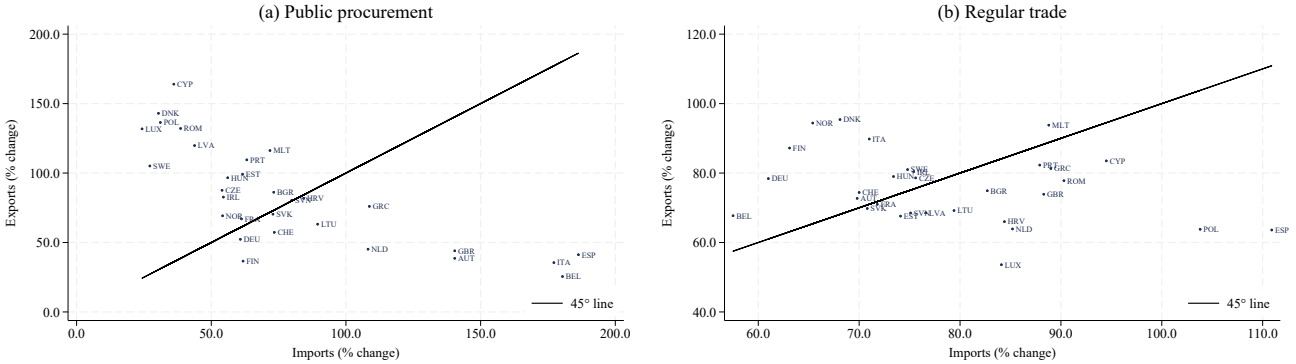
Finally, Figure 6 shows that the relationship between changes in exports and imports for public procurement with services differs from that for regular trade with services. In line with patterns observed for trade with goods, there is a negative correlation between changes in exports and imports for the public procurement trade and a weak positive correlation for the regular trade.

5.4 Counterfactual analysis: regular trade border costs in public procurement trade

The counterfactual analysis of preceding section showed that bilateral trade costs unrelated to distance represent an important barrier to public procurement trade. In this section we deal with international border as the key barrier to trade and raise the following question: how would trade flows change if international border in public procurement presented a similar hurdle to that of regular trade. Specifically, we impose the estimated international border coefficients for regular trade flows on public procurement trade flows (separately for goods and services), while keeping all the remaining parameters in line with the baseline estimates.

The aggregate effects for this experiment are shown in Table 5 with corresponding table showing country-level effects in Appendix (Table 9). As we expected from the differences in the reduced-form

Figure 6: Effects of reducing all trade costs on trade flows with services: Public procurement vs. regular trade



Notes: These figures show the 'full-endowment' GE percentage changes in trade flows for scenario reducing all trade cost parameters by 10 percent. The estimates are obtained using an estimated parameter $\theta = 3.6$ from Eaton and Kortum (2002).

coefficients, the changes in trade flows are rather large for both goods and services. However, European public procurement trade with goods would increase by more than elevenfold, whereas trade with services would increase 255 percent. Although this experiment is affecting countries' trade costs equally (i.e. partial effects are the same), there are large differences across countries. For example, the peripheral countries tend to exhibit even larger changes for both trade flows with goods, while changes in exports are smaller for exports and significantly larger for imports. In spite of extensive trade realocations, the changes in output are relatively small (15 percent for goods and 1.6 percent for services at the European level), primarily due to a small proportions of baseline shares of trade flows in output.

* potentially interesting to combine regular and PP sectors to see whether and if to what extent resources diverted from regular goods manuf to PP goods manuf (and same for services)

5.5 Counterfactual analysis: publishing all tenders in English

The estimates of common language parameters of gravity equations (Table A-1) suggest that mitigating language barriers may provide a significant boost to public procurement trade. One of the policy measures that could be used to stimulate international transactions in public procurement is a mandate to publish contract notices (CNs) in one or all official languages in EU, as it is already mandated for transaction that involve EU funds. In this section, we provide our final counterfactual analysis that attempts to quantify the effects of mandating publication of all CNs in English.

In executing this analysis, we rely on the reduced-form estimates of the coefficients for a common language variable using public procurement trade flows. These estimates capture the additional trade facilitated by shared (official) language between trading partners. We assume that the estimated common language coefficients capture the effects of *all* firms of an exporting country are able to comprehend *all* the public procurement notices in an importing country. This assumption – which may not hold in multilingual countries where only parts of population speak a language of another country – allows use of the estimated coefficients also for the changes in the probability that a random firm in the exporting country comprehends a CN of a random public tender in the importing country.[16]

[16]If this assumption does not hold and the common language variable assumes a value of 1 even for pairs of countries for

Table 5: Effects of replacing regular trade border coefficient

Country	(1) Exports	(2) Imports	(3) Output	(4) Price
Panel A. Public procurement trade with goods				
Europe	1,151.5	1,151.5	15.0	4.1
Periphery	1,334.9	1,281.8	15.7	6.4
Panel B. Public procurement trade with services				
Europe	254.6	254.6	1.6	7.7
Periphery	167.7	801.4	0.6	20.4

Notes: This table shows the 'full-endowment' GE results (percentage changes) for scenario of replacing international border coefficients for public procurement trade with corresponding coefficients for regular trade. The changes reported for Europe and peripheral countries (Cyprus, Greece, Malta, Portugal and Spain) are obtained as weighted averages using the baseline values of variables for construction of country-sector specific weights. The estimates are obtained using an estimated parameter $\theta = 3.6$ from Eaton and Kortum (2002).

We implement this counterfactual scenario by replacing the values of common language variable with the change in the probability that a firm from exporting country is able to understand CN in English. This probability measure is determined as a product of the proportion of English speakers in exporting country and the change of the share of CNs published in English in the importing country due to mandate to publish all tenders in English. This approach assumes that the actual share of tenders published in English is already reflected in the baseline scenario trade flows. By the same logic, we also apply changes only to international trade flows and country pairs that do not share a common language. The latter rules out the possibility that we attribute to country pairs with common language, which already benefit from lower linguistic barriers, a value lower than 1.

The share of English speakers for our set of countries is obtained from the Special Eurobarometer 386 survey (2012). This survey, titled 'Europeans and their languages', was conducted from February 25, 2012 to March 11, 2012, and included responses of 26,571 participants from 27 EU countries. The survey question D48 asked about whether a person is a native speaker (item a) or able to speak well enough to hold a conversation in English (items b to d). The shares that we report and use are calculated as sums of proportions of English speakers across all four questions. ADD: Jo, could you add the reference to the source of values for countries not included in the survey? While this survey dates back to 2012, we posit that the shifts in the shares of English speakers have likely occurred gradually. Consequently, we contend that these shares remain applicable to the year 2018, the year for which our counterfactual analysis is conducted. The country-level shares are reported in Appendix (column (1) of Table 10), ranging between 22.1 percent (Spain) and 98.7 percent (Ireland) and the unweighted EU mean at 54.4 percent.

The information on languages in which CNs were published is sourced from TED. Utilizing tender-level data, we constructed an indicator variable that assumed a value 1 for a tender that was published in English and calculated unweighted country-level shares of CNs in English, separately for goods and services. The shares reported in Appendix (Table 10, column (2) for goods and column (7) for services) reveal even greater variation across countries with range of values between 0 and 100 percent. Unweighted shares for Europe in 2018 were 14.2 percent for goods and 13.5 percent for services.

Table 6 summarizes the key results of mandating all CNs in English for Europe, and three subgroups of countries based on shares of English speakers and baseline share of tenders published in English (see Appendix, Table 10 for country-level effects). We distinguish between high and low English proficiency, where we apply 50 percent as a cutoff, and within a group of high proficiency countries between those that publish all tenders in English (essentially where English is official language) and others. The shares of English speakers and tenders reported for country groups are calculated as weighted averages with output and expenditures shares in the baseline scenario. These weighted shares reported in Table 6 differ from corresponding unweighted shares, for services in particular. For example, the share of English speakers and tenders for Europe are 54.8 (64.2) percent and 19.3 (34.0) percent for goods (services).

The effects of publishing all CNs in English on trade flows, output and prices are generally mixed and suggest that only trade with goods could be stimulated with English tenders. When considering Europe as a whole public procurement trade volume increases by 14.9 percent for goods and decreases

which the probability that trading partners are able to communicate is less than 1, the estimated reduced-form gravity equation coefficients for common language are likely downward biased in comparison to estimates that would be based on a continuous probability measure that random partners from countries comprehend each other. Then also the effects on trade flows obtained in counterfactual analysis are likely downward biased.

Table 6: Effects of publishing all tenders in English

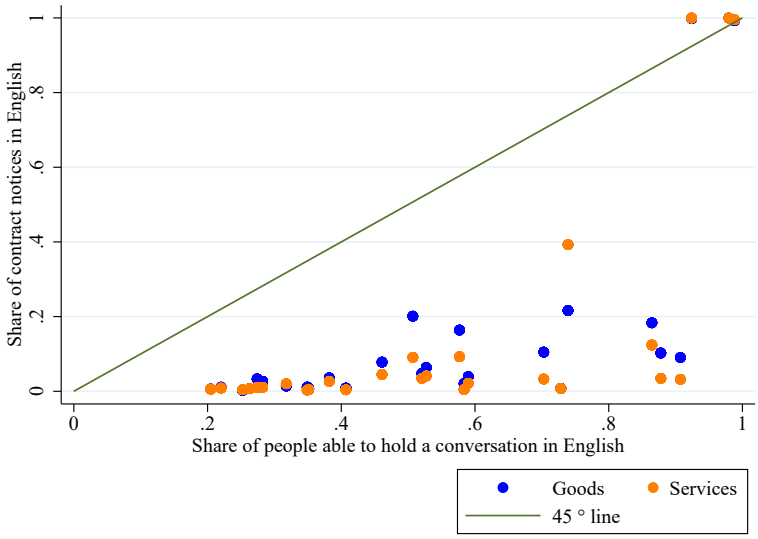
Country group	(1) Eng. speakers	(2) Eng. tenders	(3) Exports	(4) Imports	(5) Output	(6) Price
Panel A. Public procurement trade with goods						
Europe	54.8	19.3	14.9	14.9	0.1	-0.7
High proficiency, high tender share	97.9	100.0	24.8	18.7	0.0	4.3
High proficiency, low tender share	66.5	3.8	12.7	13.3	0.1	-0.5
Low proficiency	35.8	1.0	14.7	15.7	0.1	-2.4
Panel B. Public procurement trade with services						
Europe	64.2	34.0	-1.9	-1.9	0.2	7.8
High proficiency, high tender share	97.9	100.0	-14.4	91.8	0.2	31.7
High proficiency, low tender share	75.0	2.7	2.8	-9.2	0.5	-3.9
Low proficiency	37.7	0.4	1.7	-6.7	0.1	-4.7

Notes: This table shows the 'full-endowment' GE results (percentage changes) for scenario of replacing international border coefficients for public procurement trade with corresponding coefficients for regular trade. The values reported for different country groups are obtained as weighted averages using the baseline values of variables for construction of country-sector specific weights. The shares of English speakers and tenders published in English (given in percent) are weighted using output and expenditure shares, respectively. The estimates are obtained using an estimated parameter $\theta = 3.6$ from Eaton and Kortum (2002).

by 1.9 percent for services. Nevertheless, real output increases for both goods and services by 0.1 and 0.2 percent, respectively. Consistently with shifts in trade flows, factory-gate prices decrease by 0.7 percent for goods and increase 7.8 percent for services, respectively. These differences between goods and services may be at least partly attributed to higher initial share of tenders published in English for services, providing slightly weaker stimulus to trade.

Regarding the outcomes for the three country groups, we anticipate that countries with higher English proficiency should exhibit a more pronounced increase in exports. Simultaneously, countries with higher baseline share of English tenders are expected to have a greater increase in imports, all while adhering to the country-level trade balance constraint. The results, however, do not fully conform with these expectations, mostly for trade with goods. Namely, for countries with English as official language (denoted high proficiency, high tender share) – for these countries the share of English tenders could not increase and the partial effect on imports is (by construction) equal to zero – we observe larger effects for exports than for imports, and also higher increase in exports than for the two groups with lower English proficiency. For services – in contrast – the same group of countries exhibits a large increase in imports, while even reducing exports.

Figure 7: Trade from i to j and vice versa



* Need to think of a good way of presenting the results

6 Conclusions

* TODO: Jo

7 Appendix

Table 7: Effects of reducing trade costs on public procurement trade with goods

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	10 % reduction in distance coefficient				10 % reduction in all trade costs			
Country	Exports	Imports	Output	Price	Exports	Imports	Output	Price
AUT	10.0	7.7	4.9	4.4	83.8	49.3	5.9	1.1
BEL	9.2	7.2	4.4	4.8	91.1	40.5	6.3	0.9
BGR	11.2	11.1	5.1	4.6	83.6	85.0	6.2	2.3
CHE	6.5	15.9	4.4	5.9	20.5	169.2	4.9	13.7
CYP	17.3	15.7	4.0	4.2	103.3	90.8	6.0	2.0
CZE	9.4	10.1	4.8	4.9	75.9	80.1	5.4	3.2
DEU	7.6	9.3	5.6	5.6	57.3	84.5	5.7	5.7
DNK	14.8	7.9	4.5	4.1	116.8	56.5	5.4	-0.3
ESP	10.4	13.2	5.8	5.7	79.1	101.9	6.1	4.9
EST	15.2	8.5	4.6	3.8	120.6	56.6	6.4	-1.4
FIN	11.7	8.4	5.6	4.7	96.7	63.1	6.8	1.0
FRA	9.5	7.8	5.8	5.4	82.7	61.3	6.0	3.2
GBR	8.9	11.5	5.4	5.6	78.8	102.9	5.5	4.8
GRC	17.5	8.0	5.1	3.8	127.5	58.5	6.3	-1.3
HRV	8.7	12.1	4.7	4.9	64.8	107.2	5.9	4.9
HUN	10.2	8.9	4.9	4.4	81.8	70.3	6.2	1.1
IRL	11.3	11.1	4.9	5.2	81.7	75.2	6.6	4.3
ITA	10.9	10.0	5.5	5.1	82.1	69.6	5.9	3.1
LTU	12.2	10.5	4.8	4.5	94.7	75.8	6.3	1.7
LUX	10.4	9.4	3.6	4.5	69.1	48.5	9.4	3.8
LVA	14.6	8.2	4.8	3.9	119.3	53.7	6.8	-1.4
MLT	25.8	10.2	2.1	2.0	145.5	57.4	3.8	-3.0
NLD	7.1	11.9	4.5	5.6	46.8	138.8	4.8	9.6
NOR	12.6	8.2	5.6	4.7	105.2	63.7	6.7	0.6
POL	9.9	10.6	5.5	5.2	77.1	84.7	6.1	3.8
PRT	13.1	13.3	5.0	5.2	93.1	91.9	6.1	3.8
ROM	13.1	9.6	5.4	4.6	99.3	75.5	6.2	1.2
SVK	10.5	7.0	4.6	4.1	105.5	46.4	6.3	-1.5
SVN	13.9	7.7	4.2	3.8	113.9	50.3	5.7	-1.7
SWE	9.0	10.8	5.7	5.2	70.7	96.7	6.3	4.0
EU	8.9	8.9	5.5	5.3	67.5	67.5	5.9	3.8

Notes: This table shows the 'full-endowment' GE results (percentage changes) for scenarios of reducing (i) distance-related trade costs by 10 percent (columns (2)-(5)) and (ii) all trade cost by 10 percent (columns (6)-(9)). The estimates are obtained using an estimated parameter $\theta = 3.6$ from Eaton and Kortum (2002).

Table 8: Effects of reducing trade costs on regular trade with goods

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	10 % reduction in distance coefficient				10 % reduction in all trade costs			
Country	Exports	Imports	Output	Price	Exports	Imports	Output	Price
AUT	16.6	16.5	10.3	10.4	34.1	33.2	14.3	12.6
BEL	14.0	14.3	9.2	9.9	29.7	29.7	13.3	12.3
BGR	18.2	18.5	11.8	10.9	35.9	37.1	18.0	14.0
CHE	18.6	17.7	9.7	9.9	38.9	34.9	13.0	11.6
CYP	28.4	18.0	12.2	10.0	51.0	28.8	19.5	12.4
CZE	16.8	19.0	10.1	10.6	35.6	43.0	13.9	13.2
DEU	15.0	16.0	10.6	10.6	33.9	39.5	12.2	12.2
DNK	19.8	19.1	10.0	10.2	42.9	39.6	14.2	12.3
ESP	21.2	20.7	11.4	10.6	46.3	46.1	13.3	11.8
EST	16.5	16.3	11.7	10.9	31.1	30.7	19.6	14.7
FIN	18.8	18.2	11.7	10.9	39.5	37.9	15.8	13.1
FRA	16.1	14.8	11.3	10.6	38.2	32.9	14.0	11.9
GBR	19.6	15.1	10.5	9.9	53.9	32.7	12.6	10.0
GRC	23.4	20.3	11.5	10.5	48.3	39.4	15.9	12.3
HRV	17.1	15.1	11.4	10.6	35.0	28.4	19.0	13.8
HUN	17.3	17.7	10.6	10.5	37.1	38.1	15.1	13.0
IRL	17.7	23.4	10.2	10.7	34.2	52.0	13.6	13.3
ITA	20.7	20.5	10.7	10.4	45.6	45.5	12.2	11.5
LTU	18.2	17.5	11.8	10.9	34.7	32.9	18.8	14.3
LUX	14.3	14.0	9.7	10.1	24.5	23.5	17.2	13.8
LVA	17.4	15.9	12.5	11.2	32.0	28.2	21.1	15.0
MLT	28.7	18.8	9.9	9.0	50.5	29.9	17.2	11.6
NLD	14.1	16.9	9.0	10.2	31.0	42.5	12.2	12.9
NOR	17.2	21.4	11.4	11.2	35.3	51.8	14.9	14.3
POL	18.6	19.5	11.0	10.8	41.3	44.9	13.7	12.7
PRT	23.2	20.4	10.7	10.1	48.9	40.0	14.2	11.5
ROM	21.7	19.2	11.3	10.5	48.3	40.0	14.8	11.9
SVK	14.6	15.2	10.0	10.3	30.2	32.3	15.5	13.4
SVN	16.4	17.0	10.7	10.6	30.6	32.1	17.6	14.0
SWE	18.6	17.3	11.6	10.8	42.1	37.7	15.3	12.7
EU	17.3	17.3	10.7	10.5	38.1	38.1	13.3	12.1

Notes: This table shows the 'full-endowment' GE results (percentage changes) for scenarios of reducing (i) distance-related trade costs by 10 percent (columns (2)-(5)) and (ii) all trade cost by 10 percent (columns (6)-(9)). The estimates are obtained using an estimated parameter $\theta = 3.6$ from Eaton and Kortum (2002).

Table 9: Effects of replacing regular trade border coefficient, by country

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Goods				Services			
Country	Exports	Imports	Output	Price	Exports	Imports	Output	Price
AUT	1,952.1	480.0	35.2	-6.7	190.6	1,183.0	2.9	20.0
BEL	1,639.7	408.9	75.1	9.2	123.4	2,770.8	8.1	43.5
BGR	1,238.4	985.1	32.9	0.2	414.6	323.4	6.2	-3.3
CHE	245.9	3840.3	73.5	63.5	410.3	550.7	21.4	18.4
CYP	1,121.2	765.9	49.5	6.1	819.0	64.0	9.9	-19.2
CZE	1,389.5	1,391.6	20.0	1.8	522.4	259.6	4.7	-8.0
DEU	857.3	2,759.7	14.1	14.1	317.8	411.3	3.9	3.9
DNK	3,848.1	328.5	27.8	-17.5	1,176.8	74.6	1.9	-23.2
ESP	1,255.6	2662.1	13.5	8.6	159.5	1,515.3	0.4	21.5
EST	2,184.2	294.5	47.8	-11.4	456.4	231.2	4.1	-10.8
FIN	1,822.3	666.0	35.5	-4.9	248.1	354.0	4.8	-8.8
FRA	1,921.0	1,332.1	7.8	-2.2	389.7	404.3	0.9	3.8
GBR	988.1	3,295.1	6.3	10.7	210.2	1,227.2	0.4	16.6
GRC	3,450.0	252.4	33.8	-19.9	306.1	479.8	3.9	1.7
HRV	766.8	1,370.5	39.1	11.8	389.2	391.5	7.1	0.8
HUN	1,368.4	682.6	35.2	-5.4	555.7	264.7	5.0	-7.0
IRL	1,067.4	997.9	66.0	24.1	725.5	384.9	12.5	6.5
ITA	1,614.8	1,286.6	13.7	-2.1	130.7	1,831.0	0.0	27.6
LTU	1,392.6	791.6	40.0	1.2	288.4	407.5	4.4	-3.1
LUX	482.7	303.0	170.0	43.8	1,373.8	41.7	24.3	-14.6
LVA	2043.3	279.1	52.9	-9.9	628.2	142.6	4.3	-16.6
MLT	3,388.5	142.9	52.2	-17.7	532.3	262.8	8.4	-3.5
NLD	551.1	3,293.9	33.5	34.0	206.5	754.4	1.2	17.2
NOR	2,158.5	598.1	31.1	-8.5	379.3	246.6	3.1	-10.0
POL	1,305.7	1,613.8	18.6	3.9	1093.4	100.0	2.6	-21.0
PRT	1,283.2	1,272.5	34.5	9.2	509.8	260.3	4.4	-5.9
ROM	1,994.6	827.5	20.4	-9.3	813.6	134.7	4.3	-16.3
SVK	2,300.6	222.8	55.3	-13.0	379.6	373.1	4.6	-3.3
SVN	2,733.2	218.4	48.3	-15.9	378.3	364.3	6.3	0.9
SWE	1,076.0	1,766.1	19.0	3.7	1,373.3	69.7	3.1	-24.9
Europe	1,151.5	1,151.5	15.0	4.1	254.6	254.6	1.6	7.7

Notes: This table shows the 'full-endowment' GE results (percentage changes) for scenario of replacing international border coefficient for public procurement trade with corresponding coefficient for regular trade (by sector). The changes reported for Europe are obtained as weighted averages. The estimates are obtained using an estimated parameter $\theta = 3.6$ from Eaton and Kortum (2002).

Table 10: Effects of publishing all tenders in English, by country

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
		Goods					Services				
Country	Eng. speakers	Eng. tenders	Exports	Imports	Output	Price	Eng. tenders	Exports	Imports	Output	Price
AUT	72.8	0.0	27.2	6.9	0.2	-1.8	0.7	-10.1	115.5	0.7	9.6
BEL	52.7	3.8	3.6	1.4	0.1	-1.1	3.0	-3.1	6.3	0.0	0.7
BGR	25.2	0.3	12.6	16.6	0.3	-3.8	0.1	22.2	-3.4	0.5	-13.5
CHE	73.0	7.7	0.4	9.2	-0.1	-0.3	2.2	-1.8	10.2	0.5	1.4
CYP	73.9	8.0	29.5	20.8	0.6	-1.4	46.2	81.4	-12.0	0.8	-8.3
CZE	27.3	3.1	14.3	20.8	0.2	-3.0	0.5	39.0	-9.7	0.4	-15.6
DEU	58.4	1.6	11.8	28.2	0.1	0.1	0.5	6.8	31.5	0.6	0.6
DNK	86.5	15.0	61.0	9.5	0.3	-3.6	6.4	265.2	-25.5	0.2	-17.6
ESP	22.1	1.0	8.8	25.1	0.1	-2.2	1.3	-7.4	55.2	0.1	-4.2
EST	50.6	13.7	33.1	9.0	0.4	-4.3	7.1	46.9	-2.0	0.6	-12.3
FIN	70.3	12.9	28.1	12.5	0.3	-2.2	2.4	-8.9	-19.2	0.2	-17.2
FRA	40.7	0.8	16.5	15.5	0.1	-2.1	0.3	10.5	12.7	0.1	-3.2
GBR	97.9	100.0	25.3	24.8	0.0	4.3	100.0	-15.6	188.5	0.2	31.8
GRC	28.0	2.6	24.3	7.1	0.2	-5.4	2.4	8.7	10.4	0.4	-10.0
HRV	27.0	2.9	8.9	22.5	0.3	-2.7	1.1	22.5	7.2	0.7	-11.5
HUN	20.5	0.5	13.3	13.0	0.3	-4.6	0.4	34.5	-12.3	0.3	-16.1
IRL	98.7	100.0	20.0	11.0	0.1	4.0	100.0	1.3	33.8	0.3	29.7
ITA	35.0	0.9	15.3	15.1	0.1	-2.3	0.2	-11.5	66.3	0.2	0.9
LTU	38.1	1.6	21.0	16.7	0.4	-3.5	1.2	10.4	13.8	0.6	-10.7
LUX	57.7	20.7	3.4	2.5	0.3	-1.0	13.6	8.0	-3.7	0.2	-2.8
LVA	46.1	4.6	32.4	9.5	0.5	-4.8	3.8	68.5	-19.0	0.4	-16.5
MLT	92.2	100.0	39.7	0.6	0.2	0.1	100.0	-1.9	33.0	0.5	20.3
NLD	90.7	3.2	18.0	58.9	0.1	3.7	1.5	-2.4	204.4	0.8	20.1
NOR	79.0	11.4	50.0	18.3	0.4	-3.1	4.7	72.4	26.8	0.9	-7.8
POL	35.0	0.5	15.2	23.8	0.2	-2.5	0.1	97.8	-27.8	0.1	-19.8
PRT	28.1	1.1	13.9	18.8	0.3	-2.7	0.4	35.0	-9.8	0.3	-13.4
ROM	31.8	1.2	19.8	14.2	0.2	-4.2	1.5	63.1	-22.6	0.2	-17.6
SVK	26.4	0.0	24.6	6.7	0.4	-5.5	0.0	16.5	0.6	0.4	-13.9
SVN	58.9	2.2	45.2	7.9	0.4	-5.1	2.2	41.0	35.7	1.2	-5.3
SWE	87.8	5.1	25.4	34.9	0.2	0.0	2.5	115.9	-27.4	0.1	-19.1
Europe	54.4	14.2	14.9	14.9	0.1	-0.7	13.5	-1.9	-1.9	0.2	7.8

Notes: This table shows the 'full-endowment' GE results (percentage changes) for scenario of replacing international border coefficient for public procurement trade with corresponding coefficient for regular trade (by sector). The changes reported for Europe are obtained as weighted averages. The estimates are obtained using an estimated parameter $\theta = 3.6$ from Eaton and Kortum (2002).

Pages refer to main0.tex. I tried to keep the correct figures/tables here.

- First descriptive Tables & Figures
- Section 4: Gravity equation estimates (reverse ordering from below):
  - Table 1: Side by side PP & RT, without border (excl. internal trade)
  - Table 2: Side by side PP & RT, with border (incl. internal trade)
  - What is difference with other results (previously Table 5, now Table 3)? Estimation method?
- Section 5: Structural estimates
  - Table 3: 10% reduction in trade costs, PP estimates, only 3 of the current columns (showing $\%\Delta E$, $\%\Delta I$, $\%\Delta P$), left only the distance coefficient, right both distance, border, and t_{ij} coefficients. $\rightarrow$ use this table to illustrate how the model and nature of adjustment works (might be necessary to bring back some of the other columns)
  - Table A1: corresponding table for RT estimates in Appendix
  - Figure A1: 2 graphs side by side for exports & imports, showing change in X/I for PP versus RT after 10% decline in trade costs in Appendix (below on pages 25 & 26)
  - Figure 1: 2 graphs side by side for PP and RT, change in imports v. change in exports following 10% decrease in all trade costs (below on pages 27 & 28)
  - Table 4: 2 columns (for counterfactual changes in PP when (1) all RT trade costs are imposed, (2) all notices are in English). Rows for (many) variables: Aggregate (or country-level average) changes in prices, imports, exports, quantities imported, exported,...
  - Figure 2: Counterfactual change in IM versus change in EX for PP when regular trade costs (all) are imposed (below on page 29)
  - Figure 3: Counterfactual change in IM versus change in EX for PP when all contract notices are in English (below on page 30)

Throughout I am not sure whether we want to use the t_{ij} from trade as well when we impose RT trade costs on PP. In principle we do, but it might lead to much larger changes that are not easy to justify if the 2 sets of t_{ij} from RT and PP differ too much. Maybe we should look directly at a graph plotting these 2 sets of coefficients against each other.

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Table 4 & 5 to be combined in 1 Table

Table 3: Procurement goods

	10 % reduction in distance coefficient			10 % reduction in all trade costs		
	$\%\Delta exports$	$\%\Delta imports$	$\%\Delta prices$	$\%\Delta exports$	$\%\Delta imports$	$\%\Delta prices$
AUT	51	24	-3.9	50	23	-3.7
BEL	57	14	-5.3	61	15	-5.6
BGR	54	35	-4.9	47	30	-4.5
CHE	12	85	3.3	11	82	3.2
CYP	32	31	-5	26	25	-4.3
CZE	26	31	-4.1	29	33	-3.9
DEU	25	60	.19	25	60	.19
DNK	62	19	-4.7	58	18	-4.5
ESP	35	69	-.36	29	57	-.64
EST	46	10	-7.8	49	10	-7.3
FIN	52	30	-4.3	47	27	-3.9
FRA	50	33	-3.1	47	32	-3.2
GBR	29	59	.62	28	57	.5
GRC	85	11	-9	70	8.7	-8.1
HRV	24	58	-.84	24	58	-.52
HUN	46	18	-5	45	17	-4.8
IRL	46	42	.85	47	43	.72
ITA	44	40	-3.2	39	35	-3.1
LTU	42	20	-7.3	44	19	-6.7
LUX	35	18	-4.2	41	21	-4.4
LVA	55	5.5	-9.3	57	4.9	-8.6
MLT	91	5.4	-9.6	79	4.6	-8.8
NLD	21	48	.54	23	55	.71
NOR	54	27	-4.6	48	24	-4.2
POL	38	47	-2	34	42	-1.9
PRT	49	49	-1.3	42	42	-1.4
ROM	73	25	-6.2	61	21	-5.7
SVK	60	11	-7.2	68	13	-7.3
SVN	64	6.3	-6.9	69	6.7	-7
SWE	37	52	-2.4	35	48	-2.2
N	30					

Prices in columns 3 and 6 are factory-gate prices.

Table 3: Procurement services

	10 % reduction in distance coefficient			10 % reduction in all trade costs		
	$\%\Delta exports$	$\%\Delta imports$	$\%\Delta prices$	$\%\Delta exports$	$\%\Delta imports$	$\%\Delta prices$
AUT	19	96	4.8	16	80	4.3
BEL	6.6	83	4.3	6.3	81	4.2
BGR	59	20	-5.7	44	15	-4.6
CHE	27	57	.37	23	49	.28
CYP	85	11	-6	51	7.9	-3.9
CZE	56	19	-7.3	54	18	-6.1
DEU	32	40	.19	28	36	.18
DNK	29	9.6	-5.7	28	8.2	-4.4
ESP	18	98	3.8	12	67	2.6
EST	48	13	-8.2	50	14	-6.8
FIN	25	43	-3.8	23	36	-2.3
FRA	40	36	-1.8	33	30	-1.7
GBR	16	57	-.58	13	50	-.53
GRC	41	63	1.4	29	44	.94
HRV	43	32	-3.2	42	32	-3
HUN	57	12	-4.2	51	11	-3.9
IRL	68	38	-2	59	33	-1.8
ITA	16	97	4	12	71	3
LTU	20	34	-4.4	21	31	-2.9
LUX	67	7.1	-3.9	67	7.4	-4
LVA	70	8.5	-9	63	7.3	-7.2
MLT	72	37	-2.5	51	26	-2.2
NLD	21	62	3	20	62	2.8
NOR	48	22	-5.9	42	18	-4.5
POL	54	13	-6.2	43	9.8	-4.9
PRT	76	30	-2.6	57	24	-2.7
ROM	85	24	-3.5	59	18	-2.9
SVK	33	32	-5.5	32	29	-4.4
SVN	33	28	-2.5	34	29	-2.2
SWE	88	8.9	-9.1	70	6.8	-7.2
N	30					

Prices in columns 3 and 6 are factory-gate prices.

Table 6 & 7 combined in Table for the Appendix

Select Figures and Tables for descriptive analysis section from main0.tex file

Similarly, there are many more figures showing counterfactual results in main0.tex

Figure 1: Services

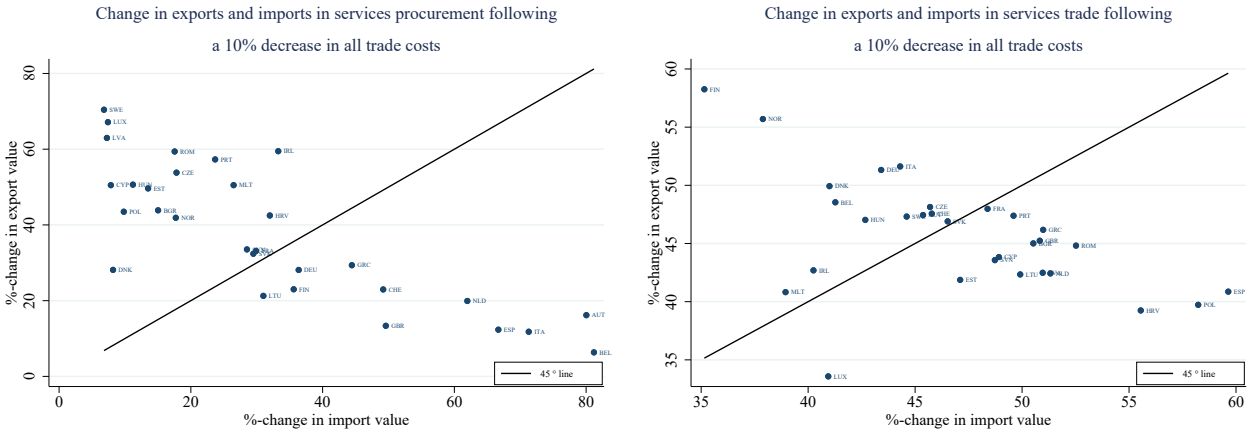


Table 4: Goods

	RT tradecosts imposed on PP-trade	All contract notices in English
%Δ export value	825	112
%Δ import value	674	81
%Δ importer price	-38	-18
%Δ consumer price	-2.3	-2.7
%Δ import quantity	1665	129
%Δ consumption quantity	31	1.9
%Δ internal quantity	-22	-2.9

Table 4: Services

	RT tradecosts imposed on PP-trade	All contract notices in English
%Δ export value	530	120
%Δ import value	154	69
%Δ importer price	-19	-17
%Δ consumer price	-8	1.3
%Δ import quantity	440	118
%Δ consumption quantity	7.8	2.4
%Δ internal quantity	-3.2	-.93

Figure 2: RT trade costs imposed on PP trade

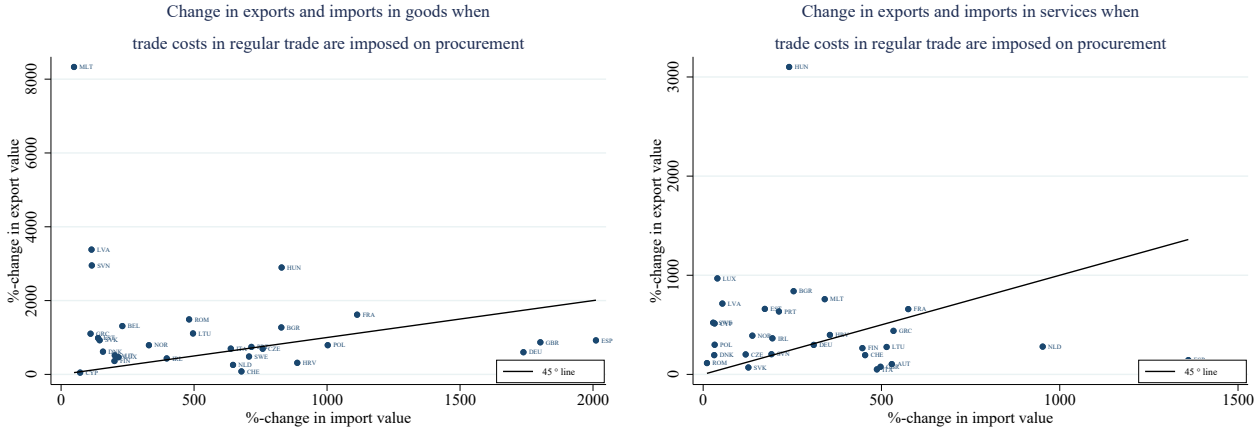


Figure 3: All contract notices in English

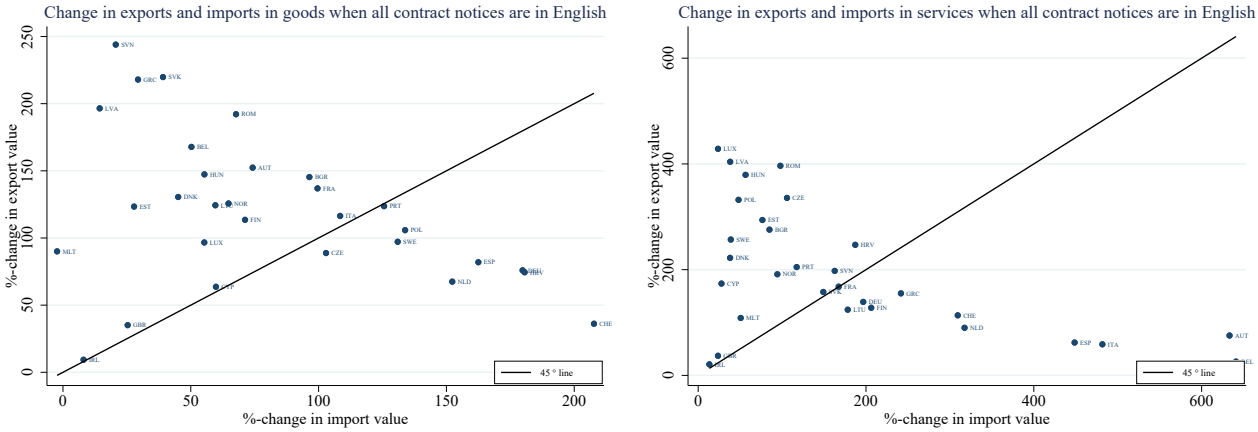


Figure for Appendix:

Appendix

A-1 Data description

Table A-1: Including domestic consumption

	International trade		All trade		English
	Procurement	Regular trade	Procurement	Regular trade	Procurement
Log of distance	-0.544***	-0.502***	-0.373***	-0.598***	-0.544***
	(0.100)	(0.021)	(0.090)	(0.015)	(0.100)
Contiguity	1.301***	0.474***	1.292***	0.454***	1.301***
	(0.145)	(0.026)	(0.140)	(0.033)	(0.145)
Common official language	0.688**	0.301***	1.012***	0.286***	0.688**
	(0.237)	(0.042)	(0.244)	(0.038)	(0.237)
Eurozone	0.210	0.0550	-0.418*	0.110***	0.210
	(0.223)	(0.034)	(0.169)	(0.025)	(0.223)
Border crossing			-6.586***	-3.925***	
			(0.221)	(0.032)	
English					16.34***
					(1.431)
Observations	8442	8526	8820	8820	8442
Pseudo R^2					

Notes: All specifications are estimated on years from 2009 to 2018 and 30 countries, and include exporter-time and importer-time fixed effects. Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A1: Regular trade goods

	10 % reduction in distance coefficient			10 % reduction in all trade costs		
	$\%\Delta exports$	$\%\Delta imports$	$\%\Delta prices$	$\%\Delta exports$	$\%\Delta imports$	$\%\Delta prices$
AUT	38	38	5	32	30	3.8
BEL	33	34	4.5	31	30	3.8
BGR	42	47	4.2	32	35	3.3
CHE	43	37	4	35	30	3.1
CYP	107	11	-4.5	59	14	-1.7
CZE	33	44	5.8	28	35	4.4
DEU	39	49	4	32	39	3.1
DNK	42	38	4.3	33	30	3.2
ESP	53	52	3	37	37	2.4
EST	35	35	4.6	30	29	3.7
FIN	50	48	3.4	37	35	2.5
FRA	49	38	2.6	39	31	2.2
GBR	62	29	.95	46	25	1.1
GRC	66	40	1.1	43	29	1.2
HRV	55	26	1.2	44	23	1.2
HUN	33	35	6.2	27	28	4.6
IRL	32	51	5.5	25	39	4.4
ITA	54	52	2.7	38	38	2.2
LTU	44	39	4	34	30	3
LUX	25	23	6	24	21	5.1
LVA	44	31	3.3	36	25	2.5
MLT	59	23	2.2	41	17	1.6
NLD	29	46	5.4	27	40	4.4
NOR	33	60	6	26	44	4.5
POL	44	52	4.5	34	38	3.3
PRT	53	40	3	38	30	2.3
ROM	62	42	1.8	42	31	1.6
SVK	30	35	6.1	26	29	4.7
SVN	32	36	5.5	27	30	4.4
SWE	45	41	4.3	34	30	3.1
N	30					

Prices in columns 3 and 6 are factory-gate prices.

Table A1: Regular trade services

	10 % reduction in distance coefficient			10 % reduction in all trade costs		
	$\%\Delta exports$	$\%\Delta imports$	$\%\Delta prices$	$\%\Delta exports$	$\%\Delta imports$	$\%\Delta prices$
AUT	70	66	1.8	47	45	1.3
BEL	63	53	1.8	49	41	1.3
BGR	72	81	2.8	45	51	1.9
CHE	69	66	1.8	48	46	1.3
CYP	80	89	3.3	44	49	2.2
CZE	69	65	1.8	48	46	1.3
DEU	74	62	1.1	51	43	.79
DNK	75	61	.98	50	41	.67
ESP	68	100	3.7	41	60	2.6
EST	58	66	2.2	42	47	1.8
FIN	92	55	-.85	58	35	-.63
FRA	68	69	1.8	48	48	1.3
GBR	66	74	2.2	45	51	1.7
GRC	81	89	2.4	46	51	1.6
HRV	55	79	3.7	39	56	2.7
HUN	70	63	2.1	47	43	1.5
IRL	65	61	3.5	43	40	2.3
ITA	85	72	1	52	44	.72
LTU	65	76	3.2	42	50	2.3
LUX	44	53	5	34	41	3.8
LVA	62	74	2.9	42	51	2.1
MLT	69	66	4.2	41	39	2.6
NLD	57	69	2.7	42	51	2.1
NOR	86	58	-.23	56	38	-.19
POL	63	93	3.6	40	58	2.6
PRT	78	81	2.8	47	50	1.9
ROM	75	88	2.6	45	53	1.8
SVK	64	64	2	47	47	1.5
SVN	60	67	2.8	44	49	2.1
SWE	74	70	1.2	47	45	.88
N	30					

Prices in columns 3 and 6 are factory-gate prices.

Figure A1: Goods

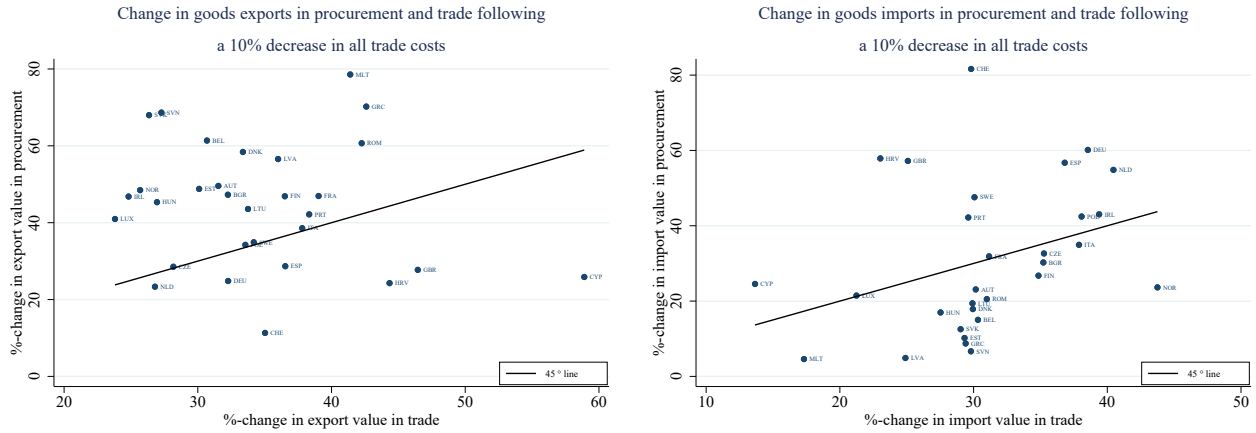
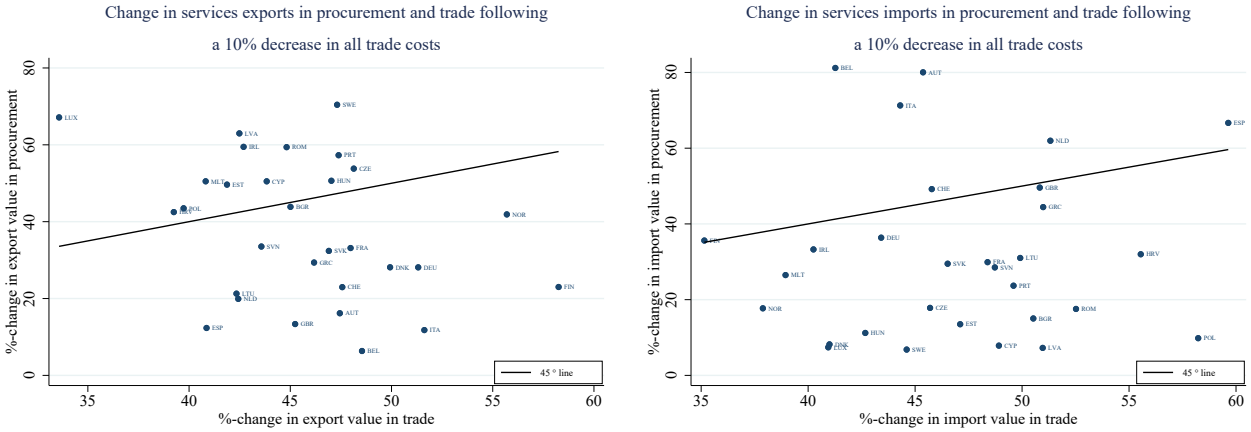


Figure A1: Services



Online Appendix: Not for Publication