Proximity as a Substitute of Contract Enforcement in Specialized Trade*

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Abstract

We examine how geographic proximity can substitute for contract-enforcement institutions in enabling international exports of specialized goods. When exporters must meet buyers' specific product requirements, successful trade depends on either strong contract enforcement or close buyer-seller relationships that enable monitoring and trust. We argue that geographic proximity facilitates such relationships by reducing the costs of frequent business travel. Our theoretical framework predicts that institutional quality should primarily affect specialized trade over longer distances, as proximity-based relationship-building becomes prohibitively expensive. Using bilateral, product-specific export data in a gravity model, we find strong empirical support for this prediction. Consistent with our theory, we also show that business travel expenses and passenger flights decline more sharply with distance when destination countries have weak contract enforcement institutions.

Keywords: International trade, Contract enforcement, Relationship-specific trade, specialized goods, Gravity model, Business travel.

JEL Classification: F14, F15, K12, L14

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1 Introduction

The international trade literature has shown how contract enforcement institutions are key for countries to compete in "contract intensive" activities (Levchenko, 2007; Nunn, 2007). Indeed, as trade in specialized goods involves the risk that providers do not meet costly idiosyncratic requirements, importers are unlikely to procure such goods from countries lacking opportunities for legal recourse. Contract enforcement institutions, however, should be most relevant for specialized trade when importers are unable to find, monitor and build trust with their suppliers. If these and other "relational" dynamics are enabled between countries that are better connected to each other, then partner proximity should work as a substitute for exporting countries' contract-enforcement institutions.

In this paper, we provide a theoretical framework and empirical evidence consistent with the view that connectivity to destination countries works as a substitute of exporters' contract enforcement institutions in determining their competitiveness in markets for specialized goods. We first introduce a stylized model of international procurement choices for specialized goods. Buyers determine how much they want to buy from a foreign provider, and then, they choose how much to spend in business travel for sustaining the relationship. Frequent travel induces providers to meet buyers' specific requirements *before* any payments are made, and the cost of travel is determined by the connectivity between both countries. The buyer realizes whether product customization was successful or not only *after* payments have been transferred. The buyer can sue for damages in front of the provider's national courts, with chances of success being contingent on the quality of contract-enforcement institutions in the provider's country.

The framework suggests that bilateral connectivity and origin country contract-enforcement institutions should work as substitutes: Importers of specialized items may procure these goods from connected countries with bad contract enforcement institutions because private costs of travel are not prohibitive. However, the frequent travel necessary to develop relationship-specific transactions can become prohibitively costly between disconnected countries, such that specialized imports become contingent on the possibility of legal recourse via good contract-enforcement institutions in the exporting country.[1] We test for this prediction by estimating a gravity model of trade on bilateral product-specific export data. Consistent with the current literature, we find that exporter contract-enforcement institutions enable trade in specialized goods at average bilateral distances. However, consistent with our model, we find that this effect attenuates for countries closer to each other.

This substitutability is also observed when focusing on the effects of proximity on specialized trade: while distance erodes relationship-specific exports at average levels of exporter institutional quality, this negative effect attenuates as exporters' contract enforcement capabilities grow. Relatedly, because motives for travel to countries with poor institutions dwindle at longer distances, our theoretical framework also predicts that better contract enforcement capabilities in destination countries should attenuate the negative effect of bilateral distance on business travel and expenditures. We empirically confirm this prediction leveraging bilateral data on business expenditures and passenger flight frequency and capacity.

This paper contributes to the literature on institutions as a source of comparative advantage in "contract-intensive" products (Levchenko, 2007; Nunn, 2007; Nunn and Trefler, 2014). The standard framework predicts that countries with poor formal institutions should be locked out of specialized economic activities. By adding the bilateral dimension of trade to our theoretical and empirical framework, we offer a refined understanding about the role of formal institutions as an enabler of specialized trade whenever connectivity costs prevent relational dynamics between trading partners. Indeed, our empirical analyses confirm that poor contract-enforcement institutions erode exports of specialized goods *at average distances* between country pairs. However, far from being unable to compete in specialized markets, institutionally underdeveloped countries can still engage in relationship-specific transactions with nearby partners with whom relational dynamics can be sustained affordably.

[1]Mexico provides an illustrative example consistent with this prediction: Contrary to the general predictions of Levchenko (2007) and Nunn (2007), Mexico exports specialized goods -mainly to the United States- despite having subpar contract-enforcement institutions.

In our theoretical framework, the importance of relational contracting (Macaulay, 1963; Baker et al., 2002) as an alternative to formal enforcement has to do with the moral hazard and hold-up problems that commonly arise in the presence of incomplete contracts (Klein et al., 1978; Holmström, 1979, 1982; Holmström and Milgrom, 1991; Hart and Moore, 1999). A few studies focusing on developing-country case studies have delved into the importance of relational contracting in international trade (McMillan and Woodruff, 1999; Macchiavello, 2022; Cajal-Grossi et al., 2023). Other studies focusing on bilateral trade patterns have documented the importance of geographic proximity for developing specialized products with few substitutes, emphasizing the relative importance of search costs and information barriers in these specific products (Rauch, 1999; Chaney, 2008). Our empirical finding that bilateral proximity erodes the relevance of domestic institutions for competing in specialized markets suggests that, beyond search costs, proximity allows partners to develop credible commitments that are required to sustain relationship-specific transactions in the absence of formal enforcement alternatives.

A separate strain of the literature has considered how connectivity costs erode trade by inhibiting business travel (Cristea, 2011; Blonigen and Cristea, 2015; Donaldson and Hornbeck, 2016; Donaldson, 2018; Söderlund, 2020; Wang et al., 2021; Söderlund, 2023; Cristea, 2023; Ho et al., 2024; Morales-Arilla and Bustos, 2024). Our theoretical framework and empirical results highlight the role of the business travel in enabling specialized exports from institutionally underdeveloped countries. Finally, there is a long-standing literature on the institutional alternatives for developing economies to make credible commitments despite weak domestic contract enforcement capabilities (World Bank, 1992; Schmitz and Nadvi, 1999; Madani, 1999; UNCTAD, 2015; Cirera and Lakshman, 2014; Yap, 2004; Rodrik, 1991; Rodrik and Subramanian, 2004; DeLong, 2003; Haftel, 2007; Copelovitch and Ohls, 2012). Consistent with the relational contracting rationale, many historical and modern examples emphasize the importance of informal networks in overcoming commitment problems (Greif et al., 1994; Greif, 2006; Maxfield and Schneider, 1997; Sen, 2013; Roy et al., 2014).

To our knowledge, this is the first paper to show how geographic proximity substitutes for contract enforcement institutions in enabling exporting countries to compete in relationship-specific markets, showing complementary evidence of increased business travel over short distances towards destinations with poor contract-enforcement institutions. We interpret our findings as driven by the enhanced possibility of developing transparent business relationships over short distances. From this perspective, remote economies may need to develop their formal contract-enforcement institutions in order to compete in specialized markets. Similarly, initiatives that reduce exporters' connectivity costs may have disproportionate returns for the development of specialized industries in countries with underdeveloped contract enforcement institutions.

The paper continues as follows: Section 2 introduces our theoretical framework. Section 3 presents our data and empirical strategy. Section 4 discusses our results on bilateral trade of specialized goods, bilateral business travel and air connectivity. Section 5 concludes.

2 Theoretical Framework Outline

In this section, we outline the logic and conclusions of a simple model of contracting frictions in international trade. The focus is on a one-off international purchase of an intermediate good that needs to be customized to the buyer's specific requirements to be of any value. While the rest of this section simply outlines the model's assumptions and testable predictions, we provide a detailed description and solution of the model in Appendix A.1.

2.1 Benchmark model of trade and contracting frictions

First, a buyer located in country d makes an offer to a supplier located in country o, specifying the amount to be paid, $X_{od} \geq 0$, for the provision of a good that needs to be customized. We do not distinguish between price and quantity: the parties agree on a total payment for some quantity not specified to us[2]. The supplier can accept or reject this offer.

[2] Although *payment* goes from d (importer) to o (exporter), we follow the convention of indexing in terms of the flow of *goods*, from o to d.

2.1.1 Customization

We make the following assumptions regarding the customization process. First, a product can only be "fully customized" or "not customized at all", i.e., we do not allow for partial customization. Second, the supplier fully controls whether the product he delivers is customized or not, i.e. we do not allow for uncertainty in the outcome. Finally, customizing a product is more expensive than not customizing it, where the benchmark cost of a good that was not customized is normalized to zero. Hence, if the buyer's offer is accepted and a contract is signed, the supplier chooses to abide by the contract or to deliver a non-customized product.

2.1.2 Opportunism

The incentive for opportunistic behavior by the supplier arises because payment is transferred upon delivery but before the buyer has had enough time to assess whether the product was fully customized, which for practical purposes is as if the buyer had paid the supplier in advance. Because this prepayment is akin to the buyer investing in a relationship-specific asset, he risks being *held-up* by the supplier, which in this model means receiving a non-customized product. If the product was customized, the product has a predetermined value for the buyer, but if not, we assume it is worthless[3].

2.1.3 Dispute settlement.

If the buyer received a good that was not customized, her only recourse is to take the supplier to court in the latter's *home country*. We assume that this decision is costless, so the buyer will always choose to do so.

Why *national* institutions? Domestic contract enforcement may play only a minor role on international transactions given the availability of international institutions that private parties can rely upon. First, contracts can specify a *Choice of Law* clause, where parties can opt for the law of any country (even a third one). Second, contracts can specify

[3] We assume that the value to the buyer of the customized good is at least as large as the cost of customization so the exchange is socially efficient.

a *Choice of Forum* clause, where parties can agree on the jurisdiction that would resolve potential disputes (including a third country). Third, the parties could opt to resolve their dispute by arbitration instead of using the courts. Fourth, even when relying on national courts, contract law has been standardized across countries via initiatives such as the New York Convention of 1958 or the Vienna Convention of 1980. These four characteristics should diminish the effect that country differences in institutional quality have on cross-border transactions. However, these tools only affect the dispute *resolution*, not its *compliance*. If the losing party chooses to ignore the ruling, compliance can only be enforced by judicial execution organs in locations where that party has assets. Therefore, we should still expect national institutions to affect international transactions (Berkowitz et al., 2004, 2006).

Why the *exporter*'s institutions? There is an asymmetry between the risks that buyers and sellers face in international transactions. Exporters face the risk of not being paid by the importer, but they have at their disposal old tried-and-true tools to reduce this risk, such as prepayment, bills of exchange, or letters of credit. In contrast, importers face the risk of getting defective or, as in our model, "not fully customized" goods. Mitigation of this type of risk requires hiring inspection and testing agents, who may not even be able to test every important specification, or be able to do so in a timely manner. This risk asymmetry has two implications. First, the importer may care more than the exporter about the quality of contract enforcement institutions. Second, if the exporter were to lose a legal dispute, unless it voluntarily abides by the ruling, compliance can only be coerced in a country where it has assets, which is most likely its home country. Hence, exporter contract enforcement institutions are the most likely to influence international transactions (Berkowitz et al., 2004, 2006).

We define the "quality" or "strength" of a country's contract enforcement institutions as the degree of certainty that the plaintiff will receive compensation if wronged. We model it as a country-specific exogenous probability $\mathrm{CE}_o \in [0, 1]$ that the supplier is forced by the courts to deliver the customized product. We assume that suppliers are not subject to additional penalties.

2.1.4 Equilibrium.

Since the production cost without customization is zero, in equilibrium suppliers always break their contracts for the $1 - \text{CE}_o$ chance that they can get away with it and keep the payment. Despite this result, the model predicts nonetheless that imports from countries with weak institutionswould be observed in the data. This is because buyers are risk neutral, going to court is free, and there is always a chance of winning in court[4].

Although the model cannot rationalize *extensive* margin effects (zero trade flows), it has predictions for the *intensive* margin (amount traded). Anticipating how the game will be played, buyers will take the probability of receiving a worthless good into account when deciding how much to offer in the initial contract (X_{od}) which we map to observed trade flows. Our model predicts that trade in customized intermediate goods will be directly proportional to the institutional quality of the exporting countries, a standard result in the literature (Berkowitz et al., 2004, 2006; Levchenko, 2007; Nunn, 2007; Costinot, 2009; Nunn and Trefler, 2014).

2.2 Introducing *travel*

We extend the standard framework to give buyers one additional tool: the ability to travel to the supplier's country to supervise its production process *before any payments are made*. Supervision gives the buyer the opportunity to discover a potential lack of customization with a probability proportional to the *intensity* of the buyer's travel, which summarizes choices such as the number of trips or the number of envoys in each trip[5]. We assume that if a breach of contract is detected during supervision, the supplier is compelled to comply with the contract.

Because business travel is costly, the buyer faces a trade-off. In equilibrium, buyers choose

[4] Trade only breaks down in the knife's edge case in which justice is *never* served in the exporting country ($\text{CE}_o = 0$).

[5] Although throughout the text we emphasize the *supervision* of suppliers, there are other ways in which the physical presence of the buyer's envoys facilitates customization, such as the provision of *technical assistance* or the implementation of *relational contracting* (Macaulay, 1963; Baker et al., 2002)

the intensity of travel to equalize marginal expected costs and benefits. We assume that supervision costs increase with travel intensity, but also with the distance between the two countries, $\text{Dist}_{od} \geq 1$.

2.3 Empirical predictions

The model predicts that the expected amount that a buyer in country d spends on specialized goods from a supplier in country o decreases with the quality of contract-enforcement institutions in country o and with the distance between the two countries. Most importantly, geographic proximity to markets attenuates (and eventually changes the sign of) the effect of exporters' contract enforcement institutions on its specialized exports, and vice versa.

This is the institutions-proximity substitutability prediction: Institutions are disproportionately relevant for specialized trade between distant partners for whom supervision travel is prohibitively expensive. Similarly, connectivity costs are disproportionately relevant for specialized exports of countries with poor contract enforcement institutions that rely on relational contracting.

Relatedly, the model also predicts non-linear effects of proximity and contract enforcement institutions for the intensity of bilateral business travel between country pairs: Proximity will have a disproportionate effect on travel toward countries with poor contract-enforcement institutions because suppliers in that country rely on relational supervision from their buyers in order to engage on specialized trade.

3 Data and Empirical Strategy

Data

Trade flows. We use bilateral trade flow at the product level for 2015 from *Base pour l'Analyse du Commerce International* (BACI) (Gaulier and Zignago, 2010), a dataset maintained and made publicly available by the *Centre d'études prospectives et d'informations* *internationales* (CEPII) on its website.[6] BACI is updated yearly, and its multiple versions are identified by the year and month of its release. We use the version of January 2023. In BACI, a "product" is defined as a subheading (a six digit code) in Harmonized System (HS), a standard system for classifying goods used by most custom authorities. Since its creation in 1988, the HS has been revised six times, and each revision is identified by the year of its introduction. We use HS revision 2012.

Sector classification. We use the conversion key from the OECD's Bilateral Trade Database by Industry and End-Use (BTDIxE) that assigns to each product (defined as in BACI) an economic sector based on the fourth revision of the United Nations' International Standard Industrial Classification of all Economic Activities (ISIC). Only products classified as "Agriculture, Forestry and Fishing", "Mining and Quarrying", or "Manufacturing" which jointly represent more than 98% of the products and the value traded) were included in the sample. Table A.1 provides the list of the 18 sectors included in the sample and the distribution of the number of products and the value between them. The three most important sectors with respect to trade value are "Computer, electronic and optical goods" (14%), "Mining and quarry" (11%), and "Motor vehicles, trailers and semi-trailers" (9%).

Product classification. The identifications of products in BACI as "final", "specific", or "generic" is based on the fifth revision of Broad Economic Categories (BEC) from 2016. In this revision, products are defined in the same way as in BACI (a six digit code in the HS 2012 revision), making these datasets compatible. There are 5,120 different product codes in the sample. BEC provides a high-level aggregation of products that is structured in six levels, called "dimensions". We classified products based on the third, fourth and fifth dimensions. The third dimension classifies products according to their end use as (1) "intermediate consumption", (2) "gross fixed capital formation", and (3) "final

[6]The information in BACI is based on the official trade data reported by countries to the United Nations, which is disseminated via their Commodities Trade Statistics (COMTRADE) database. Since countries report both their imports and exports to the United Nations, bilateral trade flows are likely to be reported twice in the raw data, and although these reported values should match, in practice they do not. Thus, CEPII implements a harmonization procedure to reconcile mismatched duplicate trade flows into a single figure. BACI is the result of this process.

consumption"; the fourth dimension classifies products according to their processing as (1) "primary" or (2) "processed"; and the fifth dimension classifies products as (1) "generic" or (2) "specific". Some products have dual classifications, which was fixed by reclassifying in some cases and removing in others, leaving 4,997 products in the final sample.

We create one variable that labels trade flows according to the characteristics of the good being traded. We consider goods classified by BEC as "intermediate", "processed" and "specific" as the empirical equivalent of specialized goods in the model. All other goods are considered non-specialized, except for "gross fixed capital formation" (capital) goods, which are dropped from the sample because their end-use cannot be unambiguously established as either final or intermediate. We then split the the non-specialized category, distinguishing between "final goods" and the remaining non-specialized intermediate goods. We call this variable (denoted by t) *product type* and use it to index trade flows[7]:

$$t = \begin{cases} 0 & \text{if product is a final good} \\ 1 & \text{if product is a non-specific intermediate good} \\ 2 & \text{if product is a specific intermediate good} \end{cases}$$

Table A.2 summarizes the distribution of products and trade value according to the final categories. Most trade is evenly distributed between final goods (29.8%), non-specialized intermediate goods (28.8%) and specialized intermediate goods (28.6%), and the remaining 12.8% being capital goods that are not included in the final sample.

Institutional quality. For each country, we construct a measure for the quality of contract enforcement institutions using the "Rule of Law" index from the Worldwide Governance Indicators (WGI) database, Kaufmann and Kraay (2022). This is a perception-based indicator based "on several hundred variables obtained from 31 different data sources", and it is meant to reflect the opinions of survey respondents, non-governmental

[7] To economize on computing time, we reduce the number of observations in our dataset by aggregating the bilateral trade data from product-level to industry and product type.

organizations, commercial businesses and the public sector[8]. Some countries did not have information for one or more of these variables which, depending on the specification, implies that observations involving these countries are dropped from the sample. Fortunately, 75% of all country pairs (across all products) representing 99% of the value traded have information on all variables for the exporter and contract enforcement quality for the importer.

Business travel, passenger flights and country networks. We consider a bilateral index of business travel spending for 2015 from Coscia et al. (2020). This index captures the intensity of use of corporate credit cards originated in one country for purchases located in a different country. Moreover, we take information about the total number of passenger flights operating between different country pairs and their aggregate capacity in 2015 from OAG (2025). Finally, we consider the networks connecting different country pairs. We take bilateral distances from Conte et al. (2022). Data on the cultural, historical, political and genetic links between countries come from Spolaore and Wacziarg (2018) and Pellegrino et al. (2025).

Table A.3 provides summary statistics for the main variables considered in the analyses below.

Empirical strategy

Specification. Our starting point is the standard sectoral gravity equation (Chaney, 2008; Costinot et al., 2011; Caliendo and Parro, 2014), which we expand to include a term that captures the effect of contract enforcement institutions on trade in specialized goods (Levchenko, 2007; Nunn, 2007; Berkowitz et al., 2004, 2006). We expand this expression once more by adding two terms that capture the additional effect that distance can have on the trade flows of specialized goods (Chaney, 2008; Rauch, 1999), and the substitutability between distance and institutions, respectively.

Our data allows us to control for several unobservable regressors systematically using dif-

[8]The original index is not bounded between 0 and 1, so we normalized it.

ferent combinations of fixed effects. All our specifications share the same basic structure presented in the previous paragraph, but differ in their fixed effects and thus in the number of coefficients that can be identified with the remaining variation in the data. Our least strict specification only includes exporter-industry and importer-industry-product type fixed effects, which allows us to estimate the complete set of coefficients of interest:

$$\begin{aligned}\text{Trade}_{odst} = \exp\Big\{ & \underbrace{\beta_D \log\left(\text{Dist}_{od}\right) + \gamma_1' C_{od}}_{\text{bilateral effects (all goods)}} + \underbrace{\beta_E \left(S_t \times \text{CE}_o\right)}_{\text{institutions (specific goods)}} \\ & + \underbrace{\beta_{DS}\Big(\log\left(\text{Dist}_{od}\right) \times S_t\Big) + \left(\gamma_2' C_{od} \times S_t\right)}_{\text{search costs (specific goods)}} \\ & + \underbrace{\beta_{ED}\Big(\log\left(\text{Dist}_{od}\right) \times S_t \times \text{CE}_o\Big) + \left(\gamma_3' C_{od} \times S_t \times \text{CE}_o\right)}_{\text{substitution effects (specific goods)}} \\ & + \phi_{os} + \phi_{dst}\Big\} + \varepsilon_{odst} \qquad (1)\end{aligned}$$

where $\text{Trade}_{odst} \geq 0$ is the value of exports from origin country o to destination country d of products in sector s that are of type t; $\log\left(\text{Dist}_{od}\right) \geq 0$ is the logarithm of the bilateral distance between o and d; $\text{CE}_o \in [0, 1]$ is a proxy for contract enforcement institutional quality of country o; $S_t \in \{0, 1\}$ is an indicator variable for specialized product types within each sector s; C_{od} is a column vector with a set of bilateral controls capturing geographical contiguity as well as the historical, cultural and genetic ties between country pairs; ϕ_{os} and ϕ_{dst} are origin-sector and destination-sector-product type fixed effects; and ε_{odst} is an error term.

Given our focus on the substitutability between contract enforcement institutions and proximity, we mostly care about correctly estimating β_{ED}. Our most strict specification includes exporter-sector-product type, importer-sector-product type and exporter-importer fixed effects that absorb most of the regressors in equation 1, but leaves enough variation to estimate β_{DS}, β_{ED} and other controls:

$$\begin{aligned}\text{Trade}_{odst} = \exp\Big\{ & \underbrace{\beta_{DS}\Big(\log(\text{Dist}_{od}) \times S_t\Big) + (\gamma_2' C_{od} \times S_t)}_{\text{search costs (specific goods)}} \\ & + \underbrace{\beta_{ED}\Big(\log(\text{Dist}_{od}) \times S_t \times \text{CE}_o\Big) + (\gamma_3' C_{od} \times S_t \times \text{CE}_o)}_{\text{substitution effects (specific goods)}} \\ & + \phi_{od} + \phi_{ost} + \phi_{dst}\Big\} + \varepsilon_{odst} \end{aligned} \tag{2}$$

where ϕ_{od} and ϕ_{ost} are origin-destination and origin-sector-product type fixed effects, respectively.

The specification for business travel and passenger flights is similar to those for trade, except that we no longer have variation across sectors and product type. This leaves us with only one feasible specification, akin to the aggregate gravity equations:

$$\begin{aligned}\text{Travel}_{od} = \exp\Big\{ & \underbrace{\beta_D \log(\text{Dist}_{od}) + \gamma_1' C_{od}}_{\text{bilateral effects}} + \underbrace{\beta_{ED}\Big(\log(\text{Dist}_{od}) \times \text{CE}_d\Big) + (\gamma_2' C_{od} \times \text{CE}_d)}_{\text{substitution effects}} \\ & + \phi_o + \phi_d\Big\} + \varepsilon_{od} \end{aligned} \tag{3}$$

Where Travel_{od} is the bilateral business travel / passenger flights outcome, ϕ_o and ϕ_d capture origin fixed effects and destination fixed effects, and ϵ_{od} is a bilateral error term[9]. In this specification, β_D captures the effect of distance on travel for destination countries with the lowest contract enforcement institutions ($\text{CE}_d = 0$), while β_{ED} captures how the effect of distance on bilateral travel changes as contracting institutions in travel destinations improve.

Estimation Method. We use Poisson Pseudo-Maximum Likelihood (PPML) to estimate the parameters of the gravity models of both bilateral trade and travel. In all cases, standard errors are estimated by allowing error correlation within origin-destination blocks.

[9]Note that the country of origin in the business travel equation corresponds to the country of destination in the trade equation.

Causal identification. The main threat to causal identification is reverse causality, as trade flows may influence institutional quality if agents face greater incentives to develop and maintain good institutions in countries specialized in the production of customized goods. This issue is addressed using instrumental variables. Following (Nunn, 2007), we instrument the institutional qualities of countries with their historical legal origins, taken from Conte et al. (2022).

4 Results

Effects on Trade

Table 1 provides results from estimating variations of equations 1 and 2. Column 1 estimates equation 1 and confirms the patterns established in Nunn (2007) and Levchenko (2007): better contract enforcement institutions are associated with more trade for specific goods. Interestingly, results in Column 1 go against those of Rauch (1999) and Chaney (2008), as trade in specific goods is *less* sensitive to distance relative to non-specific ones. Column 2 incorporates a country-pair fixed effect and the interaction term between relationship specific product types, the quality of contract enforcement institutions in the exporting country and the log of bilateral distance. We now see that the effects of improved institutions are counterintuitive for countries at no distance from each other, while the effects of distance are in line with the expectations from Rauch (1999) and Chaney (2008) for exporting countries with the worst possible contract-enforcement institutions. Chiefly, we see a positive and statistically significant interaction term, suggesting that contract-enforcement institutions and geographic proximity (the inverse of distance) work as substitutes: At longer distances, the positive role of contract enforcement institutions for relationship-specific exports starts to show up. Similarly, the positive role of geographic proximity on specialized exports starts to disappear for exporters with better contract enforcement institutions. We confirm these patterns in Column 3 after adding origin-sector-product type fixed effects into our specification - while absorbing the relative effect of contract-enforcement institutions on specialized goods between countries at no distance from each other, we continue to see the positive and significant interaction term, confirming how exporter contract-enforcement and geographic proximity work as substitutes in enabling relationship-specific trade. Because the PPML estimation method does not lend itself to the use of instrumental variables, Columns 4 and 5 perform analog OLS and instrumental variable specifications on the log of the traded value. Both specifications confirm the finding that proximity and contract enforcement institutions operate as substitutes in specialized trade.

Table 1: Bilateral trade regressions, year 2015

Dependent variable:	Bilateral trade flows by product				
	Level			Log	
Method:	PPML			OLS	2SLS
Specification:	(1)	(2)	(3)	(4)	(5)
Log distance	-0.958***				
	(0.029)				
Specific × CE exporter	0.603***	-1.475**			
	(0.146)	(0.679)			
Specific × Log distance	0.146***	-0.155**	-0.170**	-0.315***	-0.352***
	(0.035)	(0.068)	(0.072)	(0.031)	(0.081)
Specific × CE exporter × Log distance		0.279***	0.354***	0.409***	0.483***
		(0.084)	(0.087)	(0.042)	(0.119)
Exporter-sector FE	X	X			
Exporter-sector-product type FE			X	X	X
Importer-sector-RS FE	X	X	X	X	X
Country pair FE		X	X	X	X
R^2	0.898	0.934	0.951	0.754	-
No. observations	1,636,724	1,201,942	1,187,856	512,510	502,937
No. clusters	34,225	25,080	25,080	22,415	183

Note: Clustered standard errors by country pair in parentheses, except for column 5, where errors are clustered by exporter and importer. * p < 0.1, ** p < 0.05, *** p < 0.01. **Specific** is a binary variable equal to one if the traded product is a *relationship-specific* intermediate good, and zero otherwise (i.e., for non-RS intermediate goods and all final goods; capital goods are excluded from the sample). **CE exporter** is a proxy for the quality of *contract enforcement* institutions in the exporting country. All regressions include controls for shared border, common language, genetic distance, common colonial history, and common legal origins -all interacted with the RS dummy. All columns except the first also include triple interactions between the RS dummy, contract enforcement quality, and the respective bilateral controls. Following Nunn (2007), Column 5 instruments origin-country contract enforcement institutions by their historical legal origins.

Given that triple interaction terms can be difficult to interpret, we complement the results in Table 1 with graphical representations of the average marginal effects (AME) of institutional quality and distance in Figure 1. Since all of our specifications include fixed effects, it is important to explicitly connect our interpretation with the underlying identification assumptions. In Panel A, we plot the semi-elasticity of relationship-specific trade with respect to institutional quality as a function of log distance[10]:

$$\frac{\partial \log \mathbb{E}\left[\text{Trade}_{odst}|S_t = 1, \log\left(\text{Dist}_{od}\right)\right]}{\partial \text{CE}_o} = \beta_E + \beta_{ED} \log\left(\text{Dist}_{od}\right) + \gamma_3' \mathbb{E}\left[C_{od}|S_t = 1, \log\left(\text{Dist}_{od}\right)\right]$$

Since institutional quality is a country-level (exporter) variable and our specification includes an exporter-sector fixed effect (ϕ_{os}), our interpretation is correct only if institutional quality does not affect trade in non-specific goods ($d\phi_{os}/d\text{CE}_o = 0$). We find that improved institutions enhance relationship-specific trade at the average and median distances between all country pairs. However, this effect becomes statistically insignificant for the 10% of country pairs that are closest to each other.

Similarly, in Panel B, we plot the *percentage point difference* between the elasticity of relationship-specific trade with respect to distance and the elasticity of non-specific trade with respect to distance as a function of institutional quality[11]. We use this more restrictive interpretation because we cannot assume that distance does not affect non-specific trade flows, a well established empirical fact[12]. Hence, Panel B shows the *difference* between the marginal effect of distance on relationship-specific trade relative to that on non-specific trade:

$$\begin{aligned}
\frac{\partial^2 \log \mathbb{E}\left[\text{Trade}_{odst}|S_t, \text{CE}_o\right]}{\partial \log\left(\text{Dist}_{od}\right) \partial S_t} &= \frac{\partial \log \mathbb{E}\left[\text{Trade}_{odst}|S_t = 1, \text{CE}_o\right]}{\partial \log\left(\text{Dist}_{od}\right)} - \frac{\partial \log \mathbb{E}\left[\text{Trade}_{odst}|S_t = 0, \text{CE}_o\right]}{\partial \log\left(\text{Dist}_{od}\right)} \\
&= \beta_{DS} + \beta_{ED} \text{CE}_o
\end{aligned}$$

We find that, at average levels of exporters' institutional quality, proximity does not have

[10] We used the minimum, maximum, mean and percentiles 1, 5, 10, 25, 50, 75, 90, 95 and 99 of the log distance distribution in the data. We also plotted the (kernel) density function of log distance to help in the interpretation of results.

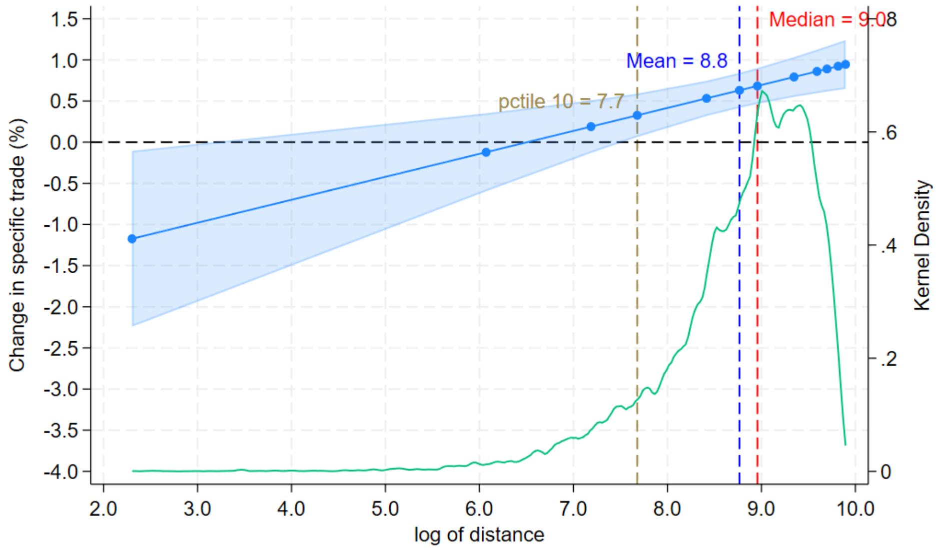
[11] We used the minimum, maximum, mean and percentiles 1, 5, 10, 25, 50, 75, 90, 95 and 99 of the institutional quality distribution in the data. We also plotted the (kernel) density function of institutional quality to help in the interpretation of results.

[12] In fact, column one of Table 1 shows that distance negatively affects all types of trade flows.

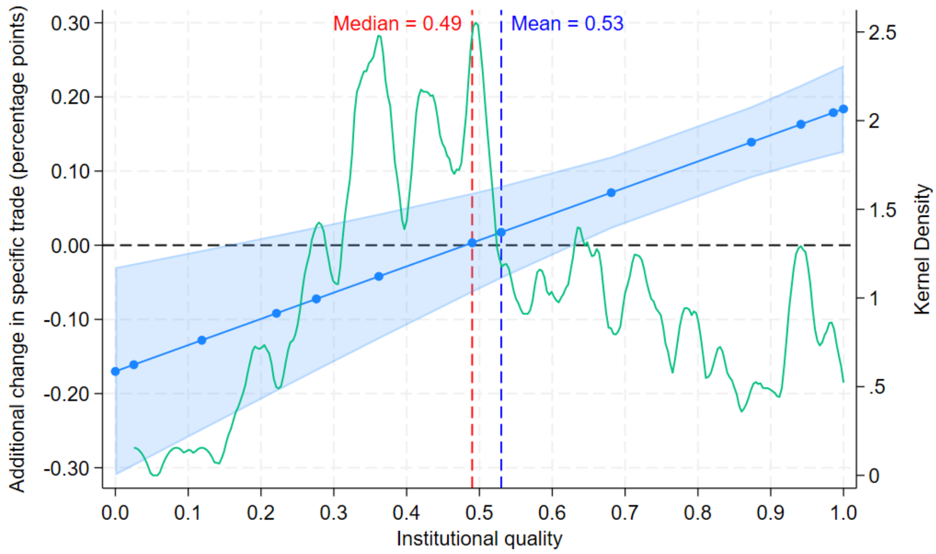
a disproportionate effect on specialized in comparison to non-specialized trade. Longer distances reduce relationship-specific trade *more* than they reduce non-specific trade only for exporters with institutions with below the median quality. For the rest of exporters, and in particular, for the 25% of exporters with the highest contract enforcement scores, the effect is significantly reversed. These results are consistent with the idea that supervision and relational contracts are very important for trade when formal contract-enforcement institutions are not reliable. Hence, since longer distances make travel more expensive, we would expect to see a reduction in trade flows.

Figure 1: Marginal effect (%) of institutions and distance on trade in specific goods

(a) Institutional quality (unit increase)



(b) Distance (1% increase)



Note: Marginal effects estimated based on results reported on Columns 2 and 3 of Table 1. Panel A shows the average marginal semi-elasticity with respect to exporter's institutional quality, derived from column 2, plotted at different log distances between country pairs. Panel B shows the average marginal elasticity with respect to bilateral distance, derived from column 3, plotted for different values of exporter's institutional quality. The panels also show the kernel density of log distance and exporter's institutional quality, respectively.

Effects on Business Travel and Air Connectivity

One of the empirical predictions discussed above is that we should observe more business travel over short distances towards countries with poor contract enforcement institutions for the motive of oversight in relationship-specific activities aimed at supplying clients with specialized inputs. Table 2 provides estimates from the specification described in Equation 3. Columns 1-2 focus on the effects of bilateral distance on the bilateral business travel index introduced in Coscia et al. (2020), while Columns 3-4 focus on the number of bilateral passenger flights and Columns 5-6 focus on the number of available passenger seats in those flights. As expected, Columns 1, 3 and 5 suggest that higher distances reduce business travel and air connectivity. However, Columns 2, 4 and 6 suggest that proximity is most important for business travel and air connectivity among destinations with poor contract-enforcement institutions, as the negative effect of distance seems to attenuate with improved contract enforcement institutions.

Table 2: Bilateral travel regressions, year 2015

Dependent variable:	Bilateral business expenditure flows		Bilateral passenger frequency		Bilateral passenger capacity	
Specification:	(1)	(2)	(3)	(4)	(5)	(6)
Log distance	-0.857***	-1.381***	-1.288***	-1.943***	-1.079***	-1.838***
	(0.077)	(0.167)	(0.083)	(0.183)	(0.078)	(0.183)
CE exporter × Log distance		0.613***		0.877***		1.007***
		(0.212)		(0.243)		(0.243)
Exporter (travel destination) FE	X	X	X	X	X	X
Importer (travel origin) FE	X	X	X	X	X	X
pseudo R^2	0.342	0.343	0.884	0.890	0.871	0.879
Observations	6,055	6,055	32,220	32,220	32,220	32,220
Nbr. exporter (or importer) clusters	103	103	180	180	180	180

Clustered standard errors by exporter and importer in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01. **CE exporter** is a proxy for the quality of *contract enforcement* institutions in the exporting country. All regressions are estimated using Pseudo-Poisson Maximum Likelihood (PPML) and include bilateral controls for contiguity, common language, genetic distance, common colonial history, and common legal origins. Specifications (2), (4) and (6) also include interactions between contract enforcement quality and the respective bilateral controls.

5 Conclusion

This paper examines how geographic proximity can substitute for weak contract enforcement institutions in enabling developing countries to compete in markets for specialized goods. We develop a theoretical framework showing that when buyers can supervise or build trust with their foreign suppliers through cost-effective travel, the need for strong formal contract enforcement in exporting countries diminishes. Our empirical analysis of bilateral trade data confirms this substitutability: while contract enforcement institutions matter for specialized exports at average distances, their importance attenuates significantly for proximate trading partners.

Our findings challenge the conventional wisdom that countries with weak institutions are locked out of contract-intensive production. Instead, we show that institutionally underdeveloped countries can successfully engage in specialized trade with nearby partners, as proximity makes supervision and relational contracting feasible. The complementary evidence on business travel patterns reinforces this mechanism — we find increased business travel and air connectivity over short distances precisely to destinations with weaker contract enforcement, consistent with buyers engaging in direct supervision as a substitute for legal recourse.

By revealing how geography and institutions interact in shaping comparative advantage, this paper underscores that the path to competing in specialized markets need not be identical for all developing countries. Recognizing these interactions highlights the role of geography and connectivity in prioritizing export promotion strategies. For remote developing countries, improving formal contract enforcement institutions remains crucial for accessing specialized export markets. Similarly, returns to investments in connectivity infrastructure — such as improved air links, streamlined visa processes, and reduced travel costs — may yield their highest returns in countries with poor contract-enforcement institutions. Given modern technological advances, future research could explore how the virtual supervision of production processes can affect the proximity-institution trade-off, as it may reduce the importance of physical distance in enabling transparent trade in specialized goods.

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A.1 Model in detail

A.1.1 Description of the bilateral game

This section describes and solves the dynamic game played between the buyer and the supplier of an intermediate good that needs to be customized to the buyer's specific requirements. Customized, the product has a value $R = 1$ to the buyer, otherwise it has a value $R = 0$. The sub-indices o and d are used to track the supplier's and buyer's countries, respectively.

Stage 1: Contract design. The game starts with the buyer making an offer specifying the amount to be paid, $X_{od} \geq 0$, for the provision of a good that needs to be customized to the level $\psi^c \in [0, 1]$, whose value is normalized to 1 (and therefore not shown in the game tree). As explained in the main text, we do not distinguish between price and quantity: the parties agree on a total payment for some quantity not specified to us. The supplier can accept or reject this offer.

Stage 2: Customization vs. supervision decisions If the supplier accepts the offer, the players first play a simultaneous game in which the buyer decides how "intensively" to supervise the supplier ($T \in [0, 1]$), while the latter decides whether to honor ($\psi = 1$) or breach ($\psi = 0$) the contract. The supplier has an incentive to breach the contract for two reasons. First, it allows him to save on production costs because these are positive if the good is customized ($C_o > 0$), but zero if it is not. Second, payment is transferred upon delivery, but before the buyer has had enough time to assess whether the product was fully customized. Supervision gives the buyer the opportunity to discover the potential breach of contract *before* payment, which occurs with probability $(T \times 100)\%$. The buyer chooses how strong to monitor by weighing this benefit against its cost, which behaves according to the following function.

$$M\big(d_{od}, T\big) = \frac{(d_{od})^{\alpha}\,(T)^{\gamma}}{\gamma}, \quad \gamma > 1 \tag{4}$$

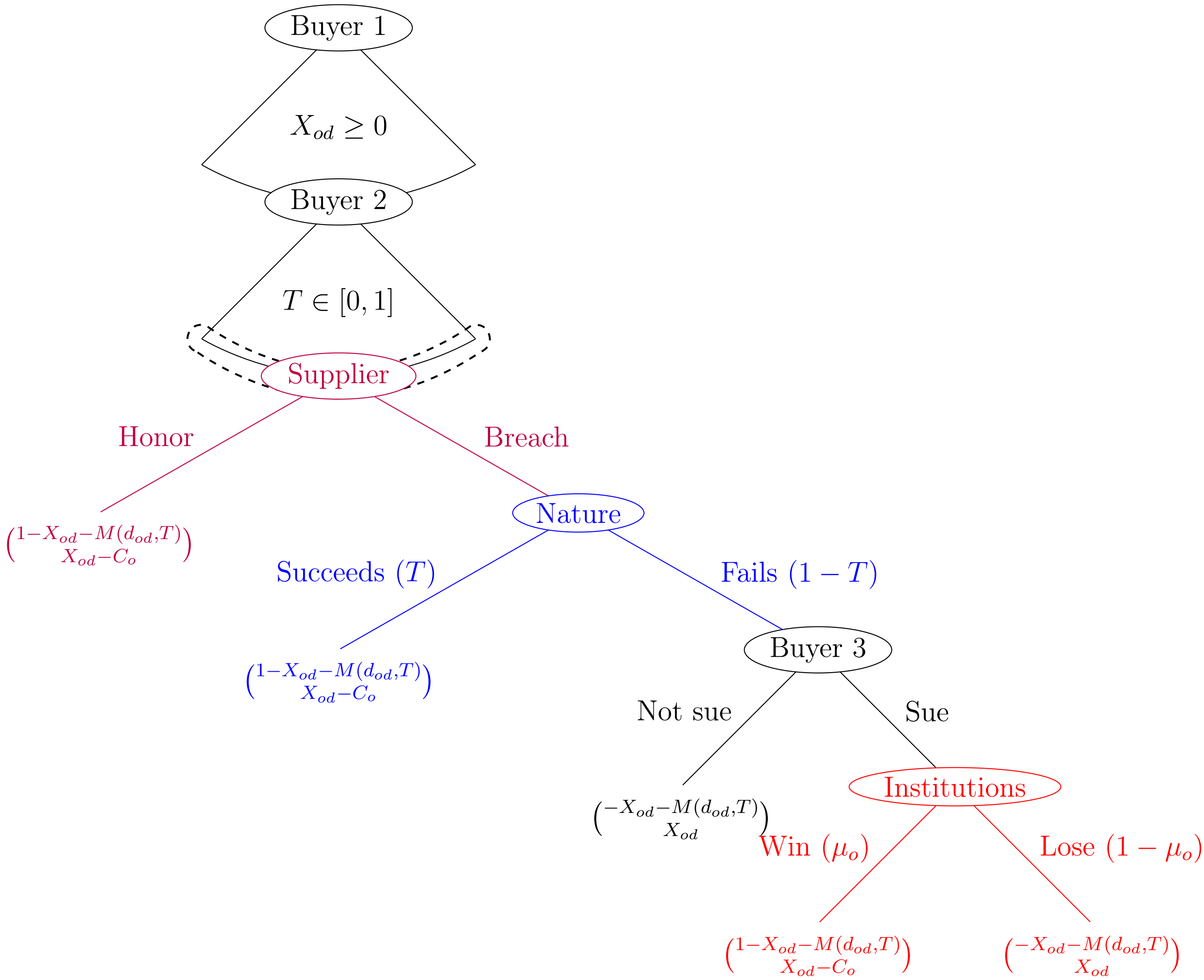
where $d_{od} \geq 1$ is the distance between countries o and d. This function is consistent with the intuition that more intense supervision or more distant suppliers increase costs.

Stage 3: Four possible outcomes There are four possible outcomes from the previous game. If the supplier abides by the contract, regardless of the intensity of supervision, the game ends: the customized good is delivered, payment is transferred, and the players get their payoffs. If the supplier breaches the contract, two scenarios open up. If supervision is successful, we assume that the buyer can compel the supplier to comply with the original contract under his supervision, and the game ends: the customized good is delivered, payment is transferred, and the players get their payoffs. If supervision fails to discover the breach, the good is delivered and payment is transferred, but eventually the buyer realizes that he has been cheated and the game proceeds to a fourth stage.

Stage 4: Contract enforcement. The buyer's only recourse is to take the supplier to court in the supplier's home country. We assume that going to court is free, so it is always optimal to do it. However, countries vary in the "quality" of their contract enforcement institutions, so the outcome of the trial is uncertain. The probability that contract enforcement institutions are able to (or willing to) enforce the original contract (without any additional penalties) depends on a country-specific exogenous probability $\mu_o \in [0, 1]$.

The extensive form representation of this game is as follows.

Figure A.1: Game in extensive form



A.1.2 Solving the game

Solving the game by backward induction, we find that, if the game reaches the fourth stage, the buyer always sues and that the supplier always chooses to breach the contract. Hence, the buyer's choice of supervision intensity reduces to solving the following optimization problem.

$$\max_{T\in[0,1]} \mu_o + (1-\mu_o)T - X_{od} - M(d_{od},T) \quad \text{s.t. equation 4}$$

Thus, the optimal supervision intensity T^* is:

$$T^* = \left(\frac{1 - \mu_o}{d_{od}^{\alpha}} \right)^{\frac{1}{\gamma - 1}} \tag{5}$$

This result is intuitive. First, better contract enforcement institutions ($\uparrow \mu_o$) increase the certainty that the customized product will be delivered, even if the supplier initially chooses to breach the contract. This reduces the marginal benefit of supervision, so we would expect the buyer to monitor less intensively ($\downarrow T^*$). In the limit, perfect contract enforcement ($\mu_o \to 1$) makes supervision completely unnecessary ($T^* \to 0$). Second, supervision is more expensive at longer distances ($\uparrow d_{od}$), so we would also expect less intense supervision ($\downarrow T^*$). If the distance gets arbitrarily longer ($d_{od} \to \infty$), supervision gets arbitrarily small ($T^* \to 0$). This result implies that the supervision expenses observed in equilibrium are negatively related to both distance and institutional quality.

$$M(d_{od}, T^*) = \left(\frac{1}{\gamma} \right) \left[\frac{(1 - \mu_o)^{\gamma}}{d_{od}^{\alpha}} \right]^{\frac{1}{\gamma - 1}} \tag{6}$$

Since T^* does not depend on the value of X_{od}, the amount offered by the buyer in the contract is the solution to the following optimization problem.

$$\max_{X_{od} \geq 0} \mu_o + (1 - \mu_o)T^* - X_{od} - M(d_{od}, T^*)$$

$$\text{s.t.} \quad X_{od} - C_o + (1 - T^*)(1 - \mu_o)C_o \geq 0 \quad \text{and equations 5 and 6}$$

The buyer will choose the lowest possible transfer consistent with the supplier's participation constraint being satisfied, which is that where this constraint binds.

$$X_{od}^* = C_o \left[\mu_o + (1 - \mu_o)T^* \right] \tag{7}$$

A.1.3 From model to data

Bilateral business credit card expenses regression. Our priors for the signs of the regression coefficients come from equation 6. The model predicts that supervision expenditure decreases with distance and institutional quality and that these variables are *substitutes*: a higher value of one attenuates the magnitude (and possibly changes the sign) of the other's effect on travel expenditure:

$$\frac{\partial M_{do}}{\partial \mu_o} = -\left(\frac{\gamma}{\gamma - 1}\right)\left(\frac{M^*_{do}}{1 - \mu_o}\right) \leq 0$$
$$\frac{\partial M_{do}}{\partial \log\left(d_{od}\right)} = -\left(\frac{\alpha}{\gamma - 1}\right) M^*_{do} \leq 0$$
$$\frac{\partial^2 M_{do}}{\partial \mu_o \partial \log\left(d_{od}\right)} = \left(\frac{\alpha}{\gamma - 1}\right)\left(\frac{\gamma}{\gamma - 1}\right)\left(\frac{M^*_{do}}{1 - \mu_o}\right) \geq 0$$

Bilateral trade flows regression. Similarly, our priors for the signs of the regression coefficients come from equation 7, although it is not as straightforward as in the previous case. First, note that trade flows are globally decreasing with respect to distance.

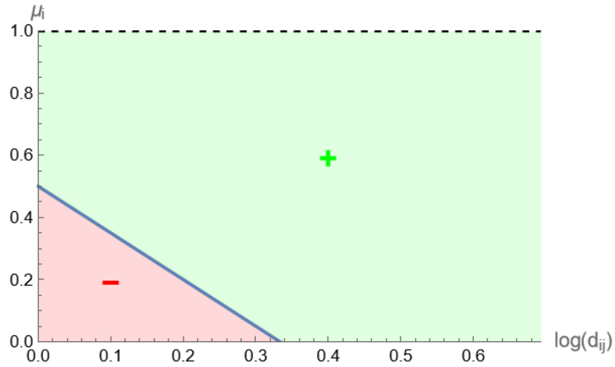
$$\frac{\partial X_{od}}{\partial \log\left(d_{od}\right)} = -C_o \left(\frac{\alpha}{\gamma - 1}\right)\left(1 - \mu_o\right) T^* \leq 0$$

In contrast, trade flows have an ambiguous relationship with institutional quality. For "low" levels of supervision intensity ($T^* < 1 - \frac{1}{\gamma}$), trade flows increase with institutional quality, but for "high" levels ($T^* > 1 - \frac{1}{\gamma}$), the sign of the relationship is reversed.

$$\frac{\partial X_{od}}{\partial \mu_o} = C_o \left[1 - \left(\frac{\gamma}{\gamma - 1}\right) T^*\right]$$

Since T^* is a function of both μ_o and d_{od}, the sign of the relationship will depend on their specific values. Figure A.2 shows an example of this relationship for values of $\gamma = 2$ and $\alpha = 1.5$.

Figure A.2: Sign of $\frac{\partial X_{od}}{\partial \mu_o}$ as a function of combinations of μ_o and $\log d_{od}$



For this example we used $\gamma = 2$ and $\alpha = 1.5$.

This graph illustrates a more general point: the partial effect of institutional quality on trade flows is more likely to be positive at longer distances[13]. This makes mathematical sense: given that a longer distance ($\uparrow d_{od}$) reduces T^*, and that a lower T^* increases $\frac{\partial X_{od}}{\partial \mu_o}$, then longer distances are more likely to be associated with positive values. In addition, this is intuitive. First, remember that the buyer pays the supplier just enough to cover her expected costs, which are equal to the production costs (C_o) times the probability that she will have to incur them. Second, this probability reflects the fact that the supplier customizes only in two circumstances: either she is discovered by the buyer ex-ante (which happens with probability T^*) or supervision fails, but the courts rule in the buyer's favor (which occurs with probability $(1 - T^*)\mu_o$). Third, better institutional quality leads to a lower supervision intensity, which lowers the probability of discovering a contractual deviation, which lowers expected costs and, thus, reduces the amount that needs to be offered. However, better institutional quality increases the probability of being coerced to abide by the Courts, which raises expected costs, and, thus, increases the amount that needs to be offered. Trade will increase if the latter effect is larger than the former.

Despite the lack of global predictions for the partial effect of μ_o on trade, the model unambiguously predicts that institutions and distance are also substitutes:

$$\frac{\partial^2 X_{od}}{\partial \mu_o \partial \log(d_{od})} = C_o \left(\frac{\alpha}{\gamma - 1}\right) \left(\frac{\gamma}{\gamma - 1}\right) T^* \geq 0$$

[13]The graph also shows that it is more likely to be positive for exporters with high institutional quality.

A.2 Additional Tables and Figures

Table A.1: Distribution of products and trade across economic sectors.

Sector		Products		Trade value	
Code	Name	Nbr.	%	bill. US$	%
A	Agriculture, forestry and fishing	368	7	1,592	3
B	Mining and quarrying	93	2	5,611	11
C10_12	Food products, beverages and tobacco	571	11	3,104	6
C13_15	Textiles, textile products, leather and footwear	824	16	2,830	5
C16_18	Wood, paper products and printing	207	4	1,066	2
C19	Coke and refined petroleum products	17	<1	2,604	5
C20	Chemicals and chemical products	810	16	4,392	8
C21	Pharmaceutical products	75	2	1,614	3
C22	Rubber and plastics products	134	3	1,331	3
C23	Other non-metallic mineral products	164	3	580	1
C24	Basic metals	373	7	3,681	7
C25	Fabricated metal products	237	5	1,307	3
C26	Computer, electronic and optical products	269	5	7,518	14
C27	Electrical equipment	177	4	2,525	5
C28	Machinery and equipment n.e.c.	466	9	4,097	8
C29	Motor vehicles, trailers and semi-trailers	64	1	4,541	9
C30	Other transport equipment	80	2	1,794	3
C31_32	Furniture; other manufacturing	191	4	1,954	4

Note: The trade statistics come from the BACI dataset for year 2015. Products are assigned a sector using the conversion key from the OECD's BTDIxE.

Table A.2: Distribution of products and trade across classifications.

BEC classification			Products		Trade value		Final
End-use	Processing	Specification	Nbr.	%	bill. US$	%	classification
Final consumption			1,356	27	14,776	30	Final goods
Intermediate consumption	Primary		329	7	5,728	12	Generic inputs
	Processed	Generic	1,096	22	8,548	17	
		Specific	1,631	33	14,169	29	Specific inputs
Gross Fixed Capital Formation			585	12	6,365	13	Not included

Note: The trade statistics come from the BACI dataset for years 2012, 2015 and 2018.

Table A.3: Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	p25	p50	p75	Max
Trade flows (Mil. US$)	2,240,352	28	2,900	0	0	0	0	2,085,457
Specific	746,784	26	2,492	0	0	0	0	1,217,327
Non-specific	1,493,568	29	3,210	0	0	0	0	2,085,457
Distance (000's km)	41,488	8.1	4.6	0.0	4.5	7.8	11.5	19.8
Contiguity (binary)	41,488	0.0	0.1	0.0	0.0	0.0	0.0	1.0
Common language (binary)	40,678	0.2	0.4	0.0	0.0	0.0	0.0	1.0
Shared history (binary)	41,488	0.2	0.4	0.0	0.0	0.0	0.0	1.0
Shared legal origins (binary)	41,488	0.3	0.5	0.0	0.0	0.0	1.0	1.0
Genetic distance	35,156	0.1	0.1	0.0	0.0	0.1	0.2	0.3
Institutional quality	201	0.5	0.2	0.0	0.4	0.5	0.7	1.0

Note: Summary statistics for the main variables used in the analysis.