北京大学中国经济研究中心
China Center for Economic Research
讨论稿系列
Working Paper Series

E2020009 2020-08-06

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We are grateful to Andrei Levchenko, Chen Sun, Daniel Trefler, Rudai Yang, Stephen Yeaple, and two anonymous referees for their helpful comments. All errors are ours.

1 Introduction

Contracting environment matters for certain industries when they intensively use customized input requiring relationship-specific investments.[1] A good contracting environment and judicial quality in a country alleviate under-investment in the making of customized input and reduce its cost, constituting a comparative advantage in contract-intensive industries. This implication has been extensively investigated by existing studies, for example, Nunn (2007) and Levchenko (2007). In this paper, we argue that judicial quality is more than a comparative advantage: Lower cost of customized input can induce quality upgrading of domestic varieties, increase the exports of low-quality domestic varieties, and intensify domestic competition that eliminates low-quality imported varieties. We theoretically and empirically analyze how these effects interact with comparative advantage to affect various trade margins besides a country's export specialization patterns. Finally, we propose new welfare formulas built on the effects of domestic competition and quality composition to interpret welfare consequences revealed by certain changes in trade patterns and prices, complementing the welfare formula by Arkolakis et al. (2012) (ACR formula henceforth). The application of our new welfare formula to Eurozone countries during 2002-2007 highlights the importance of domestic shocks in driving relative changes in price index and welfare.

We begin by building the role of judicial quality into a quality choice model that features input-output quality linkage. Due to relationship-specificity, it is costly for a local court to verify customized input quality and enforce contracts. A customized input supplier thus suffers from hold-up and under-invests in input quality production. Better judicial quality reduces the costs of enforcing contracts, mitigates hold-up, and improves the provision of customized input quality. Because output quality depends on input quality, better judicial quality thus encourages quality upgrading and increases the price per variety for final goods.

We then integrate the quality choice model into a Ricardian trade model à la Eaton and Kortum (2002) and show that judicial quality affects a country's pattern, price, and

[1] Hereafter, we refer to industries intensively using customized input as "contract-intensive" industries, and an industry's intensity of customized input usage as "contract intensity".

quality of export and import in a multi-country environment. The sizes of these effects vary in contract intensity. While better judicial quality constitutes a comparative advantage and increases exports relatively more in contract-intensive industries, it also increases domestic competition and decreases import demands relatively more in contract-intensive industries. For export price and quality, better judicial quality and lower customized input cost cause a *within-variety effect* that facilitates quality upgrading of exported varieties at the intensive margin, and a *composition effect* that allows more low-quality varieties to export at the extensive margin. In our model, these two effects cancel out with each other, so judicial quality has no explicit impacts on export prices or quality of contract-intensive products. Meanwhile, increased domestic competition due to better judicial quality wipes out low-quality imported varieties and thus raises import prices and quality relatively more for contract-intensive products. Therefore, we generate testable predictions about the effects of judicial quality on different trade margins across industries and products.

Our theoretical framework describes one novel channel of how contracting environment and judicial quality affect production outcomes: Better judicial quality reduces under-provision of customized input quality and the cost of customized input, which then encourages quality upgrading of final goods. To do so, we combine the insight of how contracting environment and relationship-specificity cause hold-up (Williamson, 1979; Grossman and Hart, 1986; Nunn, 2007; Levchenko, 2007),[2] with the well-documented channel of input-output quality linkage (Kugler and Verhoogen, 2012; Manova and Zhang, 2012; Bastos et al., 2018; Fieler et al., 2018). Meanwhile, our modelling of how output quality choice depends on input cost and other production-related service cost follows Mandel (2010), Feenstra and Romalis (2014), Zhang (2018) and Fan et al. (2019). To this end, we also provide a tractable way to embed quality differentiation and quality choice into a Ricardian trade model in the manner of Eaton and Kortum (2002).

We leverage the cross-country differences in judicial quality and cross-industry differences in contract intensity to test the theoretical predictions delivered by our model. Using legal origin to instrument for country-level judicial quality and trade data from UN Comtrade, we empirically confirm that a country with better judicial quality ex-

[2] There is another large literature discussing contracts, vertical integration, and multinational strategies (e.g., Antras, 2003; Antras and Helpman, 2004; Antràs, 2014), which is not the focus of this paper.

ports relatively more and imports relatively less in contract-intensive industries. We also document new and robust findings of how judicial quality affects the price and quality of trade. Using unit value data and quality index developed by Feenstra and Romalis (2014), we find that a country's judicial quality does not have any explicit impacts on its export prices or quality, but increases its import prices and quality relatively more for contract-intensive products. Hence, incorporating quality choice into the theoretical framework is essential in understanding the empirical findings of trade price and quality. Most of the empirical findings are more pronounced for industries and products with higher degrees of output customization and are robust to alternative empirical specifications and measures of key variables.

Our theoretical and empirical assessments complement previous studies about the impacts of institutional quality on trade (Berkowitz et al., 2006; Nunn, 2007; Levchenko, 2007; Ma et al., 2010; Yu, 2010; Feenstra et al., 2013; Wang et al., 2014). While the previous studies mostly focus on the effect of a country/region's institutional quality on export specialization pattern from the production side, the implications for other trade margins, especially those for trade price and quality, have yet been studied in an integrated framework.[3] We contribute to this literature by showing that judicial quality not only affects a country's comparative advantage in exports, but also shapes its domestic competition and quality compositions of exports and imports, which then affects import pattern, trade price, and quality of trade. In this regard, our findings also speak to a broader literature that investigates the link between factor abundance and trade pattern (Schott, 2003; Romalis, 2004; Bernard et al., 2007; Manova, 2013).

We also provide a new perspective to interpret the price and quality margins of trade. Existing studies tend to relate the variations in trade price and quality to trade costs (Hummels and Skiba, 2004), to sizes and incomes of trading partners (Schott, 2004; Hummels and Klenow, 2005; Hallak, 2006; Fajgelbaum et al., 2011; Eaton and Fieler, 2019), to firm heterogeneity (Johnson, 2012; Manova and Zhang, 2012; Fan et al., 2018), and to changes in trade shocks (Martin and Mejean, 2014; Fan et al., 2015). We relate these variations to exporter's and importer's judicial quality, as well as an industry or a product's dependence on contracting environment. Therefore, our findings also con-

[3] Berkowitz et al. (2006) also estimate the differential impacts of institutional quality on imports of complex products and simple products based on Rauch (1999)'s classification.

nect to Essaji and Fujiwara (2012) and Crinò and Ogliari (2017), who study the impacts of judicial quality and financial development on export quality, respectively.[4] Our empirical analysis adopts trade quality index from Feenstra and Romalis (2014), which is developed in a quality choice model that shares lots of key features and implications with ours. Meanwhile, our empirical findings about quality are robust to quality index inferred using demand-side approach (Khandelwal, 2010; Hallak and Schott, 2011; Khandelwal et al., 2013; Fan et al., 2015; Piveteau and Smagghue, 2019).

Our findings generate new implications in interpreting the welfare effects of changes in trade margins. In particular, we propose new formulas to infer relative welfare changes from observed changes in trade patterns and prices. The intuitions of our formulas naturally stem from our model: Lower import share and higher import price can be due to tougher domestic competition that wipes out low-quality imported varieties, which then decreases price index and increases welfare. Therefore, comparing two importers' trade from a common exporter and holding the trade costs of buying from the common exporter fixed, we infer a relative welfare improvement for the importer with a relative decline in import share and a relative increase in import price. The *relative* welfare changes we infer can be due to both *domestic shocks* in the importing countries and *foreign shocks* in any other countries. So we also complement the welfare formula proposed by Arkolakis et al. (2012), which evaluates *absolute* welfare changes caused by only *foreign shocks*. We apply one of our formulas to Eurozone countries during 2002-2007, and find that *domestic shocks* are critical in driving the relative welfare changes across countries.

The rest of the paper is organized as follows. Section 2 presents a Ricardian model that combines contracting environment and judicial quality with quality choice to predict how judicial quality affects several trade margins across industries with different contract intensities. These predictions guide our empirical analysis. Section 3 discusses our empirical strategies, including specifications, identification, and the instrument to tackle potential reverse causality. Section 4 describes the data and the constructions of key variables. Section 5 reports empirical findings and robustness analysis, discusses their economic importance, and develops new welfare formulas. Section 6 concludes.

[4] Essaji and Fujiwara (2012) use the data of the US imports from other countries to test whether the judicial-quality-based comparative advantage is also reflected in export quality.

2 Theory: Contracting Environment, Quality, and Trade

We introduce the role of contracting environment into the determination of product quality with international trade in final goods. First, we allow relationship-specificity and the resulting hold-up to affect the provision of customized input quality, which then shapes the quality choice of final goods producers. Second, we embed this framework into a Ricardian trade model à la Eaton and Kortum (2002) to show how trade margins vary with contracting environments. Judicial quality not only drives differences in comparative advantage, but also results in differences in domestic competition, quality upgrading of domestic varieties, and quality compositions of exports and imports. These forces interact to affect trade patterns, prices, and quality across countries and products.

2.1 Contracting Environment and Quality Production

There are three types of producers in each country: final goods producer, supplier of customized input, and supplier of standardized input. A final goods producer buys customized input and standardized input from suppliers to produce final goods, and the transactions involve contracts between the final goods producer and the suppliers. The making of customized input requires *ex ante* relationship-specific investments by the supplier, while the making of standardized input does not.[5]

Input Sourcing, Hold-up, and Contracting Environment

A final goods producer offers a *take-or-leave* contract $\{\lambda^c, q^c, T^c\}$ to a customized input supplier, stating its requirements about input quality λ^c, quantity q^c, and payment to the supplier T^c. Production of input quality features the following unit cost function:

$$w \cdot \lambda^c,$$

where w is the cost of the factor used to produce customized input. The marginal cost of the input supplier increases as the final goods producer raises input quality demand.

[5] Customized input and standardized input can always be defined to include different materials, labors with different skills or performing different tasks, and capital.

Because the making of customized input entails relationship-specific investments by the input supplier, the quality of the input, λ^c, is much more valued within the contract than outside of it.[6] Relationship-specificity can arise from specific requirements about the input, such as size, shape, and material,[7] and thus gives the customized input supplier extremely few options and low value of selling to other final goods producers. In this case, the final goods producer always has the incentive to renegotiate and lower the amount of pre-specified payment T^c. An *ex post* hold-up problem hence occurs.

Faced with the hold-up problem, the input supplier can turn to a local court to have the contract enforced. Once the court verifies that q^c and λ^c meet the requirements of the contract, the supplier recoups the full amount of T^c paid by the final goods producer, and the contract is enforced. However, because customized input is highly relationship-specific, verifying λ^c usually incurs extra costs. These costs can generate adverse effects to the supplier, and the extent to which these effects can be alleviated critically hinges on the quality of judicial system.[8] This linkage between contracting environment and hold-up follows Williamson (1979), Grossman and Hart (1986), Nunn (2007), Levchenko (2007), and Nunn and Trefler (2014).

We model the costs of enforcing contracts as a fraction of the payment T^c. Specifically, we assume that if the supplier chooses to enforce contracts via the local court, the final goods producer pays back the full amount T^c, among which only $0 < \delta < 1$ fraction the supplier can recoup. To induce a supplier to enter the contract $\{\lambda^c, q^c, T^c\}$, the incentive-compatible constraint satisfies:

$$\delta \cdot T^c \geq w \cdot \lambda^c \cdot q^c, \quad 0 < \delta < 1.$$

$\delta \cdot T^c$ is the supplier's outside option value of legal remedies. Better judicial quality increases δ and the supplier's outside option value. Given T^c and q^c, δ reflects the extent of supplier's under-provision of input quality to protect itself from hold-up. The hold-

[6] Equivalently, any third parties outside of the contract do not recognize or value the quality λ^c.

[7] For example, touch screens made for *iPhone* are not compatible with *Huawei*, *Samsung*, or other cellphones, so the value of these touch screens would be much lower were they not sold to *iPhone* producers.

[8] First, the costs of hiring experts to verify quality λ^c and legal professionals for the lawsuit can be substantial. Second, the costs of delayed payments can be enormous, especially when the supplier is subject to financial frictions and heavily relies on liquidity to finance its working capital. Third, if the court fails to verify λ^c, the contract is not even enforced, so the supplier risks losing all the payment.

up is also a cost to the final goods producer, as it needs to provide an extra monetary incentive to attract the supplier, inflating its customized input cost by a factor of $1/\delta$ given q^c and λ^c. So better judicial quality reduces customized input cost.

Similarly, the final goods producer offers a *take-or-leave* contract $\{\lambda^s, q^s, T^s\}$ to a standardized input supplier, stating its requirements about input quality λ^s, quantity q^s, and payment to the supplier T^s. The unit cost of standardized input with quality λ^s is $w \cdot \lambda^s$.[9]

The provision of standardized input, however, is not subject to hold-up. Because the input is highly standardized, λ^s is equally valued within and outside of the contract. If the final goods producer attempts to breach the contract and renegotiate T^s, the input supplier can resell the input to other final goods producers without any discounts. Therefore, the incentive-compatible constraint for a supplier to enter the contract is:

$$T^s \geq w \cdot \lambda^s \cdot q^s.$$

The outside option of reselling to other final goods producers in the market is at least as valuable as staying in the contract. In this case, the provision of standardized inputs is not affected by the contracting environment and judicial quality.[10]

Therefore, a final goods producer's input cost is determined as follows:

$$T^c + T^s = \frac{w \cdot \lambda^c \cdot q^c}{\delta} + w \cdot \lambda^s \cdot q^s, \tag{1}$$

so a good contracting environment and judicial quality affect the input cost of final goods producers by lowering the cost of customized input.

Input Quality and Contract Intensity

High-quality output requires high-quality input (Kugler and Verhoogen, 2012; Bastos et al., 2018; Fieler et al., 2018). We assume that the quality of final goods of variety ω,

[9] To simplify the analysis, we assume that factors used to produce customized inputs and standardized inputs are the same. Relaxing this assumption does not affect any of our theoretical results.

[10] More generally, as long as the option of reselling to other final goods producers is more valuable than the option of legal remedies, T^s is not affected by contracting environment and judicial quality.

$z(\omega)$, is increasing in the quality of the input bundle, $\lambda(\omega)$:

$$z(\omega) = [\varphi(\omega) \cdot \lambda(\omega)]^{\frac{1}{\alpha}}, \ \ \alpha > 1,$$

where $\varphi(\omega)$ is the efficiency of transforming input quality $\lambda(\omega)$ to output quality $z(\omega)$. We refer to $\varphi(\omega)$ as "productivity". $\alpha > 1$ indicates that quality upgrading is subject to diminishing return.

Both customized input and standardized input are used to produce final goods. The quality of input bundle, $\lambda(\omega)$, depends on the quality of standardized input $\lambda^s(\omega)$ and that of customized input $\lambda^c(\omega)$:

$$\lambda(\omega) = [\lambda^c(\omega)]^{\eta} \cdot [\lambda^s(\omega)]^{1-\eta}, \ \ 0 < \eta < 1. \tag{2}$$

(2) suggests that the quality of the inputs, $\lambda^s(\omega)$ and $\lambda^c(\omega)$, is important in determining input bundle quality. η is the elasticity of input bundle quality with respect to customized input quality, and measures the importance of customized input.[11]

The input bundle quantity production function is:

$$q = \min\{q^c, q^s\}, \tag{3}$$

so customized input and standardized input are perfect complements in the input bundle quantity production.[12] Intuitively, one must need four tires (relatively standardized) and one engine (relatively customized) to produce a car.

A final goods producer minimizes the total input cost in (1), subject to the constraints of production technologies (2) and (3):

$$\min_{\lambda^c, \lambda^s, q^c, q^s} [\frac{w \cdot \lambda^c \cdot q^c}{\delta} + w \cdot \lambda^s \cdot q^s]$$
$$\text{s.t.} \quad z = [\varphi \cdot (\lambda^c)^{\eta} \cdot (\lambda^s)^{1-\eta}]^{\frac{1}{\alpha}} \ \text{ and } \ q = \min\{q^s, q^c\}.$$

The problem boils down to choosing λ^s and λ^c to minimize the *per-unit* cost of input bundle quality. The final goods producer chooses high quality of customized input relative

[11] We assume (2) so the empirical measure of contract intensity is also grounded by the theory.
[12] Allowing the ratio between two inputs to vary does not alter our theoretical results.

to standardized input under a good contracting environment (when δ is high):

$$\frac{\lambda^c}{\lambda^s} = \frac{\eta}{1-\eta} \cdot \delta.$$

A high value of η also induces producers to choose higher λ^c. We follow Nunn (2007) to refer to η as "contract intensity", because η is also the cost share of customized input, whose cost is sensitive to contracting environment and judicial quality.

The resulting *per-unit* input cost, given output quality z, is:

$$\frac{w \cdot \lambda^c}{\delta} + w \cdot \lambda^s = w \cdot \frac{z^\alpha}{\varphi} \cdot \left(\frac{1}{1-\eta}\right)^{1-\eta} \cdot \left(\frac{1}{\eta\delta}\right)^{\eta} = b \cdot \frac{z^\alpha}{\varphi} \cdot \delta^{-\eta}.$$

where $b = \left(\frac{1}{1-\eta}\right)^{1-\eta} \left(\frac{1}{\eta}\right)^{\eta} w$. The input cost is increasing in output quality z, as higher output quality requires higher input quality that is more costly. An improvement in judicial quality lowers input cost and marginal input cost of quality upgrading. The effects are stronger if η is high.

Determination of Final Goods Quality

For a final goods producer, *per-unit* input cost, given quality z and productivity φ, is:

$$b \cdot \frac{z^\alpha}{\varphi} \cdot \delta^{-\eta}, \quad \alpha > 1. \tag{4}$$

$\alpha > 1$ suggests that the marginal input cost of quality upgrading is increasing in output quality.[13] Besides input cost, the final goods producer also bears costs of production-related services, such as packaging, transportation, distribution, and retail. We refer to all these costs as "service cost". Following Mandel (2010) and Zhang (2018), we assume that the *per-unit* service cost is:

$$t \cdot z^\chi, \quad 0 < \chi < 1,$$

where t is a cost parameter of the services. The service cost depends on output quality z, and $\chi < 1$ indicates that the marginal service cost of quality upgrading is decreasing

[13] This is a common assumption used in the literature of quality determination. See for example, Khandelwal (2010), Kugler and Verhoogen (2012), and Feenstra and Romalis (2014).

in z.[14] For example, the costs of packaging and shipping may increase with z, but the cost increase is less than proportional. Feenstra and Romalis (2014) and Fan et al. (2019) assume that $\chi = 0$. In this case, *per-unit* service cost does not vary with output quality.[15]

The amount of effective consumption in ω, $Q(\omega)$, is composed of quantity $q(\omega)$ and quality $z(\omega)$. Consumer's utility U is increasing in effective consumption of each ω, so $U(Q(\omega)) = U(q(\omega) \cdot z(\omega))$, and $U'(\cdot) > 0$.[16] Given $Q(\omega)$, the final goods producer of ω solves the cost minimization problem:

$$\min_{z(\omega),q(\omega)} [b \cdot \frac{z(\omega)^{\alpha}}{\varphi(\omega)} \cdot \delta^{-\eta} + t \cdot z(\omega)^{\chi}] \cdot q(\omega), \quad \text{s.t. } Q(\omega) = q(\omega) \cdot z(\omega)$$
$$\Rightarrow \min_{z(\omega)} [b \cdot \frac{z(\omega)^{\alpha-1}}{\varphi(\omega)} \cdot \delta^{-\eta} + t \cdot z(\omega)^{\chi-1}] \cdot Q(\omega).$$

Therefore, the optimal quality $z(\omega)$ essentially minimizes the average cost *per quality unit*. To see the trade-off, notice that average input cost *per quality unit* $b \cdot \frac{z(\omega)^{\alpha-1}}{\varphi} \cdot \delta^{-\eta}$ increases with output quality, while the average service cost *per quality unit* $t \cdot z(\omega)^{\chi-1}$ decreases with output quality. The quality choice, after balancing these two costs, is:

$$z(\omega) = \left(\frac{1-\chi}{\alpha-1} \cdot \frac{t \cdot \varphi(\omega)}{b} \cdot \delta^{\eta}\right)^{1/(\alpha-\chi)}. \tag{5}$$

Since $\alpha > 1$ and $\chi < 1$, (5) is well-defined. A final goods producer chooses high quality $z(\omega)$ if productivity $\varphi(\omega)$ is high or input cost b is low. When the service cost parameter t is high, $z(\omega)$ is also high because it is cheaper to embed more quality units in each quantity unit, a *per-unit* scale effect similar to the "shipping-the-good-apples-out" effect.[17]

More importantly, a good contracting environment decreases contract enforcement costs and thus customized input cost. Therefore, input cost is also lower, leading to an increase in output quality to balance input cost and service cost. Such an effect is stronger when contract intensity is higher.

[14] As long as $\chi < 1$, the solution to optimal quality is well-defined. Mathematically, the per-unit service cost is concave in output quality. We further impose $\chi > 0$ because it is the empirically relevant case.

[15] In Feenstra and Romalis (2014), Zhang (2018) and Fan et al. (2019), t varies across exporter-importer pairs to reflect specific trade cost. For simplicity, we assume that t does not vary across different importers for an exporter. Relaxing this assumption does not affect our theoretical results.

[16] This assumption of how quality enters preference is common in the literature, e.g., Hallak (2006), Hallak and Schott (2011), Khandelwal et al. (2013), and Fan et al. (2015, 2018), .

[17] It is also known as the "Washington Apple" effect or the "Alchian-Allen" effect.

Average cost *per quality unit* is the sum of average input cost and service cost:

$$C(\omega) = \left(\frac{b \cdot \delta^{-\eta}/\varphi(\omega)}{\phi}\right)^{\phi} \cdot \left(\frac{t}{1-\phi}\right)^{1-\phi}, \tag{6}$$

where $\phi = \frac{1-\chi}{\alpha-\chi}$. (6) is the cost *per quality unit* of ω. ϕ is the share of input cost in total cost. Better judicial quality lowers $C(\omega)$ relatively more if η is high. We are also interested in the cost of variety ω *per quantity unit*:

$$c(\omega) = C(\omega) \cdot z(\omega) = \left(\phi \cdot \frac{\varphi(\omega)}{b \cdot \delta^{-\eta}}\right)^{\frac{\chi}{\alpha-\chi}} \cdot \left(\frac{t}{1-\phi}\right)^{\frac{\alpha}{\alpha-\chi}}.$$

Since $\chi > 0$, a more productive variety always has higher $c(\omega)$,[18] and a good contracting environment always increases $c(\omega)$. On the one hand, according to (5), a more productive variety in a good contracting environment always chooses a higher z that raises the marginal cost. On the other hand, given the same level of z, a more productive variety in a good contracting environment enjoys lower marginal cost as in (4). The former effect always dominates the latter under $\chi > 0$. Furthermore, the effect of judicial quality on $c(\omega)$ is stronger for a higher value of η.

In Feenstra and Romalis (2014) and Fan et al. (2019), $\chi = 0$, so the two effects cancel out with each other and $c(\omega)$ does not vary with $\varphi(\omega)$ or δ. When $\chi = -\infty$, $c(\omega) = C(\omega) = b \cdot \delta^{-\eta}/\varphi(\omega)$ and we are back to the case of Eaton and Kortum (2002) where quality differentiation disappears.[19]

2.2 Trade Pattern, Trade Price, and Quality: A Ricardian Approach

We now embed our quality choice model into a Ricardian model à la Eaton and Kortum (2002) to study different margins of trade.

Technology and Preference

For each variety ω within the continuum $[0, 1]$, there is perfect competition among final goods producers from different countries. Producers in the same country have access to

[18] This result is consistent with Mandel (2010), Johnson (2012), and Zhang (2018).
[19] When $\chi = -\infty$, all varieties choose the uniform quality $z(\omega) = 1$.

the same technology and produce variety ω at the same cost. We denote an importer by d and an exporter by o. International trade from o to d entails an *ad valorem* cost τ_{do}.[20] The price *per quality unit* of selling from o to d, which is the cost under perfect competition, is:

$$P_{do}(\omega) = \tau_{do} \cdot C_o(\omega) = \tau_{do} \cdot B_o \cdot \delta_o^{-\eta\phi} \cdot \varphi_o(\omega)^{-\phi},$$

where $B_o \equiv \left(\frac{b_o}{\phi}\right)^{\phi} \left(\frac{t_o}{1-\phi}\right)^{1-\phi}$. b, t and δ vary by exporter o, meaning that input cost, service cost, and contracting environment differ across countries.

Following Eaton and Kortum (2002), we assume that in each exporting country o, productivity $\varphi_o(\omega)$ is drawn from a Fréchet distribution:

$$\Pr[\varphi_o(\omega) \leq \varphi] = G_o(\varphi) = \exp\left(-T_o \cdot \varphi^{-\theta}\right), \tag{7}$$

where T_o is proportional to the unconditional mean of $\varphi_o(\omega)$, and θ is the dispersion parameter. The probabilistic formulation gives tractable forms of trade pattern and price.

We assume that representative consumer in an importer country d has a CES (constant elasticity of substitution) utility function:

$$U_d = \left\{ \int_0^1 Q_d(\omega)^{\frac{\sigma-1}{\sigma}} d\omega \right\}^{\frac{\sigma}{\sigma-1}} = \left\{ \int_0^1 [q_d(\omega) \cdot z_d(\omega)]^{\frac{\sigma-1}{\sigma}} d\omega \right\}^{\frac{\sigma}{\sigma-1}}, \ \sigma > 1.$$

The budget constraint is $X_d \geq \int_0^1 p_d(\omega) \cdot q_d(\omega) d\omega = \int_0^1 P_d(\omega) \cdot Q_d(\omega) d\omega$. $p_d(\omega)$ and $P_d(\omega)$ are price *per quantity unit* and price *per quality unit* of ω in d. $P_d(\omega) = p_d(\omega)/z_d(\omega)$. X_d is the total expenditure. σ is the elasticity of substitution among varieties. Demand for the effective consumption of ω in d, $Q_d(\omega)$, is:[21]

$$Q_d(\omega) = P_d(\omega)^{-\sigma} \cdot \Psi_d^{\sigma-1} \cdot X_d.$$

We can also define demand for the quantity of variety ω in d:

$$q_d(\omega) = p_d(\omega)^{-\sigma} \cdot \Psi_d^{\sigma-1} \cdot X_d \cdot z_d(\omega)^{\sigma-1}. \tag{8}$$

[20] Bilateral trade cost τ_{do} include physical barriers such as distance and time zone difference, policy barriers such as tariff and currency difference, and cultural barriers such as language and taste differences.

[21] We formulate $Q_d(\omega)$ as consumer demand for simplicity, but it can also represent the sum of consumption demand and intermediate input demand as in Caliendo and Parro (2015).

Aggregation

For variety $\omega \in [0,1]$, an importer d decides where to buy. Because consumer's utility depends on the amount of effective consumption $Q_d(\omega)$, the relevant price for consumer's decision is $P_{do}(\omega)$, price *per quality unit* offered by exporter o to importer d. We refer to $P_{do}(\omega)$ as *effective price*. Perfect competition suggests that consumer in d buys ω from country o that offers the lowest $P_{do}(\omega)$:

$$P_d(\omega) = \min_o \{P_{do}(\omega);\ \forall\, o\}.$$

With the Fréchet distribution assumption about $\varphi(\omega)$, the probability distribution of $P_{do}(\omega)$, effective price available for importer d from exporter o, is:

$$G_{do}(P) = 1 - \exp\,[-T_o \cdot \delta_o^{\eta\theta} \cdot (\frac{B_o \cdot \tau_{do}}{P})^{-\frac{\theta}{\phi}}].$$

We characterize the determination of bilateral trade pattern in Lemma 1:

Lemma 1. *When $\varphi_o(\omega)$ follows Fréchet in (7), the probability that importer d buys a particular variety ω from exporter o, π_{do}, is:*

$$\pi_{do} = \frac{T_o \cdot \delta_o^{\eta\theta} \cdot (B_o \cdot \tau_{do})^{-\frac{\theta}{\phi}}}{\Phi_d}, \tag{9}$$

where $\Phi_d = \sum_s T_s \cdot \delta_s^{\eta\theta} \cdot (B_s \cdot \tau_{ds})^{-\frac{\theta}{\phi}}$. π_{do} is also the fraction of varieties that d buys from o.[22]

Lemma 1 delivers a trade equation that resembles the one in Eaton and Kortum (2002). Bilateral trade fraction/probability follows a gravity form, and judicial quality affects bilateral trade. Country d imports relatively more from exporters with better contracting environments when contract intensity is high.

Proposition 1. *The probability distribution of $P_d(\omega)$, the effective price of variety ω consumed in d, is:*

$$G_d(P) = 1 - \exp\,[-\Phi_d \cdot P^{\frac{\theta}{\phi}}], \tag{10}$$

[22] See Appendix A 1.1 for the proof of Lemma 1.

which is also the effective price distribution of varieties that d actually buys from o, $\tilde{G}_{do}(P)$.

The exact price index in d, Ψ_d, *is:*

$$\Psi_d = \Phi_d^{-\frac{\phi}{\theta}} \cdot \Gamma[1 + \frac{\phi(1-\sigma)}{\theta}]^{\frac{1}{1-\sigma}}; \;\; \theta > \phi(\sigma - 1), \tag{11}$$

where $\Gamma[\cdot]$ *is the Gamma function.*[23]

Proposition 1 describes how Φ_d determines the effective price distribution and price index in country d. First, a higher Φ_d results in a lower mean effective price. The effective price distribution of varieties that d actually buys from o, $\tilde{G}_{do}(P)$, coincides with $G_d(P)$. Intuitively, d would increase its purchase from an exporter offering lower price until no difference in price distributions across exporters can be exploited, so a no-arbitrage condition that $\tilde{G}_{do}(P) = G_d(P)$ must hold. Second, price index Ψ_d is inversely related to Φ_d. So better judicial quality in one country benefits all countries by increasing Φ_d.

Because $\tilde{G}_{do}(P) = G_d(P)$, π_{do} is also the share of expenditure that d spends on varieties from o. The value of trade from o to d, X_{do}, is thus proportional to π_{do}:

$$X_{do} = \pi_{do} \cdot X_d = T_o \cdot \delta_o^{\eta\theta} \cdot (B_o \cdot \tau_{do})^{-\frac{\theta}{\phi}} \cdot \Phi_d^{-1} \cdot X_d.$$

Analogously, we can define the quantity of trade from o to d, q_{do}, and bilateral trade price.

Lemma 2. *The price of trade from o to d is:*

$$p_{do} \equiv \frac{X_{do}}{q_{do}} = \underbrace{\tau_{do} \cdot \left(\frac{t_o}{1-\phi}\right)^{\frac{1}{1-\chi}} \cdot B_o^{-\frac{\chi}{1-\chi}} \cdot \delta_o^{\frac{\eta\chi}{\alpha-\chi}}}_{\text{Within-variety effect}} \cdot \underbrace{\frac{E[\varphi_o(\omega)^{\phi(\sigma-1)} \mid \omega \in \Omega_{do}]}{E[\varphi_o(\omega)^{\phi\sigma - \frac{1}{\alpha-\chi}} \mid \omega \in \Omega_{do}]}}_{\text{Composition effect}}, \tag{12}$$

where Ω_{do} *is the set of varieties that d actually buys from o.*

When $\varphi_o(\omega)$ *follows Fréchet in (7), the composition effect in (12) is:*

$$\frac{E[\varphi_o(\omega)^{\phi(\sigma-1)} \mid \omega \in \Omega_{do}]}{E[\varphi_o(\omega)^{\phi\sigma - \frac{1}{\alpha-\chi}} \mid \omega \in \Omega_{do}]} = \Phi_d^{\frac{\chi}{\theta(\alpha-\chi)}} \cdot \tau_{do}^{\frac{\chi}{1-\chi}} \cdot B_o^{\frac{\chi}{1-\chi}} \cdot \delta_o^{-\frac{\eta\chi}{\alpha-\chi}} \cdot \Gamma^p, \tag{13}$$

[23] See Appendix A 1.2 for the proof of Proposition 1.

and

$$p_{do} = \left(\tau_{do} \cdot \frac{t_o}{1-\phi}\right)^{\frac{1}{1-\chi}} \cdot \Phi_d^{\frac{\chi}{\theta(\alpha-\chi)}} \cdot \Gamma^p, \tag{14}$$

where Γ^p *is a constant. The average quality of trade from* o *to* d*,* z_{do}*, is:*

$$z_{do} \equiv \frac{p_{do}}{P_{do}} = \left(\tau_{do} \cdot \frac{t_o}{1-\phi}\right)^{\frac{1}{1-\chi}} \cdot \Phi_d^{\frac{1}{\theta(\alpha-\chi)}} \cdot \Gamma^z, \tag{15}$$

where P_{do} *is the average effective price of trade from* o *to* d *and* Γ^z *is a constant.*[24]

Lemma 2 decomposes the price of trade into two margins: a *within-variety effect* capturing the intensive margin, and a *composition effect* capturing the extensive margin. The within-variety effect indicates that for each variety sold from o to d, a good contracting environment in o increases quality and price *per variety*. The composition effect suggests that a good contracting environment admits more low-productivity, low-quality, and thus low-priced varieties to be sold from o to d, decreasing aggregate trade price. Both effects are stronger when contract intensity is high. Under Fréchet, these two effects offset each other. Therefore, there is no direct impact of judicial quality and contracting environment in o on the aggregate trade price p_{do} in (14).

Interestingly, trade price p_{do} is increasing in Φ_d. Due to the composition effect, only those productive varieties with higher quality and prices can compete in a more competitive market in d featuring a lower price index. This effect is switched off when $\chi = 0$ (Feenstra and Romalis, 2014; Fan et al., 2019) and reversed when $\chi = -\infty$ (Eaton and Kortum, 2002).

2.3 Judicial Quality, Contract Intensity, and Margins of Trade

We now study how cross-country differences in contracting environments and judicial quality affect the margins of export and import. We focus on the impacts on trade share, price, and quality. Our analysis compares the effects of judicial quality on trade across industries and products that differ in their reliance on the contracting environment.

[24] See Appendix A 1.3 for the proof of Lemma 2.

We first show how judicial quality in one origin country affects competition in all destination countries, measured by Φ_d, the inverse of price index:

$$\frac{d\ln\Phi_d}{d\ln\delta_o} = \eta\theta\cdot\frac{T_o\cdot\delta_o^{\eta\theta}\cdot(B_o\cdot\tau_{do})^{-\frac{\theta}{\phi}}}{\sum_s T_s\cdot\delta_s^{\eta\theta}\cdot(B_s\cdot\tau_{ds})^{-\frac{\theta}{\phi}}} = \eta\theta\cdot\pi_{do}.$$

A better contracting environment and judicial quality in o increases competition in d. This effect increases with contract intensity η, the dispersion parameter of productivity distribution θ, and the market share of o in d. Intuitively, if o is a major supplier of d, any change of δ_o would yield a considerable effect on the competitive environment in d.

International trade is bilateral, so we take a bilateral point of view when analyzing the effects of judicial quality. When it comes to the effect of judicial quality on export, it is essential to compare exporters with different judicial quality conditional on the same importer to eliminate any demand-specific confronting factors. Similarly, when it comes to the effect of judicial quality on import, we compare importers with different judicial quality conditional on the same exporter to eliminate any supply-specific confronting factors. We further examine the differential effects of judicial quality on export and import across industries and products with different contract intensities.

The effects of judicial quality on trade pattern are summarized in Proposition 2. Comparison conditional on an importer d (an exporter o) is denoted as $|_d$ (as $|_o$).

Proposition 2. *Conditional on an importer d, a country with better judicial quality exports relatively more to d in contract-intensive industries:*

$$\frac{d^2\ln\pi_{do}}{d\ln\delta_o d\eta}\ |_d = \theta > 0. \tag{16}$$

Conditional on an exporter o, a country with better judicial quality imports relatively less from o in contract-intensive industries:

$$\frac{d^2\ln\pi_{do}}{d\ln\delta_d d\eta}\ |_o = -\theta\cdot\pi_{dd} < 0. \tag{17}$$

(16) indicates that contracting environment and judicial quality constitute a comparative advantage in industries heavily relying on contract enforcement, broadly consistent

with the findings of previous studies summarized by Nunn and Trefler (2014).[25] We show that this implication holds in a multi-country environment.

(17) reveals another novel result: Better judicial quality generates relatively more domestic competition and less import demand in contract-intensive industries. In an importer country with better judicial quality and hence higher δ_d, domestic producers in contract-intensive industries possess comparative advantage and have relatively higher quality, making these industries tougher to survive for foreign varieties. The competitive environment is reflected by a high Φ_d and a low price index. This import-reducing effect magnifies as domestic producers' market share grows.

Compared with the effects on trade patterns, significantly less discussion has been devoted to how the contracting environment shapes prices and quality of trade. We describe the effects of judicial quality on trade price and quality in Proposition 3.

Proposition 3. *Conditional on an importer d, a country's judicial quality has no explicit impacts on its export prices or quality to d in contract-intensive products:*

$$\frac{d^2 \ln p_{do}}{d \ln \delta_o d\eta} |_d = 0; \quad \frac{d^2 \ln z_{do}}{d \ln \delta_o d\eta} |_d = 0. \tag{18}$$

Conditional on an exporter o, a country with better judicial quality imports at relatively higher prices and quality from o in contract-intensive products:

$$\frac{d^2 \ln p_{do}}{d \ln \delta_d d\eta} |_o = \frac{\chi}{\alpha - \chi} \cdot \pi_{dd} > 0; \quad \frac{d^2 \ln z_{do}}{d \ln \delta_d d\eta} |_o = \frac{\pi_{dd}}{\alpha - \chi} > 0. \tag{19}$$

(18) shows that judicial quality does not have any explicit impacts on export prices or quality in contract-intensive products. This is due to two opposite effects. On the one hand, due to the within-variety effect in (12), a higher δ_o lowers customized input cost and raises the price and quality of a given variety. On the other hand, due to the composition effect in (12), a higher δ_o allows more low-quality and low-priced varieties to sell from o to d, lowers the aggregate price and quality of trade. These two effects offset each other under the assumption of Fréchet distribution and lead to an elasticity of zero. The zero elasticity holds across products with different η.

[25] Comparative advantage due to judicial quality resembles endowment-based comparative advantages, such as capital, but not Ricardian comparative advantage due to productivity dispersion.

(19) suggests better judicial quality leads to relatively higher import prices and quality in contract-intensive products due to the composition effect in (12). A higher δ_d causes tougher competition in the domestic market, so only the most productive foreign varieties can compete in that country, increasing aggregate import price and quality. Stronger composition effects occur in contract-intensive products. Allowing for quality differentiation is important to generate these predictions.[26]

To sum up, our model generates implications about the effects of judicial quality on a country's trade margins across industries and products varying in contract intensity. Besides the comparative advantage effect studied by existing literature, we highlight the effects of domestic competition, domestic varieties' quality upgrading, and quality compositions of exports and imports. We test Propositions 2 and 3 in the subsequent analysis.

2.4 Alternative Model Assumptions

Our framework offers several sharp predictions regarding how judicial quality shapes trade margins. These predictions are robust to alternative model assumptions.

First, while we adopt a Ricardian model following Eaton and Kortum (2002), our results are unchanged when we instead assume monopolistic competition with heterogeneous firms. When final goods producers are heterogeneous firms à la Melitz (2003) and productivity distribution is Pareto as in Chaney (2008), we obtain the same results as in Propositions 2 and 3, with θ being the dispersion parameter of Pareto distribution.[27]

Second, while we only consider domestic input sourcing, our results should be robust to international sourcing. On the one hand, international sourcing incurs huge fixed costs (Antras and Helpman, 2004; Antras et al., 2017), so most producers source most of their inputs from domestic suppliers (Amiti et al., 2014; Kee and Tang, 2016). The contractual frictions of the domestic transactions hinge on the domestic contracting environment. On the other hand, if international sourcing undermines any linkage between a country's input cost and its contracting environment, it tends to work against our predic-

[26] For comparison, if $\chi = 0$ (Feenstra and Romalis, 2014), $\frac{d^2 \ln p_{do}}{d \ln \delta_d d\eta} |_o = 0$; if $\chi = -\infty$ (Eaton and Kortum, 2002), $\frac{d^2 \ln p_{do}}{d \ln \delta_d d\eta} |_o = -\pi_{dd}$.

[27] Feenstra and Romalis (2014) also adopt this setup. Under this setup, allowing for free entry basically introduces agglomeration in T_o in our framework and does not substantially change the results.

tions. Hence, we would underestimate the actual effects of our proposed mechanisms.

Third, as another mechanism, variable markup cannot generate our predictions about import price. Tougher domestic competition due to better judicial quality should lower markups of imported varieties and depress import price, so variable markup predicts a negative $\frac{d^2 \ln p_{do}}{d \ln \delta_d d\eta} \mid_o$. We show in 5.2 that the estimates of $\frac{d^2 \ln p_{do}}{d \ln \delta_d d\eta} \mid_o$ are actually all positive.

3 Empirical Strategy

In this section, we explain our empirical strategy, which is directly informed by our theoretical analysis. Consistent with Romalis (2004), Nunn (2007), and Nunn and Trefler (2014), we exploit cross-country variation in judicial quality and cross-industry variation in contract intensity for identification.[28]

3.1 Baseline Specifications

To empirically test Propositions 2 and 3, we need to compare bilateral trade outcomes across different exporters for a given importer, and across different importers for a given exporter. Recognizing the bilateral structure of trade data, we use the following specification to detect the effects of judicial quality on export margins:

$$y_{do}^g = \beta_{E1} \cdot JQ_o \times \eta^g + \beta_{E2} \cdot H_o \times h^g + \beta_{E3} \cdot K_o \times k^g + \zeta_d^g + \zeta_o + \mathbf{X}_o^g + \mathbf{B}_{do}^g + \varepsilon_{Edo}^g. \quad (20)$$

y_{do}^g denotes a bilateral trade outcome at the exporter(o)-importer(d)-industry(g) level. JQ_o is the judicial quality of the exporter o. η^g is the contract intensity of an industry or a product g. H_o and K_o are exporter o's skill and capital endowments, and h^g and k^g are the skill and capital intensities of industry or product g. We are interested in β_{E1}, the differential effects of judicial quality on export margins across industries or products with different contract intensities. We include importer-industry or importer-product fixed effects ζ_d^g to control all industry- or product-specific demand-side factors. So β_{E1}, β_{E2}, and β_{E3} are identified using the variations across exporters within an importer-industry or importer-product cell. Exporter fixed effects ζ_o absorb the effects of an exporter's char-

[28] This is because indicators of contracting environment or judicial quality barely vary across years.

acteristics, such as income level and labor cost. $\mathbf{X}_o^g$ are control variables at the exporter-industry or exporter-product level. $\mathbf{B}_{do}^g$ are variables capturing bilateral trade costs.

We use a similar specification to test the effect of judicial quality on imports:

$$y_{do}^g = \beta_{I1} \cdot JQ_d \times \eta^g + \beta_{I2} \cdot H_d \times h^g + \beta_{I3} \cdot K_d \times k^g + \zeta_o^g + \zeta_d + \mathbf{X}_d^g + \mathbf{B}_{do}^g + \varepsilon_{Ido}^g. \quad (21)$$

y_{do}^g is the same as in (20). The main variable of interest is the importer's judicial quality interaction $JQ_d \times \eta^g$. The skill and capital interactions are also included. We are interested in β_{I1}, the differential impacts of judicial quality on import margins across industries or products with different contract intensities. We include exporter-industry or exporter-product fixed effects ζ_o^g to control all industry- or product-specific supply-side factors, so we identify β_{I1}, β_{I2} and β_{I3} using the variations across importers within an exporter-industry or exporter-product cell. Importer fixed effects ζ_d absorb any effects of an importer's characteristics. $\mathbf{X}_d^g$ are control variables at the importer-industry or importer-product level. $\mathbf{B}_{do}^g$ are variables of bilateral trade costs.

The outcome variables of interest y_{do}^g in (20) and (21) are different bilateral trade outcomes: trade share, trade price and quality of trade. When testing Proposition 2, we use exporter-importer-industry-level trade share as the outcome variable to better capture variations in both total import share and share of imports from different exporters.[29] When testing Proposition 3, we use exporter-importer-product-level price and quality as the outcome variables because the price and quality differences are more informative at the product level. We explain how we define industry and product in 4.1.

Control Variables

Following Nunn (2007), we include a set of country-industry or country-product level control variables in $\mathbf{X}_o^g$ and $\mathbf{X}_d^g$ in (20) and (21) respectively. First, we include the interaction of country-level financial development with an industry-level measure of external financial dependence.[30] Second, we include the interactions of country-level log per capita income with several industry-level characteristics: value-added share, production

[29] We investigate the trade pattern outcomes at the industry level, mainly due to the difficulty of computing absorption and total import share at the product level. η^g also varies at the industry level.

[30] Manova (2013) finds that countries with better financial development have a comparative advantage in more financially-vulnerable industries.

fragmentation (measured by intra-industry trade), technological progress (measured by productivity growth in the previous twenty years), and product complexity (measured by the Herfindahl index of input concentration). The bilateral trade cost variables $\mathbf{B}_{do}^{g}$ between the exporter o and the importer d include bilateral tariff, log distance, and dummy variables indicating whether the trading partners share a common border, share a common official language, have any colonial tie, are in a common currency union, and are in any common free trade agreement (FTA).

3.2 Endogeneity: Legal Origin as the Instrumental Variable

Contracting institutions can be endogenous to economic growth and international trade (Nunn and Trefler, 2014). Specifically, a country may have a greater incentive to maintain a good contracting environment if it produces or consumes more contract-intensive goods. To identify the causal effects of judicial quality on trade margins, we follow Nunn (2007) to instrument a country's judicial quality using the country's legal origin. Legal origin was predetermined centuries ago and is unlikely to be affected by the current trade patterns. Meanwhile, legal origin affects the efficiency and consistency of a country's judicial system, generating the exogenous variation in judicial quality across countries (La Porta et al., 1999; Acemoglu and Johnson, 2005). Finally, by including a large set of control variables and fixed effects, we control for other potential channels through which legal origin may yield effects on a country's trade.

We instrument exporter o's judicial quality interaction $JQ_o \times \eta^g$ in (20) using the interactions of o's legal origin indicator variables with contract intensity. These interactions are $B_o \times \eta^g$, $G_o \times \eta^g$ and $S_o \times \eta^g$, where B_o, G_o, and S_o indicate whether exporter o's legal origin is British common law, German civil law, or Scandinavian civil law, respectively.[31] The standard errors are clustered at the exporter level accordingly. Similarly, we use $B_d \times \eta^g$, $G_d \times \eta^g$ and $S_d \times \eta^g$ to instrument for importer d's judicial quality interaction $JQ_d \times \eta^g$ in (21), and cluster the standard errors at the importer level.

[31] There are in total five categories of legal origins: British common law, French civil law, German civil law, Scandinavian civil law, and Socialist law. All countries with Socialist law legal origin were dropped due to missing data of skill and capital interactions. The omitted category is French civil law.

4 Data and Variables

We describe the data and variable constructions in this section. We also provide suggestive evidence for the predictions of Propositions 2 and 3.

4.1 Bilateral Trade Pattern, Price, and Quality

Our bilateral trade data for each 4-digit code of the Standard International Trade Classification (SITC henceforth) Revision 2 are drawn from the United Nations Comtrade (UN Comtrade henceforth) data. Our sample contains 198 countries and $1,186$ unique combinations of the SITC 4-digit code and the unit of measurement. The trade data are also mapped to the U.S. Bureau of Economic Analysis (BEA henceforth) 1997 I-O industry classification of 225 I-O industries. All trade data are in the year of 1997.

We use the BEA I-O industry classification to define different industries. To measure bilateral trade share π^g_{do} at the industry level, we first calculate the share of country d's import value from country o in country d's total import value for an industry g, Imp^g_{do}. We then use the World Input-Output Database (WIOD henceforth) to calculate the share of total imports from all other countries over total absorption in each WIOD sector for each country in 1997. These total import shares are then mapped to the BEA I-O industry level.[32] Multiplying Imp^g_{do} by the total import share of country d in that BEA I-O industry gives π^g_{do}. For robustness, we use free-on-board (FOB henceforth) value and trade value including cost, insurance, and freight (CIF henceforth) to construct two measures of π^g_{do}.

We also construct another measure of bilateral trade share based on the number of traded varieties (measured by the unique combinations of SITC 4-digit-unit and exporter). First, we calculate the share of country d's number of imported varieties from o in country d's total number of imported varieties for a BEA I-O industry. We then multiply this variety share by the total import share of country d in that BEA I-O industry to obtain the variety-based bilateral trade share.[33]

[32] Hence, the country-industry-level total import share only varies at the WIOD sector level, which is more aggregate than the BEA I-O industry level. The choice of the WIOD-level total import share is due to the data limitation in computing absorption at a more disaggregate industry level for different countries.

[33] The share of d's total number of imported varieties in d's total number of absorbed varieties is not available, so we use the value-based import share as a proxy.

The price or unit value of bilateral trade is computed at the exporter-importer-product level. We define a product as a unique combination of SITC 4-digit code and unit of measurement. Bilateral trade price is computed as bilateral trade value divided by bilateral traded quantity. For robustness, we construct both FOB price and CIF price. For the quality of trade, we use the estimated bilateral trade quality index in each SITC 4-digit-unit cell from Feenstra and Romalis (2014). Specifically, they estimate trade quality in a model of quality choice that shares a lot of key features with our theoretical model.[34] Because Feenstra and Romalis (2014) endogenizes quality choice, their estimation of quality is more robust to the supply-side assumptions concerning the number of varieties than the demand-side approach.[35] Importantly, their bilateral export quality index is only comparable across exporters conditional on an importer d for a product, and their bilateral import quality index is only comparable across importers conditional on an exporter o for a product. Thus, the inclusions of importer-product fixed effects ζ_d^g in (20) and exporter-product fixed effect ζ_o^g in (21) are essential when estimating the effects on quality.

4.2 Judicial Quality and Contract Intensity

Our preferred measure of country-level judicial quality JQ is the "rule of law" indicator from Kauffmann et al. (2004), which measures a country's efficiency and consistency in judicial procedures and practice, as well as its situation of contract enforcement, during 1997-98. Moreover, Gwartney and Lawson (2003) and the World Bank's "Doing Business Survey" also provide measures on judicial quality and contract enforcement for each country. We use these two alternative measures in our robustness analysis.[36]

Our measure of contract intensity η^g comes from Nunn (2007). Using a classification of customized products at the SITC 4-digit level from Rauch (1999), a concordance table

[34] Although Feenstra and Romalis (2014) is based on a firm heterogeneity model, under their assumption of Pareto productivity distribution, most of their implications are highly similar to ours. We refer our readers to the original paper of Feenstra and Romalis (2014) for the details of their model and estimation. Feenstra and Romalis (2014) also consider differences in preference for quality due to differences in cross-country per capita income. Our empirical results are robust to this adjustment.

[35] The demand-side approach estimates quality as a "product appeal" after eliminating the effect of price (e.g., Khandelwal, 2010; Hallak and Schott, 2011; Khandelwal et al., 2013).

[36] Most of the variation in country-level judicial quality comes from the country-specific component that does not vary over time. In fact, country fixed effects account for 95.7% and 95.3% of the total variation in Kauffmann et al. (2004)'s JQ measure and Gwartney and Lawson (2003)'s JQ measure, respectively.

between the SITC 4-digit product and the BEA I-O industry, and the U.S. I-O table, Nunn (2007) constructs contract intensity as the cost share of customized input in total input for each BEA I-O industry.[37] This measure is consistent with our interpretation of η^g.[38] For the analysis of price and quality of trade, we map η^gs to the SITC 4-digit level.

4.3 Control Variables

Measures of skill intensity and capital intensity are drawn from Nunn (2007). The construction of the external finance dependence measure follows Rajan and Zingales (1998). Other industry characteristics, including value-added share, intra-industry trade share, productivity growth, and Herfindahl index of input concentration, are all from Nunn (2007). The above measures are all at the BEA I-O industry level, so we map them to the SITC 4-digit level when the outcome variables are price and quality of trade. Country-level skill endowment, capital endowment, financial development, and per capita income are also from Nunn (2007). Bilateral tariff data at the SITC 4-digit level are from the UN Comtrade data set. Information about bilateral distance, shared border, common official language, colonial tie, common currency union, and common FTA is from the CEPII database.

4.4 A First Look at the Data

To motivate the empirical analysis, we present several figures that illustrate the effects of judicial quality on the relative trade pattern and relative trade price between the most and least contract-intensive industries. We first run the following fixed effects regression:

$$\ln \pi^g_{do} = \mathbf{B}^g_{do} + \mathbf{Z}^g_o + \mathbf{Z}^g_d + \epsilon^g_{do}, \tag{22}$$

where $\mathbf{B}^g_{do}$ is the bilateral trade cost variables specified before. The fixed effects $\mathbf{Z}^g_o$ and $\mathbf{Z}^g_d$ capture average trade share at the exporter-industry level and the importer-industry level, respectively, after controlling for bilateral trade frictions.

[37] Rauch (1999) classifies all the SITC 4-digit products into three categories: "sold on an organized exchange", "reference priced", and "neither". Customized products are those classified as "neither".

[38] Rauch (1999) provides a "conservative" standard and a "liberal" standard of classifications. We use η^g following the "conservative" standard in the main analysis. Our results are robust to the "liberal" standard.

We define an industry g as "high contract intensity" if η^g exceeds median contract intensity across all industries, and as "low contract intensity" otherwise. For each exporter o, we calculate the mean $\mathbf{Z}_o^g$ for high-contract-intensity and low-contract-intensity industries separately.[39] The ratio between the mean $\mathbf{Z}_o^g$ of the high-contract-intensity industries and the mean $\mathbf{Z}_o^g$ of the low-contract-intensity industries is exporter o's "export share premium" in contract-intensive industries. We calculate a similar measure for $\mathbf{Z}_d^g$, importer d's "import share premium" in contract-intensive industries.

[Figure 1 here]

In Figure 1, we plot the country-level log "export share premium" (left panel) and log "import share premium" (right panel) in contract-intensive industries against log judicial quality measure from Kauffmann et al. (2004) in the horizontal axis. Different symbols indicate countries on different continents. Consistent with Proposition 2, a country's export share premium in contract-intensive industries increases with its judicial quality. Regressing log export share premium on log judicial quality yields a coefficient of 2.101 with a robust standard error of 0.348. A country's import share premium in contract-intensive industries decreases with its judicial quality. Regressing log import share premium on log judicial quality gives a coefficient of -0.492 with a standard error of 0.122.

Analogously, we can replace π_{do}^g with p_{do}^g, the bilateral trade price from o to d in SITC 4-digit-unit product g, when estimating (22). Repeating the procedures above, we obtain the country-level "export price premium" and "import price premium" in contract-intensive products. In Figure 2, we plot the log export price premium (left panel) and log import price premium (right panel) against log judicial quality. A country's export price premium in contract-intensive industries does not significantly vary with judicial quality. A bivariate regression of log export price premium on log judicial quality gives a coefficient of -0.084 with a standard error of 0.122. On the other hand, a country's import price premium in contract-intensive industries increases with its judicial quality. Regressing log import price premium on log judicial quality generates a coefficient of 0.222 with a standard error of 0.051.[40]

[39] To ensure that $\mathbf{Z}_o^g$s are comparable across different industries g, we demean $\mathbf{Z}_o^g$ within each g before calculating the averages.

[40] To ensure robustness, we re-classify industries into either "high contract intensity" if η^g is higher than

[Figure 2 here]

5 Empirical Analysis

Our empirical analysis proceeds as follows. First, we use bilateral trade share at the BEA I-O industry level to validate Proposition 2. Second, we use bilateral trade price and quality at the SITC 4-digit-unit level to test Proposition 3. Finally, we discuss the economic magnitudes of our results, derive new welfare formulas, and apply one of our formulas to analyze the relative welfare changes of Eurozone countries during 2002-2007. Following Nunn (2007), we standardize all explanatory variables to directly compare their relative importance.

5.1 Effects of Judicial Quality on Trade Pattern

We begin by testing whether a country with better judicial quality specializes in the exports of contract-intensive industries. Columns (1) to (3) of Table 1 report the OLS estimation results of (20). In columns (1) and (2), our outcome variables are bilateral trade shares π_{do}^{g} at the BEA I-O industry level based on FOB and CIF trade value, respectively. In column (3), we use the variety-based bilateral trade share as the outcome variable. Besides the exporter's judicial quality interaction $\eta^{g} \times JQ_{o}$, we include skill interaction and capital interaction of the exporter to control for skill-based and capital-based comparative advantages, and bilateral variables $\mathbf{B}_{do}^{g}$ to capture bilateral trade barriers. As guided by our empirical strategy, we control for importer-industry fixed effects ζ_{d}^{g} and exporter fixed effects ζ_{o}. The coefficients of the judicial quality, skill, and capital interactions are all positive and statistically significant at the 1% level. Consistent with Nunn (2007), the judicial quality interaction has a larger effect on the value-based bilateral trade share than the combined effects of the skill and capital interactions.

Columns (4) to (6) of Table 1 test whether a country with better judicial quality imports relatively less in contract-intensive industries by estimating (21). The outcome variables are value-based and variety-based bilateral trade shares, respectively. We include

the 75% percentile of contract intensity across all industries, or "low contract intensity" if η^{g} is lower than the 25% percentile. Figures D.1 and D.2 in Appendix D report the alternative figures that give the same results.

factor endowment interactions of the importer and $\mathbf{B}^g_{do}$ that capture trade barriers. We control for exporter-industry fixed effects ζ^g_o and importer fixed effects ζ_d as indicated in (21). The OLS estimates of coefficients are all negative and statistically significant.

[Table 1 here]

Judicial quality may be endogenous to international trade. To isolate the causal effects of judicial quality on export and import patterns, we re-estimate all columns of Table 1 using legal origin as the instrument for a country's judicial quality. We also include the interaction of country-level financial development with industry-level external finance dependence, and the interactions of country-level log per capita income with several industry-level characteristics as additional controls.[41] The IV estimates reported in Table 2 are highly aligned with and larger than the OLS ones in Table 1.[42] First, the effects of exporter's judicial quality interaction on trade shares remain significantly positive and larger than the combined effect of the skill and capital interactions. A one standard deviation increase in $\eta^g \times JQ_o$ increases the value-based trade share and variety-based trade share by about 112% and 29%, respectively. These IV estimates are close to those obtained by Nunn (2007).[43] Second, the effects of importer's judicial quality interaction on trade shares are negative and statistically significant. A one standard deviation increase in $\eta^g \times JQ_d$ decreases both the value- and variety-based trade shares by about 25%.

Turning to the statistical tests about the legal origin instrument, we find that the Kleibergen-Paap (K-P henceforth) LM statistics are all statistically significant at the 1% level and the K-P F statistics are all larger than 10. Thus, under-identification or weak instrument does not seem a first-order concern. Meanwhile, most of the Hansen J values are statistically insignificant in Table 2. The only significant one is in column (6). As discussed by Angrist and Pischke (2008), the rejection of over-identification test needs not to suggest an identification failure, but can instead be a symptom of treatment effect

[41] The results of first stage regressions are reported in Table C.1 in Appendix C. The industry-level characteristics include value-added share, production fragmentation, technological progress, and product complexity.

[42] The IV estimates are larger than the OLS estimates, possibly because the measurement errors in JQ tend to bias the OLS estimates towards zero. The measurement errors can arise as the JQ from Kauffmann et al. (2004) is based on individuals' perceptions of the judiciary environment.

[43] In columns (1) and (2) of Table 2, the standardized beta coefficients of $\eta^g \times JQ_o$ are 0.504 and 0.507. In column (6) of Table VII in Nunn (2007), the standardized beta coefficient is 0.520.

heterogeneity. Since our estimated IV coefficients are average effects across heterogeneous countries and industries, it is plausible that the statistically significant Hansen J values are mainly due to heterogeneity in the underlying coefficients or treatment effects. Overall, legal origin appears a valid instrument that predicts judicial quality well in our exporter-importer-industry specifications.

[Table 2 here]

To sum up, Tables 1 and 2 validate the predictions of Proposition 2. A country with better judicial quality exports relatively more and imports relatively less in contract-intensive industries. In particular, the import-reducing effect indicates tougher domestic competition in contract-intensive industries due to better judicial quality. The effects of comparative advantage and domestic competition also apply to the other two factor endowments: A skill- or capital-abundant country exports relatively more and imports relatively less in skill- or capital-intensive industries.

5.2 Effects of Judicial Quality on Trade Price and Quality

We next turn to uncover new findings of how judicial quality affects a country's price and quality of export and import. First, we test whether a country with better judicial quality exports at relatively higher prices or quality in contract-intensive industries. In columns (1) to (2) of Table 3, we report the OLS estimates of (20) using bilateral FOB and CIF prices as outcome variables, respectively. In column (3), the outcome variable is the export quality index from Feenstra and Romalis (2014). We include other factor endowment interactions and bilateral trade cost variables, as well as importer-product fixed effects ζ_d^g and exporter fixed effects ζ_o. The coefficient of judicial quality interaction is estimated to be positive but statistically insignificant at the 10% level. These results are aligned with the prediction of Proposition 3. Second, we test whether a country with better judicial quality imports at relatively higher prices and quality in contract-intensive industries. We do so by estimating (21) using bilateral FOB and CIF prices, and import quality index from Feenstra and Romalis (2014) as outcome variables. In columns (4) to (6) of Table 3, the coefficient of importer's judicial quality interaction is positive and significant at the 1% level. Better judicial quality is correlated with relatively higher import price and quality in contract-intensive industries.

[Table 3 here]

To further identify the causal effects, we re-estimate all columns of Table 3 using legal origin as the instrument for judicial quality. We include the interaction of country-level financial development with industry-level external finance dependence, as well as the interactions of country-level log per capita income with several industry-level characteristics as additional controls.[44] The IV estimates are reported in Table 4 and are highly consistent with the OLS estimates in Table 3. First, the effects of exporter's judicial quality interaction on price and quality are statistically insignificant. All t-values are between 0.8 to 0.9, corresponding to a 40% significance level, so the estimates are not significantly different from 0 by any conventional standards. Moreover, the standard errors are relatively small, so the insignificant results are not due to imprecise estimates.[45] Second, the effects of importer's judicial quality interaction on price and quality are positive and statistically significant, at least at the 10% level. A one standard deviation increase in $\eta^g \times JQ_d$ increases the import price and import quality index by about 12% and 6%, respectively. Meanwhile, all columns are accompanied by K-P LM statistics significant at the 1% level and K-P F statistics larger than 10, alleviating the concern about under-identification and weak instruments. The Hansen J values are marginally significant at the 10% level in columns (1), (2), (3), and (6), and statistically insignificant in columns (4) and (5). As indicated before, we interpret the marginally significant Hansen J values as a symptom of heterogeneity in the underlying coefficients.

[Table 4 here]

The skill and capital interactions do not yield similar effects on price and quality as the judicial quality interaction. Particularly, in columns (1) to (3) of Table 4, the capital interaction is even found to significantly reduce export price and quality. While an overall increase in capital endowment is not always accompanied by capital input upgrading,

[44] The results of first stage regressions are reported in Table C.2 in Appendix C.

[45] The standard errors of the judicial quality interaction range from 0.137 to 0.154, while those in columns (1) to (3) of Table 2 range from 0.127 to 0.433.

it can replace unskilled labors and tasks not directly related to quality production and reduce the associated costs, thus lowering prices.[46]

In sum, Tables 3 and 4 provide evidence supporting Proposition 3, and highlight the importance of incorporating quality differentiation to understand how judicial quality affects trade prices and quality. A country's judicial quality does not have explicit impacts on its export prices and quality in contract-intensive industries due to two offsetting effects: the *within-variety effect* that induces quality upgrading of individual varieties, and the *composition effect* that admits more low-quality domestic varieties to export. In contrast, a country with better judicial quality imports at relatively higher prices and quality. Combined with the domestic competition effect indicated in Table 2, the result suggests that the imported varieties that survive tougher domestic competition are of higher prices and quality.

Robustness

To ensure that our findings are not subject to measurement issues, we use alternative measures of judicial quality, contract intensity, price, and quality of trade to estimate the specifications in Tables 2 and 4. First, we use the "legal quality" indicator from Gwartney and Lawson (2003) and the judicial system's efficiency indicator from the World Bank's "Doing Business Survey" as alternative measures of JQ. We also use the "liberal"-based contract intensity referring to Rauch (1999). Second, following Khandelwal et al. (2013), Fan et al. (2015), and Fan et al. (2018), we use the demand-side approach to infer quality of trade as outcome variable. Third, to avoid potential measurement bias of trade price at the SITC 4-digit level, we use trade price at the Harmonized System (HS henceforth) 6-digit classification as the outcome variable. The details and results of these robustness analysis are reported in Appendix B. In general, we obtain highly consistent results.

5.3 Controlling for Output Customization

Producing customized output usually requires more customized input, so an industry or a product's contract intensity, which measures its degree of input customization, is

[46] For example, if an increase in capital endowment decreases the service cost t_o, it actually decreases both p_{do} and z_{do} in (14) and (15), .

often correlated with its degree of output customization. To control for any effects of judicial quality that differ by output customization, we re-estimate our empirical results separately for customized industries/products and standardized industries/products. We use Rauch (1999)'s classification to define customized products at the SITC 4-digit product level and customized industries at the BEA I-O industry level.[47] This exercise is essential for two reasons. First, our findings should hold after we control for any effects of judicial quality that vary by output customization. Second, our findings should be more pronounced for customized industries and products because they are more likely to use customized input.

Table 5 presents the effects of judicial quality on trade patterns for customized and standardized industries separately, using legal origin as the instrument. The top panel reports the effects on exports, and the bottom panel reports the effects on imports. For each specification, we report the estimated coefficient of judicial quality interaction, standard error, K-P F statistic, p-value of Hansen J, and number of observations. The effects of exporter's judicial interaction on trade share are all significantly positive for customized industries but all statistically insignificant for standardized industries. Meanwhile, the effects of importer's judicial quality interaction are all significantly negative for customized industries, but all statistically insignificant for standardized industries.

[Table 5 here]

Table 6 reports the effects of judicial quality on trade price and quality for customized and standardized products separately. The effects of exporter's judicial quality interaction on price and quality are mostly statistically insignificant for both types of products.[48] Meanwhile, the effects of importer's judicial quality interaction on price and quality are mostly significantly positive for customized products and all statistically insignificant for standardized products.[49] Overall, aligned with our conjecture, all of our empirical findings hold for customized industries and products, but are less relevant for standardized

[47] If an SITC 4-digit product is classified as "sold on an organized exchange" or "reference priced" according to Rauch's classification, we define it as "standardized". Otherwise, we define it as "customized". If for a BEA I-O industry, over 85% of its SITC 4-digit products are classified as customized products, we define the industry as "customized". Otherwise, we define it as "standardized".

[48] Only column (5) shows a significantly negative estimate at the 10% level for customized products.

[49] The t-statistic of importer's interaction in column (3) of Table 6 for customized products is 1.42, close to the critical value of 10% significance level.

industries and products.

[Table 6 here]

5.4 Alternative Specification: Country-Industry Level

So far, we have been using the empirical strategy guided by our theoretical framework, which takes advantage of the bilateral feature of trade data. An alternative empirical strategy is to aggregate all variables to the country-industry level:

$$y_c^g = \beta_1 \cdot \eta^g \times JQ_c + \beta_2 \cdot h^g \times H_c + \beta_3 \cdot k^g \times K_c + \zeta_c + \zeta^g + \mathbf{X}_c^g + \varepsilon_c^g, \tag{23}$$

where subscript c denotes a country and superscript g denotes an industry or product. The outcome variable y_c^g is any trade-related variable varying at the country-industry level. JQ_c, H_c, and K_c are judicial quality, skill, and capital endowments of country c. $\mathbf{X}_c^g$ are control variables.[50] ζ_c and ζ^g are country fixed effects and industry (or product) fixed effects. Previous studies use a similar strategy to detect if a particular country-level feature constitutes a comparative advantage for certain industries.[51] For example, Nunn (2007) shows that a good contracting environment facilitates the exports of contract-intensive industries relatively more.

To measure the country-industry-level trade pattern, we calculate a country's total export value and total import share at the BEA I-O industry level. We also calculate a country's numbers of export destinations and import origins in each BEA I-O industry. To measure country-product-level trade price and quality, we use a country's export price, import price, export quality index, and import quality index at the SITC 4-digit-unit level from Feenstra and Romalis (2014).

Table 7 reports the estimation results of (23) for different trade-related outcome variables, using legal origin to instrument for judicial quality. The top panel reports the results concerning different margins of exports. Our estimates in column (1) are very

[50] Control variables include financial interaction, the interactions of log per capita income with value-added share, intra-industry trade share, production complexity, and TFP growth.

[51] Rajan and Zingales (1998) use such a specification to test whether industries that are more dependent on external finance grow faster in countries with better financial development. Romalis (2004) uses it to test whether a country abundant in a factor endowment specializes in industries intensively using that factor.

close to those obtained by Nunn (2007).[52] Column (2) shows that the judicial quality interaction significantly increases the number of export destinations, so part of the larger export volume is due to more trade partners.[53] Column (3) and (4) show that the effects of judicial quality interaction on country-product-level export price and quality remain statistically insignificant.

The bottom panel of Table 7 reports the results about different margins of imports. Column (1) shows that a country with better judicial quality has relatively lower total import share in contract-intensive industries.[54] Column (2) further shows that such a country also imports from relatively fewer origin countries in contract-intensive industries. In columns (3) and (4), we also find that the effects of judicial quality interaction on import price and quality are significantly positive. To sum up, our main empirical findings still hold when we use alternative empirical strategies.

[Table 7 here]

5.5 Implications of Empirical Results

Having established the empirical results, we turn to the explorations of their implications. We first quantify the economic magnitudes of our key estimates. We then use the insights from our model and findings to develop new formulas that capture relative welfare changes due to both *domestic shocks* and *foreign shocks*. Our welfare formulas are complementary to the formula in Arkolakis et al. (2012) and can be used to interpret the welfare effects of observed changes in trade margins. The application of our formula suggests that *domestic shocks* plays a big role in affecting relative change in welfare in Eurozone countries during 2002-2007.

[52] In columns (1) of Table 7, the standardized beta coefficient of $\eta^g \times JQ_c$ is 0.506. In column (6) of Table VII in Nunn (2007), the same coefficient is 0.520.

[53] Chan and Manova (2015) show that financial development also increases a country's number of export destinations relatively more for financially vulnerable industries.

[54] The total import share used in Table 7 only varies at the WIOD sector level for each country, more aggregate than the BEA I-O industry level. This is due to the data limitation in computing industry-level absorption for different countries. We thus view this result as only suggestive. The statistically significant Hansen J value may again be a symptom of heterogeneity in the underlying coefficients.

5.5.1 Economic Magnitudes of the Estimates

How large are the differences in trade margins driven by country-level judicial quality? To answer this question, we consider a thought experiment in which a country improves its judicial quality from 0.354 (the 25^{th} percentile of the judicial quality distribution among all countries) to 0.664 (the 75^{th} percentile). We use our estimates in Tables 2 and 4 to compute the changes in trade margins caused by the hypothetical increase in judicial quality. To highlight the heterogeneous effects due to contract intensity η, we consider three industries: "frozen food production" ($\eta = 0.232$), "pharmaceutical and medicine production" ($\eta = 0.544$), and "optical instrument and lens production" ($\eta = 0.845$). Specifically, we use the estimates in columns (1) and (4) in Table 2 to compute the changes in trade patterns, and the estimates in columns (1), (3), (4) and (6) in Table 4 to compute the changes in trade prices and quality.

Table 8 reports the results. In column (1), if a country improves its judicial quality from the 25^{th} percentile to the 75^{th} percentile, its exports in the "frozen food industry" would increase by 45.8%.[55] For the "pharmaceutical & medicine industry" and "optical instrument & lens industry" featuring higher contract intensities, the increments in exports are 141.9% and 294.4%, respectively. In contrast, in column (4), the same improvement in judicial quality leads to the largest decrease in imports of "optical instrument & lens industry" by 28.4%, and smaller decreases in imports of less contract-intensive goods (19.4% for "pharmaceutical & medicine industry" and 8.8% for "frozen food industry"). Since both our theory and our empirical estimates in Table 4 indicate that judicial quality does not have explicit impacts on export prices and quality, the impacts on export price and quality caused by the hypothetical increase in JQ in columns (2) and (3) are simply 0. Meanwhile, in columns (5) and (6), the impacts on import price and quality are positive and increase drastically with contract intensity. Improving judicial quality increases import price and quality by 4.3% and 2.0% for the "frozen food industry". The increases

[55] The percentage increase of 45.8% is calculated as follows:

$$\exp\left[1.121 \times \frac{(0.664 - 0.354) \times 0.232}{0.214}\right] - 1 = 45.8\%,$$

where 0.214 in the denominator is the standard deviation of $\eta^g \times JQ_o$ and 1.121 is the estimate in column (1) of Table 2.

in import price and quality are 10.3% and 4.8% for the "pharmaceutical & medicine industry", and 16.4% and 7.6% for the "optical instrument & lens industry".

[Table 8 here]

5.5.2 Welfare Formulas: Interpreting Changes in Bilateral Trade Data

Our empirical findings have offered supportive evidence for our model's key insights. Comparative advantage triggers tougher domestic competition that wipes out low-quality imported varieties. These changes decrease imports share and raise import price and quality via changes in quality composition of imports.

What can we learn about welfare from these insights? Comparing two importers, d_1 and d_2, for a common exporter o, we reach the following expression of relative trade share between two importers using (9):

$$\frac{\pi_{d_1 o}}{\pi_{d_2 o}} = \left(\frac{\tau_{d_1 o}}{\tau_{d_2 o}}\right)^{-\frac{\theta}{\phi}} \cdot \frac{\Phi_{d_2}}{\Phi_{d_1}}.$$

We further combine the expression above with (11) and obtain the relative exact price index between the two importers:

$$\frac{\Psi_{d_1}}{\Psi_{d_2}} = \left(\frac{\Phi_{d_1}}{\Phi_{d_2}}\right)^{-\frac{\phi}{\theta}} = \frac{\tau_{d_1 o}}{\tau_{d_2 o}} \cdot \left(\frac{\pi_{d_1 o}}{\pi_{d_2 o}}\right)^{\frac{\phi}{\theta}}.$$

For a variable x, we define its value in the initial equilibrium as x, and its value in the new equilibrium as x'. The "hat" change is defined by $\hat{x} = x'/x$. The hat change of relative price index between d_1 and d_2 is:

$$\frac{\hat{\Psi}_{d_1}}{\hat{\Psi}_{d_2}} = \frac{\hat{\tau}_{d_1 o}}{\hat{\tau}_{d_2 o}} \cdot \left(\frac{\hat{\pi}_{d_1 o}}{\hat{\pi}_{d_2 o}}\right)^{\frac{\phi}{\theta}}. \tag{24}$$

Suppose we can control for the changes in relative trade cost, a decrease in the relative trade share indicates a decrease in the relative exact price index. The intuition of such inference comes from the insight of the domestic competition effect. If trade costs are not changed, conditional on the same exporter, a relative decrease in $\pi_{d_1 o}$ reflects a relative increase in domestic competition in d_1.[56] As a result of the intensified competition, the welfare of customers in d_1 improves relatively due to a lower price index.

Formula (24) complements the welfare formula in Arkolakis et al. (2012).[57] While the ACR formula is used to study *absolute* welfare changes caused by only *foreign shocks* within a wide class of trade models, our formula captures the *relative* welfare effects due to both *foreign shocks* and *domestic shocks* in d_1 and d_2.[58] Therefore, (24) can be used to infer the relative welfare consequences of any productivity shocks or judicial quality changes in both home country and foreign countries.

We also derive the change in the relative exact price index by comparing trade prices between two importers d_1 and d_2 for a common exporter o. Using (14) and (11), we have

$$\frac{\hat{\Psi}_{d_1}}{\hat{\Psi}_{d_2}} = \left(\frac{\hat{\tau}_{d_1 o}}{\hat{\tau}_{d_2 o}}\right)^{\frac{1}{\chi}} \cdot \left(\frac{\hat{p}_{d_1 o}}{\hat{p}_{d_2 o}}\right)^{-\frac{1-\chi}{\chi}}. \tag{25}$$

Suppose we can control for the changes in relative trade cost, an increase in the relative trade price indicates a decrease in the relative exact price index. The insights of domestic competition and quality composition are crucial to the understanding of this inference. Conditional on the same exporter, a relative increase in import price is due to more exits of low-quality imported varieties. The exits of these imported varieties reflect a relative increase in competition in d_1 that lowers price index and benefits customers in d_1.

Therefore, with both the domestic competition and the quality composition effects supported by the empirical results, we can use (24) and (25) to infer the welfare effects from observed changes in bilateral trade data. Holding trade costs of buying from a common exporter constant, we infer relatively increased welfare for an importer that sees a relative decline in import share and a relative increase in import price. The welfare changes captured by (24) and (25) can arise from both domestic shocks and foreign

[56] It is critical to ensure that the comparison is within the same exporter to net out all supply-side factors that vary across exporters, such as technology and wage cost.

[57] The ACR formula also holds in our model. Combining (9) and (11) and setting $d = o$, we get

$$\hat{\Psi}_d = \hat{\pi}_{dd}^{\frac{\phi}{\theta}}.$$

The change in Ψ_d due to any *foreign shocks* outside d is captured by the change in domestic trade share π_{dd}.

[58] For example, China's exogenous productivity growth is one of its domestic shocks, while changes in China's tariffs and other countries' tariffs are foreign shocks for China.

shocks. These new welfare formulas are complementary to the ACR welfare formula.

To illustrate the application of our welfare formulas, we infer price index changes of Eurozone countries from 2002 to 2007. We compare the estimates based on (24) and those based on the ACR formula.[59] When using (24), we set China (CN) as the common exporter o and Germany (DE) as the benchmark economy d_2.[60] The change of a Eurozone country's price index relative to that of Germany during 2002-2007 is:

$$\tilde{\boldsymbol{\Psi}}_{d_1} = \frac{\hat{\Psi}_{d_1}}{\hat{\Psi}_{DE}} = \frac{\hat{\tau}_{d_1,CN}}{\hat{\tau}_{DE,CN}} \cdot \left(\frac{\hat{\pi}_{d_1,CN}}{\hat{\pi}_{DE,CN}}\right)^{\frac{\phi}{\theta}} \approx \left(\frac{\hat{\pi}_{d_1,CN}}{\hat{\pi}_{DE,CN}}\right)^{\frac{\phi}{\theta}}.$$

The approximate equality follows because the changes in trade costs of exporting from China are approximately the same during 2002-2007 for Eurozone countries.[61] The change of d_1's price index relative to that of Germany, indicated by the ACR formula, is

$$\tilde{\boldsymbol{\Psi}}^{ACR}_{d_1} = \left(\frac{\hat{\pi}_{d_1,d_1}}{\hat{\pi}_{DE,DE}}\right)^{\frac{\phi}{\theta}}.$$

To compute $\tilde{\boldsymbol{\Psi}}_{d_1}$ and $\tilde{\boldsymbol{\Psi}}^{ACR}_{d_1}$, we need to calibrate $\frac{\phi}{\theta}$. Since $-\frac{\theta}{\phi}$ is the trade elasticity according to (9), we calibrate $\frac{\theta}{\phi} = 5.03$ following Head and Mayer (2014).[62] The data to compute $\hat{\pi}$ are from WIOD. For illustration, we calculate trade shares for the manufacturing sector, but it is feasible to compute them for each WIOD sectors.

[Table 9 here]

Table 9 reports the inferred changes in the price index in Eurozone countries relative to Germany during 2002-2007. If our assumption $\frac{\hat{\tau}_{d_1,CN}}{\hat{\tau}_{DE,CN}} \approx 1$ holds, $\tilde{\boldsymbol{\Psi}}_{d_1}$ captures relative price index changes due to *domestic shocks* and *foreign shocks*. Meanwhile, $\tilde{\boldsymbol{\Psi}}^{ACR}_{d_1}$ captures those relative changes when only *foreign shocks* are present. The gap between $\tilde{\boldsymbol{\Psi}}_{d_1}$ and $\tilde{\boldsymbol{\Psi}}^{ACR}_{d_1}$ thus reflects how important the *domestic shocks* (e.g., d_1's productivity growth) are in driving relative changes in price index across countries.

For most Eurozone countries, $\tilde{\boldsymbol{\Psi}}_{d_1}$ and $\tilde{\boldsymbol{\Psi}}^{ACR}_{d_1}$ display different and even opposite

[59] We do not use (25) in the calculation because it requires calibrating or estimating χ.
[60] China's manufacturing exports to Eurozone experienced enormous growth during this period.
[61] For example, Eurozone countries impose the same tariff against China and use the same currency Euro.
[62] Head and Mayer (2014) conclude that -5.03 is their preferred estimate for trade elasticity after surveying 744 estimates that come from 32 papers.

pictures. While the ACR formula indicates an increase in Austria's price index relative to Germany's by 0.325%, our formula suggests a relative decline by 4.214%. The gap suggests that Austria experienced more favorable domestic shocks than Germany did during this period. In contrast, the ACR formula implies a decline in Portugal's price index relative to Germany's by 0.084%, while our formula reveals a relative increase in price index by 9.332%. The difference indicates that Portugal underwent more adverse domestic shocks than Germany did. The gaps between $\tilde{\mathbf{\Psi}}_{d_1}$ and $\tilde{\mathbf{\Psi}}_{d_1}^{ACR}$ across Eurozone countries highlight the importance of domestic shocks in driving relative differences in the price index and welfare.

6 Concluding Remarks

We incorporate relationship-specific customized input and product quality choice into a Ricardian trade model to understand how country-level judicial quality affects trade patterns, trade prices, and trade quality. In particular, relationship-specificity of customized input generates hold-up and leads to under-provision of customized input quality. Our analysis shows that better judicial quality not only constitutes a comparative advantage in contract-intensive industries, but also increases domestic competition, induces quality upgrading of domestic varieties, and changes the quality compositions of exports and imports. Using legal origin as the instrument for country-level judicial quality, we empirically confirm our predictions about judicial quality's impacts on trade margins. Our findings highlight the importance of considering quality differentiation to understand the effects of judicial quality on trade. We also propose welfare formulas built on the domestic competition and the quality composition effects to infer relative welfare changes from observed data. Applying one of our formulas to Eurozone countries during 2002-2007 reveals that domestic shocks are critical to the relative welfare changes across countries.

In our future research, we plan to estimate the key parameters of the model and examine its quantitative implications in general equilibrium. Recent micro-level studies also reveal systematic association between local judicial quality and firm-level sourcing and production organizations (Boehm, 2018; Boehm and Oberfield, 2018). Our findings indicate that differences in input quality and output quality, especially for customized products, can be an important margin that responds to the imperfect contracting environment in a production network. We plan to extend our future research along this line.

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A Tables

Table 1: The Effect of Judicial Quality on Trade Pattern, OLS

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable (log):	FOB share	CIF share	Variety	FOB share	CIF share	Variety
Interactions, exporter:						
Judicial quality: $\eta^g \times JQ_o$	0.689***	0.688***	0.058***			
	(0.074)	(0.074)	(0.022)			
Skill: $h^g \times H_o$	0.268***	0.266***	0.052***			
	(0.038)	(0.038)	(0.011)			
Capital: $k^g \times K_o$	0.227***	0.234***	0.139***			
	(0.073)	(0.073)	(0.022)			
Interactions, importer:						
Judicial quality: $\eta^g \times JQ_d$				-0.056*	-0.058**	-0.133***
				(0.030)	(0.030)	(0.019)
Skill: $h^g \times H_d$				-0.136***	-0.136***	-0.102***
				(0.023)	(0.023)	(0.016)
Capital: $k^g \times K_d$				-0.156***	-0.155***	-0.038*
				(0.031)	(0.031)	(0.021)
Bilateral controls	Yes	Yes	Yes	Yes	Yes	Yes
Exporter-industry FEs				Yes	Yes	Yes
Importer-industry FEs	Yes	Yes	Yes			
Exporter FEs	Yes	Yes	Yes			
Importer FEs				Yes	Yes	Yes
Within R-squared	0.182	0.180	0.084	0.250	0.248	0.075
Number of Obs.	250,444	250,444	250,444	201,519	201,519	201,519

Note: This table reports the effect of country-level judicial quality on the trade pattern across industries with different contract intensities. Columns (1) to (3) present the effects on exports. Columns (4) to (6) present the effects on imports. Bilateral controls include tariff, bilateral distance, shared border, common official language, colonial tie, common currency union, and common FTA. Standard errors (clustered at the exporter-industry level in columns (1) to (3); clustered at the importer-industry level in columns (4) to (6)) are shown in parentheses. *, **, and *** indicate significance at the 10 percent, 5 percent, and 1 percent levels.

Table 2: The Effect of Judicial Quality on Trade Pattern, IV

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable (log):	FOB share	CIF share	Variety	FOB share	CIF share	Variety
Interactions, exporter:						
Judicial quality: $\eta^g \times JQ_o$	1.121**	1.126**	0.293**			
	(0.433)	(0.433)	(0.127)			
Skill: $h^g \times H_o$	0.172**	0.170**	0.032**			
	(0.080)	(0.081)	(0.016)			
Capital: $k^g \times K_o$	0.344*	0.356*	0.181***			
	(0.192)	(0.193)	(0.059)			
Interactions, importer:						
Judicial quality: $\eta^g \times JQ_d$				-0.254**	-0.248**	-0.249***
				(0.102)	(0.101)	(0.093)
Skill: $h^g \times H_d$				-0.099***	-0.100***	-0.066**
				(0.034)	(0.033)	(0.029)
Capital: $k^g \times K_d$				-0.268***	-0.263***	-0.139***
				(0.064)	(0.063)	(0.045)
Bilateral controls	Yes	Yes	Yes	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes	Yes	Yes	Yes
Exporter-industry FEs				Yes	Yes	Yes
Importer-industry FEs	Yes	Yes	Yes			
Exporter FEs	Yes	Yes	Yes			
Importer FEs				Yes	Yes	Yes
Kleibergen-Paap LM stat.	14.109***	14.109***	14.109***	17.453***	17.453***	17.453***
Kleibergen-Paap F stat.	11.805	11.805	11.805	25.229	25.229	25.229
Hansen J stat. (p-value)	0.342	0.342	0.903	0.665	0.590	0.017
Number of Obs.	227,055	227,055	227,055	181,462	181,462	181,462

Note: This table reports the effect of country-level judicial quality on the trade pattern across industries with different contract intensities, using legal origin to instrument for country-level judicial quality. Columns (1) to (3) present the second stage results of exports. Columns (4) to (6) present the second stage results of imports. Bilateral controls include tariff, bilateral distance, shared border, common official language, colonial tie, common currency union, and common FTA. Additional controls include the financial interaction, the interactions of log per capita income with value-added share, intra-industry trade share, production complexity, and TFP growth. Standard errors (clustered at the exporter level in columns (1) to (3); clustered at the importer level in columns (4) to (6)) are shown in parentheses. *, **, and *** indicate significance at the 10 percent, 5 percent, and 1 percent levels.

Table 3: The Effect of Judicial Quality on Trade Price and Quality, OLS

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable (log):	FOB price	CIF price	Quality	FOB price	CIF price	Quality
Interactions, exporter:						
Judicial quality: $\eta^g \times JQ_o$	0.025	0.025	0.025			
	(0.025)	(0.025)	(0.023)			
Skill: $h^g \times H_o$	0.020	0.018	0.020			
	(0.019)	(0.019)	(0.017)			
Capital: $k^g \times K_o$	-0.220***	-0.222***	-0.204***			
	(0.037)	(0.037)	(0.033)			
Interactions, importer:						
Judicial quality: $\eta^g \times JQ_d$				0.076***	0.083***	0.030***
				(0.012)	(0.011)	(0.007)
Skill: $h^g \times H_d$				0.010	0.011	0.019***
				(0.010)	(0.010)	(0.006)
Capital: $k^g \times K_d$				-0.085***	-0.068***	-0.049***
				(0.013)	(0.012)	(0.008)
Bilateral controls	Yes	Yes	Yes	Yes	Yes	Yes
Exporter-product FEs				Yes	Yes	Yes
Importer-product FEs	Yes	Yes	Yes			
Exporter FEs	Yes	Yes	Yes			
Importer FEs				Yes	Yes	Yes
Within R-squared	0.020	0.022	0.028	0.027	0.030	0.057
Number of Obs.	507,591	507,591	507,591	424,118	424,118	424,118

Note: This table reports the effect of country-level judicial quality on the trade price and quality across products with different contract intensities. Columns (1) to (3) present the effects on exports. Columns (4) to (6) present the effects on imports. Bilateral controls include tariff, bilateral distance, shared border, common official language, colonial tie, common currency union, and common FTA. Standard errors (clustered at the exporter-industry level in columns (1) to (3); clustered at the importer-industry level in columns (4) to (6)) are shown in parentheses. *, **, and *** indicate significance at the 10 percent, 5 percent, and 1 percent levels.

Table 4: The Effect of Judicial Quality on Trade Price and Quality, IV

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable (log):	FOB price	CIF price	Quality	FOB price	CIF price	Quality
Interactions, exporter:						
Judicial quality: $\eta^g \times JQ_o$	-0.122	-0.138	-0.111			
	(0.150)	(0.154)	(0.137)			
Skill: $h^g \times H_o$	0.009	0.009	0.009			
	(0.020)	(0.020)	(0.018)			
Capital: $k^g \times K_o$	-0.218***	-0.223***	-0.200***			
	(0.064)	(0.065)	(0.059)			
Interactions, importer:						
Judicial quality: $\eta^g \times JQ_d$				0.118**	0.124**	0.057*
				(0.052)	(0.051)	(0.034)
Skill: $h^g \times H_d$				0.004	0.005	0.011
				(0.011)	(0.011)	(0.007)
Capital: $k^g \times K_d$				-0.041	-0.027	-0.018
				(0.036)	(0.036)	(0.024)
Bilateral controls	Yes	Yes	Yes	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes	Yes	Yes	Yes
Exporter-product FEs				Yes	Yes	Yes
Importer-product FEs	Yes	Yes	Yes			
Exporter FEs	Yes	Yes	Yes			
Importer FEs				Yes	Yes	Yes
Kleibergen-Paap LM stat.	13.447***	13.447***	13.447***	18.008***	18.008***	18.008***
Kleibergen-Paap F stat.	10.373	10.373	10.373	22.673	22.673	22.673
Hansen J stat. (p-value)	0.067	0.058	0.062	0.102	0.127	0.070
Number of Obs.	452,663	452,663	452,663	376,431	376,431	376,431

Note: This table reports the effect of country-level judicial quality on the trade price and quality across products with different contract intensities, using legal origin to instrument for country-level judicial quality. Columns (1) to (3) present the second stage results of exports. Columns (4) to (6) present the second stage results of imports. Bilateral controls include tariff, bilateral distance, shared border, common official language, colonial tie, common currency union, and common FTA. Additional controls include the financial interaction, the interactions of log per capita income with value-added share, intra-industry trade share, production complexity, and TFP growth. Standard errors (clustered at the exporter level in columns (1) to (3); clustered at the importer level in columns (4) to (6)) are shown in parentheses. *, **, and *** indicate significance at the 10 percent, 5 percent, and 1 percent levels.

Table 5: Customized Industries and Standardized Industries, Trade Pattern

Dependent variable (log):	(1) FOB share	(2) CIF share	(3) Variety	(4) FOB share	(5) CIF share	(6) Variety
	η^g: "Conservative"			η^g: "Liberal"		
Judicial interaction, exporter:	$\eta^g \times JQ_o$					
Customized industries	1.708***	1.709***	0.338***	1.458***	1.456***	0.326***
	(0.541)	(0.539)	(0.101)	(0.482)	(0.479)	(0.096)
K-P F stat.	11.860	11.860	11.860	11.926	11.926	11.926
Hansen J p-value	0.416	0.410	0.482	0.250	0.242	0.428
Number of Obs.	163,022	163,022	163,022	156,026	156,026	156,026
Standardized industries	-0.226	-0.244	0.088	0.112	0.095	0.157
	(0.675)	(0.676)	(0.138)	(0.651)	(0.651)	(0.156)
K-P F stat.	10.845	10.845	10.845	10.881	10.881	10.881
Hansen J p-value	0.252	0.253	0.269	0.363	0.355	0.265
Number of Obs.	64,033	64,033	64,033	71,029	71,029	71,029
Judicial interaction, importer:	$\eta^g \times JQ_d$					
Customized industries	-0.368**	-0.363**	-0.300***	-0.240*	-0.235*	-0.170*
	(0.151)	(0.149)	(0.107)	(0.138)	(0.137)	(0.087)
K-P F stat.	24.419	24.419	24.419	24.438	24.438	24.438
Hansen J p-value	0.777	0.755	0.166	0.696	0.665	0.101
Number of Obs.	128,093	128,093	128,093	122,752	122,752	122,752
Standardized industries	0.143	0.141	0.049	0.050	0.048	-0.051
	(0.318)	(0.320)	(0.308)	(0.244)	(0.244)	(0.207)
K-P F stat.	22.961	22.961	22.961	23.146	23.146	23.146
Hansen J p-value	0.128	0.125	0.089	0.129	0.129	0.123
Number of Obs.	53,369	53,369	53,369	58,710	58,710	58,710

Note: This table reports the effect of country-level judicial quality on the trade pattern across industries with different contract intensities, using legal origin to instrument for country-level judicial quality. Customized (Standardized) industries are BEA I-O industries with $\geq$ 85% ($<$ 85%) of SITC 4-digit products defined as customized products according to Rauch (1999). Standard errors (clustered at the exporter level for exporter regressions; clustered at the importer level for importer regressions) are shown in parentheses. Kleibergen-Paap F statistics and p-values of Hansen J statistics are also reported. *, **, and *** indicate significance at the 10 percent, 5 percent, and 1 percent levels.

Table 6: Customized Products and Standardized Products, Trade Price and Quality

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable (log):	FOB price	CIF price	Quality	FOB price	CIF price	Quality
	η^g: "Conservative"			η^g: "Liberal"		
Judicial interaction, exporter:	$\eta^g \times JQ_o$					
Customized products	-0.187	-0.202	-0.166	-0.226	-0.241*	-0.201
	(0.143)	(0.149)	(0.130)	(0.135)	(0.143)	(0.123)
K-P F stat.	10.747	10.747	10.747	10.823	10.823	10.823
Hansen J p-value	0.071	0.061	0.068	0.068	0.059	0.067
Number of Obs.	338,079	338,079	338,079	324,861	324,861	324,861
Standardized products	-0.036	-0.037	-0.024	-0.066	-0.068	-0.062
	(0.143)	(0.144)	(0.132)	(0.162)	(0.161)	(0.146)
K-P F stat.	8.365	8.365	8.365	9.022	9.022	9.022
Hansen J p-value	0.008	0.006	0.005	0.079	0.067	0.062
Number of Obs.	114,584	114,584	114,584	127,802	127,802	127,802
Judicial interaction, importer:	$\eta^g \times JQ_d$					
Customized products	0.077*	0.085**	0.034	0.108***	0.112***	0.048**
	(0.039)	(0.039)	(0.024)	(0.039)	(0.038)	(0.023)
K-P F stat.	23.413	23.413	23.413	23.200	23.200	23.200
Hansen J p-value	0.123	0.231	0.081	0.068	0.093	0.041
Number of Obs.	277,739	277,739	277,739	266,753	266,753	266,753
Standardized products	0.106	0.109	0.032	0.108	0.111	0.044
	(0.073)	(0.077)	(0.048)	(0.070)	(0.072)	(0.049)
K-P F stat.	20.383	20.383	20.383	20.819	20.819	20.819
Hansen J p-value	0.017	0.011	0.028	0.051	0.041	0.049
Number of Obs.	98,692	98,692	98,692	109,678	109,678	109,678

Note: This table reports the effect of country-level judicial quality on the trade price and quality across products with different contract intensities, using legal origin to instrument for country-level judicial quality. Customized (standardized) products are SITC 4-digit products defined as customized (standardized) products according to Rauch (1999). Standard errors (clustered at the exporter level for exporter regressions; clustered at the importer level for importer regressions) are shown in parentheses. Kleibergen-Paap F statistics and p-values of Hansen J statistics are also reported. *, **, and *** indicate significance at the 10 percent, 5 percent, and 1 percent levels.

Table 7: Alternative Specification: Country-Industry Level

	(1)	(2)	(3)	(4)
Dependent variable (log):	Export value	Export # of destinations	Export price	Export quality
Judicial quality: $\eta^g \times JQ_c$	1.499***	0.716***	-0.093	0.017
	(0.407)	(0.152)	(0.076)	(0.063)
Skill: $h^g \times H_c$	0.216*	0.164***	-0.025	0.024
	(0.117)	(0.051)	(0.029)	(0.036)
Capital: $k^g \times K_c$	0.646**	0.287***	-0.227***	-0.163***
	(0.261)	(0.098)	(0.048)	(0.060)
Additional controls	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes
Industry FEs	Yes	Yes		
Product FEs			Yes	Yes
Kleibergen-Paap LM stat.	16.753***	16.753***	16.739***	16.739***
Kleibergen-Paap F stat.	34.448	34.448	22.537	22.537
Hansen J stat. (p-value)	0.291	0.448	0.113	0.663
Number of Obs.	7,702	7,702	26,680	26,680
	(1)	(2)	(3)	(4)
Dependent variable (log):	Import share	Import # of origins	Import price	Import quality
Judicial quality: $\eta^g \times JQ_c$	-0.167**	-0.314***	0.151***	0.091***
	(0.075)	(0.114)	(0.033)	(0.023)
Skill: $h^g \times H_c$	-0.027	-0.056	0.000	-0.009
	(0.019)	(0.036)	(0.011)	(0.007)
Capital: $k^g \times K_c$	-0.175***	-0.279***	-0.040	-0.023
	(0.044)	(0.105)	(0.025)	(0.017)
Additional controls	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes
Industry FEs	Yes	Yes		
Product FEs			Yes	Yes
Kleibergen-Paap LM stat.	14.612***	14.612***	16.001***	16.001***
Kleibergen-Paap F stat.	41.216	41.216	37.502	37.502
Hansen J stat. (p-value)	0.025	0.809	0.117	0.164
Number of Obs.	9,298	9,298	36,847	36,847

Note: This table reports the effects of country-level judicial quality on trade margins across industries (products) with different contract intensities, using legal origin to instrument for country-level judicial quality. Additional controls include the financial interaction, the interactions of log per capita income with value-added share, intra-industry trade share, production complexity, and TFP growth. Standard errors (clustered at the country level) are shown in parentheses. *, **, and *** indicate significance at the 10 percent, 5 percent, and 1 percent levels.

Table 8: Economic Magnitudes for Different Margins of Trade

	(1)	(2)	(3)	(4)	(5)	(6)
	Percentage change in %:					
	Export			Import		
Industry	π^g_{do}	p^g_{do}	z^g_{do}	π^g_{do}	p^g_{do}	z^g_{do}
Frozen food ($\eta^g = 0.232$)	45.8	0.0	0.0	-8.8	4.3	2.0
Pharmaceutical & medicine ($\eta^g = 0.544$)	141.9	0.0	0.0	-19.4	10.3	4.8
Optical instrument & lens ($\eta^g = 0.845$)	294.4	0.0	0.0	-28.4	16.4	7.6

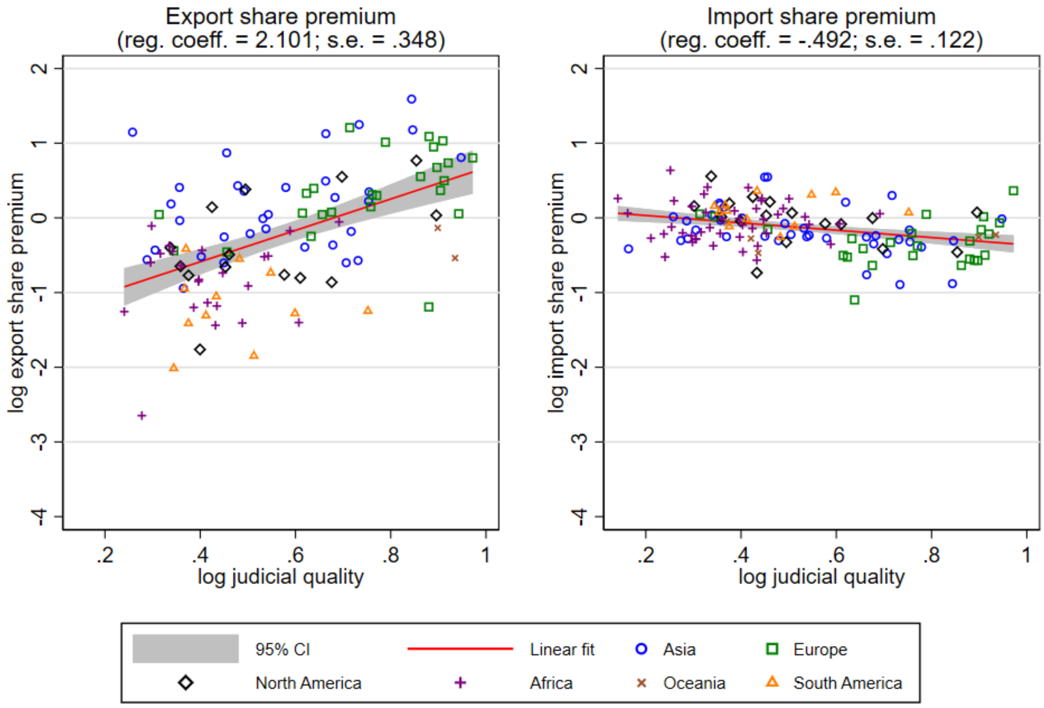
Note: This table reports the changes in various trade margins of several industries with different contract intensities when a country hypothetically improves its judicial quality measure from 0.354 (the 25*th* percentile of the judicial quality distribution) to 0.664 (the 75*th* percentile).

Table 9: Inferred Changes in Manufacturing Price Index (2002-2007), Eurozone

	Percentage change in %:	
Country	$\tilde{\Psi}^{ACR}_{d_1} - 1 = \left(\frac{\hat{\pi}_{d_1,d_1}}{\hat{\pi}_{DE,DE}}\right)^{\frac{\phi}{\theta}} - 1$	$\tilde{\Psi}_{d_1} - 1 = \left(\frac{\hat{\pi}_{d_1,CN}}{\hat{\pi}_{DE,CN}}\right)^{\frac{\phi}{\theta}} - 1$
Austria	0.325	-4.214
Belgium-Luxembourg	-0.354	-0.699
Finland	0.451	5.091
France	-0.312	0.989
Germany	0.000	0.000
Greece	-0.670	0.854
Ireland	3.350	9.645
Netherlands	-1.479	-1.490
Portugal	-0.084	9.332
Spain	1.333	2.257

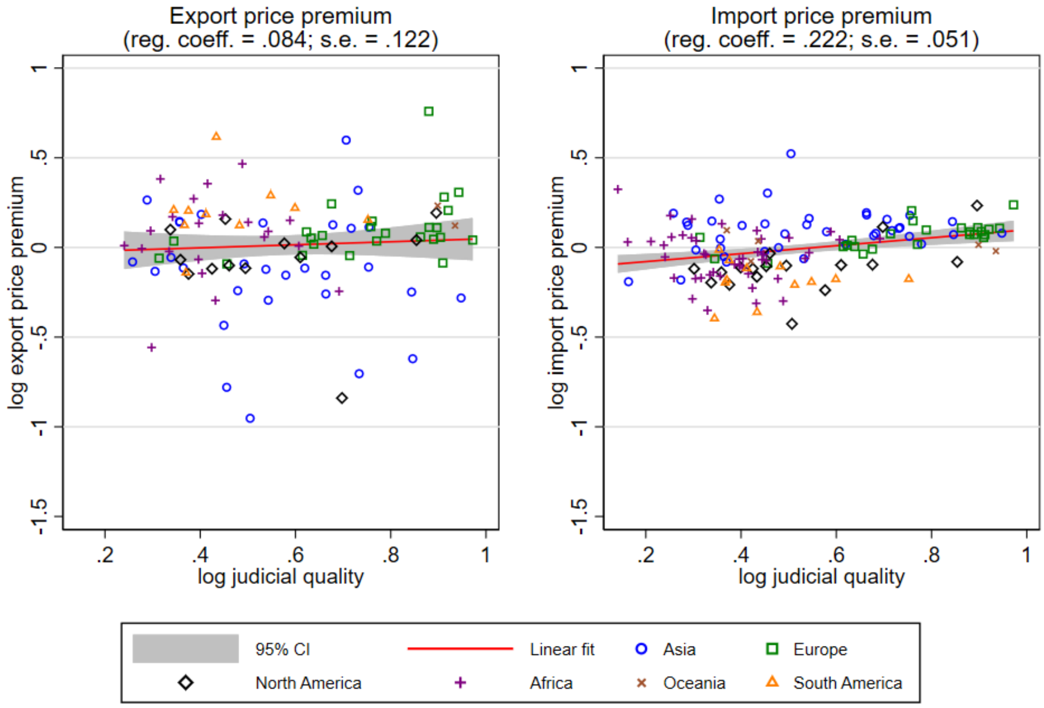
Note: This table reports the inferred changes in manufacturing price index in different Eurozone countries from 2002 to 2007, relative to Germany. Germany is the benchmark economy for comparison. $\tilde{\Psi}^{ACR}_{d_1}$ is computed using the ACR formula. $\tilde{\Psi}_{d_1}$ is computed using (24) by setting the common exporter o as China. $\frac{\phi}{\theta}$ is calibrated as $\frac{1}{5.03}$ following Head and Mayer (2014).

B Figures



Note: Each dot is a country's export or import share premium in contract-intensive industries, calculated based on the top 50% and the bottom 50% contract-intensive industries. Different symbols represent different continents. Robust standard errors are used.

Figure 1: Trade Share Premium and Judicial Quality



Note: Each dot is a country's export or import price premium in contract-intensive products, calculated based on the top 50% and the bottom 50% contract-intensive industries. Different symbols represent different continents. Robust standard errors are used.

Figure 2: Trade Price Premium and Judicial Quality

ONLINE APPENDIX (Not for Publication):

"Judicial Quality, Input Customization, and Trade Margins: The Role of Product Quality"*

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1 Appendix A: Theory Proof

1.1 Proof of Lemma 1

For each variety $\omega \in [0,1]$, there is perfect competition among producers from different exporter countries, so the representative consumer in d sources ω from the exporter that offers the lowest price *per quality unit*:

$$P_d(\omega) = \min_o \{P_{do}(\omega);\ \forall\ o\}.$$

where $P_{do}(\omega) = \tau_{do} \cdot B_o \cdot \delta_o^{-\eta\phi} \cdot \varphi_o(\omega)^{-\phi}$. We assume that productivity of variety ω in export country o, $\varphi_o(\omega)$, follows Fréchet distribution:

$$\Pr[\varphi_o(\omega) \leq \varphi] = G_o(\varphi) = \exp\left(-T_o \cdot \varphi^{-\theta}\right) \tag{A.1}$$

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We first solve the probability distribution of $P_{do}(\omega)$, the distribution of price *per quality unit* available for importer d from exporter o:

$$G_{do}(P) = \Pr\left[P_{do}(\omega) \leq P\right] = 1 - G_o\left(\left(\frac{\tau_{do} \cdot B_o}{P}\right)^{\frac{1}{\phi}} \delta_o^{-\eta}\right) = 1 - \exp\left[-T_o \cdot \delta_o^{\eta\theta} \cdot \left(\frac{B_o \cdot \tau_{do}}{P}\right)^{-\frac{\theta}{\phi}}\right]$$

The probability distribution of $P_d(\omega)$, the actual price distribution in importer d, is:

$$\begin{aligned}
G_d(P) = &\Pr\left[P_d(\omega) \leq P\right] = 1 - \Pi_s[1 - G_{ds}(P)] \\
=&1 - \Pi_s\left[\exp\left[-T_s \cdot \delta_s^{\eta\theta} \cdot \left(\frac{B_s \cdot \tau_{ds}}{P}\right)^{-\frac{\theta}{\phi}}\right]\right] \\
=&1 - \exp\left[-P^{\frac{\theta}{\phi}} \cdot \sum_s T_s \cdot \delta_s^{\eta\theta} \cdot (B_s \cdot \tau_{ds})^{-\frac{\theta}{\phi}}\right] \\
=&1 - \exp\left[-\Phi_d \cdot P^{\frac{\theta}{\phi}}\right],
\end{aligned}$$

where $\Phi_d \equiv \sum_s T_s \cdot \delta_s^{\eta\theta} \cdot (B_s \cdot \tau_{ds})^{-\frac{\theta}{\phi}}$ summarizes importer d's access to the global technology weighted by the inverse of sourcing cost from different exporters, including input cost, service cost, trade costs, and contracting environment.

The probability of d's sourcing a particular variety from o, π_{do}, follows a gravity form as in Eaton and Kortum (2002):

$$\begin{aligned}
\pi_{do} &= \Pr\left[P_{do}(\omega) \leq P_{ds}(\omega);\ \forall\ s \neq o\right] \\
&= \int_0^{\infty} \Pi_{s \neq o}[1 - G_{ds}(P)] dG_{do}(P) \\
&= \frac{T_o \cdot \delta_o^{\eta\theta} \cdot (B_o \cdot \tau_{do})^{-\frac{\theta}{\phi}}}{\Phi_d} \cdot \int_0^{\infty} \exp\left[-\Phi_d \cdot P^{\frac{\theta}{\phi}}\right] d(\Phi_d \cdot P^{\frac{\theta}{\phi}}) \\
&= \frac{T_o \cdot \delta_o^{\eta\theta} \cdot (B_o \cdot \tau_{do})^{-\frac{\theta}{\phi}}}{\sum_s T_s \cdot \delta_s^{\eta\theta} \cdot (B_s \cdot \tau_{ds})^{-\frac{\theta}{\phi}}}.
\end{aligned} \tag{A.2}$$

Therefore, the sourcing probability is increasing in absolute advantage T_o and decreasing in trade costs τ_{do}, costs of making products B_o, and contract enforcement costs δ_o.

1.2 Proof of Proposition 1

We investigate in the probability distribution of price *per quality unit* among varieties that d actually buys from o:

$$\begin{aligned}
\tilde{G}_{do}(P) &= \Pr\left[P_{do}(\omega) \leq P \mid P_{do}(\omega) \leq P_{ds}(\omega);\ \forall\, s \neq o\right] \\
&= \frac{\Pr\left[P_{do}(\omega) \leq P \leq P_{ds}(\omega);\ \forall\, s \neq o\right]}{\Pr\left[P_{do}(\omega) \leq P_{ds}(\omega);\ \forall\, s \neq o\right]} \\
&= \frac{\int_0^P \Pi_{s\neq o}[1 - G_{ds}(q)]dG_{do}(q)}{\pi_{do}} \\
&= \frac{1}{\pi_{do}} \cdot \frac{T_o \cdot \delta_o^{\eta\theta} \cdot (B_o \cdot \tau_{do})^{-\frac{\theta}{\phi}}}{\Phi_d} \cdot \int_0^P \exp\left[-\Phi_d \cdot q^{\frac{\theta}{\phi}}\right] d(\Phi_d \cdot q^{\frac{\theta}{\phi}}) \\
&= 1 - \exp\left[-\Phi_d \cdot P^{\frac{\theta}{\phi}}\right] = G_d(P).
\end{aligned} \tag{A.3}$$

Intuitively, the price distribution of varieties that d sources from o coincides with the price distribution of all varieties consumed in d, a non-arbitrage condition arising from a Ricardian model with perfect competition.

Because $\tilde{G}_{do}(P) = G_d(P)$ is constant across exporters o for a given importer d, the value of trade flow from o to d is therefore proportional to the sourcing probability π_{do}. Thus bilateral trade flow in value is:

$$X_{do} = \pi_{do} \cdot X_d = T_o \cdot \delta_o^{\eta\theta} \cdot (B_o \cdot \tau_{do})^{-\frac{\theta}{\phi}} \cdot \Phi_d^{-1} \cdot X_d. \tag{A.4}$$

The exact price index in d is straightforward to solve:

$$\begin{aligned}
\Psi_d^{1-\sigma} &= \int_0^1 P_d(\omega)^{1-\sigma} d\omega = E[P_d(\omega)^{1-\sigma}] \\
&= \int_0^\infty P^{1-\sigma} \exp\left[-\Phi_d \cdot P^{\frac{\theta}{\phi}}\right] d(\Phi_d \cdot P^{\frac{\theta}{\phi}}) \\
&= \Phi_d^{\frac{\phi(\sigma-1)}{\theta}} \cdot \int_0^\infty \frac{(\Phi_d \cdot P^{\frac{\theta}{\phi}})^{\frac{\phi(1-\sigma)}{\theta}}}{\exp\left[\Phi_d \cdot P^{\frac{\theta}{\phi}}\right]} d(\Phi_d \cdot P^{\frac{\theta}{\phi}}) \\
&= \Phi_d^{\frac{\phi(\sigma-1)}{\theta}} \cdot \int_0^\infty \frac{t^{\frac{\phi(1-\sigma)}{\theta}}}{\exp(t)} dt = \Phi_d^{\frac{\phi(\sigma-1)}{\theta}} \cdot \Gamma[1 + \frac{\phi(1-\sigma)}{\theta}].
\end{aligned}$$

where $\Gamma(\cdot)$ is the Gamma function. Therefore:

$$\Psi_d = \Phi_d^{-\frac{\phi}{\theta}} \cdot \Gamma[1 + \frac{\phi(1-\sigma)}{\theta}]^{\frac{1}{1-\sigma}}. \tag{A.5}$$

An importer with better access to global technology Φ_d thus enjoys a lower price index.

1.3 Proof of Lemma 2

To compute the price of bilateral trade from o to d, we also need the bilateral trade value X_{do} and quantity q_{do}. From the CES demand function we have:

$$X_d(\omega) = P_d(\omega)^{1-\sigma} \cdot \Psi_d^{\sigma-1} \cdot X_d = \tau_{do}^{1-\sigma} \cdot B_o^{1-\sigma} \cdot \delta_o^{\eta\phi(\sigma-1)} \cdot \varphi(\omega)^{\phi(\sigma-1)} \cdot \Psi_d^{\sigma-1} \cdot X_d$$

and

$$\begin{aligned} q_d(\omega) &= P_d(\omega)^{-\sigma} \cdot \Psi_d^{\sigma-1} \cdot X_d \cdot z_d(\omega)^{-1} \\ =&(1-\phi)^{\frac{1}{1-\chi}} \cdot \tau_{do}^{-\sigma} \cdot B_o^{-\sigma+\frac{1}{1-\chi}} \cdot \delta_o^{\eta(\phi\sigma-\frac{1}{\alpha-\chi})} \cdot \varphi(\omega)^{\phi\sigma-\frac{1}{\alpha-\chi}} \cdot t_o^{-\frac{1}{1-\chi}} \cdot \Psi_d^{\sigma-1} \cdot X_d. \end{aligned}$$

The price of trade from o to d can be directly computed:

$$\begin{aligned} p_{do} \equiv \frac{X_{do}}{q_{do}} &= \frac{\tau_{do}^{1-\sigma} B_o^{1-\sigma} \delta_o^{\eta\phi(\sigma-1)} \Psi_d^{\sigma-1} X_d [\int_{\omega\in\Omega_{do}} \varphi_o(\omega)^{\phi(\sigma-1)} d\omega]}{(1-\phi)^{\frac{1}{1-\chi}} \tau_{do}^{-\sigma} B_o^{-\sigma+\frac{1}{1-\chi}} \delta_o^{\eta(\phi\sigma-\frac{1}{\alpha-\chi})} t_o^{-\frac{1}{1-\chi}} \Psi_d^{\sigma-1} X_d [\int_{\omega\in\Omega_{do}} \varphi_o(\omega)^{\phi\sigma-\frac{1}{\alpha-\chi}} d\omega]} \\ &= \tau_{do} \cdot \left(\frac{t_o}{1-\phi}\right)^{\frac{1}{1-\chi}} \cdot B_o^{-\frac{\chi}{1-\chi}} \cdot \delta_o^{\frac{\eta\chi}{\alpha-\chi}} \cdot \left[\frac{\int_{\omega\in\Omega_{do}} \varphi_o(\omega)^{\phi(\sigma-1)} d\omega}{\int_{\omega\in\Omega_{do}} \varphi_o(\omega)^{\phi\sigma-\frac{1}{\alpha-\chi}} d\omega}\right] \\ &= \tau_{do} \cdot \left(\frac{t_o}{1-\phi}\right)^{\frac{1}{1-\chi}} \cdot B_o^{-\frac{\chi}{1-\chi}} \cdot \delta_o^{\frac{\eta\chi}{\alpha-\chi}} \cdot \frac{E[\varphi_o(\omega)^{\phi(\sigma-1)} \mid \omega\in\Omega_{do}]}{E[\varphi_o(\omega)^{\phi\sigma-\frac{1}{\alpha-\chi}} \mid \omega\in\Omega_{do}]}. \end{aligned} \tag{A.6}$$

Next, we solve the probability distribution of $\varphi_o(\omega)$ among varieties in d that are served by o, $\tilde{G}_{do}(\varphi)$:

$$
\begin{aligned}
\tilde{G}_{do}(\varphi) &= \Pr\left[\varphi_o(\omega) \le \varphi \mid P_{do}(\omega) \le P_{ds}(\omega);\ \forall\, s \neq o\right] \\
&= \frac{\Pr\left[\varphi_s(\omega) \le \varphi_o(\omega)\left(\frac{\delta_s^{-\eta\phi}\cdot B_s\cdot\tau_{ds}}{\delta_o^{-\eta\phi}\cdot B_o\cdot\tau_{do}}\right)^{\frac{1}{\phi}} \le \varphi\left(\frac{\delta_s^{-\eta\phi}\cdot B_s\cdot\tau_{ds}}{\delta_o^{-\eta\phi}\cdot B_o\cdot\tau_{do}}\right)^{\frac{1}{\phi}};\ \forall\, s \neq o\right]}{\Pr\left[P_{do}(\omega) \le P_{ds}(\omega);\ \forall\, s \neq o\right]} \\
&= \frac{\int_0^{\varphi} \Pi_{s\neq o} G_{ds}(x\left(\frac{\delta_s^{-\eta\phi}\cdot B_s\cdot\tau_{ds}}{\delta_o^{-\eta\phi}\cdot B_o\cdot\tau_{do}}\right)^{\frac{1}{\phi}})dG_{do}(x)}{\pi_{do}} \\
&= \frac{1}{\pi_{do}} \cdot \int_0^{\varphi} \Pi_{s\neq o} \exp\left[-T_s \cdot (x\left(\frac{\delta_s^{-\eta\phi}\cdot B_s\cdot\tau_{ds}}{\delta_o^{-\eta\phi}\cdot B_o\cdot\tau_{do}}\right)^{\frac{1}{\phi}})^{-\theta}\right] d\exp\left(-T_o \cdot x^{-\theta}\right) \\
&= \frac{1}{\pi_{do}} \cdot \int_0^{\varphi} \exp\left[-x^{-\theta} \cdot \frac{\Phi_d}{\delta_o^{\eta\theta}\cdot(B_o\cdot\tau_{do})^{-\frac{\theta}{\phi}}}\right] d(-T_o \cdot x^{-\theta}) \\
&= \int_0^{\varphi} \exp\left[-\frac{\Phi_d}{\delta_o^{\eta\theta}\cdot(B_o\cdot\tau_{do})^{-\frac{\theta}{\phi}}} \cdot x^{-\theta}\right] d(-\frac{\Phi_d}{\delta_o^{\eta\theta}\cdot(B_o\cdot\tau_{do})^{-\frac{\theta}{\phi}}} \cdot x^{-\theta}) \\
&= \exp\left[-\frac{\Phi_d}{\delta_o^{\eta\theta}\cdot(B_o\cdot\tau_{do})^{-\frac{\theta}{\phi}}} \cdot \varphi^{-\theta}\right] = \exp\left[-\frac{T_o}{\pi_{do}} \cdot \varphi^{-\theta}\right].
\end{aligned}
$$

For any power function of $\varphi_o(\omega)$, the conditional expectation of $\varphi_o(\omega)^a$ is:

$$
\begin{aligned}
E[\varphi_o(\omega)^a \mid \omega \in \Omega_{do}] = \int_0^{\infty} \varphi^a d\tilde{G}_{do}(\varphi) &= \int_0^{\infty} \frac{\varphi^a}{\exp\left[\frac{T_o}{\pi_{do}}\cdot\varphi^{-\theta}\right]} d\left[-\frac{T_o}{\pi_{do}} \cdot \varphi^{-\theta}\right] \\
&= -\left(\frac{T_o}{\pi_{do}}\right)^{\frac{a}{\theta}} \cdot \int_0^{\infty} \frac{\left(\frac{T_o}{\pi_{do}}\cdot\varphi^{-\theta}\right)^{-\frac{a}{\theta}}}{\exp\left[\frac{T_o}{\pi_{do}}\cdot\varphi^{-\theta}\right]} d\left[\frac{T_o}{\pi_{do}} \cdot \varphi^{-\theta}\right] \\
&= \left(\frac{T_o}{\pi_{do}}\right)^{\frac{a}{\theta}} \cdot \int_0^{\infty} \frac{t^{-\frac{a}{\theta}}}{\exp(t)} dt = \left(\frac{T_o}{\pi_{do}}\right)^{\frac{a}{\theta}} \cdot \Gamma(1-\frac{a}{\theta}).
\end{aligned}
$$

The ratio of conditional expectations characterizing the composition effect is:

$$
\begin{aligned}
&\frac{E[\varphi_o(\omega)^{\phi(\sigma-1)} \mid \omega \in \Omega_{do}]}{E[\varphi_o(\omega)^{\phi\sigma-\frac{1}{\alpha-\chi}} \mid \omega \in \Omega_{do}]} = \frac{\left(\frac{T_o}{\pi_{do}}\right)^{\frac{\phi(\sigma-1)}{\theta}} \cdot \Gamma(1-\frac{\phi(\sigma-1)}{\theta})}{\left(\frac{T_o}{\pi_{do}}\right)^{\frac{\phi\sigma-\frac{1}{\alpha-\chi}}{\theta}} \cdot \Gamma(1-\frac{\phi\sigma-\frac{1}{\alpha-\chi}}{\theta})} \\
=&\left(\frac{T_o}{\pi_{do}}\right)^{\frac{\chi}{\theta(\alpha-\chi)}} \cdot \frac{\Gamma(1-\frac{\phi(\sigma-1)}{\theta})}{\Gamma(1-\frac{\phi\sigma-\frac{1}{\alpha-\chi}}{\theta})} = \left(\frac{\Phi_d}{\delta_o^{\eta\theta}\cdot(B_o\cdot\tau_{do})^{-\frac{\theta}{\phi}}}\right)^{\frac{\chi}{\theta(\alpha-\chi)}} \cdot \frac{\Gamma(1-\frac{\phi(\sigma-1)}{\theta})}{\Gamma(1-\frac{\phi\sigma-\frac{1}{\alpha-\chi}}{\theta})} \\
&= \Phi_d^{\frac{\chi}{\theta(\alpha-\chi)}} \cdot \tau_{do}^{\frac{\chi}{1-\chi}} \cdot B_o^{\frac{\chi}{1-\chi}} \cdot \delta_o^{-\frac{\eta\chi}{\alpha-\chi}} \cdot \Gamma^p
\end{aligned}
\tag{A.7}
$$

where $\Gamma^p = \Gamma(1 - \frac{\phi(\sigma-1)}{\theta})/\Gamma(1 - \frac{\phi\sigma - \frac{1}{\alpha-\chi}}{\theta})$.

Therefore, by combining (A.6) and (A.7), we obtain the price of trade from o to d:

$$\begin{aligned} p_{do} &= \tau_{do} \cdot \left(\frac{t_o}{1-\phi}\right)^{\frac{1}{1-\chi}} \cdot B_o^{-\frac{\chi}{1-\chi}} \cdot \delta_o^{\frac{\eta\chi}{\alpha-\chi}} \cdot \Phi_d^{\frac{\chi}{\theta(\alpha-\chi)}} \cdot \tau_{do}^{\frac{\chi}{1-\chi}} \cdot B_o^{\frac{\chi}{1-\chi}} \cdot \delta_o^{-\frac{\eta\chi}{\alpha-\chi}} \cdot \Gamma^p \\ &= \left(\tau_{do} \cdot \frac{t_o}{1-\phi}\right)^{\frac{1}{1-\chi}} \cdot \Phi_d^{\frac{\chi}{\theta(\alpha-\chi)}} \cdot \Gamma^p. \end{aligned} \tag{A.8}$$

Define the average price *per quality unit* of trade from o to d as P_{do}:

$$\begin{aligned} P_{do} \equiv & E[P_{do}(\omega) \mid \omega \in \Omega_{do}] = \int_0^\infty P d\tilde{G}_{do}(P) \\ = & \Phi_d^{-\frac{\phi}{\theta}} \cdot \int_0^\infty \frac{(\Phi_d \cdot P^{\frac{\theta}{\phi}})^{\frac{\phi}{\theta}}}{\exp\left[\Phi_d \cdot P^{\frac{\theta}{\phi}}\right]} d(\Phi_d \cdot P^{\frac{\theta}{\phi}}) = \Phi_d^{-\frac{\phi}{\theta}} \cdot \Gamma[1 + \frac{\phi}{\theta}] \propto \Psi_d. \end{aligned}$$

We can therefore define the average quality of aggregate trade from o to d, z_{do}:

$$z_{do} \equiv \frac{p_{do}}{P_{do}} = \Phi_d^{\frac{1}{\theta(\alpha-\chi)}} \cdot \left(\frac{t_o}{1-\phi} \cdot \tau_{do}\right)^{\frac{1}{1-\chi}} \cdot \frac{\Gamma^p}{\Gamma[1+\frac{\phi}{\theta}]}. \tag{A.9}$$

2 Appendix B: Robustness Analysis

To ensure the robustness of our findings, we consider alternative measures of judicial quality, contract intensity, and price and quality of trade in this appendix. In general, we obtain highly consistent results.

2.1 Alternative Measures of JQ and η

In the main analysis, our measure of judicial quality JQ is the "rule of law" indicator from Kauffmann et al. (2004). We also use two alternative measures of JQ. The first alternative is the "legal quality" indicator from Gwartney and Lawson (2003). The second alternative is a measure of the judicial system's efficiency from the World Bank's "Doing Business Survey". For contract intensity η, our preferred measure is constructed using customized inputs defined by the "conservative" standard of Rauch (1999). We also use his "liberal" standard to define customized inputs and construct alternative contract intensity.

We re-estimate the specifications in Table 2 of the main paper using alternative measures of JQ and η and report the results in Table C.3. The top panel reports the effect of judicial quality on the export pattern, and the bottom panel reports the effect on the import pattern. In each row, we use a different measure of JQ. We use the "conservative"-based contract intensity in columns (1) to (3), and the "liberal"-based contract intensity in columns (4) to (6). Each cell in the table reports the estimated coefficient and standard error for the judicial quality interaction, using legal origin to instrument for judicial quality. K-P F statistics and p-values of Hansen J statistics are also reported. Our results about the effects of judicial quality on trade patterns are robust. Regardless of the measures of JQ and η, the estimated coefficients of exporter's judicial quality interaction are significantly positive, while those of importer's judicial quality interaction are significantly negative.

[Table C.3 here]

We also re-estimate the specifications in Table 4 of the main paper using the same alternative measures of JQ and η and report the results in Table C.4 in a similar way. The estimated coefficients of exporter's judicial quality interaction are not different from 0 at any conventional levels of statistical significance, while 16 out of the 18 estimated coefficients of importer's judicial quality interaction are significantly positive at least at the 10% level.[1] Overall, our empirical findings are not sensitive to the measurements of JQ and η.

[Table C.4 here]

2.2 Alternative Measures of Quality: Demand-side Approach

In the main analysis, we use the quality index from Feenstra and Romalis (2014) to measure trade quality. Alternatively, we can use the demand-side approach to infer the quality of trade from data. To illustrate, consider the following CES demand augmented with quality $z_d(\omega)$:

$$q_d(\omega) = p_d(\omega)^{-\sigma} \cdot \Psi_d^{\sigma-1} \cdot X_d \cdot z_d(\omega)^{\sigma-1}.$$

Our goal is to infer $z_d(\omega)$. Re-arranging the log-linear form of the equation yields:

$$\ln z_d(\omega) = \frac{\ln q_d(\omega)}{\sigma - 1} + \frac{\sigma \ln p_d(\omega)}{\sigma - 1} - \ln \Psi_d - \frac{\ln X_d}{\sigma - 1}. \tag{A.10}$$

(A.10) has been widely used to infer quality when quantity and price data are available.[2] The idea is that conditional on price, a variety with higher sales should be assigned to higher quality $z_d(\omega)$. The aggregate demand $-\ln \Psi_d - \frac{\ln X_d}{\sigma-1}$ is usually unobserved, so one can only infer relative quality among products sold in the same market.

To infer quality, a key parameter needed is σ, the elasticity of substitution. We construct three quality measures by using different sources of σ. $Quality_1$ uses SITC 4-digit-level σ from Feenstra and Romalis (2014). $Quality_2$ further adjusts for income-related preference for quality across importers following Feenstra and Romalis (2014) based on $Quality_1$. $Quality_3$ uses SITC 4-digit-level σ from Broda and Weinstein (2006).

We re-estimate the specifications in Table 4 of the main paper using demand-side quality index as outcome variables. The results are reported in Table C.5. Columns (1) to (3) report the effects of exporter's judicial quality interaction on $Quality_1$, $Quality_2$,

[1] The t-statistics of the two insignificant estimates are 1.62 and 1.49, very close to the critical value of the 10% significance level.

[2] Khandelwal et al. (2013), Fan et al. (2015), and Piveteau and Smagghue (2019) all use this approach to infer quality.

and $Quality_3$, while columns (4) to (6) report the effects of importer's judicial quality interaction on the same quality measures. Our empirical results about quality of trade still hold. The estimated coefficients of $\eta^g \times JQ_o$ are all statistically not different from 0, while the estimated coefficients of $\eta^g \times JQ_d$ are all significantly positive at least at the 5% level.[3]

[Table C.5 here]

2.3 Alternative Trade Price Measure: Harmonized System 6-digit Level

One may worry that trade price at the SITC 4-digit level is not disaggregate enough to reflect the actual price variation, leading to potential measurement bias. To alleviate this concern, we use bilateral trade data at the HS 6-digit classification in 1997 from the UN Comtrade database to construct trade price as our outcome variable (Manova and Zhang, 2012; Fan et al., 2015).

In general, we obtain qualitatively similar results. Our OLS and IV estimates indicate that the estimated coefficients of importer's judicial quality interaction on the price of trade are positive and statistically significant at the 1% level. In contrast, the estimated coefficients of exporter's judicial quality interaction are all statistically not different from 0. Therefore, our results about trade prices do not seem to be driven by any measurement bias at the SITC 4-digit level.

[Table C.6 here]

[3] The results in columns (4) to (6) in Table C.5 now capture the difference in import quality premium (import quality relative to the importer-product mean) across different importers, rather than the import quality difference across importers.

3 Appendix C: Supplementary Tables

Table C.1: The Effect of Judicial Quality on Trade Pattern, First Stage

	(1)	(2)
Dependent variable :	Exporter's judicial interaction	Importer's judicial interaction
Interactions, exporter:		
British origin: $ci^g \times B_i$	0.164***	
	(0.061)	
German origin: $ci^g \times G_i$	0.142**	
	(0.057)	
Scandinavian origin: $ci^g \times S_i$	0.157***	
	(0.029)	
Interactions, importer:		
British origin: $ci^g \times B_k$		0.172***
		(0.063)
German origin: $ci^g \times G_k$		0.158***
		(0.043)
Scandinavian origin: $ci^g \times S_k$		0.188***
		(0.023)
Controls	Yes	Yes
Exporter-sector FEs		Yes
Importer-sector FEs	Yes	
Exporter FEs	Yes	
Importer FEs		Yes
Within R-squared	0.408	0.413
Number of Obs.	223,930	178,456

Note: This table reports the effect of country-level judicial quality on the trade pattern across industries with different contract intensities, using legal origin to instrument for country-level judicial quality. Columns (1) presents the first stage results of exports. Columns (2) presents the first stage results of imports. Controls include the skill interaction, capital interaction, all bilateral controls, and all additional controls. Standard errors (clustered at the exporter level in column (1); clustered at the importer level in column (2)) are shown in parentheses. *, **, and *** indicate significance at the 10 percent, 5 percent, and 1 percent levels.

Table C.2: The Effect of Judicial Quality on Trade Price and Quality, First Stage

	(1)	(2)
Dependent variable :	Exporter's judicial interaction	Importer's judicial interaction
Interactions, exporter:		
British origin: $\eta^g \times B_o$	0.168***	
	(0.059)	
German origin: $\eta^g \times G_o$	0.130**	
	(0.054)	
Scandinavian origin: $\eta^g \times S_o$	0.137***	
	(0.027)	
Interactions, importer:		
British origin: $\eta^g \times B_d$		0.181***
		(0.062)
German origin: $\eta^g \times G_d$		0.150***
		(0.042)
Scandinavian origin: $\eta^g \times S_d$		0.182***
		(0.023)
Controls	Yes	Yes
Exporter-product FEs		Yes
Importer-product FEs	Yes	
Exporter FEs	Yes	
Importer FEs		Yes
Within R-squared	0.413	0.415
Number of Obs.	432,449	365,282

Note: This table reports the effect of country-level judicial quality on the trade price and quality across products with different contract intensities, using legal origin to instrument for country-level judicial quality. Column (1) presents the first stage results of exports. Column (2) presents the first stage results of imports. Controls include the skill interaction, capital interaction, all bilateral controls, and all additional controls. Standard errors (clustered at the exporter level in column (1); clustered at the importer level in column (2)) are shown in parentheses. *, **, and *** indicate significance at the 10 percent, 5 percent, and 1 percent levels.

Table C.3: Alternative Judicial Quality and Contract Intensity, Trade Pattern

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable (log):	FOB share	CIF share	Variety	FOB share	CIF share	Variety
	η^g: "Conservative"			η^g: "Liberal"		
Exporter's judicial interaction:						
JQ_o: Rule of law	1.121**	1.126**	0.293**	1.061**	1.065**	0.290**
	(0.433)	(0.433)	(0.127)	(0.404)	(0.404)	(0.125)
K-P F stat.	11.805	11.805	11.805	11.844	11.844	11.844
Hansen J p-value	0.342	0.342	0.903	0.319	0.317	0.961
JQ_o: Legal quality	1.004**	1.010**	0.280**	0.958**	0.964**	0.279**
	(0.424)	(0.425)	(0.118)	(0.396)	(0.397)	(0.117)
K-P F stat.	12.987	12.987	12.987	13.081	13.081	13.081
Hansen J p-value	0.332	0.331	0.934	0.295	0.292	0.990
JQ_o: WB official cost	1.051**	1.043**	0.275***	0.906*	0.898*	0.257**
	(0.510)	(0.508)	(0.103)	(0.462)	(0.460)	(0.100)
K-P F stat.	13.469	13.469	13.469	13.676	13.676	13.676
Hansen J p-value	0.128	0.123	0.451	0.077	0.073	0.358
Importer's judicial interaction:						
JQ_d: Rule of law	-0.254**	-0.248**	-0.249***	-0.180*	-0.175*	-0.190**
	(0.102)	(0.101)	(0.093)	(0.099)	(0.098)	(0.084)
K-P F stat.	25.229	25.229	25.229	25.362	25.362	25.362
Hansen J p-value	0.665	0.590	0.017	0.835	0.777	0.015
JQ_d: Legal quality	-0.244**	-0.236**	-0.216**	-0.177*	-0.169*	-0.165*
	(0.101)	(0.099)	(0.092)	(0.098)	(0.097)	(0.085)
K-P F stat.	25.265	25.265	25.265	25.412	25.412	25.412
Hansen J p-value	0.557	0.473	0.009	0.795	0.717	0.010
JQ_d: WB official cost	-0.373***	-0.373***	-0.495***	-0.261**	-0.262**	-0.411***
	(0.133)	(0.132)	(0.164)	(0.121)	(0.120)	(0.139)
K-P F stat.	9.282	9.282	9.282	9.228	9.228	9.228
Hansen J p-value	0.951	0.985	0.405	0.883	0.942	0.331

Note: This table reports the effect of country-level judicial quality on the trade pattern across industries with different contract intensities, using legal origin to instrument for country-level judicial quality. Different measures of judicial quality and contract intensity are used. Standard errors (clustered at the exporter level for exporter regressions; clustered at the importer level for importer regressions) are shown in parentheses. Kleibergen-Paap F statistics and p-values of Hansen J statistics are also reported. *, **, and *** indicate significance at the 10 percent, 5 percent, and 1 percent levels.

Table C.4: Alternative Judicial Quality and Contract Intensity, Trade Price and Quality

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable (log):	FOB price	CIF price	Quality	FOB price	CIF price	Quality
	η^g: "Conservative"			η^g: "Liberal"		
Exporter's judicial interaction:						
JQ_o: Rule of law	-0.122	-0.138	-0.111	-0.170	-0.187	-0.152
	(0.150)	(0.154)	(0.137)	(0.140)	(0.145)	(0.128)
K-P F stat.	10.373	10.373	10.373	10.477	10.477	10.477
Hansen J p-value	0.067	0.058	0.062	0.071	0.061	0.066
JQ_o: Legal quality	-0.098	-0.112	-0.089	-0.144	-0.159	-0.128
	(0.142)	(0.146)	(0.130)	(0.134)	(0.139)	(0.122)
K-P F stat.	10.747	10.747	10.747	10.829	10.829	10.829
Hansen J p-value	0.062	0.052	0.056	0.064	0.054	0.059
JQ_o: WB official cost	0.048	0.048	0.045	0.016	0.015	0.015
	(0.163)	(0.167)	(0.150)	(0.156)	(0.161)	(0.144)
K-P F stat.	14.144	14.144	14.144	14.341	14.341	14.341
Hansen J p-value	0.024	0.017	0.022	0.014	0.010	0.013
Importer's judicial interaction:						
JQ_d: Rule of law	0.118**	0.124**	0.057*	0.141***	0.144***	0.070**
	(0.052)	(0.051)	(0.034)	(0.053)	(0.052)	(0.034))
K-P F stat.	22.673	22.673	22.673	22.413	22.413	22.413
Hansen J p-value	0.102	0.127	0.070	0.090	0.110	0.056
JQ_d: Legal quality	0.111**	0.116**	0.055	0.132**	0.134**	0.066*
	(0.052)	(0.053)	(0.034)	(0.054)	(0.054)	(0.034)
K-P F stat.	23.017	23.017	23.017	22.679	22.679	22.679
Hansen J p-value	0.133	0.181	0.083	0.116	0.155	0.065
JQ_d: WB official cost	0.131**	0.150**	0.055	0.159**	0.175***	0.068*
	(0.058)	(0.058)	(0.037)	(0.065)	(0.064)	(0.040)
K-P F stat.	10.304	10.304	10.304	9.898	9.898	9.898
Hansen J p-value	0.026	0.027	0.023	0.025	0.031	0.016

Note: This table reports the effect of country-level judicial quality on the trade price and quality across products with different contract intensities, using legal origin to instrument for country-level judicial quality. Different measures of judicial quality and contract intensity are used. Standard errors (clustered at the exporter level for exporter regressions; clustered at the importer level for importer regressions) are shown in parentheses. Kleibergen-Paap F statistics and p-values of Hansen J statistics are also reported. *, **, and *** indicate significance at the 10 percent, 5 percent, and 1 percent levels.

Table C.5: Alternative Measure of Quality Estimates: Demand-side Approach

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable (log):	$Quality_1$	$Quality_2$	$Quality_3$	$Quality_1$	$Quality_2$	$Quality_3$
Interactions, exporter:						
Judicial quality: $\eta^g \times JQ_o$	0.018	0.012	0.481			
	(0.126)	(0.130)	(0.380)			
Skill: $h^g \times H_o$	0.045*	0.049*	0.333**			
	(0.024)	(0.025)	(0.130)			
Capital: $k^g \times K_o$	-0.135**	-0.149**	0.014			
	(0.061)	(0.062)	(0.172)			
Interactions, importer:						
Judicial quality: $\eta^g \times JQ_d$				0.153***	0.128***	0.406**
				(0.037)	(0.041)	(0.183)
Skill: $h^g \times H_d$				0.008	-0.003	0.170***
				(0.013)	(0.015)	(0.056)
Capital: $k^g \times K_d$				0.017	-0.065*	-0.421***
				(0.024)	(0.034)	(0.092)
Bilateral controls	Yes	Yes	Yes	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes	Yes	Yes	Yes
Exporter-product FEs				Yes	Yes	Yes
Importer-product FEs	Yes	Yes	Yes			
Exporter FEs	Yes	Yes	Yes			
Importer FEs				Yes	Yes	Yes
Kleibergen-Paap LM stat.	13.447***	13.447***	13.386***	18.008***	18.010***	18.135***
Kleibergen-Paap F stat.	10.373	10.373	10.721	22.673	22.673	23.578
Hansen J stat. (p-value)	0.027	0.028	0.257	0.707	0.838	0.275
Number of Obs.	452,663	452,631	416,252	376,431	376,409	347,157

Note: This table reports the effect of country-level judicial quality on trade quality across products with different contract intensities, using legal origin to instrument for country-level judicial quality. Trade quality is inferred from a CES preference. $Quality_1$, $Quality_2$ and $Quality_3$ denote quality index inferred using different sources of estimated parameter σ. Columns (1) to (3) present the second stage results of exports. Columns (4) to (6) present the second stage results of imports. Bilateral controls include tariff, bilateral distance, shared border, common official language, colonial tie, common currency union, and common FTA. Additional controls include the financial interaction, the interactions of log per capita income with value-added share, intra-industry trade share, production complexity, and TFP growth. Standard errors (clustered at the exporter level in columns (1) to (3); clustered at the importer level in columns (4) to (6)) are shown in parentheses. *, **, and *** indicate significance at the 10 percent, 5 percent, and 1 percent levels.

Table C.6: The Effect of Judicial Quality on Trade Price, HS 6-digit Level

Dependent variable (log): price	(1) OLS	(2) IV	(3) OLS	(4) IV
Interactions, exporter:				
Judicial quality: $\eta^g \times JQ_o$	0.005	-0.082		
	(0.029)	(0.138)		
Skill: $h^g \times H_o$	-0.009	-0.007		
	(0.022)	(0.022)		
Capital: $k^g \times K_o$	-0.160***	-0.185***		
	(0.036)	(0.056)		
Interactions, importer:				
Judicial quality: $\eta^g \times JQ_d$			0.585***	1.375***
			(0.071)	(0.474)
Skill: $h^g \times H_d$			0.034	-0.013
			(0.057)	(0.081)
Capital: $k^g \times K_d$			-0.045	0.274
			(0.077)	(0.224)
Bilateral controls	Yes	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes	Yes
Exporter-product FEs			Yes	Yes
Importer-product FEs	Yes	Yes		
Exporter FEs	Yes	Yes		
Importer FEs			Yes	Yes
Kleibergen-Paap LM stat.		11.655***		19.889***
Kleibergen-Paap F stat.		7.611		18.392
Hansen J stat. (p-value)		0.054		0.004
Number of Obs.	1,412,204	1,412,204	1,241,511	1,241,511

Note: This table reports the effect of country-level judicial quality on the trade price across products with different contract intensities with bilateral trade data at the HS 6-digit level. In columns (2) and (4), we use legal origin to instrument for country-level judicial quality and present the second stage results. Columns (1) to (2) present results on exports, while columns (3) and (4) present results on imports. Bilateral controls include tariff, bilateral distance, shared border, common official language, colonial tie, common currency union, and common FTA. Additional controls include the financial interaction, the interactions of log per capita income with value-added share, intra-industry trade share, production complexity, and TFP growth. Standard errors (clustered at the exporter level in columns (1) to (2); clustered at the importer level in columns (3) to (4)) are shown in parentheses. *, **, and *** indicate significance at the 10 percent, 5 percent, and 1 percent levels.

4 Appendix D: Supplementary Figures

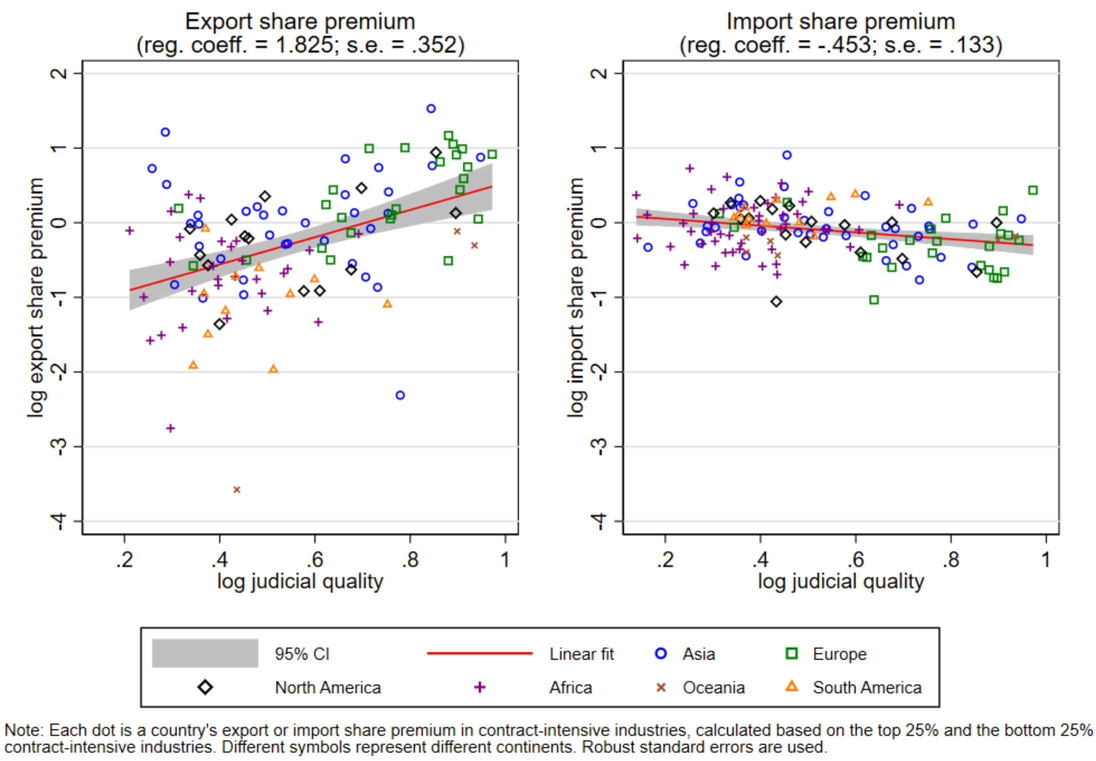
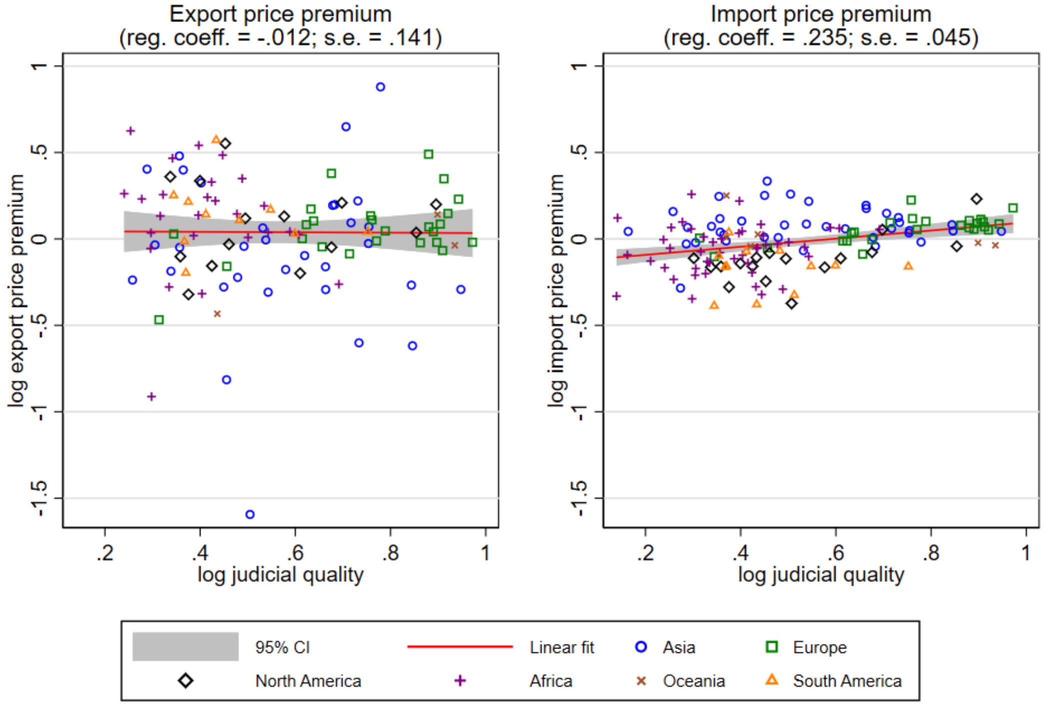


Figure D.1: Trade Share Premium and Judicial Quality, Alternative Cutoff



Note: Each dot is a country's export or import price premium in contract-intensive products, calculated based on the top 25% and the bottom 25% contract-intensive industries. Different symbols represent different continents. Robust standard errors are used.

Figure D.2: Trade Price Premium and Judicial Quality, Alternative Cutoff

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