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Contractual frictions and margins of trade

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ABSTRACT

A recent body of work has shown that quality of national institutions that enforce written contracts plays an important role in shaping a country's comparative advantage. The current paper contributes to this literature by providing a comprehensive analysis of the mechanisms through which institutional frictions affect the pattern of aggregate trade flow by distinguishing its effect on the intensive and extensive margins. We find that better contracting institutions not only increase the probability of exporting (the extensive margin) but also enhance the export sales after entry (the intensive margin), particularly in industries where relationship-specific investments are most important. With around two-third to three-fourth share (depending on the definition used), the contribution of institutions along the intensive margin dominates that along the extensive margin. The benefits of improved institutions, particularly via the intensive margin, favor the less developed countries over the more developed ones. In addition, better contracting institutions increase the probability of survival of export products in more contract-intensive industries in particular. These findings are robust to measuring the intensive and extensive margins using a more granular export data based on firm-level aggregates, as well as the variety and destination based definitions.

1. Introduction

Understanding the sources of comparative advantage lies at the heart of the international trade literature. While traditional theories have emphasized the role of technology and factor endowments, a growing body of work has focused on differences in institutional quality as a source of comparative advantage (Levchenko, 2007; Nunn, 2007). In particular, several studies have shown that countries with poor contracting institutions export relatively more in industries that are less susceptible to holdup problems, as measured by input concentration (Levchenko, 2007) or contractual input intensity (Nunn, 2007).

Although the effects of contracting institutions on trade patterns are now extensively studied, little is known about the exact mechanisms through which this effect operates. The present paper fills this gap by providing a comprehensive analysis of the mechanisms through which institutional frictions affect aggregate export flows. In particular, we decompose the effects of institutional quality on aggregate exports into the two standard margins of trade; namely, the entry into exporting (extensive margin) and the volume of export after entry (intensive margin).

Our contribution to the recent but growing literature on the relative importance of the intensive and extensive margins in explaining comparative advantage is closely related to two works. The first one is the work of Manova (2013) who has studied the role of financial development in explaining comparative advantage and examined the relative importance of intensive and extensive components. While Manova assesses how the impact of financial development varies across sectors depending on the

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degree of financial dependence and asset tangibility, we depart from her analysis by taking interest in how institutional quality differentially affects different industries based on their institutional/contract-intensity.

The second related work is that of Kim et al. (2019) who have disentangled the effect of institutions on trade into the intensive and extensive margins. Their focus, however, is on the institutional quality of importers and regime types while our focus is on the effects of exporters' domestic (contracting) institutions.

Evaluating the causal effect of institutions on trade is notoriously challenging because of endogeneity issues. Specifically, institutional quality may evolve in response to increased export activity. Furthermore, institutions both shape and are subject to other country characteristics that can independently boost export activity. Against this background, we identify the effect of institutions by exploiting cross-country differences in institutional quality together with cross-industry variation in contract intensity. In particular, we study how the interaction between country-specific measures of contract enforcement and sector-specific indicators of contract intensity affect the export pattern. We establish the causal effect by including a large set of fixed effects, and we control for the traditional sources of comparative advantage such as physical and human capital endowments and overall development in order to address potential omitted variable biases.

To isolate the effects of institutions on the intensive and extensive margins of trade, we follow a two-stage structural estimation procedure as in Helpman et al. (2008) and Manova (2013). In the first stage, we estimate the effect of institutional quality on the probability of exporting. Then, in the second stage, we estimate the effect of contracting institutions on the value of exports. To control for firm selection into exporting, the predicted probability of exporting from the first stage serves as an additional control in the second stage.

We provide evidence that contracting institutions matter for countries' export activity both at the intensive and extensive margins. We find that countries with better contractual institutions export more in products that are more contract-intensive, which is in line with Nunn (2007) who documents the same result with aggregate cross-sectional data. While Nunn (2007) focuses on the impact of institutions on the total value of exports, we document that the trade-specific effect of institution operates through both the extensive and intensive margins of export. More specifically, we find that better contracting institutions increase export at the extensive margin (entry into export market, the number of product varieties exported and the number of export destinations) and at the intensive margin (volume of export after entry). Nonetheless, factor endowment, and especially human capital, still plays a quantitatively more important role than institutions in shaping comparative advantage.

In addition to disentangling the effect of institutions on the intensive and extensive margins of trade, we also test the closely related hypothesis that institutional quality affects export survival rates. We find that better institutions increase the survival rate of new export products in the more contract-intensive sectors.

Finally, for each of these relationships, we investigate disparities between regions at different levels of development and robustness of results to regional sub-samples. Developing countries benefit more than their developed counterparts along the intensive margin. The importance of institutions along both margins holds for both within and across region trade.

The rest of the paper is organized as follows. Section 2 reviews the literature on the link between institutions and the pattern of trade. Section 3 presents the conceptual framework while Section 4 specifies the empirical models and describes the estimation techniques. Section 5 provides definitions of the variables used in the study and the sources of data. Section 6 contains the analysis and interpretation of results, and Section 7 concludes.

2. Related literature

This paper is part of the growing body of empirical literature that explores the interactions between domestic institutions and international trade patterns. Nunn (2007) was one of the first to empirically demonstrate the importance of institutional quality as a source of comparative advantage. The author has shown that countries with better contracting institutions export relatively more in industries that are more vulnerable to holdup problems between producers and input suppliers, as measured by the share of inputs that are not sold on open markets. He emphasizes that products whose production relies heavily on inputs that are not sold on open markets are more exposed to the 'hold-up' problem. That is, the input supplier has the (potential) ability to halt (or threaten to do so) its supply at any point in time, which makes the producer of the final product vulnerable. There could also be other situations in which the input supplier is the vulnerable party. What matters is that the input has less value outside the relationship between the two parties than inside. As rational agents, the two parties need to enter into a contract in advance. For these two parties to engage in optimal levels of investment, there should be a reliable mechanism to enforce the contract they enter into. In other words, "when investments are relationship-specific, under-investment occurs if contracts cannot be enforced" and since "countries with better contract enforcement have less under-investment, they will have a cost advantage in the production of goods requiring relationship-specific investments" (Nunn, 2007, p. 569). Levchenko (2007) developed an alternative measure of the extent to which holdup problems between producers and input suppliers affect the trade pattern. Levchenko (2007) argues that industries that rely heavily on a larger number of input suppliers are more vulnerable to holdup problems and are hence more sensitive to imperfect institutions. A substantial body of literature that followed these seminal papers confirms the role of institutions in explaining international trade patterns (see Nunn and Trefler (2014) for detailed review of the empirical literature).

Notwithstanding the growing body of evidence documenting the role of contracting institutions as a source of comparative advantage, our understanding of the underlying mechanisms is still rather limited. There are many potential ways that domestic institutions could affect trade patterns. For example, weak contract enforcement may simply affect firms' decision to enter into foreign markets by increasing the cost of relationship-specific intermediate inputs — increasing the threshold of exporting (extensive margin). In addition to restricting export entry, weak contract enforcement can also distort the level of firm exports as firms need

efficient and cheap supply of intermediate inputs to expand their export sales (intensive margin). Such institutional deficiencies could also affect the survival of firms in foreign markets since new exporting firms could later discover that the cost of contract enforcement makes an important component of profitability calculations, as a result of which some of them may have to exit sooner than one would expect.

To understand the operating forces and underlying mechanisms, one needs a micro-founded theoretical framework and cross-country firm-level data. Manova (2013) developed a heterogeneous-firm model by building upon (Melitz, 2003) to explore the mechanisms through which credit constraints affect international trade patterns. She finds that credit constraints substantially reduce exports both at the extensive margin and at the intensive margin. Our study follows closely the work of Manova (2013) but differs at least in two main respects. First, while the author focuses on financial frictions, we take interest in how limited contract enforcement affects different industries based on their contract-intensity. Second, we explore the trade effect by utilizing unique harmonized firm-level data that are ideally suited to studying these operating forces and mechanisms. Thus, this paper improves the understanding of the relationship between domestic institutions and the trade pattern at the firm level.

In another related contribution, Kim et al. (2019) have disentangled the effect of institutions on trade into the intensive and extensive margins. Kim et al. (2019, p. 755) assert that "political institutions matter for the extensive margin of trade but not for the intensive margin". Their results also show that the influence of (political) institutions on trade is stronger and more robust along the extensive margin than the intensive margin. However, while they look into the influence of political institutions (regime types) in the partner countries, our focus is on the effects of exporters' domestic (contractual) institutions.

Our paper is also related to the nascent literature that explores the effects of institutions on trade patterns and dynamics using firm-level data. Ma et al. (2010), using data from 28 countries taken from the World Bank's Enterprise Surveys, show that firms located in areas with better institutional quality export goods that are more contract intensive. Araujo et al. (2016) develop a model of trade with imperfect contract enforcement to study how the dynamics of exporting firms depends on the strength of the contracting institutions of the destination countries. Using panel data of Belgian firms, they find that producers selling to countries with good contracting institutions start their activities there with higher volumes. They also document that the quality of contracting institutions in the destination markets enhances exporter survival rate. A related paper by Aeberhardt et al. (2014), using firm-level data from France, documents that better institutional quality improves the persistence of trade relationships for firms operating in industries with severe contracting problems. However, the existing firm-level studies have generally focused either on institutional differences within a single exporting country or across destination markets. We make use of the Exporter Dynamics Database, the first and the only database that provides detailed comparable information on the micro-structure of trade flows between countries across a large number of countries, to explore the effects of institutional differences across countries. This represents an advance with regard to the existing firm-level studies, which rely on a single exporting country.

3. Conceptual framework

To guide the empirical analysis, we present a simple framework that introduces contractual frictions into a model of international trade with firm heterogeneity, à la Melitz (2003). The framework closely follows Manova (2013) who proposes a model of trade with credit constraints. Instead of financial frictions, we have explored how contractual frictions affect the pattern of trade by separating the effects on intensive and extensive margins. Fig. 1 illustrates this.

3.1. Effect of contractual frictions on the extensive margin of trade

Firms within each sector are assumed to be heterogeneous in terms of their productivity (ϕ), and they must pay a fixed entry cost in order to access foreign market. Fig. 1(A) shows that a firm's profit is strictly increasing in productivity. It also depicts the difference in the productivity cut-offs for exporting with and without contractual frictions. The productivity cut-off to enter a particular market can be determined by finding the marginal firm that is indifferent between entering and not entering the foreign market. The productivity cut-off for exporting is ϕ^* as in Melitz (2003). In the absence of contractual frictions, exporting is profitable for all firms with $\phi > \phi^*$.

We now assume that exporters source their intermediate inputs and sourcing is subject to contracting frictions that increase cost to a firm. Intermediate inputs vary in the degree to which their buyers and sellers are subject to holdup problems. The cost of contractual frictions on firms depends on the sector in which they operate (c_s). In other words, all firms in a given sector are subject to the same level of supplier enforcement costs, but more productive firms earn higher revenues and can cover the cost of sourcing from input suppliers. The fixed costs of exporting are higher in contract-intensive industries. As contractual friction affects the fixed costs of setting up a business (more) in contract-intensive sectors, the productivity cut-off for exporting will be ϕ_i, which is higher than the cut-off for a frictionless market (ϕ^*). In the presence of contractual frictions, firms with productivity between ϕ^* and ϕ_i have a productivity too low to allow them to generate enough profits in the foreign market to recover the fixed entry cost associated with enforcing supplier contracts. These firms could profitably export in the absence of contractual frictions but fail to cover the cost of contract enforcement. Compared to a world without contractual frictions, there will be fewer number of exporters in a given sector that require formal contract enforcement, i.e., contractual frictions affect the extensive margin of trade. Very high productivity firms ($\phi > \phi_i$), no matter how large the cost of contract enforcement, will be able to export as they can afford to cover the costs of enforcing supplier contract.

The figure illustrates the productivity cut-offs in a given sector and in a given country. However, productivity cut-off for exporting varies across sectors. Productivity cut-off for exporting is higher in industries that require contract enforcement. Likewise, countries differ in the quality of institutions to enforce supplier contracts. In countries with weak contracting institutions, fewer firms become exporters particularly in contract-intensive industries — the extensive margin.

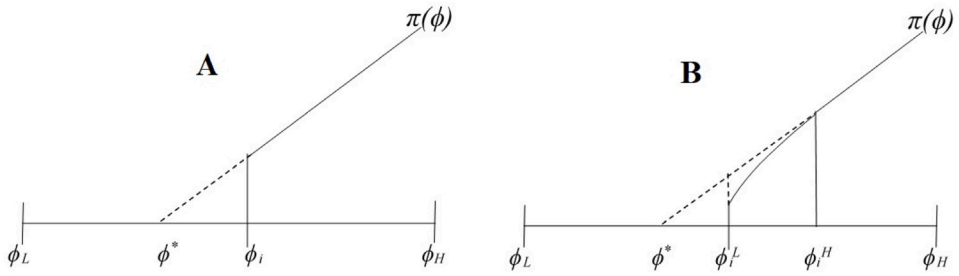

Fig. 1. Firms need to meet a minimum productivity level in order to export profitably, and this cut-off is higher in the presence of contractual frictions than in their absence. This difference could apply to the entry into the export market (Panel A) or both to the entry into and the intensity of exporting (Panel B). *Source:* Adapted from Manova (2013).

3.2. Effect of contractual frictions on the intensive margin of trade

In addition to affecting a firm's decision to enter an export market, contractual frictions can also reduce the volume of exports of a given exporter conditional on exporting. This happens if contractual frictions increase both variable and fixed costs of exporting, a situation illustrated in Fig. 1(B). The figure shows that: (i) all firms with productivity above ϕ_i^L enter export markets, (ii) firms with intermediate levels of productivity, between ϕ_i^L and ϕ_i^H, would not earn enough revenues to cover the cost of contract enforcement had they exported at the best level absent contractual frictions; instead, they choose to export lower volume in order to reduce the cost of contract enforcement as they expand their production, and (iii) those with productivity above a higher cut-off, ϕ_i^H, export the same volume as in a frictionless market.

The volume of export in contract-intensive industries are now lower in countries with weak contract enforcement because exporters with productivity between ϕ_i^L and ϕ_i^H export lower volume than they would have done in the absence of contractual frictions.

To sum up, the quality of contract enforcement affects firms' export decision and volume of exports when firms rely on relationship-specific intermediate inputs. In countries with better contract enforcement, the cost savings from cheap contract enforcement allow some non-exporting firms in contract-intensive sectors to enter into exporting markets (the extensive margin), and existing firms to increase their export volume (the intensive margin).

4. Empirical specification

In this section, we describe the empirical models and estimation procedures. In this regard, we closely follow Manova (2013). The basic model we use to estimate the effects of institutions on export is given by:

$$X_{jist} = \alpha_0 + \alpha_{ist} + \alpha_{jt} + \alpha_{ji} + \beta_1 z_s Q_{jt} + \boldsymbol{\gamma}' \boldsymbol{Z} + \varepsilon_{jist}, \tag{1}$$

where

X_{jist} is a measures of trade flow from country j to country i in sector/industry s in year t;

$z_s Q_{jt}$ is the interaction between the institutional quality of country j in year t (Q_{jt}) and the contract-intensity of industry s (z_s);

α_{ist} and α_{jt} are Importer×Sector×Year and Exporter×Year fixed effects, which capture the multilateral trade resistance (MTR) faced by the importer and exporter countries, respectively;[1]

α_{ji} is Exporter×Importer fixed effect and captures bilateral trade resistance between country pairs;

α_0 is the constant term and ε_{jist} is the idiosyncratic error term; and

$\boldsymbol{Z}$ is a vector of control variables including traditional sources of comparative advantage (physical capital (K_{jt}), human capital (H_{jt}) and natural resource endowments (NR_{jt}) interacted with the corresponding factor intensities k_s, h_s and n_s), and $\boldsymbol{\gamma}$ the vector of corresponding coefficients.

Other important variables at the heart of the gravity equation such as exporter GDP, importer GDP, and the physical and cultural distance (such as shared border and language) between them are absorbed by various fixed effects. Namely, exporter GDP is absorbed by Exporter×Year fixed effects, importer GDP is subsumed into Importer×Year fixed effects, and distance between the two is captured by Exporter×Importer dummies. While importer GDP could be adequately captured by the interaction term Importer×Year, we further interacted this with sector dummies to allow for the potential differential impact of importers' economic sizes across industries.

[1] While the exporter and importer MTR terms are conceptually symmetric, there is an asymmetry in our specification. The reason behind this asymmetry is that including Exporter×Sector×Year fixed effects would absorb the effects of variables that vary by exporter–industry–year and thereby render the estimation of the parameter of interest impossible. Thus, we used Exporter×Year to get as close as possible to the exporter MTR term. We thank an anonymous referee for the suggestion.

As we are interested in the effect of institutional quality on the pattern of trade, our parameter of interest is β_1. As our first testable hypothesis, we expect that $\beta_1 > 0$. That is, the effect of institutions on exports is increasing in the institutional-intensity of the industry. Put differently, improving institutions leads to a more than proportionate expansion of exports in the institution-intensive sectors — establishing institutions as a source of comparative advantage.

It should, however, be noted that estimating this model leads to dropping a large number of observations with zero trade, and thus the estimate of β_1 does not give the true effect of interest. Instead, it gives the effect of institutions on the pattern of trade for the sample of country-pairs with non-zero trade only, which is a biased estimate for the true (population-wide) effect of institutions in the face of selection bias. A solution to this problem of selection-bias is to estimate Eq. (1) along with a selection model. The latter entails estimating a probit/logit model and gives the influence of institutions on the probability of exporting a positive value, which constitutes one among the several definitions of the extensive margin. The model for this is specified as:

$$\rho_{jist} = Pr(X_{jist} > 0 | observables) = \Phi(\alpha_0 + \alpha_j + \alpha_i + \alpha_s + \alpha_t + \beta_0 Q_{jt} + \beta_1 z_s Q_{jt} + \boldsymbol{\gamma}' \boldsymbol{Z}), \tag{2}$$

where ρ_{jist} is the probability of country j exporting product s (a product within industry s) to country i in year t, and X_{jist} is the value of exports.

An important difference between Model (1) and Model (2) is that the fixed effects enter the former as dyads (interactions) while these effects enter the latter individually. While the use of interactions is the ideal specification, it will imply a prohibitively large number of dummy variables for the second model. With 215 exporters, 222 importers and 28 industries, for instance, using separate dummies (α_j, α_i, α_s) implies 465 (= 215 + 222 + 28) parameters to estimate while using interaction dummies (α_{jis}) adds 1,336,440 (= 215 × 222 × 28) parameters to the model. The beauty of linear models (such as the one in Eq. (1)) lies in the possibility to absorb the fixed effects in executing the estimation. Such option is not available with the non-linear model in Eq. (2). In order to at least partially counteract the less than ideal specification, Model (2) included variables such as importer GDP, exporter GDP, and distance between exporters and importers.

Proper identification of the intensive margin in Eq. (1) requires that at least one element of the vector $\boldsymbol{Z}$ in Eq. (2) is a variable that affects the decision to export but not the level/intensity of export (i.e., is a determinant of fixed costs but not variable costs of exporting). Following Helpman et al. (2008) and Manova (2013), we utilize three country characteristics for this purpose: number of days, number of legal procedures and the monetary cost of starting a business. If $\beta_1 > 0$ in Eq. (2), then better institutions increase the probability of a country entering the export market of an institutionally-intensive product more favorably than they raise the probability of exporting an institutionally less-intensive product.

Regarding the estimation techniques, we proceed as follows. For the sake of comparison, we begin by estimating Eq. (1) using the OLS technique, with no correction for selection-bias. Next, we estimate Eq. (1) conditional on Eq. (2), which we implement in two steps. We first estimate Eq. (2) using *probit*, then save the Inverse Mills-Ratio from this step, and finally run OLS on Eq. (1) by including the Inverse Mills-ratio as an additional regressor.[2] The use of *Heckman* or the Inverse Mills-ratio takes care of the bias arising from the fact that the trading set of country pairs may constitute a non-random sample of the population of all country pairs. As Manova (2013) shows this falls short of correcting for bias arising from firm-level selection into exporting. As a result, the one-step Heckman approach does not fully correct for selection-bias, and this is why we opted for the sequential procedure of estimating Eq. (2), and then extracting some pieces of information from there, and finally estimating Eq. (1). As per this procedure, the $\hat{\rho}_{\text{jist}}$ we get from Eq. (2), is the source of two pieces of information we need in order to disentangle the extensive margin from the intensive.

We then consider other alternative definitions of, and therefore ways of disentangling, the extensive margin from the intensive. The first definition takes the number of varieties exported – also referred to as the *scope* of export – as an indicator of the extensive margin. Correspondingly, we take the (average) value of export per variety – the export *deepening* dimension – as the indicator of the intensive margin. Accordingly, we re-estimate Eq. (1) by replacing the left hand side (LHS) variable with E_{jist} – the number of HS-6 product varieties within an ISIC-Rev.2 3-digit classification – and $\bar{x}_{jist}$ – the average exports per variety – for estimating the influence of institutions on the extensive and intensive margins, respectively.

In a similar manner, we disaggregate the effect of institutions on total export into effects on the number of destinations and on the value of export per destination. Here, counting the number of destinations means that we have to collapse the importer dimension of the data. Substituting the number of destinations (D_{jst}) and average export per destination ($\bar{x}_{jst}$) for X_{jist} in Eq. (1), in turn, and dropping the i sub-identifier across the board yields equations for the extensive and intensive margins, respectively.

After testing the basic hypothesis that $\beta_1 > 0$ in Eq. (1), we carry on to examine if institutional quality is quantitatively more important than factor endowments in explaining comparative advantage by solving for the standardized beta coefficients, and comparing the coefficients of the interaction terms in the same equation. Parallel comparisons are also undertaken for each margin. Finally, by interacting the term $z_s Q_{jt}$ in Eq. (1) with *OECD* – a dummy variable that assumes a value of 1 for OECD members and 0 otherwise – we test if the influence of institutions on the pattern (and margins) of trade differs for countries at different levels of economic development.

As Besedeš and Prusa (2011) argue, the role of the extensive margin could unduly be overemphasized if one ignores the duration of export relationships, especially for developing countries. While we agree to the importance of the duration/survival aspect of export relationships, we conjecture that institutional quality has a positive impact on export/exporter survival rate. If there is a support for the claim that institutional quality positively affects export survival rates (and does more profoundly so for

[2] Our two-step results are consistent with the results from estimating the two equations simultaneously using the one-step Heckman procedure.

institution-intensive products) in addition to its positive effect on the extensive margin, it means that their fear is, at least partly, counterbalanced in a way. To test this claim, we re-estimate Eq. (2) by redefining ρ_{jist} to stand for survival rate, operationalized as the probability of exporting a positive value in two consecutive years, *t-1* and *t*: i.e., $\rho_{\text{jist}} = Pr(X_{jist} > 0 | X_{jist-1} > 0, \ldots)$.

To gauge the relative importance of the two margins, we proceed as follows. As per the baseline definition where the intensive margin refers to the value of export conditional on firm entry into export, we estimate two sets of models. One set estimates the coefficient of interest with no regard for the issue of firm heterogeneity and the consequent firm selection into exporting (controlling only for possible selection bias emanating from non-randomness of the trading country pairs). Such estimation results give the overall effect of institutions on trade without distinguishing between the two margins (let this be denoted by β_{Total}). We then estimate models which explicitly take care of firm selection into exporting. The coefficient from this second set reflects the effect of institutions on export conditional on firms entering the export market — hence the intensive margin (represented by $\beta_{Intensive}$). The ratio of a coefficient estimated under the second scenario to the corresponding coefficient under the first scenario gives the relative importance of the intensive margin. That is, the share of the influence of institutional quality on export that materializes through the intensive margin is calculated as:

$$\frac{\beta_{Intensive}}{\beta_{Total}} \times 100\%.$$

In the case of the variety-based alternative definition of margins the value of export conditional on exporting is split into two: the number of varieties exported (the extensive margin, perhaps more accurately described as the scope dimension of the intensive margin in line with the definition above) and the average value exported per variety. According to this definition, by construction,

$$\begin{aligned} Export &= (Export/Variety) \times Variety. \\ \Rightarrow ln(Export) &= ln(Export\ per\ Variety) + ln(Variety). \\ \Rightarrow \frac{d[ln(Export)]}{dQ} &= \frac{d[ln(Export\ per\ Variety)]}{dQ} + \frac{d[ln(Variety)]}{dQ}. \\ \Rightarrow \beta_{Total} &= \beta_{Intensive} + \beta_{Extensive}, \end{aligned}$$

where Q may stand for our variable of interest or any other regressor. Consequently, the relative importance of the intensive and extensive margins are given by:

$$\frac{\beta_{Intensive}}{\beta_{Total}} \times 100\% \text{ and } \frac{\beta_{Extensive}}{\beta_{Total}} \times 100\%,$$

respectively. The calculations of the relative contributions of the intensive and extensive margins as per the destination-based definitions follow similar lines as the variety-based definitions.

The methodology section winds up by highlighting how we addressed an important methodological challenge. As has rightly been recognized in the literature, endogeneity is a major concern. It could result from the omission of variables that affect both export pattern and institutional quality as well as reverse causality running from export to institutional quality. With regard to omitted variables bias, the inclusion of Importer×Sector×Year, Exporter×Year and Exporter×Importer fixed effects takes care of endogeneity that may emanate from factors varying along these dimensions. That is, our specification is immune to the omission of importer characteristics that vary across industry and/or over time, exporter characteristics that vary over time, and factors which are unique to exporter–importer pairs. The remaining concern in this regard relates to the omission variables which vary along the Exporter×Sector×Year dimension and that are also correlated to our variable of interest. Of such determinants of trade pattern, our models control for physical capital, human capital and natural resources, all interacted with the corresponding measures of sectoral factor intensities. While all this may reduce the possibility of omitted variables bias, it does not fully eliminate it.

Moreover, given that trade has the potential to influence institutional quality, reverse causality is still an issue. Indeed, Levchenko (2013) provides evidence of causality – though weak – running from exporting in institution-intensive sectors to improvements in institutional quality (see also Hochman et al., 2013). Theoretically, this issue could be addressed using one of the following four approaches: instrumental variables, vector autoregression (VAR), lagging the independent variable, and event study. Testing for the direction of Granger (non-)causality using VAR is not an option as we have a short panel of eight years. Moreover, as we are looking into the effect of institutions in general, and not a particular aspect of it which can be traced easily (for example, financial liberalization), the attempt to supplement the panel regression analysis with an event study – à la (Manova, 2008) – has not been successful. We were unable to find useful discrete shocks in institutional reforms.

This leaves us with finding instrumental variables for institutions or using lags. In spite of some differences, the instruments used to address endogeneity are generally weak/poor, and exclusion restrictions are debatable. Besides being weak instruments, variables such as legal origin and shared languages are time-invariant and could not serve that purpose in the current setting (they suit cross-sectional analysis). Although not a panacea by itself, the use of panel data – through enabling the exploitation of both temporal and spacial dimensions – has the potential to mitigate the problem. At the minimum, it addresses one source of endogeneity: unobserved heterogeneity (component of the error term potentially correlated with included regressors). In this regard, by exploiting both between and within country (and between sector) variations using panel data, our study presents some potential improvement over cross-sectional studies.[3] In other words, getting rid off the time dimension in hope of using time-invariant instruments in a cross-sectional regression is theoretically worse than relying on panel data.

[3] While the study by Feenstra et al. (2013) is based on panel data, their analysis is confined to Chinese provinces.

The last option is to lag the independent variable (in our case, institutional quality). This is not an unreasonable approach because cause naturally precedes its effect. Thus, using institutional quality from year *t-1* or earlier to predict export pattern at year *t* addresses our concern over reverse causality. Besides, it is consistent with improvements in institutional quality impacting export with some delay. Accordingly, we have also re-estimated our main models with one-year and two-year lagged values of institutional quality, and the results are robust (see Table A.4 in the Appendix).

Before we take these hypotheses to the data (Section 6), we devote some paragraphs to the description of data and their sources.

5. Data

This section presents the description of the variables and the data sources used in the paper.

Trade data. Trade data are obtained from two sources: BACI database and the World Bank Exporter Dynamics Database (EDD). We obtain trade flows (in thousands of US dollars) at the 6-digit HS2007 level from the BACI database, constructed by CEPII based on the UN-Comtrade data (Gaulier and Zignago, 2010). Since the data on an important component of our main independent variable (contract-intensity of industries) are available only at ISIC Revision-2 3-digit level, conversions are needed. To this end, we used the World Integrated Trade Solution (WITS) product concordance table[4] to convert data from HS2007 to ISIC-Revision 2. This is used as the dependent variable in the base model. Other models employ the number of product varieties – the count of HS2007 6-digit products within an ISIC Revision 2 3-digit product group – and average exports per variety. To clarify the measurement of *the number of product varieties* with the help of an example, in the year 2008, Afghanistan exported 15 product varieties (i.e., according to the HS2007 6-digit classification) to France, all of which belong to the division "Fabricated Metal Products" (code 381) as per ISIC Revision 2 3-digit classification. Thus, variety = 15 is the entry for exporter = Afghanistan, importer = France, year = 2008 and isic2 = 381. In models that estimate the effect of institutions on the volume of exports to the whole world, the number of export destinations, or average exports per destination – instead of bilateral trade flows – the trade data are further aggregated over all importers, thereby changing the observation identifier from exporter–importer–industry–year to exporter–industry–year.

Despite the large proportion of zero-trade entries, we have data for 215 exporters, 222 destinations, 28 industries and 8 years. (We had to drop the 29th industry (ISIC 312) due to missing values on factor-intensity.) Moreover, a large number of observations are automatically dropped due to missing values in one or the other variable. Depending on the model estimated, this leaves us with 632,363–1,662,720 observations (in the full set of countries) out of the potential of over 11 million observations. The number of non-missing values per variable is shown in Table A.1. Although this indicates that the export dummy has a lot more '0's than '1's, the two categories are well-balanced in the estimation samples. For instance, in the probit results of Table 2, there are 919,893 (55%) '0's and 742,827 (45%) '1's. As all the linear regressions results are subsequently based on the results from the probit estimations, the categories remain roughly balanced.

In the more granular analysis, we rely on the World Bank's Exporter Dynamics Database (EDD), which is based on firm-level customs data covering the universe of export transactions provided by customs agencies from 69 countries.[5] The description of the database is provided in Fernandes et al. (2016). EDD contains aggregated measures on export sector characteristics and dynamics at different levels of aggregation. For our analysis, we are mainly interested in two indicators of the dataset: the number of exporting firms and average export per firm, which is constructed at the country–year–industry level.

Country-level measures. Data on institutional quality indicators are obtained from two sources: the Worldwide Governance Indicators (WGI) database of the World Bank and the Economic Freedom of the World (EFW) of the Fraser Institute. While various indicators from these sources have been used in some robustness checks, the main indicators used are the *rule of law* from the former and the *contract enforcement* variable from the latter source. These are chosen because they correspond to the theoretical channels proposed to link institutions to the pattern of trade, better than the other indicators.

Natural resource endowment figures – total natural resource rent as percentage share of GDP – are extracted from the World Development Indicators (WDI) database of the World Bank. Exporter and importer GDP (both in constant 2010 US dollars) are also extracted from WDI. Human capital endowment is constructed from the human capital index, employment and average hour worked variables in version 9.0 of Penn World Tables (PWT) (Feenstra et al., 2015). The product of persons employed and average hours worked per person is multiplied by the human capital index they constructed from years of schooling to give a measure of effective (or augmented) labor — human capital endowment. Data on endowment of (physical) capital, defined as the value of capital stock at 2011 constant national prices and converted to millions of US dollars, are also from PWT. The number of days, number of procedures, and monetary costs (as percent of income per capita) needed for business startup, used in the probit models, come from the Doing Business database (last updated 03/01/2017, and available at http://www.doingbusiness.org). For each of the three variables, we used the average of the entries for men and women. Distance between exporter–importer pairs refers to the geographical distance in kilometers between the most populated cities and the data are from CEPII's GeoDist database (see Mayer and Zignago, 2011).

[4] The conversion table is available at http://wits.worldbank.org/product_concordance.html.

[5] The aggregate measures are publicly available at http://www.worldbank.org/en/research/brief/exporter-dynamics-database.

Industry-specific measures. Data on the contract-intensity of industries are from Nunn (2007). His measure of institutional intensity has two definitions. Both definitions refer to the weighted average of the proportion of relationship-specific inputs used in the production of the product concerned, where the weights are the value of the input relative to the value of all inputs. The difference is that whereas the first definition counts only inputs that are neither sold on exchange nor reference priced as relationship-specific, the second one additionally includes inputs that are reference priced. Each of these definitions has two estimates: liberal and conservative. We used the first definition because it displays more variation (in terms of both range and standard deviation) than the second. Also, the correlation between liberal and conservative estimates is stronger for the first definition than for the second (0.9799 versus 0.8951). Between the two estimates of this preferred definition, the conservative estimate is given preference over the liberal one as the former has more variation than the latter (standard deviation and range of 0.209 and 0.828 as compared to 0.206 and 0.801, respectively). Nonetheless, all the four statistics (from the two definitions, and the two estimates per definition) are positively and (statistically highly) significantly correlated with one another, and the main results are robust to the use of alternative definitions. Data on other factor intensities (i.e., capital, human capital and natural resource intensity) of the industries are from Manova (2013). Table A.3 provides the average factor-intensities of the 28 industries used in the analysis. Another important industry-level characteristic is the number of firms or establishments. Unlike factor intensities, this variable varies both over time and between countries. The inclusion of this variable in the regression models is critical for discerning the trade-specific effect of institutional quality from its overall effect on production and trade. The data for this variable are from UNIDO's INDSTAT 2.

Table A.2 reports summary statistics for these variables. Our main independent variable is the interaction between institutional quality (a country-specific measure) and contract-intensity (an industry-specific measure).

6. Results

We are interested in the differential effects of institutions on overall trade flows across industries, and the mechanism through which such effects operate. In this section, we first examine the effect of institutions on main outcomes of interest (probability of exporting, trade volume, product scope, export destination, and export survival rate) using country and industry level characteristics (Section 6.1). We then investigate our main hypothesis using more disaggregated data which come from the firm-level database (Section 6.2). Sections 6.3–6.5 examine the relative strength of institutions vis-à-vis factor endowments, heterogeneity in effects of institutions, and export survival rate, respectively. Finally, we wind up the section by presenting further robustness checks in Section 6.6.

6.1. Institutions and export margins: Aggregate bilateral trade data

6.1.1. Production versus trade-specific effects

Better contracting institutions may influence not only exports, but also domestic production. We start by highlighting the importance of distinguishing between two effects of institutions: (i) the effect on domestic production, and (ii) the trade-specific effect – i.e., the effect on export pattern over and above the effect on domestic production pattern. One way to understand the difference between the two is to think of a policy action implemented with the intention of making contracts more secure. This would reduce total trading costs thereby making it easier for non-exporting firms to embark on exporting and for those already exporting to scale up their operation. In addition, this policy action would also influence the incentive of incumbent firms to restructure their production and of potential firms to be attracted (more) towards a particular sector. While the latter will also ultimately affect the pattern of trade, it is the former effect that reflects the direct and immediate trade-specific effect of the policy reform.

As the OLS estimate in the first column of Table 1 shows, the coefficient of the interaction term *Rule of Law* × *Institutional-Intensity*, which captures the effect of institutions on the pattern of trade, is 0.416 and statistically highly significant. However, part of this effect could represent the effect of improved institutions on domestic production which could of course subsequently boost exports. Column 2 isolates the differential trade-specific effect by controlling for the production effect using the (log) number of establishments. Comparing the two coefficients, it is clear that the effect of institutions on the pattern of export – over and above enhancing domestic production – makes up about 85 percent (= (0.353/0.416)x100%) of what we would have inferred without controlling for the effect on domestic production. This corresponds to an overstatement of the effect by around 18 percent (= ((0.416–0.353)/0.353)x100%).

Columns 3 and 4 (of Table 1) repeat the exercise by controlling for the traditional sources of comparative advantage: physical capital, human capital and natural resources. In this case, failing to control for the effect on domestic production overstates the effect of institutions on the pattern of trade by about 6 percent (= ((0.562–0.523)/0.523)x100%). While controlling for more factors reduces the gap between the two estimates remarkably, the wedge between the two persists. Hence, given the importance of distinguishing between the two effects that the results in Table 1 lend support to, we include the (log) number of establishments in all our subsequent regressions.

Table 1
Trade-specific effect of institutions on export .

Dependent variable:	$ln(Export)_{jist}$			
	(1)	(2)	(3)	(4)
Rule of law x Inst-Int	0.416***	0.353***	0.562***	0.523***
lnESTABLISH		0.086***		0.077***
lnH x H-Int			0.159***	0.148***
lnK x K-Int			−0.373***	−0.365***
NR x N-Int			−0.012***	−0.012***
No. of observations	1 185 467	1 185 467	782 458	782 458
F-Statistic	428.073	332.210	131.614	132.846
Prob > F	0.000	0.000	0.000	0.000
R^2	0.792	0.792	0.821	0.821
$\bar{R}^2$	0.782	0.782	0.810	0.810

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Each regression includes unreported coefficients for Exporter–Importer, Importer-Sector-Year and Exporter–Year dummies. All standard errors are clustered by exporter–importer pairs.

Table 2
Institutional quality and the probability of exporting.

Dependent variable:	$Pr(Export_{jist} > 0)$		
	(1)	(2)	(3)
Days	−0.002***		
Procedure		0.001	
Cost			−0.012***
Rule of law	−0.268***	−0.273***	−0.144***
Rule of law x Inst-Int	0.357***	0.358***	0.358***
lnH	−0.173**	−0.232***	0.064
lnH x H-Int	0.065***	0.065***	0.065***
lnK	−0.186*	−0.006	−0.602***
lnK x K-Int	−0.437***	−0.437***	−0.438***
NR	−0.013***	−0.013***	−0.007***
NR x N-Int	0.001	0.001	0.001
lnESTABLISH	0.029***	0.028***	0.028***
lnGDPE	1.101***	1.058***	0.899***
lnGDPI	0.027	0.024	0.023
lnDIST	−0.151***	−0.151***	−0.151***
No. of observations	1 662 720	1 662 720	1 662 720
No. of clusters	9714	9714	9714
χ^2	37 178.764	37 212.19	37 159.165
Prob > χ^2	0.000	0.000	0.000

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. All regressions include exporter, importer, industry and year fixed effects. Standard errors are clustered by exporter–importer pairs.

6.1.2. Institutions and the extensive margin: Selection into exporting

To identify the effect of institutions on the export pattern and to disentangle the influence on the extensive margin from that on the intensive, we need to estimate a selection model that explains what influences the probability that country *j* exports a positive value of a product in sector *s* to another country *i* in year *t*. Table 2 presents regression results of this exercise. Each column in the table includes a variable unique to the selection equation – a variable that determines the decision to export but not the amount of export. Following the literature, we use the number of days required for starting a new business (*Days*) in the baseline specification (Column 1). The result is robust to the use of other commonly used variables – the number of procedures (Column 2) or monetary cost of business startup (Column 3) – instead of (or in addition to) the number of days. This relationship is also robust to the inclusion of a number of controls: the full set of exporter, importer, year and sector fixed effects (dummies); total GDP of both exporters and importers (to capture market size); and the distance between exporter and importer. Time-invariant country and sector-specific characteristics are subsumed into sector, exporter and importer fixed effects. Global trends and/or shocks common to all countries are captured by year dummies. Following Manova (2013), errors are clustered by exporter–importer pairs to account for "unobserved variation in bilateral trade costs" which may induce error correlations within country pairs.

Across all the columns, the likelihood of a country exporting a contract intensive product increases (relatively faster than that of exporting a less contract-intensive product) with the country's level of institutional quality. Similarly, the probability that a country exports a product that is intensive in human capital rises with the country's human capital endowment. Natural resource endowment has a statistically insignificant (albeit positive) effect on the differential probability of exporting resource-intensive manufactures. On the other hand, physical capital endowment seems not to favor the chance of exporting capital intensive products over the less capital intensive ones. However, multicollinearity is likely to be behind the unexpected sign of physical capital endowment (more on this below). Consistent with expectations, the economic size of the exporter as measured by its GDP (*lnGDPE*) has a robust positive

Table 3
Rule of law and margins of export: Effects on volume, scope and export per variety.

Dep. variable:	$ln(Export)_{jist}$			$ln(No.\ of\ varieties)_{jist}$			$ln(Export\ per\ Variety)_{jist}$		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Rule of law x Inst-Int	0.611***	0.416***	0.428***	0.277***	0.160***	0.156***	0.334***	0.257***	0.272***
lnH x H-Int	0.207***	0.182***	0.180***	0.118***	0.104***	0.100***	0.089***	0.079***	0.080***
lnK x K-Int	−0.377***	−0.307**	−0.297**	−0.139***	−0.102**	−0.085*	−0.238**	−0.205*	−0.211**
NR x N-Int	−0.014***	−0.013***	−0.014***	−0.005***	−0.004***	−0.005***	−0.009***	−0.009***	−0.009***
lnESTABLISH	0.068***	0.054***	0.055***	0.025***	0.017***	0.017***	0.042***	0.037***	0.038***
No. of observations	718 608	718 608	718 608	718 608	718 608	718 608	718 608	718 608	718 608
F-Statistic	148.724	191.007	90.162	280.903	392.503	112.695	61.427	59.615	47.797
Prob > F-Statistic	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
R^2	0.822	0.823	0.823	0.906	0.907	0.907	0.686	0.687	0.687
$\bar{R}^2$	0.811	0.812	0.812	0.900	0.902	0.902	0.668	0.669	0.669

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Each regression includes unreported coefficients for full set of Exporter–Importer, Importer–Industry–Year and Exporter–Year dummies. All standard errors are clustered by exporter–importer pairs. Columns 1, 4 and 7 control for the conventional Heckman-type selection bias; the rest additionally correct for firm selection into exporting, using either the polynomials of z – i.e., z, z^2 and z^3 – (Columns 2, 5, 8) or a dummy variable for each of the 50 bins formed on the basis of the probability of exporting saved from the first column of the Probit regression in Table 2 (Columns 3, 6, 9).

effect on the probability of exporting. Importer's economic size (*lnGDPI*) has the expected positive sign, but its effect is statistical insignificant. Finally, the physical distance between exporting and importing countries has a robust effect of hampering trade. More importantly, the variable of interest – institutions – retains its sign and significance across all specifications, with little to no change in magnitude.

6.1.3. Institutions and the intensive margin: Trade volume conditional on exporting

Next, we turn to the effects of institutions on the intensive margin of export. The results are presented in Columns 1–3 of Table 3. Column 1 provides estimates after correcting for the conventional selection-bias by incorporating information on the likelihood of exporting from the results in Table 2. It specifically saves the Inverse-Mills-Ratio (Heckman's correction term) from Column 1 of Table 2 and includes it as an additional regressor. The coefficient estimate of the effect of institutions on comparative advantage is larger here than the corresponding OLS estimate (compare 0.611 in Column 1 of Table 3 to 0.523 in Column 4 of Table 1). This suggests that estimating the effect of institutions on the trade pattern using data from those country-pairs that are actually trading – i.e., ignoring the zero-trade – undermines the true effect of institutions. Put differently, the role of institutions is apparently more pronounced in the population than in the trading sample of countries. As shown below, this is only apparent because controlling for an additional bias reveals that the true effect is smaller.

In Columns 2 and 3, we subsequently correct for bias due to selection into exporting emanating from underlying firm-heterogeneity. We do so using two of the techniques proposed by Manova (2013). The techniques we chose are the ones that rely on minimal distributional assumptions. We proceed as follows. Common to both approaches, we first save the probability of exporting from the Probit model (Column 1 of Table 2), and then winsorize the top 1 percent and the bottom 1 percent of the probabilities in order to reduce the influence of extreme values.[6] In accordance with the first approach, we generate the inverse cumulative standard normal distribution z from the winsorized predicted probabilities, and include its polynomials (i.e., z, z^2 and z^3) as additional regressors (Column 2). In Column 3, we follow the second approach of grouping the winsorized predicted probabilities of exporting into 50 bins and including a dummy variable regressor for each of the resulting 50 groups.

As the results indicate, in both cases, the coefficients of interest are smaller than not only the corresponding estimates from the OLS technique but also the estimate from the model which corrects for the conventional (Heckman) selection bias only. Most of the criticism in the literature has targeted the bias which would arise from ignoring the fact that the set of trading countries is a non-random sample from the population of countries in the world. Nonetheless, the estimate for the effect of institutions on the intensive margin of trade would still be biased unless we take into account the distribution of firm productivity (which drives firm selection into exporting) and include these additional controls. The results in columns 2 and 3 of Table 3 support this: correcting for this additional source of bias reduces the magnitude of the coefficients as compared to both models which correct for the conventional selection bias only or models which do not correct for any bias at all. In fact, Column 1 gives the effect of institutions on volume of trade (i.e., the total effect). Columns 2 and 3, on the other hand, give the effect on volume of trade conditional on firms' selection into exporting (which is one definition of the intensive margin). Thus, dividing our coefficient of interest in Column 2 or 3 by the corresponding coefficient in Column 1 yields the contribution of the intensive margin. Accordingly, about 68 to 70 percent of the effect of institutional quality on the trade pattern materializes through the intensive margin.[7]

As for the control variables, the interaction term involving human capital has the expected positive sign, suggesting that human capital boosts the export of products which are more intensive in human capital more than it does so for products that are relatively less intensive. This influence is also statistically highly significant. Likewise, the number of domestic establishments has a significant

[6] That is, values of $\hat{\rho}_{jist}$ below 0.0001129 are set to 0.0001129 and values of $\hat{\rho}_{jist}$ above 0.999703 are set equal to 0.999703. Qualitatively, the results are robust to the use of different cut-off points – such as 0.0000001 and 0.9999999 as used in Manova (2013) – or to no winsorization at all.

[7] (0.416/0.611)×100% = 68.1% and (0.428/0.611)×100% = 70%.

expected positive effect on total exports. The effect of the interaction between physical capital endowment and capital intensity on export volume is against expectations. As mentioned in relation to the probability of exporting earlier, a likely cause of this shakiness is multicollinearity. This suspicion is supported by the fact that the sector with the highest capital intensity – *petroleum refineries* – is also the sector with the highest human capital intensity. Besides, the pairwise correlation coefficient between the human capital and physical capital terms is around 0.7 (the strongest correlation of any pair of variables in the model) and statistically highly significant. Another indication of multicollinearity is that excluding human capital from the model restores the expected sign for the coefficient of the physical capital term with high statistical significance, and without affecting our main conclusion.

Natural resource endowment interacted with resource intensity has an unexpected sign that persists in most specifications. Although the correlation coefficient between the natural resource and physical capital terms is also statistically significant, its magnitude is only moderate (0.26). Besides, the exclusion of the physical or human capital terms from the model does not guarantee the expected sign for this variable. This could result from two possible sources: the limited number of sectors covered and the way this variable is measured. As for the first reason, natural resource endowments may still favor the export of natural resource intensive products but those products just happen to be outside the manufacturing sectors covered in our study. If the exploration of more natural resources boost the export of raw materials, we may not see a more than proportionate expansion in the export of natural resource-intensive manufacturing goods. This is consistent with the experiences of many developing countries exporting unprocessed raw materials (and importing back processed goods). The fact that the natural resource term does not show an unexpected sign for the OECD countries lends support to this line of reasoning. Although this could explain why we do not observe positive and significant coefficients, it does not, however, explain why we see the unexpected but significant negative sign (at least in some models).

The second possible explanation is the fact that sectors are categorized as either resource-intensive or not resource-intensive using a zero–one dummy variable, with nothing in between. None of the other factor intensities are categorical. Moreover, the two categories of natural resource intensity are not well-balanced as the percentage of 0's is around 75% (against 25% for 1's). In the estimation samples, the share of 1's drops to slightly below 20%.

In sum, the effects of institutional quality on the total volume of export, the probability of exporting (the extensive margin), and the volume of export conditional on exporting (the intensive margin) all rise with the contract-intensity of the sector, and are all statistically highly significant. Moreover, more than two-thirds of the effect of institutions fall on the intensive margin. As shown in a later section, these relationships are also robust to the use of alternative definitions of institutional quality as well as to the inclusion/exclusion of other control variables.

6.1.4. Institutions and variety-based margins of trade: Product scope and deepening

We next examine the effects of contractual institutions on the product scope of countries' exports. In other words, we assess the role of institutions using alternative variety-based definitions of the margins. This could also be seen as a further disaggregation of what we previously called the intensive margin into product scope and deepening sub-margins.

Even though a country might have already been exporting an ISIC 3-digit product (say, ISIC 311), the change in the volume of export (conditional on exporting) may come partly from genuine intensification in a familiar product but partly from exporting a new product that still falls under ISIC 311. While this could theoretically be overcome by using a higher level of product disaggregation, the fact that institutional and other factor intensities are available only at the 3-digit level means that we have to look for other solutions. Hence, we take two alternative ways of disaggregating the volume effect into the extensive (scope) and intensive (deepening) effects. In the first approach, the extensive and intensive margins are defined, respectively, as the number of HS-6 product varieties within a 3-digit ISIC product group and the average value of exports per product variety. Later in the section, we will use destination-based definitions of the two margins.

Columns 4–6 and 7–9 of Table 3 summarize, respectively, the results for the (variety-based) extensive and intensive margins from alternative estimation techniques. As can be seen from these results, institutions explain comparative advantage along both margins. That is, the contribution of better institutions to the number of varieties exported as well as to the average value exported per variety rises with the level of contract intensity of the sector. Another important inference can also be made from the results in Table 3. By construction, the coefficients in Columns 4 and 7 of Table 3 add up to the corresponding coefficient in Column 1 of the same table. Similarly for the other columns (Column 5 + Column 8 = Column 2 and Column 6 + Column 9 = Column 3). Thus, one can assess the relative importance of the scope and depth dimensions in contributing to the overall role played by institutions (or any other factor) in explaining the pattern of trade. Accordingly, about 62 to 64 percent of the effect on the intensive margin (as per our first definition of the intensive margin) comes from enhanced export per variety (the deepening effect) and the remainder from increase in the number of varieties exported (the scope effect). Results in Columns 1, 4 and 7 are presented as baseline results before correcting for a bias (discussed earlier) for the purpose of comparison, and thus excluded from these percentage calculations. Nonetheless, even according to these miss-specified models, the contribution of the deepening dimension (55%) is greater than that of the scope dimension.

In a similar manner, human capital contributes more to the export of highly human capital intensive products (as compared to less human capital intensive ones) along both margins. On the other hand, and consistent with earlier discussions, physical capital appears to have negative effect on both dimensions. That is, the export of highly capital intensive products seems to benefit less from increased physical capital endowment than the export of relatively less capital intensive products. This is the case both for the number of varieties exported and the average export per variety. However, the effect of the physical capital term is once again shaky depending on the inclusion or exclusion of the human capital term with which it is strongly correlated.

Both the number of product varieties exported and the average export earnings (per variety) of a country rise with the number of domestic establishments. Except for the probability of exporting, natural resource endowment appears to have a robust negative

Table 4
Rule of law and margins of export: Destination-based definitions.

Dep. variable:	$ln(Export)_{jst}$		$ln(Export/Destination)_{jst}$		$ln(No.\ of\ destinations)_{jst}$	
	(1)	(2)	(3)	(4)	(5)	(6)
Rule of law x Inst-Int	0.385**	0.374***	0.359**	0.284**	0.026	0.090***
lnH x H-Int	0.029	0.029	−0.004	−0.014	0.033***	0.043***
lnK x K-Int	0.010	−0.037	0.158	0.183	−0.148*	−0.221**
NR x N-Int	−0.001	−0.003	−0.004	−0.004	0.003	0.002
lnESTABLISH	0.052*	0.047	0.051*	0.047*	0.000	0.000
No. of observations	9377	9377	9377	9377	9377	9377
F-Statistic	3.381	2.398	2.359	2.043	11.913	4.986
Prob >F-Statistic	0.003	0.035	0.028	0.070	0.000	0.000
R^2	0.921	0.923	0.901	0.903	0.925	0.926
$\bar{R}^2$	0.918	0.920	0.897	0.899	0.922	0.923

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. All regressions include (unreported) Industry and Exporter–Year fixed effects. Standard errors are clustered by exporter–industry pairs. Regressions in Columns 1, 3 and 5 correct for Heckman-type selection bias only while those in Columns 2, 4 and 6 control for firm selection into exporting as well, using the 50-bins dummy variable approach.

effect on the export of resource-intensive products. Perhaps, discovering more natural resources comes with specializing in the export of the raw materials themselves, thereby compelling resource-rich countries to cut back on the production and export of resource-intensive manufacturing products, possibly after a temporary effort to enter the market followed by short-lived trade relationships.

6.1.5. Institutions and the destination-based margins of trade

Next, we use destination-based definitions of the extensive and intensive margins of trade; namely, number of export destinations for the former and average export per destination for the latter. Even though the occurrence of zero-trade is limited (compared to the case of exports to individual destinations), we still control for the potential selection bias since not every country exports every ISIC-product in every year.

Table 4 presents the regression results of this exercise. The first column under each of the headings total export, average export per destination, number of destinations (1, 3 and 5) displays estimates from the technique which controls for Heckman-type selection-bias. Columns 2, 4 and 6 correct for both sources of selection bias discussed earlier. In agreement with the results so far, institutional quality has the expected positive and disproportionately favorable influence on the exports of contract intensive products. Hence, the influence of institutions on comparative advantage prevails regardless of changing the level of aggregation – i.e., considering export to the world in lieu of export to each destination.

Moreover, institutional quality has the expected sign in both the extensive and intensive margins. Again, the contribution along the intensive margin dominates that along the extensive margin (0.374/0.385 = 0.97). Note that this calculation is still according to the first definition of the two margins and gauges the estimates which correct for firm selection into exporting relative to the effect on the volume of export. Thus, maintaining the micro-based definition while raising the level of aggregation tends to increase, perhaps overstate the relative importance of the intensive margin. If we use the destination-based definition of margins, instead, and compare the estimates from export per destination to estimates from total exports models, the share of the intensive margin becomes 0.284/0.374 = 76%, which is closer to what we found earlier. However, regardless of which definition we use, the intensive margin not only dominates over the extensive one in magnitude, but it also stays robustly statistically significant to alternative model specifications and/or estimation techniques. This is partly in contrast to Lee (2017) who finds the extensive margin to be the more robust channel of influence (statistical significance) despite the intensive margin having greater contribution (magnitude).

In sum, there is a robust effect of institutional quality on the pattern of trade, and this effect materializes through both intensive and extensive margins. These results generally hold regardless of whether one uses variety-based or destination-based definitions of the margins. Again, regardless of the definition used, the intensive margin accounts for the larger share of the influence of institutions on the pattern of trade. Moreover, it represents the (statistically) more robust channel of influence as per all definitions.

6.2. Institutions and export margins: Evidence from cross-country firm-level data

The results presented to this point have used disaggregated product-level data to study the trade effects of institutional quality. A potential drawback of the product-level data used so far is that they do not provide information on the actual number of exporting firms. More specifically, we have (for instance) used the number of 6-digit HS product groups traded within a 3-digit ISIC sector as a measure of the extensive margin of countries' exports. This could potentially bias the relative contribution of the intensive and extensive margins since the mapping between products and firms is unlikely to be one-to-one.

In what follows, we re-examine our results using a more granular trade dataset — the World Bank's Exporter Dynamics Database (EDD). The advantage of EDD is that it provides information on the actual number of exporting firms as well as export sales per exporter, which allows us to capture the extensive and intensive margins of exports more precisely.

Table 5
Institutions and export margins: Firm level evidence.

Dep. variable:	*ln_Export*		*ln_No. of Firms*		*ln_Ave. Export/Firm*	
	Model (1)	Model (2)	Model (1)	Model (2)	Model (1)	Model (2)
Rule of law x Inst-Int	1.293***	0.876***	0.469***	0.224*	0.824***	0.651***
lnH x H-Int	1.149***	0.032	0.906***	−0.155	0.243**	0.187
lnKr x K-Int	4.785***	3.281***	3.343***	1.986***	1.442***	1.295***
NR x N-Int	0.042***	−0.006	0.029***	−0.011	0.013***	0.005
Country–Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Selection bias addressed	No	Yes	No	Yes	No	Yes
N	11 867	8260	11 867	8260	11 867	8260
F-Statistic	102.441	18.116	37.401	3.966	186.162	43.899
Prob > F	0.000	0.000	0.000	0.003	0.000	0.000
R^2	0.756	0.679	0.535	0.477	0.882	0.832
$\bar{R}^2$	0.749	0.668	0.523	0.458	0.879	0.826

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. In each case, Model (2) corrects for selection bias (the occurrence of zero-export) using the dummy variable approach, as in previous tables. Significance of coefficients is based on robust standard errors.

Table 6
Institutions as a source of comparative advantage: Compared to factor endowments.

	(1)	(2)	(3)	(4)	(5)	(6)
Rule of law x Inst-Int	0.067***	0.065***	0.053***	0.105***	0.098**	0.110***
lnH x H-Int	0.338***	0.229***	0.406***	0.105	−0.061	0.668***
lnK x K-Int	−0.041**	−0.045**	−0.025*	−0.011	0.063	−0.267**
NR x N-Int	−0.008***	−0.008***	−0.006***	−0.003	−0.007	0.010
lnESTABLISH	0.028***	0.029***	0.018***	0.044	0.054*	0.000
No. of observations	718 608	718 608	718 608	9377	9377	9377
F-Statistic	90.16	47.80	112.7	2.398	2.043	4.986
Prob >F-Statistic	0.000	0.000	0.000	0.0354	0.0700	0.000
R^2	0.823	0.687	0.907	0.923	0.903	0.926
$\bar{R}^2$	0.812	0.669	0.902	0.920	0.899	0.923

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standardized beta coefficients reported. The dependent variables are, respectively: (1) $ln(Export)_{jist}$, (2) $ln(Export/Variety)_{jist}$, (3) $ln(No.\ of\ Varieties)_{jist}$, (4) $ln(Export)_{jst}$, (5) $ln(Export/Destination)_{jst}$, and (6) $ln(No.\ of\ Destinations)_{jst}$. Regressions 1–3 include Exporter–Importer, Importer-Industry-Year and Exporter–Year fixed effects. Regressions 4–6 include Industry and Exporter–Year fixed effects. Error terms are clustered by exporter–importer (Columns 1–3) or exporter–industry (Columns 4–6) pairs. The 50-bins dummy variable approach is used to correct for selection-bias.

The results are reported in Table 5. Results show that poor institutions restrict firm entry into foreign market as well as constrain the scale of firms' sales in foreign markets. Despite the fact that our analysis relies on a relatively smaller set of countries, our results reaffirm our earlier findings.

Focusing on the models that account for selection-bias (Model (2) in the second, fourth and sixth columns of the table), we see that institutions have a favorable differential effect on the export of contract-intensive products. Moreover, the effect materializes through both the intensive and extensive margins. Consistent with the results from aggregate data, more of the influence comes about through the intensive margin.

6.3. Does institutional quality triumph over factor endowments?

The results so far establish that institutional quality is an important source of comparative advantage, and that the influence operates through affecting both intensive and extensive margins. Next, we assess how this influence of institutional quality fares in comparison with factor endowments — the traditional sources of comparative advantage.

To be able to compare the relative importance of the two sources of comparative advantage (institutions and factor endowments), we need to look at the standardized beta coefficients. To this end, we rerun the models estimated earlier (in Tables 3 and 4). The results are summarized in Table 6. The estimates under each column are from the estimation technique that corrects for selection bias using the dummy variable approach (in addition to the Inverse Mills Ratio). Columns 4–6 represent a greater level of aggregation than Columns 1–3 as the former collapses the importer dimension of the data.

As can be seen from the estimates in the first three columns, human capital plays a much greater role than institutional quality in shaping the pattern of trade in exports overall (Column 1) as well as in average export per variety (Column 2) and number of varieties exported (Column 3). However, as the second half of Table 6 shows, institutional quality has a robustly greater influence on comparative advantage than factor endowments with the use of destination-based definitions. Even here, human capital outperforms institutional quality in terms of the number of destinations (Column 6). The findings in Columns 4 and 5 are consistent with the original claim by Nunn (2007). Hence, the level of aggregation (suppressing the importer dimension) appears to be the driver of Nunn's finding.

Table 7
The return to institutional quality improvement is higher for less developed countries .

Dep. variable:	*ln(Export)*		*ln(No. of Varieties)*		*ln(Export/Variety)*	
	(1)	(2)	(3)	(4)	(5)	(6)
Rule of law x Inst-Int	0.550***	0.551***	0.118***	0.117***	0.432***	0.435***
Rule of law x Inst-Int x OECD	−0.197***	−0.209***	0.033	0.022	−0.229***	−0.230***
lnH x H-Int	0.128***	0.123***	0.075***	0.072***	0.052***	0.051***
lnH x H-Int x OECD	−0.037***	−0.037***	−0.016***	−0.016***	−0.021***	−0.022***
lnK x K-Int	0.389***	0.421***	0.274***	0.288***	0.115	0.133
lnK x K-Int x OECD	−0.032	−0.032	−0.029***	−0.028***	−0.003	−0.004
NR x N-Int	−0.021***	−0.022***	−0.007***	−0.007***	−0.015***	−0.015***
NR x N-Int x OECD	0.004	0.004	0.000	0.000	0.004	0.004
lnESTABLISH	0.073***	0.073***	0.026***	0.025***	0.047***	0.048***
No. of observations	718 608	718 608	718 608	718 608	718 608	718 608
F-Statistic	164.235	93.453	307.006	132.475	60.005	48.370
Prob > F-Statistic	0.000	0.000	0.000	0.000	0.000	0.000
R^2	0.823	0.824	0.908	0.908	0.688	0.688
$\bar{R}^2$	0.813	0.813	0.903	0.903	0.670	0.670

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Each regression includes Export–Importer, Importer–Industry–Year and Exporter–Year fixed effects. Error terms are clustered by exporter–importer pairs. Selection-bias is corrected using the Inverse Mills Ratio for all, and polynomials of z in Columns 1, 3 and 5 and using the dummy variable approach in Columns 2, 4 and 6.

In sum, although institutional quality is a robust source of comparative advantage, the traditional source and particularly human capital appears to be of greater importance. This result is in direct contrast with the finding of Nunn (2007). Eliminating the importer dimension (through aggregation) produces results that are closer to Nunn's. An important caveat in concluding that factor endowments play greater role than institutional quality in shaping export patterns is that institutions are fundamental determinants of factor accumulations, and testing this role of institutions is beyond the scope of this study.

6.4. Heterogeneity in the role of institutions: Developing versus developed countries

To assess whether the effect of institutional quality on trade flow pattern differs between developed and less developed countries, we interacted our variable of interest (*Rule of Law* x *Inst-Int*) with a developed country dummy (*OECD*) and re-estimated our models. The results are summarized in Table 7.

In terms of the effect on total export conditional on exporting, the return to institutional quality improvement for OECD exporters is significantly lower than the return for the non-OECD counterparts. This is robust to the use of the alternative techniques of controlling for selection into exporting (Columns 1 and 2). As to the influence on the number of product varieties exported (Columns 3 and 4), OECD members seem to achieve more than non-members – although the benefit to both groups is positive and the difference is statistically insignificant. In terms of average export per variety (Columns 5 and 6), the differential benefit that being a developing country exporter fetches from institutional quality improvements is even larger. Overall, while both developed and developing countries benefit from improved institutions, developing countries benefit more. This differential effect favorable to developing countries comes from the intensive margin. Hence, not only do developing countries have a greater room for improving their institutional quality and thereby reaping overall benefit in terms of comparative advantage, but they would also achieve more for every step they take in that direction. As the results in Table 7 show, developing countries could similarly expect more favorable benefits from physical and human capital accumulations.

6.5. Institutions and export dynamics

As stated in earlier sections, the effects of institutions on the extensive margin of trade should be taken with a grain of salt in the face of short-lived export relationships — poor survival rates. That is, the statistical significance of the effects of institutional reforms on the extensive margin may mean little for policy makers if foreign market entrants exit the market within a year or two. This view, however, takes survival rate as exogenous — something that does not change with the reform. We argue that survival rate itself responds to institutional quality improvements. The data support our argument. As shown in Table 8, export (product) survival rate itself improves with institutional quality, and the improvement rises with the degree of contract intensity of the product/industry. That is, with better institutions, countries could not only be able to start exporting contract-intensive products (to new markets) but would also be able to survive the competition in these newly discovered products or markets. Furthermore, this holds true for both developed and developing country samples.

6.6. Robustness checks

In this subsection, we conduct a variety of sensitivity analyses to check the robustness of our main results. We employ an alternative definition of institutional quality, re-estimate the relationship in sub-samples (within OECD, within non-OECD, within region and across region trade), and reassess the basic hypothesis with Poisson regression.

Table 8
Institutions and export survival rate.

	Full set	*OECD*	*Non-OECD*
Rule of law	−0.062	0.030	−0.082
Rule of law x Inst-Int	0.318***	0.287***	0.196***
lnH	−0.334***	−0.461*	−0.170
lnH x H-Int	0.037***	0.043**	−0.022
lnK	−0.183	0.105	−0.618**
lnK x K-Int	−0.200**	−0.252*	0.602***
NR	0.012**	0.020**	−0.010
NR x N-Int	0.006***	−0.000	0.007*
lnESTABLISH	0.028***	0.016	0.034***
lnGDPE	0.464***	0.367	0.733***
lnGDPI	0.030	0.115*	−0.209**
No. of observations	632 363	425 766	201 772
No. of Clusters	9003	5518	3441
χ^2	34 860.962	25 055.355	16 534.468
Prob > χ^2	0.000	0.000	0.000

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is $Pr(Survival_{jist} > 0)$ in all cases. All models include exporter, importer, industry and year fixed effects which are not reported. Standard errors are clustered by exporter–importer pair.

6.6.1. An alternative measure of institutional quality: Contract enforcement

As our first robustness check, we re-estimate the relationships assessed earlier using an alternative measure of institutional quality — *contract enforcement*. The results for the extended model (with regional dummy variable interactions) are presented in Table 9. As the coefficients of the interaction between a country's contract enforcement and the sectoral contract-intensity measure indicate, there is a robust positive effect of institutional quality on export intensity that rises with the contract-intensity of sectors (in non-OECD countries). The same is true for OECD members, even though the effect is relatively smaller in the OECD sample. This confirms the results in Table 7. Moreover, and again in line with the findings in Table 7, the relatively lower return to contract enforcement in OECD (compared to non-OECD) countries holds in terms of trade volume and export value per variety, but not in terms of the number of varieties exported. As for the number of varieties exported, OECD members do not do better or worse than their non-OECD counterparts (i.e., the difference between the two groups is not statistically significant).

6.6.2. Estimation with alternative samples

One might wonder whether the results are being driven by broad differences between developing and developed countries or whether the importance of contract enforcement can also be seen within each country group. In order to check this, we re-run the regressions on restricted samples. More specifically, we re-run regressions for trade among the OECD countries (i.e., where both the exporter and the importer are OECD members) and similar (separate) regressions for trade among non-OECD countries. Columns 1 and 2 of Table 10 present the results for these *within OECD* and *within non-OECD* trade, respectively. In Column 3, we merge the two samples to estimate the effect for the whole within-group trade, be it within OECD or within non-OECD country groups. In other words, we exclude the between/across region trade, i.e., trade between an OECD member and a non-member. We subsequently estimate the role institutions play in this latter form of trade – between OECD and non-OECD – in the last column.

Table 10 shows the effect of institutions on both the probability of exporting (*Panel A*) and the volume of export conditional on exporting (*Panel B*). The effect of institutions on the extensive margin (i.e., the probability of exporting) is positive and highly significant for within non-OECD (Column 2), within region (Column 3) and across region (Column 4) trades. The effect for the within OECD trade (Column 1) loses statistical significance though at the margin (the p-value is 0.108).

Our results are robust with regard to the effect on the intensive margin as well (*Panel B*). The within OECD, within non-OECD, overall within region, and across region trade patterns are all positively influenced by the quality of contracting institutions. In all cases, better contract enforcement enhances the export volume of contractually intensive products more than that of contractually less intensive products. In general, the role of institutions is essential for both trade within and trade between regions at different levels of development along both margins.

6.6.3. Alternative estimation technique

In our final robustness check, we estimate the relationship between the quality of institutions and pattern of export using a different estimation technique. Arguing that the use of log(export) as the regressand results in biased estimators, Silva and Tenreyro (2006) suggest the use of Poisson regression with the level of export – instead of log(export) – as the LHS variable. As the results in Table 11 show, our results are robust to the use of this alternative technique.

In both the unconditional and conditional models (Columns 1 and 2, respectively), institutional quality has a greater positive effect on the export of contract-intensive products than on the export of products that are less intensive in institutions. Moreover, the return to institutions favors less developed countries over the more developed ones.

Table 9
Contract enforcement and export intensity.

Dep. variable:	*ln(Export)*		*ln(No. of Varieties)*		*ln(Export/Variety)*	
	(1)	(2)	(3)	(4)	(5)	(6)
Contract x Inst-Int	0.224***	0.223***	0.071***	0.070***	0.153***	0.153***
Contract x Inst-Int x OECD	−0.022*	−0.025**	0.001	−0.001	−0.023**	−0.023**
lnH x H-Int	0.128***	0.122***	0.076***	0.072***	0.052***	0.050***
lnH x H-Int x OECD	−0.035***	−0.035***	−0.015***	−0.015***	−0.020***	−0.020***
lnK x K-Int	0.483***	0.511***	0.312***	0.323***	0.172	0.189*
lnK x K-Int x OECD	−0.121***	−0.118***	−0.067***	−0.064***	−0.053*	−0.054*
NR x N-Int	−0.008**	−0.009***	−0.004***	−0.004***	−0.005*	−0.005*
NR x N-Int x OECD	−0.007	−0.006	−0.002	−0.002	−0.004	−0.004
lnESTABLISH	0.081***	0.080***	0.027***	0.026***	0.053***	0.054***
No. of observations	718 608	718 608	718 608	718 608	718 608	718 608
F-Statistic	168.323	102.377	312.452	140.076	60.155	50.276
Prob > F-Statistic	0.000	0.000	0.000	0.000	0.000	0.000
R^2	0.823	0.824	0.908	0.908	0.687	0.688
$\bar{R}^2$	0.813	0.813	0.903	0.903	0.669	0.670

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Each regression includes Exporter–Importer, Importer-Industry-Year and Exporter-Year fixed effects. Error terms are clustered by exporter–importer pairs. Selection-bias is corrected using the Inverse Mills Ratio, and polynomials of z in Columns 1, 3 and 5 and using the dummy variable approach in Columns 2, 4 and 6.

Table 10
Institutions and trade within and between regions.

	(1)	(2)	(3)	(4)
Panel A: *Dependent variable:* $Pr(Export_{jist} > 0)$				
Days	−0.0003	−0.003***	−0.003***	−0.001*
Rule of law	0.062	−0.326***	−0.254***	−0.129***
Rule of law x Inst-Int	0.181	0.112***	0.111***	0.361***
lnH	−0.010	−0.144	−0.214**	−0.031
lnH x H-Int	0.010	0.038***	0.039***	0.103***
lnK	0.203	−0.972***	−0.697***	0.349**
lnK x K-Int	0.047	0.416***	0.367***	−0.735***
NR	0.007	−0.021***	−0.019***	0.002
NR x N-Int	−0.009	−0.003	−0.007***	0.001
lnESTABLISH	−0.048***	0.050***	0.019***	0.017***
lnGDPE	0.359*	2.018***	1.780***	0.355***
lnGDPI	−0.715***	−0.060	−0.122*	0.099***
lnDIST	0.690***	−0.253***	0.002	−0.656***
No. of observations	193 479	507 214	700 693	962 027
No. of Clusters	1056	3228	4284	5430
χ^2	2458.018	15 712.42	21 064.075	55 581.04
Prob > χ^2	0.000	0.000	0.000	0.000
Panel B: *Dependent variable:* $Export_{jist}$				
Rule of law x Inst-Int	0.340***	0.669***	0.558***	0.484***
lnH x H-Int	0.142***	0.124***	0.130***	0.078***
lnK x K-Int	−0.192	1.813***	0.373*	0.274
NR x N-Int	−0.012**	−0.043***	−0.021***	−0.015***
lnESTABLISH	−0.007	0.134***	0.053***	0.114***
No. of observations	173 900	121 901	295 800	417 915
F-Statistic	11.626	56.485	44.854	47.263
Prob > F-Statistic	0.000	0.000	0.000	0.000
R^2	0.877	0.770	0.865	0.793
$\bar{R}^2$	0.872	0.726	0.852	0.775

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. All regressions in Panel A include Year, Exporter, Importer and Industry fixed effects. All Panel B regressions include Exporter–Importer, Importer-Industry-Year and Exporter–Year fixed effects. All standard errors are clustered by exporter–importer pair. The columns represent results for: the within OECD trade (Column 1), within non-OECD trade (Column 2), within region [OECD↔OECD, non-OECD↔non-OECD] trade(Column 3), and across region [OECD↔non-OECD] trade (Column 4).

Table 11
Robustness check using Poisson regression.

Dependent Variable:	$Export_{jist}$	$Export_{jist} \mid Export > 0$
Rule of law	−0.184**	−0.179*
Rule of law x Inst-Int	0.757***	0.752***
Rule of law x Inst-Int x OECD	−0.809***	−0.798***
lnH	−0.414*	−0.315
lnH x H-Int	0.090	0.089
lnH x H-Int x OECD	0.021	0.021
lnK	−0.740***	−0.710***
lnK x K-Int	−1.581**	−1.600**
lnK x K-Int x OECD	−0.433***	−0.424***
NR	0.003	0.009
NR x OECD	−0.007	−0.015*
NR x N-Int	−0.039***	−0.038***
NR x N-Int x NOECD	−0.001	−0.001
lnESTABLISH	0.029	0.031
lnGDPE	2.213***	1.958***
lnGDPI	0.320***	0.588***
lnDIST	−0.474***	−0.802***
No. of observations	1 627 008	727 969
Pseudo-R^2	0.801	0.804
χ^2	113 941.162	124 502.742
Prob > χ^2	0.000	0.000

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Each model includes exporter, importer, industry and year fixed effects. Robust standard errors reported.

7. Conclusion

Although the effects of institutions on the trade pattern are now extensively studied, little is known about the exact mechanisms through which this effect operates. In this paper, we have disentangled the influence of institutions on trade into two margins: the probability of exporting (extensive-margin) and the volume of export conditional on exporting (intensive-margin).

Our findings both complement and extend the existing empirical literature on institutions and trade flows. Using highly disaggregated product-level and firm-level trade data, we confirm that institutional quality does have a robust and significant effect on international trade patterns. Specifically, we find that countries with better institutional quality export products that are intensive in contracts while those with poor institutions specialize in institutionally less-intensive products. This finding is robust to the use of alternative measures of institutional quality as well as different estimation techniques. Nonetheless, the role of institutional quality does not supersede that of factor endowments in general and that of human capital in particular.

Our findings also point to the mechanisms through which this effect operates. We find that contractual institutions have effects through both extensive and intensive margins. In particular, the effects of institutional quality on the probability of exporting (extensive) and the volume of export conditional on exporting (intensive) matter most for products for which contracting is relatively difficult. These results are robust to using alternative definitions of the extensive and intensive margins. We corroborate this finding using more granular export data based on firm-level aggregates. We also find that, regardless of the definitions of margins that are used, the effect of institutional quality on the intensive margin is greater (in magnitude) and more robust than that on the extensive margin. We also find that institutional quality enhances the chance of exporting countries to survive in the market, and particularly so in markets for highly contract-intensive products.

Moreover, we have examined if the influence of institutional quality on trade differs between country groups. The return to better institutions is higher in developing countries than in their developed (OECD) counterparts. This holds true for the intensive margin (value exported conditional on exporting or value of export per variety). In terms of the probability of exporting in more contract-intensive products or the number of product varieties exported, OECD countries appear to benefit more than non-OECD countries, but the differences are statistically insignificant. This is in contrast to our expectation that the extensive margin is likely to be more important in developing than in developed countries. However, the total trade effect through the extensive margin could still be greater in developing countries as we have chosen to analyze the effect of institutions on trade *over and above* the effect on domestic production, which is an important channel behind the hypothesis.

The effects of institutions on the trade pattern established for the full set of countries are also affirmed for within-region and across-region trade patterns. The quality of contracting institutions has a statistically significant differential (positive) effect on the export of contract intensive products. This conclusion generally holds for both extensive and intensive margins and for within OECD, within non-OECD, within region as well as across region trade.

In a nutshell, institutional quality is a robust source of comparative advantage. Its effect on the pattern of trade materializes through both the intensive and extensive margins — the intensive margin being quantitatively more important than the extensive. The benefit of institutions in enhancing export survival is also evident. However, the claim that its role surpasses that of factor endowments in shaping export pattern does not withstand data disaggregation.

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Appendix

See Tables A.1–A.4 .

Table A.1
Summary statistics of main variables.

Variable:	*No. of obs.*	*Mean*	*Std. Dev.*	*Min.*	*Max.*
Export	2,403,647	41,409.03	585,629.8	1	118,732,896.0606
Export Dummy	11,023,609	0.2157641	0.4113514	0	1
Rule of law x Inst-Int	9,786,672	−0.0222443	0.5611805	−2.374867	1.886812
lnH x H-Int	2,809,413	24.37636	6.86442	10.12375	47.10675
lnK x K-Int	7,537,054	0.8511008	0.484766	0.1314822	3.524664
NR x N-Int	8,032,142	2.105401	6.985343	0	61.35384
lnESTABLISH	3,996,405	7.066618	2.203887	0	12.33193

Table A.2
Descriptive statistics.

Variable	Short name	Mean	S. D.	Min.	Max.
	A. Vary by industry (ISIC Group)				
Contract-intensity (Definition 1, Liberal)	z_1^L	0.487	0.206	0.058	0.859
Contract-intensity (Definition 1, Conservative)	z_1^C	0.536	0.209	0.062	0.890
Contract-intensity (Definition 2, Liberal)	z_2^L	0.867	0.150	0.460	0.995
Contract-intensity (Definition 2, Conservative)	z_2^C	0.911	0.121	0.483	0.996
Capital-intensity	k	0.069	0.038	0.018	0.196
Natural resource intensity	n	0.250	0.441	0	1
Human capital intensity	h	1	0.277	0.502	1.656
	B. Vary by Country–Year				
ln(Human capital endowment)	lnH	24.388	1.693	20.179	28.45
ln(Capital endowment)	lnK	12.254	2.228	7.264	18.029
Natural resource rent	NR	8.422	11.916	0	61.354
Rule of law	Rule (or Q)	−0.042	0.991	−2.669	2.12
Contract enforcement	Contract	4.459	1.657	0	8.1
Number of procedures	Procedure	8.163	3.34	1	21.5
Number of days	Days	32.469	53.903	0.5	690.5
Monetary cost	Cost	42.828	82.756	0	1180.7
ln(Exporter's GDP)	lnGDPE	24.129	2.478	17.276	30.44
ln(Exporter's GDP per Capita)	lnGDPPCE	8.539	1.476	5.331	11.461
ln(Importer's GDP)	lnGDPI	24.126	2.477	17.276	30.44
	C. Vary by Exporter–Importer				
ln(Distance between exporter and importer)	lnDIST	8.813	0.84	−0.005	9.899
	D. Vary by Exporter–Industry–Year				
No. of varieties exported to the world	Varietywld	202.478	157.393	2	681
No. of destinations	Destin	48.507	34.772	1	197
ln(No. of destinations)	lnDestin	3.509	1.03	0	5.283
ln(Average export per destination)	lnAveExpDes	1.607	3.145	−5.273	13.578
ln(Number of establishments/firms)	lnESTABLISH	7.067	2.204	0	12.3323
	E. Vary by exporter–importer–industry–year				
ln(Value of export)	lnV	5.751	3.249	0	18.592
No. of varieties exported	Variety	22.961	49.66	1.000	673
ln(No. of varieties exported)	lnVariety	1.861	1.545	0	6.512
ln(Average export per variety)	lnAveExpVar	3.889	2.139	0	15.245
Survival dummy	Survival	0.855	0.352	0	1

Table A.3
Factor intensity by industry.

Industry	z_1^L	z_2^L	z_1^C	z_2^C	k	n	h
311	0.331	0.557	0.356	0.677	0.062	0	0.812
313	0.713	0.949	0.725	0.956	0.062	0	1.135
314	0.317	0.483	0.318	0.483	0.018	0	1.354
321	0.376	0.82	0.384	0.883	0.073	0	0.688
322	0.745	0.975	0.749	0.981	0.019	0	0.502
323	0.571	0.848	0.65	0.87	0.032	0	0.687
324	0.65	0.934	0.69	0.948	0.018	0	0.533
331	0.516	0.67	0.543	0.977	0.065	1	0.741
332	0.568	0.91	0.581	0.985	0.039	0	0.698
341	0.348	0.885	0.363	0.984	0.132	1	1.139
342	0.713	0.995	0.716	0.996	0.052	0	0.934
351	0.24	0.884	0.266	0.91	0.124	0	1.408
352	0.49	0.946	0.522	0.96	0.06	0	1.209
353	0.058	0.759	0.062	0.762	0.196	1	1.656
354	0.395	0.895	0.474	0.9	0.074	1	1.153
355	0.407	0.923	0.595	0.936	0.066	0	0.985
356	0.408	0.985	0.453	0.989	0.088	0	0.827
361	0.329	0.946	0.443	0.992	0.055	0	0.804
362	0.557	0.967	0.611	0.985	0.09	0	1.012
369	0.377	0.963	0.429	0.973	0.068	1	0.952
371	0.242	0.816	0.338	0.845	0.102	1	1.251
372	0.16	0.46	0.2	0.686	0.101	1	1.098
381	0.435	0.945	0.532	0.965	0.053	0	0.914
382	0.764	0.975	0.838	0.985	0.058	0	1.119
383	0.74	0.96	0.82	0.972	0.076	0	1.064
384	0.859	0.985	0.89	0.992	0.071	0	1.322
385	0.785	0.981	0.854	0.988	0.052	0	1.234
390	0.547	0.863	0.599	0.919	0.039	0	0.755
Total	0.487	0.867	0.536	0.911	0.069	0.25	1

See Table A.2 for keys to factor intensity abbreviations.

Table A.4
Estimations with one-period and two-period lagged institutional quality.

Dep. variable:	*ln(Export)*		*ln(No. of Varieties)*		*ln(Export/Variety)*	
A: One-Period Lag Model						
L. Rule of law x Inst-Int	0.556***	0.557***	0.121***	0.118***	0.435***	0.439***
L. Rule of law x Inst-Int x OECD	−0.179***	−0.190***	0.036	0.024	−0.215***	−0.214***
lnH x H-Int	0.129***	0.123***	0.075***	0.071***	0.054***	0.052***
lnH x H-Int x OECD	−0.038***	−0.038***	−0.016***	−0.015***	−0.022***	−0.022***
lnK x K-Int	0.500***	0.534***	0.326***	0.339***	0.174	0.195
lnK x K-Int x OECD	−0.030	−0.031	−0.031***	−0.030***	0.001	−0.001
NR x N-Int	−0.023***	−0.023***	−0.007***	−0.007***	−0.016***	−0.016***
NR x N-Int x OECD	0.006	0.006	0.001	0.001	0.005	0.005
lnESTABLISH	0.071***	0.071***	0.024***	0.023***	0.047***	0.048***
No. of observations	617 031	617 031	617 031	617 031	617 031	617 031
F-Statistic	157.595	92.076	299.877	128.254	57.524	48.274
Prob > F-Statistic	0.000	0.000	0.000	0.000	0.000	0.000
R^2	0.823	0.824	0.908	0.908	0.687	0.687
$\bar{R}^2$	0.813	0.813	0.903	0.903	0.669	0.669
B: Two-Periods Lag Model						
L2. Rule of law x Inst-Int	0.560***	0.559***	0.120***	0.117***	0.440***	0.442***
L2. Rule of law x Inst-Int x OECD	−0.191***	−0.206***	0.029	0.017	−0.220***	−0.224***
lnH x H-Int	0.127***	0.121***	0.073***	0.069***	0.054***	0.052***
lnH x H-Int x OECD	−0.038***	−0.038***	−0.015***	−0.015***	−0.022***	−0.022***
lnK x K-Int	0.503***	0.534***	0.346***	0.359***	0.157	0.174
lnK x K-Int x OECD	−0.022	−0.021	−0.030***	−0.028***	0.008	0.007
NR x N-Int	−0.022***	−0.023***	−0.007***	−0.007***	−0.015***	−0.016***
NR x N-Int x OECD	0.006	0.007	0.001	0.001	0.006	0.006
lnESTABLISH	0.067***	0.066***	0.021***	0.020***	0.046***	0.046***

(*continued on next page*)

Table A.4 (*continued*).

Dep. variable:	*ln(Export)*		*ln(No. of Varieties)*		*ln(Export/Variety)*	
No. of observations	512 249	512 249	512 249	512 249	512 249	512 249
F-Statistic	146.227	86.054	284.422	119.653	54.074	45.504
Prob > F-Statistic	0.000	0.000	0.000	0.000	0.000	0.000
R^2	0.823	0.823	0.909	0.909	0.688	0.688
$\bar{R}^2$	0.812	0.812	0.903	0.903	0.669	0.669

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. See footnotes to Table 7.

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