Journal of Comparative Economics 38 (2010) 146–159

Contents lists available at ScienceDirect

Journal of Comparative Economics

journal homepage: www.elsevier.com/locate/jce

Judicial quality, contract intensity and trade: Firm-level evidence from developing and transition countries

Yue Ma [a], Baozhi Qu [b,*], Yifan Zhang [a]

[a] Department of Economics, Lingnan University, 8 Castle Peak Road, Tuen Mun, New Territories, Hong Kong
[b] Department of Economics and Finance, City University of Hong Kong, 83 Tat Chee Avenue, Kowloon, Hong Kong

ARTICLE INFO

Article history:
Received 13 May 2009
Revised 11 September 2009
Available online 29 September 2009

JEL Classification:
D23
D51
F11
L14
O11

Keywords:
Contract intensity
Institutions
International trade

ABSTRACT

Ma, Yue, Qu, Baozhi, and Zhang, Yifan—Judicial quality, contract intensity and trade: Firm-level evidence from developing and transition countries

Using firm-level data from 28 developing and transition countries, we investigate how judicial quality affects firm exports through relationship-specific investment. We find that a good legal system significantly increases exports among firms that use more customized goods as intermediate inputs. We control for potential reverse causality using propensity score matching. Our main results are robust to the use of different econometric methods. *Journal of Comparative Economics* **38** (2) (2010) 146–159. Department of Economics, Lingnan University, Hong Kong; Department of Economics and Finance, City University of Hong Kong, Hong Kong.

© 2009 Association for Comparative Economic Studies Published by Elsevier Inc. All rights reserved.

1. Introduction

There is a growing body of literature on how contract enforcement and relationship-specific investments affect international trade. Grossman and Helpman (2002, 2003, 2005), Antràs (2003, 2005), Antràs and Helpman (2004), and Acemoglu et al. (2007) provide theoretical guidance on the effect of contract enforcement on the business decisions and trade structures of multinational companies. These theoretical studies model the effect of the quality of contract enforcement on trade flows within the framework of contract incompleteness. Recent empirical studies in this field mainly focus on the relationship between contract enforcement and comparative advantage. For example, Levchenko (2007) and Nunn (2007) find that better institutional quality and contract enforcement shift a country's comparative advantage towards products that are more dependent on good institutions. Specifically, Levchenko (2007) shows that if some products rely on institutions more than others, then the quality of a country's institutions can be an important source of comparative advantage. Nunn (2007) demonstrates that a country's contractual environment generates comparative advantage in sectors that are more intensive in relationship-specific investments.

Most of the existing empirical studies on contract enforcement, relationship-specific investments, and the pattern of trade attempt to explain the flow of goods between countries on the basis of country-level institutions. Our study examines the institutional effects on firm exports by looking not only at the average institutional quality of a country but also at the

* Corresponding author. Fax: +852 2788 8806.
E-mail address: baozhiqu@cityu.edu.hk (B. Qu).

0147-5967/$ - see front matter © 2009 Association for Comparative Economic Studies Published by Elsevier Inc. All rights reserved.
doi:10.1016/j.jce.2009.09.002

potentially significant variation in institutions and contract enforcement within a country. By doing so, our paper extends Nunn's (2007) study to micro level analysis. Our results suggest that a good legal system significantly increases firm exports of goods for which relationship-specific investments are most important (high contract intensity). We also take account of the high degree of heterogeneity in characteristics at the firm-level. We find that exporting firms are associated with superior performance, which is generally consistent with the findings of previous studies. In particular, firms that have high productivity levels, are young, pay high wages, are large, and have high R&D expenditure are found to export more.

Our data come from a large-scale firm-level survey database compiled by the World Bank. In addition to questions about general firm characteristics, the World Bank Enterprise Survey includes many questions on the business environment as perceived by firms in developing and transition countries. This database provides us with a good opportunity to analyze how institutional quality can affect firm exports at the micro level. We borrow the basic estimation framework from the empirical literature on heterogeneous firms and trade (e.g., Clerides et al., 1998; Bernard and Jensen, 1999), and augment it with measures of judicial quality. Thus, we control for the effects of the standard firm characteristics that have been found to explain firm exports, such as firm size, wage rate, firm age, productivity, and R&D expenditure. Our baseline model estimates the firm-level export volume equation with Tobit regression. We also test the robustness of our results with alternative econometric models including the Heckman-type two-stage estimation procedure recently modified by Helpman, Melitz and Rubinstein (2008).

It is widely acknowledged that judicial quality may not be purely exogenous to firm exports and other economic outcomes. The causality between institutional quality and trade flows may even run both ways (e.g., Anderson, 2008). Following Nunn (2007), we use the propensity score matching technique to control for potential reverse causality. We compare the relative exports of firm pairs operating in British common law and French civil law countries that are matched according to firm-level characteristics and country-level control variables. Our main results are robust to this test.

The remainder of the paper is organized as follows. The next section discusses the firm-level contracting institutions. Section 3 describes the conceptual framework and the estimation strategy. Section 4 reports the main regression results. Section 5 presents the results of robustness tests. Section 6 provides concluding remarks.

2. Institutions and firms

2.1. Firm-level institutional environment

Firms are heterogeneous and each of them has specific technological and geographical characteristics. They interact with market participants and regulatory agencies (such as the various levels of government and organizations) in very different ways. Therefore, firms in the same country may face de facto different institutional environments according to, for example, their geographical locations and the industries in which they are operating. It will be interesting to extend Nunn's (2007) study to micro data and investigate whether and how the specific institutional environment of a firm affects its competitiveness and export capability at the firm-level. As Acemoglu (2005, p. 1045) points out, questions related to the importance of institutions "will be almost impossible to answer with cross-country data alone, and micro data investigations, for example, exploiting differences in regulations across markets and regions, appear to be the most promising avenue."

Various studies have demonstrated that institutions vary to a quantitatively significant extent within countries. For example, Berkowitz and Clay (2006) show that the quality of state courts varies significantly across US states and is heavily affected by the initial conditions of a state. Laeven and Woodruff (2007) also find significant variations in the quality of the legal system within Mexico. Their findings suggest that a firm's institutional environment will affect investment in that firm, and thus variation in the quality of the legal system is reflected in variation in firm size. Acemoglu and Dell (in press) argue that both de jure and de facto institutions vary greatly within countries. They point out that in countries such as Mexico and Brazil, states have considerable authority in changing laws and de jure institutions, and de facto institutions often vary substantially within national boundaries. Documenting large disparities in access to paved roads within countries in the Americas as evidence of the importance of local institutions and public goods, the authors find those disparities to be highly correlated with individual incomes. They also call for more systematic measurement of and empirical investigation into specific institutional features at the sub-national level.[1] Other studies in the literature emphasize the variation in regulation implementation and law enforcement within a country. For example, Johnson et al. (1998) argue that although formal rules may count in some instances, what really matters is how regulations and laws are actually implemented. They find that inter-regional judicial discretion is particularly large in developing and transition countries, which are the main subjects of our research.

Moreover, national institutions and policies may have differential effects on different industries or different firms within an industry. For example, a tariff policy may promote some industries while discouraging the development of others, or it may benefit certain firms in an industry while having a neutral effect on other firms. Given that a firm does not produce in every industry (unlike a country), it is quite plausible that such cross- and within-industry differences in institutional effects exist and may significantly affect the institutional environment of firms.

[1] Please refer to Acemoglu and Dell (2009) for more references on the within-country institutional differences.

Table 1
Sample distribution by country.

Country	No. of firms
1. Benin	168
2. Brazil	1556
3. Bulgaria	72
4. Cambodia	22
5. Costa Rica	252
6. Ecuador	168
7. Egypt	858
8. El Salvador	462
9. Guatemala	435
10. Guyana	143
11. Honduras	422
12. Indonesia	171
13. Kyrgyzstan	80
14. Madagascar	155
15. Malawi	146
16. Mali	106
17. Mauritius	123
18. Moldova	90
19. Morocco	849
20. Nicaragua	444
21. Oman	63
22. Poland	60
23. Senegal	170
24. South Africa	472
25. Tajikistan	49
26. Uzbekistan	87
27. Vietnam	1014
28. Zambia	155
Total	8792

Data source: World Bank Enterprise Survey 2002–2005.

Therefore, micro data analyses that take account of the sub-national and cross-firm variation in institutions may offer interesting results, on top of the existing empirical studies of the institutions that utilize country-level institution measures (country averages), including those that exploit industry-level differences to study institutions (e.g., Rajan and Zingales, 1998; Beck, 2003; Cowan and Neut, 2007; Levchenko, 2007; Nunn, 2007; Manova, 2008). In fact, there has been growing interest in the study of firm-level institutions in the cross-country analysis (e.g., Johnson et al., 2000, 2002). World Bank firm surveys, from which we obtain our data, have been employed in many existing firm-level studies of intuitions, including, among others, financial and legal constraints to firm growth (Beck et al., 2005), disentangling the effects of property rights protection and contract enforcement (Acemoglu and Johnson, 2005), and how judicial quality affects the informality of firm activity (Dabla-Norris et al., 2008).

2.2. The data source of the institution measure and firm characteristics

Our firm-level data are taken from the Enterprise Survey conducted by the World Bank between 2002 and 2005.[2] It is a cross-sectional database. This size-stratified random survey covers business perceptions and dozens of indicators of the quality of the business environment in a large number of countries (mainly developing and transition countries). The main purpose is to understand how obstacles to firm growth differ across countries. The 2002–2005 Enterprise Survey covers over 10,000 firms from 81 countries. Due to missing observations for some key variables, our sample size is 8792 manufacturing firms in 28 countries. The sample includes six transition countries and 22 developing countries from Eastern Europe, Asia, Africa, and Latin America. Table 1 reports the distribution of firms across countries. Among these 8792 firms, 39% reported exports during the sample period.

Firms' perceptions of judicial quality are best indicated by their responses to survey question 218r on "legal system obstacles."[3] Responses to this question indicate the severity of legal obstacles to the operation and growth of firms. Firms choose one of five answers ranging from "no obstacle" to "very severe obstacle." To generate our judicial quality index (*JQI*), we first assign a value between 4 (for "no obstacle") and 0 (for "very severe obstacle") and then standardize the variable to ensure that the mean is 0 and the standard deviation is 1. A higher value implies better judicial quality.

Preliminary treatment of data reveals some interesting results. To compare the within-country and cross-country variation of *JQI*, we first calculate the mean of the 28 countries' within-country standard deviation of *JQI*, and then the standard

[2] Website of the World Bank Enterprise Surveys: https://www.enterprisesurveys.org.

[3] We recognize the limitation of comparing firms' perceptions across countries – what is perceived as a major obstacle in one country may not be regarded as equally important in another.

deviation of the 28 countries' mean value of *JQI*. The average within-country variation of *JQI* (0.89) is much higher than the cross-country variation of average *JQI* (0.36). This piece of empirical evidence illustrates the heterogeneity of the firm-level judicial quality measure within a country and provides some support for our argument in favor of using firm-level institution measures to study export activities at the firm-level.

The Enterprise Survey also provides detailed information on firm characteristics such as sales, employment, ownership, corporate governance, location, and R&D expenditure. All of the financial variables are converted into US dollars using the exchange rate of the year in which the country was surveyed. Panel A of Table 2 reports the summary statistics for some key variables.

2.3. Variation of the firm-level institutional environment

To investigate how judicial quality is associated with firm-level variables, we regress the judicial quality index (*JQI*) on firm location, a state ownership dummy, the percentage of shares held by the largest shareholder, an exporter dummy, the log of total employment, log of firm age, and a full set of industry and country dummies. The independent variable "location" is taken from question 7 of the survey: "Where are this establishment and your headquarters located in this country? (1 = capital city; 2 = another city with a population of over 1 million; 3 = a city with a population of 250,000–1 million; 4 = a city with a population of 50,000–250,000; 5 = a town or location with a population of less than 50,000)." This variable is included because institutions may differ in cities of different sizes. We also include a state ownership dummy because firms with different governance and ownership structures may operate in different institutional environments. For example, state-owned firms may operate in a more favorable environment than private firms that do not have government connections. We use the variable "percentage of shares held by largest shareholder" from question 5(a) of the survey ("percentage of your firm owned by the largest shareholder or owner") as a proxy for the corporate governance structure. A higher value for this variable indicates a more closely held firm, whereas a lower value indicates a firm with many outside shareholders. Export status is a binary indicator with a value of 1 assigned to exporters and a value of 0 assigned to non-exporters. This variable is included because exporters may have a greater need for good institutions and their perceptions of the institutional environment may be affected by their export activities. We also include firm age and firm size as control variables.

Table 3 reports the OLS estimation results. A firm's perception of its institutional environment depends on factors that cannot be simply captured by country dummies. For judicial quality, firm-level institutions are determined not only by country dummies but also by other transnational factors: industry, location, ownership, corporate governance, and firm size. For example, firms that are located in capital cities or large cities, firms with many outside shareholders, privately owned firms, and relatively large firms experience more legal obstacles and report lower judicial quality indices. Table 3 shows that our firm-level institutional variables reflect a substantial degree of heterogeneity among firms' institutional environments that is not sufficiently captured by country-level differences.

3. Conceptual framework and estimation strategy

3.1. Conceptual framework

Our study is related to two strands of the international trade literature. The first strand focuses on the relationship between contract enforcement and trade flows, which has been studied in different model structures mostly based on research

Table 2
Summary statistics.

Variable	No. of firms	Mean	St. dev.	Min	Max
Panel A. Firm-level variables					
Log export ('000 US$)	8792	2.4	3.46	0	18.25
Log labor productivity (US$ per worker)	8792	2.21	2.56	−12.65	13.43
Log firm age (year)	8792	2.99	1.12	0.69	5.57
Log wage rate (US$)	8792	6.91	2.6	−11.88	19.1
Log employment	8792	3.81	1.44	0	9.86
Log R&D expenditure ('000 US$)	8792	0.56	1.39	0	10.66
Judicial quality index (*JQI*)	8792	0	1	−2.27	0.89
Variable	No. of industries				
Panel B. Contract intensity index					
z_1	123	0.51	0.2	0.11	0.87
z_2	123	0.88	0.14	0.33	1
Variable	No. of countries				
Panel C. Country-level variables					
Country-level *JQI*	28	0.04	0.36	−0.75	0.69
Rule of law index	28	−0.37	0.58	−1.3	0.87

Note: 'Log export' is the log of export volume plus one.

Table 3
Determinants of perceived judicial quality index at the firm-level (OLS estimation).

	1	2	3
Exporter dummy	0.022	0.019	0.014
	[0.016]**	[0.037]**	[0.682]
Firm location	0.025		0.023
	[0.016]**		[0.020]**
Percent of largest shareholder		0.0019	0.0013
		[0.012]**	[0.014]**
State ownership dummy		0.088	0.073
		[0.019]**	[0.030]**
ln (employment)			−0.069
			[0.000]***
ln (firm age)			−0.023
			[0.200]
Constant	0.295	0.566	0.379
	[0.018]**	[0.062]*	[0.025]**
Observations	8785	8362	8362
Adjusted R^2	0.124	0.120	0.126

Notes: The dependent variable is the judicial quality index (*JQI*) at the firm-level. The OLS regression includes a full set of industry and country dummies that are not reported in the table. The independent variable "Location" is from the World Bank survey, question 7: "Where are this establishment and your headquarters located in this country? (1 = capital city; 2 = another city with a population of over 1 million; 3 = city of 250,000–1 million; 4 = city of 50,000–250,000; 5 = town or location with a population of less than 50,000)"; the variable "Percentage largest shareholder" is from question 5(a) "percentage of your firm owned by the largest shareholder or owner," which is a proxy for the corporate governance structure (a higher value for this variable indicates a more closely held firm, whereas a lower value represents a firm with many outside shareholders); State ownership is a binary indicator with a value of 1 assigned to state-owned firms, and 0 for other firms; Exporter is a binary indicator with a value of 1 assigned to exporters and 0 to non-exporters; and firm size is approximated by the log of employment. *p*-Values are in brackets and are based on White heteroskedasticity-consistent standard errors, which are corrected for industry–country clustering. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

into contract incompleteness (e.g., Grossman and Hart, 1986; Hart and Moore, 1990). The recent wave of theoretical models on contracts and international trade include those of Grossman and Helpman (2002, 2003, 2005), Antràs (2003, 2005), Antràs and Helpman (2004), and Acemoglu et al. (2007). Antràs (2005) presents a model in which the incomplete nature of contracts that govern international transactions limits the extent to which production process can be fragmented across borders. Costinot (2005) analyzes the impact of imperfect contract enforcement on the extent of the division of labor and the pattern of trade. Acemoglu et al. (2007) develop a model to study contractual incompleteness, technological complementarities, and technology adoption, and show that differences in contracting institutions lead to differences in endogenous comparative advantage. Levchenko (2007) proposes a model of international trade in which the differences in the quality of contract enforcement are modeled within the Grossman–Hart–Moore framework of incomplete contracts, and shows that contract enforcement is an important determinant of trade flows.

To illustrate how contract enforcement can affect firm exports, consider two distinct parties that are considering investment in joint production facilities. As some of their investment will be specific to the production relationship, the irreversibility of that part of their investment makes the parties more reluctant to enter into the proposed relationship, introducing inefficiency (Klein et al., 1978; Williamson, 1979, 1985). One way to get around this problem is to write binding long-term contracts. This is precisely why contract enforcement is very important in reducing potential underinvestment. Other things being equal, firms that operate in a better judicial environment and benefit from stronger contract enforcement are less likely to suffer from underinvestment and more likely to have cost advantages and export more. Those cost advantages should be greater for firms that produce final goods that intensively use inputs that require relationship-specific investment. Therefore, a high-quality judicial system and robust contract enforcement will promote firm exports of final products, especially those requiring inputs with a high level of contract intensity.

Empirical work in this area mainly focuses on the relationship between country-level differences in institutional quality and the trade flows across countries. Anderson and Marcouiller (2002) show that ineffective law enforcement institutions located in the importer's country raise international transaction costs and deter international trade. Berkowitz et al. (2006) show how good institutions located in the exporter's country can enhance international trade in customized goods which contain many characteristics that cannot be fully stipulated in a contract. In a recent paper that is more relevant to our study, Nunn (2007) tests for whether countries with better contract enforcement export more in industries for which contract intensity is important. He constructs a variable that measures the proportion of intermediate inputs for which relationship-specific investments are required and finds that at the country–industry level, countries with better contract enforcement export more in industries for which relationship-specific investments are most important (high contract intensity goods).

The second strand of relevant literature focuses on heterogeneous firms and trade. Recent research into heterogeneous firms challenges traditional models of representative firms in international trade. Recent empirical studies find that relatively few firms export, and that exporters are more productive, larger, and more likely to survive than non-exporters (e.g., Clerides et al., 1998; Bernard and Jensen, 1999). Motivated by these empirical findings, Eaton and Kortum (2002),

Bernard et al. (2003), and Melitz (2003) have developed firm-level models that acknowledge certain stylized facts about exporting firms. Focusing on the heterogeneity of firms, these models attempt to analyze why some firms export while others do not.

In a recent survey article, Bernard et al. (2007, p. 106) conclude that "the focus of the international trade field has shifted from countries and industries towards firms and products." We contribute to this line of research by focusing on the effects of institutional quality on a firm's exports by examining firm-level evidence.

3.2. Measuring contract intensity

We use the contract intensity index formulated by Nunn (2007) to measure the importance of relationship-specific investment across industries.[4] Nunn's data are classified according to the industry classification of the US input–output table compiled by the Bureau of Economic Analysis, which is based on NAICS 1997. Firm industry information in the World Bank Enterprise Survey is based on four-digit ISIC codes. Thus, we use a concordance table from the US Census Bureau to convert NAICS 1997 classifications into ISIC classifications.[5]

In constructing his contract intensity index, Nunn (2007) first used the 1997 US I–O table to identify which intermediate inputs are used in each industry. To determine which intermediate inputs are relationship-specific, Nunn (2007) used data from Rauch (1999), who sorted four-digit SITC industries into three trading categories: (1) goods that are mainly traded on organized exchanges (e.g., gasoline, pork); (2) goods that are reference priced (e.g., chemicals, fertilizers); and (3) goods that have neither reference prices nor are traded on organized exchanges (e.g., cars, machinery). Intermediate inputs that are traded on organized exchanges usually have many buyers and sellers, and are unlikely to face the hold-up problem. Inputs that have reference prices have an intermediate level of relationship specificity. If an input is neither traded on an organized exchange nor reference priced, it is more likely to be relationship-specific.

Using the Rauch data and I–O table, Nunn was able to calculate for each final good i the proportion of its intermediate inputs that is relationship-specific:

$$z_1 = \sum_k \theta_{ik} R_k^{neither}, \tag{1}$$

$$z_2 = \sum_k \theta_{ik} \left(R_k^{neither} + R_k^{refprice} \right). \tag{2}$$

θ_{ik} is the proportion of total inputs represented by input k in industry i. $R_k^{neither}$ is the proportion of input k that is neither sold on an organized exchange nor reference priced. Similarly, $R_k^{refprice}$ is the proportion of input k that is reference priced. The difference between z_1 and z_2 is that z_2 deems reference priced inputs to be relationship-specific. We use both measures in our analysis. Panel B of Table 2 reports the summary statistics for z_1 and z_2.

We find that the rankings of the contract intensity of industries identified by our four-digit ISIC measures are similar to those reported by Nunn (2007). The least contract-intensive industries on our list mainly make use of primary inputs that are bought on thick markets, and include the manufacture of fertilizers and nitrogen compounds, refined petroleum products, and grain mill products, for instance. The most contract-intensive industries on our list include, for example, the manufacture of motor vehicles, computing machinery, and telecommunication equipment. These industries generally use more complex and relation-specific intermediate goods (see, for example, Nunn, 2007; Monteverde and Teece, 1982).

3.3. Tobit model

The starting point of our estimation strategy is the aforementioned empirical trade literature on heterogeneous firms. Those studies identify certain standard variables/firm characteristics that can be used to explain export activities at the firm-level. As our dependent variable is export volume, which takes on a value of zero for those firms that do not have export activities (a significant portion of the sample), a Tobit model is estimated for the firm-level export volume equation. Our explanatory variables include firm characteristics and the judicial quality index (*JQI*). The basic econometric model is specified as follows:

$$\begin{aligned} \ln(Exp_{jic} + 1) = {} & \alpha + \beta z_i JQI_{jic} + \gamma_1 Age_{jic} + \gamma_2 Employment_{jic} + \gamma_3 Productivity_{jic} + \gamma_4 Wage_{jic} + \gamma_5 R\&D_{jic} \\ & + \sum_i \delta_i \; Industry\ dummy_i + \sum_c \delta_c \; Country\ dummy_c + \varepsilon_{jic} \end{aligned} \tag{3}$$

The dependent variable is the logarithm of export volume plus one to avoid taking log of zeros. In Eq. (3), subscript j is for firm j, subscript i is for industry i, and subscript c is for country c. For example, Exp_{jic} is the export volume of firm j operated in industry i and located in country c. z_i is our measure of contract intensity for industry i, and JQI_{jic} is the measure for judicial quality for firm j in industry i of country c. We include the firm-level control variables noted in the foregoing discussion, such

[4] The data are downloadable from Nathan Nunn's personal website: http://www.economics.harvard.edu/faculty/nunn/data_nunn.

[5] The concordance table is downloadable from the US Census Bureau web site: http://www.census.gov/epcd/naics/concordances/index.html#ISIC.

Table 4
Determinants of firm export volume (Tobit estimation).

	1	2	3	4	5	6
$z_1 \times JQI$	0.132	0.107	0.086			
	[0.008]***	[0.037]**	[0.039]**			
$z_2 \times JQI$				0.152	0.147	0.102
				[0.003]***	[0.016]***	[0.023]**
ln (labor productivity)		0.857	0.746		0.757	0.638
		[0.000]***	[0.012]**		[0.000]***	[0.019]**
ln (firm age)		−0.392	−0.318		−0.262	−0.223
		[0.040]**	[0.052]*		[0.112]	[0.147]
ln (wage rate)		0.315	0.287		0.314	0.282
		[0.034]**	[0.039]**		[0.039]**	[0.042]**
ln (employment)		2.557	2.342		2.557	2.341
		[0.000]***	[0.009]***		[0.000]***	[0.007]***
ln (R&D expenditure)		0.254	0.240		0.255	0.243
		[0.000]***	[0.003]***		[0.000]***	[0.008]***
Constant	−8.386	−8.652	−19.175	−16.417	−16.917	−32.896
	[0.012]**	[0.000]***	[0.000]***	[0.019]**	[0.000]***	[0.000]***
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Interaction of industry and country fixed effects	No	No	Yes	No	No	Yes
Observations	8792	8792	8792	8792	8792	8792
Countries	28	28	28	28	28	28
Pseudo R^2	0.132	0.134	0.163	0.133	0.138	0.166
Log likelihood	−14,390	−12,916	−12,534	−14,389	−12,916	−12,537

Notes: The dependent variable is the log of export volume plus one. *JQI* is the judicial quality index at the firm-level. z_1 and z_2 are defined in Section 3. The Tobit regression includes a full set of industry and country dummies that are not reported in the table. Columns 3 and 6 also include an additional full set of interaction terms of industry dummies and country dummies to capture the comparative advantages that are not reported in the table. *p*-Values are in brackets and are based on White heteroskedasticity-consistent standard errors, which are corrected for country–industry clustering. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

as firm age, firm size, productivity, wage rate, and R&D expenditure. In the regression, a full set of industry and country dummies are also included. The absolute advantages of the respective countries and industries will be partially captured by these dummies. ε is the error term.

Similar to Nunn (2007), in Eq. (3) firm exports are explained by the interaction of contract intensity and firm-level judicial quality index, $z_i \times JQI_{jic}$. This type of functional form was first used by Rajan and Zingales (1998) to examine financial dependence and economic growth, and has also been used in other studies of comparative advantage. A positive coefficient on $z_i \times JQI_{jic}$ will indicate that firms which operate in an environment that features a high-quality judicial system (high JQI_{jic}) will export more goods for which relationship-specific investments are more important. In other words, β is expected to be positive.

4. Regression results

4.1. Tobit regression results

Table 4 reports the Tobit regression results for Eq. (3). Throughout this paper, we report *p*-values based on a heteroskedasticity-consistent standard error that is corrected for industry–country clustering. Columns (1)–(3) use the conservative measure of contract intensity, z_1, whereas columns (4)–(6) use the more liberal measure, z_2. In columns (1), (2), (4), and (5), country fixed effects and industry fixed effects are estimated to partially capture the absolute advantage. Columns (3) and (6) include an additional full set of interaction terms of industry dummies and country dummies to capture the comparative advantage: an increase in some country characteristics will cause *relatively* more production and exports in certain industries. The idea is that industries vary in the factors and institutional environment required for production, and countries differ in their capacity to offer these industry-specific requirements. In practice, comparative advantage results from such industry–country matches (Romalis, 2004; Nunn, 2007).

Regressions with both z_1 and z_2 show consistent results. In all of the specifications, the coefficients of the interaction between *z* and *JQI* have positive signs and are statistically significant at the 5% level, which is consistent with our hypothesis. The effect of the judicial quality index on exports is also quantitatively significant. For example, when a firm that produces a final good with average contract intensity (the mean of z_1 is 0.508), column (2) of Table 4 shows that a one standard deviation increase in the judicial quality index corresponds to a 5.4% increase in firm exports.[6]

[6] The calculation is as follows: 1.0 (one standard deviation in *JQI*) × 0.508 (mean of z_1) × 0.107 (coefficient of $z_1 \times JQI$) = 5.4%.

Our findings on the firm-level control variables generally support the heterogeneous firm theory and are consistent with existing results (see Bernard and Jensen, 1999, 2004). According to the regression results, firms that are more productive, younger, larger, pay higher wages, and spend more on R&D tend to export more than other firms.

4.2. Interacting contract intensity with firm characteristics

One potential problem with the estimation of Eq. (3) is that the effects of firm characteristics on exports may depend on different industries differently. As a result, our estimates of $z_1 \times JQI$ or $z_2 \times JQI$ may be biased. To deal with this problem, we include the interaction of contract intensity and some key firm characteristics in the regression. The results are reported in Table 5. The coefficients of these interaction terms are all positive and statistically significant. The implication is that firm productivity, wage rate and R&D expenditure have stronger effects on exports for those firms that use more customized goods as intermediate inputs. However, the estimation results of the interaction between contract intensity and judicial quality index remain qualitatively unchanged.

4.3. Decomposing total effects into country-level and firm-level effects

To further compare the effects of country-level and firm-level institutions, we decompose the total effects of institutions into country-level effects and firm-level effects by including both measures in a single regression. We define country-level judicial quality as the mean value of *JQI* of all firms within that country. As an alternative measure, we also use the rule of law index in line with Levchenko (2007) and Nunn (2007). Our data on the rule of law index at the country level are taken from Kaufmann et al. (2009). Panel C of Table 2 reports summary statistics of the country-level judicial quality index and rule of law index.

Columns (1)–(3) of Table 6 show the regression results using z_1, and columns (4)–(6) show the results using z_2. In columns (3) and (6), we include the interaction term of country fixed effects and contract intensity as an alternative specification. As

Table 5
Interactions of contract intensity and firm's key characteristics (Tobit estimation).

	1	2	3	4	5	6
$z_1 \times JQI$	0.104 [0.038]**	0.100 [0.036]**	0.094 [0.037]**			
$z_1 \times$ ln (labor productivity)	0.285 [0.070]*					
$z_1 \times$ ln (wage rate)		0.438 [0.012]**				
$z_1 \times$ ln (R&D expenditure)			1.046 [0.018]**			
$z_1 \times JQI$				0.147 [0.024]**	0.147 [0.026]**	0.144 [0.019]**
$z_2 \times$ ln (labor productivity)				0.376 [0.089]*		
$z_2 \times$ ln (wage rate)					0.692 [0.027]**	
$z_2 \times$ ln (R&D expenditure)						0.758 [0.014]**
ln (labor productivity)	0.630 [0.005]***	0.868 [0.000]***	0.857 [0.000]***	0.708 [0.016]**	0.855 [0.000]***	0.858 [0.000]***
ln (firm age)	−0.398 [0.015]**	−0.400 [0.113]	−0.395 [0.068]*	−0.393 [0.019]**	−0.389 [0.021]**	−0.393 [0.117]
ln (wage rate)	0.321 [0.024]**	0.105 [0.330]	0.320 [0.023]**	0.317 [0.028]**	0.375 [0.135]	0.316 [0.024]**
ln (employment)	2.558 [0.000]***	2.561 [0.000]***	2.558 [0.000]***	2.558 [0.000]***	2.556 [0.000]***	2.557 [0.000]***
ln (R&D expenditure)	0.247 [0.000]***	0.242 [0.000]***	0.228 [0.021]**	0.253 [0.000]***	0.255 [0.000]***	0.233 [0.019]**
Constant	−8.298 [0.000]***	−8.307 [0.000]***	−8.198 [0.000]***	−16.050 [0.000]***	−16.197 [0.000]***	−16.089 [0.000]***
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8792	8792	8792	8792	8792	8792
Countries	28	28	28	28	28	28
Pseudo R^2	0.142	0.138	0.137	0.138	0.135	0.135
Log likelihood	−12,912	−12,906	−12,907	−12,916	−12,916	−12,913

Notes: The dependent variable is the log of export volume plus one. *JQI* is the judicial quality index at the firm-level. *p*-Values are in brackets and are based on White heteroskedasticity-consistent standard errors, which are corrected for country–industry clustering. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 6
Decomposing the total institution effects into country level and firm-level effects (Tobit estimation).

	1	2	3	4	5	6
$z_1 \times JQI$	0.104	0.107	0.136			
	[0.025]**	[0.032]**	[0.024]**			
$z_1 \times$ Country *JQI*	0.307					
	[0.033]**					
$z_1 \times$ Country rule of law		0.203				
		[0.019]**				
$z_1 \times$ Country fixed effects			Yes			
$z_2 \times JQI$				0.153	0.148	0.154
				[0.024]**	[0.036]**	[0.013]**
$z_2 \times$ Country *JQI*				0.226		
				[0.037]**		
$z_2 \times$ Country rule of law					0.125	
					[0.031]**	
$z_2 \times$ Country fixed effects						Yes
ln (labor productivity)	0.858	0.857	0.874	0.854	0.858	0.847
	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***
ln (firm age)	−0.392	−0.371	−0.380	−0.279	−0.391	−0.351
	[0.042]**	[0.060]*	[0.114]	[0.121]	[0.019]**	[0.067]*
ln (wage rate)	0.305	0.315	0.331	0.315	0.316	0.332
	[0.042]**	[0.024]**	[0.057]*	[0.039]**	[0.054]*	[0.046]**
ln (employment)	2.557	2.557	2.503	2.552	2.556	2.503
	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***
ln (R&D expenditure)	0.254	0.254	0.260	0.257	0.255	0.273
	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***
Constant	−8.679	−8.250	−8.275	−17.603	−16.791	−16.114
	[0.000]***	[0.039]**	[0.174]	[0.000]***	[0.035]**	[0.160]
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8792	8792	8792	8792	8792	8792
Countries	28	28	28	28	28	28
Pseudo R^2	0.138	0.136	0.143	0.138	0.135	0.14
Log likelihood	−12,916	−12,913	−12,830	−12,915	−12,917	−12,835

Notes: The dependent variable is the log of export volume plus one. *JQI* is the judicial quality index at the firm-level. The country-level institutional quality variable is the mean value of the firm-level institutional quality index within that country. Rule of law at the country level is from Kaufmann et al. (2009). Columns (3) and (4) include the interaction terms of country fixed effects with z_1 and z_2, respectively, which are not reported. These interaction terms are jointly significant at the 5% level in columns (3) and (4). *p*-Values are in brackets and are based on White heteroskedasticity-consistent standard errors, which are corrected for country–industry clustering. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

the table shows, both country-level institutional variables and firm-level perceptions of institutional variables are statistically significant in determining firm exports. If we compare the coefficients, columns (1) and (4) show that the effect of country-level *JQI* is stronger than firm-level *JQI*. However, variation in firm-level perceived institutional quality is still an important factor in explaining firm exports, even after institutional quality at the country level is controlled for.

5. Robustness checks

5.1. Two-stage export-selection model

In the previous analysis, we employed the Tobit model to estimate firm-level exports to address the issue of zero export volume. An alternative estimation strategy for the firm-level export equation is to assume that firms may follow a two-stage decision-making process and thus to adopt the two-stage sample-selection consistent estimator developed by Heckman (1979). Helpman et al. (2008) modify this procedure to study country-level trade volumes that have many zeros in bilateral trade flows. The first-stage of this approach models the export decision of the firms. The dependent variable is an export dummy indicator that takes value of one for exporters and zero for non-exporters. The second-stage estimates the intensive margin of export conditional on the export decision in the first-stage by estimating the export volume of the self-selected exporting firms.[7]

[7] As Helpman et al. (2008) study industry-level trade flows, they aggregate the firm-level export volume to the corresponding industry-level export volume before implementing the second-stage estimation, which effectively becomes a nonlinear least squares (NLS) estimation due to the nonlinearity in the aggregation procedure. However, our study directly estimates the export volume at the firm level and does not need the nonlinear aggregation procedure. We will estimate the logarithm of firm exports in the second-stage instead.

With this two-stage estimation strategy, we can model the firm's export decision and export volume separately in a flexible way (Helpman et al., 2008). Specifically, we estimate the following probit model at the first-stage:

$$\text{Prob}(\textit{Export dummy}_{jic}=1)=\Phi(z_i JQI_{jic}, age_{jic}, size_{jic}, productivity_{jic}, wage_{jic}, R\&D_{jic}, regulatory\ costs_{jic}) \tag{4}$$

where subscript j is for firm j, subscript i is for industry i, and subscript c is for country c, z is the contract intensity index, Φ is the normal cumulative distribution function, and *Export dummy* is a binary variable that indicates whether the firm has entered export markets.

The second-stage estimates the export equation for the self-selected exporting firms by adding the inverse Mills ratio to correct for the sample-selection bias:

$$\begin{aligned}\ln(Exp_{jic}) &= \alpha+\beta z_i JQI_{jic}+\gamma_1 Age_{jic}+\gamma_2 Employement_{jic}+\gamma_3 Productivity_{jic}+\gamma_4 Wage_{jic}+\gamma_5 R\&D_{jic}\\ &\quad+\Sigma_i\delta_i Industry\ dummy+\Sigma_c\delta_c Country\ dummy_c+\rho\lambda(\hat{\theta}Z_{jic})+\varepsilon_{jic}\end{aligned} \tag{5}$$

where ρ is a parameter, $\lambda(\cdot)$ is the inverse Mills ratio, $\hat{\theta}$ is the estimated parameter from the first-stage probit model, subscript j is for firm j, subscript i is for industry i, and subscript c is for country c. Exp_{jic} is the export volume of firm j operated in industry i and located in country c.

Helpman et al. (2008) use country-level regulatory costs as the excluded variables for the second-stage equation. Their theoretical model shows that trade barriers affecting fixed trade costs but not variable trade costs should satisfy the exclusion restriction for the two-stage estimation. In the enterprise survey, two firm-level regulatory costs variables are similar to the country-level regulatory cost variable of Helpman et al. (2008): "Licensing obstacles" and "Regulatory uncertainty".

The variable "Licensing obstacles" is from Question 218j of the World Bank survey and measures the severity of the obstacles to obtaining business licenses and operation permits. The variable "Regulatory uncertainty" is from Question 218m, and assesses the severity of the obstacles raised for firms by uncertainty in economic and regulatory policy. For both questions 218j and 218m, firms choose one of five answers ranging from "no obstacle" to "very severe obstacle". We standardize both variables so that they have zero mean and unit standard deviation in our sample. A higher value of the variables indicates more regulatory obstacles for the firms.

Now we turn to the estimation results of our two-stage export-selection regression. Columns (1) and (3) of Table 7 report the Probit estimation results in the first-stage using z_1 and z_2 as measures for contract intensity, respectively. The significant coefficients of the two interaction terms $z_1 \times JQI$ and $z_2 \times JQI$ capture the effect that a firm's judicial environment has on its decision to enter an industry for exporting. In both specifications, the coefficients of the two regulation cost variables (licensing obstacles and regulatory uncertainty) bear negative signs and are statistically significant at the 5% level. These findings imply that regulation costs create entry barriers for firms wanting to enter export industries.

Columns (2) and (4) show the results of second-stage OLS estimation with the standard error corrected by the Heckman (1979) formula. They include the inverse Mills ratio in the regressions but drop the two regulatory cost variables. Correcting for sample-selection bias is important, because the inverse Mills ratio is positive and statistically significant in the second-stage. Columns (2) and (4) of Table 7 report the results of the exclusion restriction tests, which show that both firm-level regulatory cost variables are insignificant at the 10% level in the second-stage equation. This finding is consistent with our hypothesis that these two measures should be more likely to affect firm fixed costs than variable costs. Thus, the exclusion restriction tests increase our confidence in using both regulatory measures as valid excluded variables for the second-stage estimation.

The coefficients of $z_1 \times JQI$ and $z_2 \times JQI$ in Table 7 are positive and statistically significant at the 5% level. Compared with columns (2) and (4) in Table 4, the coefficient with z_1 is the same, but the coefficient with z_2 is larger. This confirms our hypothesis that firms operating in an environment featuring a high-quality judicial system (high *JQI*) export more goods for which relationship-specific investments are more important (high z). The results of other control variables in the second-stage regression in Table 7 are qualitatively similar to those results reported in Table 4.

5.2. The endogeneity issue

The causality between institutions and trade could run in both directions: not only do good institutions nurture trade, but trade opportunities may also help to improve institutions. Dollar and Kraay (2003) find a positive correlation between openness and trade, which implies a two-way causality between them. Anderson (2008) develops a theoretical model to show that trade fosters contract enforcement.

To tackle this endogeneity problem, it is now standard to use instruments for institutional quality. However, almost all of the instruments used in the existing literature are open to criticism. For example, critics have recently argued that the use of legal origins cannot plausibly satisfy an exclusion restriction because they influence many spheres of lawmaking and regulation (La Porta et al., 2008).

We follow the propensity score matching approach of Nunn (2007) to address the endogeneity issue. Specifically, we compare the relative exports of firm pairs operating in British common law and French civil law countries that are matched by firm-level characteristics such as productivity, firm age, wage rate, firm size, and R&D expenditure, as well as country-level control variables including per capita GDP, financial development, factor endowments, and trade openness.

Table 7
Two-stage export-selection regression.

	1 First-stage Probit (exporter = 1)	2 Second-stage Log (export volume)	3 First-stage Probit (exporter = 1)	4 Second-stage Log(export volume)
$z_1 \times JQI$	0.030 [0.014]**	0.104 [0.001]***		
$z_1 \times JQI$			0.016 [0.028]**	0.163 [0.004]***
ln (labor productivity)	0.083 [0.029]**	0.942 [0.007]***	0.084 [0.025]**	0.941 [0.003]***
ln (firm age)	−0.083 [0.037]**	−0.215 [0.023]**	−0.08 [0.032]**	−0.213 [0.036]**
ln (wage rate)	0.067 [0.037]**	0.367 [0.018]**	0.068 [0.034]**	0.359 [0.027]**
ln (employment)	0.498 [0.000]***	2.215 [0.000]***	0.497 [0.000]***	2.231 [0.000]***
ln (R&D expenditure)	0.067 [0.001]***	0.169 [0.008]***	0.065 [0.001]***	0.182 [0.003]***
Licensing obstacles	−0.068 [0.033]**		−0.072 [0.029]**	
Regulatory uncertainty	−0.014 [0.039]**		−0.013 [0.035]**	
ρ (inverse Mills ratio)		0.134 [0.038]**		0.138 [0.034]**
Constant	−2.108 [0.000]***	−9.747 [0.000]***	−2.107 [0.000]***	−9.697 [0.000]***
Exclusion restriction tests:				
Licensing obstacles (p-value)	0.437		0.351	
Regulatory uncertainty (p-value)	0.235		0.265	
Industry fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Observations	8792	3419	8792	3419
Countries	28	28	28	28
R^2	0.246	0.575	0.245	0.561

Notes: The dependent variable in columns (1) and (3) is the export dummy taking the value of one for exporting firms and zero for non-exporters. There are 3419 exporting firms: i.e., 39% of 8792 firms have export activities in our sample. The dependent variable in columns (2) and (4) is log of export volume. *JQI* is the judicial quality index at the firm-level. z_1 and z_2 are defined in Section 3. The sample-selection two-stage estimations include a full set of industry and country dummies that are not reported. The first-stage estimation in columns (1) and (3) is based on probit model. The second-stage regression in columns (2) and (4) is based on OLS with the standard error corrected by the formula given by Heckman (1979). Columns 1 and 3 report Pseudo R^2 from Tobit estimations and columns 2 and 4 report adjusted R^2 from the OLS. The independent variable "Licensing obstacles" is from Question 218j of the World Bank survey. The response measures the severity of the obstacles from business licensing and operation permits to the firms' business. The variable "Regulatory uncertainty" is from Question 218m, which assesses the severity of the obstacles from economic and regulatory policy uncertainty to the firms. For questions 218j and 218m, firms choose one of five answers ranging from "no obstacle" to "very severe obstacle". We standardize both variables so that they have zero mean and unit standard deviation in our sample. Higher values of the variables indicate more regulatory obstacles for the firms. The exclusion restriction test is based on t-statistic by adding the excluded variable to the second-stage equation and testing its significance. The p-value of the robust t-statistic is presented in the table. The p-values of the estimated coefficients are in brackets and are based on White heteroskedasticity-consistent standard errors, which are corrected for country–industry clustering. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

For the unmatched comparison, we run the following OLS regression:

$$\ln\left(\frac{x_{jib}+1}{x_{kif}+1}\right) = \alpha + \beta z_i + u_{jkibf}, \tag{6}$$

where x_{jib} and x_{kif}, respectively, denote the exports of firm j in British common law country b and the exports of firm k in French civil law country f, both of which operate in industry i; α and β are coefficients; z_i is the contract intensity index for industry i; and u_{jkibf} is the residual.

As La Porta et al. (1998) suggest, British common law countries tend to have better legal protection than French civil law countries. We expect firms in a British common law country to export more in contractually intensive industries than their counterparts in a French civil law country. Therefore, β is expected to be positive.

Our sample includes four countries in which the legal system is based on British common law—Guyana, Malawi, South Africa, and Zambia—for a total of 916 firms. Nineteen countries in the sample have legal systems based on French civil law—Benin, Brazil, Cambodia, Costa Rica, Ecuador, Egypt, El Salvador, Guatemala, Honduras, Indonesia, Madagascar, Mali, Mauritius, Morocco, Nicaragua, Oman, Senegal, Tajikistan, and Vietnam—for a total of 7487 firms.

Column (1) of Table 8 presents the OLS estimation results for Eq. (6) using a sample of all possible firm pairs in British–French legal system countries.

Table 8
Comparing matched firm pairs in British common law and French civil law countries.

	1 Not matched	2 Per capita GDP	3 Financial development	4 Factor endowment	5 Trade openness	6 All variables
Contract intensity: z_1	0.839 [0.033]**	1.034 [0.026]**	1.609 [0.037]**	2.446 [0.013]**	1.237 [0.034]**	1.404 [0.039]**
Country pair fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	667,318	916	916	916	916	916
Adj R-squared	0.194	0.265	0.206	0.231	0.192	0.227

Notes: The dependent variable is the log of the ratio of the firm's exports plus one in a common law country relative to the firm's exports plus one in a civil law country in the same industry. In addition, to match the reported country-level characteristics, columns (2)–(6) also match the firm characteristics of productivity, firm age, wage rate, firm size, and R&D expenditures. The measure of contract intensity, z_1, was estimated by Nunn (2007). Estimated coefficients are reported. p-Values are in brackets, and are based on heteroskedasticity-consistent standard error, which are corrected for industry clustering. *, **, ***represent statistical significance at the 10%, 5% and 1% level respectively.

To match firms operated in British common law and French civil law countries, we follow Nunn (2007) and use the propensity score matching method (Rosenbaum and Rubin, 1983, 1984). Let us denote L_{jic} as an indicator variable that equals one if firm j in industry i is located in country c with a legal system based on British common law, and zero if country c's legal system is based on French civil law. We first estimate the following probit model for French civil law:

$$L_{jic} = \Pr(L_{jic} = 1|W_{jic}) = \Phi(W_{jic}\theta_i), \tag{7}$$

where $\Phi(\cdot)$ is the normal cumulative density function and W_{jic} is a vector of variables used to match both firm- and country-level characteristics. Then, for each firm j in industry i in a British common law country b, we choose firm k from the same industry i in a French civil law country f that minimizes the distance between the propensity scores of firm j and firm k, as follows:

$$k(i,f) = arg\ min|\hat{P}_{jib} - \hat{P}_{kif}|, k(i,f) \in \mathscr{F}i, \tag{8}$$

where $\mathscr{F}i$, denotes the set of firms in industry i operated in French common law countries.

This matching process is carried out using the Stata module PSMATCH2 written by Leuven and Sianesi (2003).

Columns (2)–(6) of Table 8 report the OLS estimates for Eq. (6) using the samples of matched firm-country pairs. In columns (2) and (3), firm-country pairs are matched by the log of per capita GDP and financial development, respectively, in addition to the firm characteristics of productivity, firm age, wage rate, firm size, and R&D expenditure. In columns (4) and (5), firm-country pairs are matched by factor endowments and trade openness, respectively, in addition to firm characteristics. Finally, column (6) reports the firm-country pairs matched by all of the country-level characteristics, i.e., log per capita GDP, financial development, factor endowments, and trade openness, in addition to the firm characteristics.

Data on each country's legal origins are taken from La Porta et al. (1999). Country-level data on per capita GDP are the log of PPP adjusted by GDP per capita. Financial development is the log of credit extended to the private sector by banks and other financial institutions as a share of GDP. Trade openness is the log of the sum of exports and imports as a share of GDP. These three variables are averaged over our sample period of 2002–2005 and were extracted from the World Development Indicator CD-ROM issued by the Work Bank (2007). Factor endowments include a country's stock of physical capital and human capital, which is measured by the log of average capital stock per unit of labor force as estimated by Nehru and Dhareshwar (1993). The measures used here are from 1990, which is the latest year for which data are available. Human capital is measured by the log of the ratio of workers who completed high school to those who did not; the data are taken from Barro and Lee (1993, 2000). We use human capital measures for 2000, which is the year closest to our sample period of 2002–2005 for which data are available. The contract intensity measure, z_1, has been discussed in Section 3. Although Table 8 only reports the results with z_1, the results with z_2 are very similar.

As shown by Table 8, in all cases the estimated parameters on the index of the contract intensity are positive and statistically significant at the 5% level. Interestingly, we find that the magnitudes of the estimated parameters in all of the matched cases of columns (2)–(6) are larger than the baseline estimate of 0.839 from column (1). This finding indicates that not controlling for differences in important country and firm characteristics between British and French legal origin countries biases downwards the estimated effect of judicial quality on the trade flows of the firms. Our results also suggest that even when controlling for these differences, legal origin remains an important determinant of firm-level exports.

6. Conclusions

Existing empirical research on how contract enforcement and relationship-specific investments affect international trade has focused on country- and industry-level evidence. We complement this line of research and extend Nunn's (2007) results by providing further firm-level evidence. Using the World Bank Enterprise Survey of a cross-section of 8792 firms from 28 developing and transition countries, we examine the effects of relationship-specific investment and firm-level institution quality on firm exports. We find strong evidence that sound contract enforcement and a good quality legal system enhance

the export activities of firms that use as inputs customized goods for which relationship-specific investments are most important. We show that firm-level institution measure plays an important role in explaining firm exports even after country-level institution measures are controlled for. We also find that exporting firms generally have superior performance characteristics, which is consistent with the existing literature on heterogeneous firms and trade.

Our results from Tobit estimation are robust to using an alternative estimation strategy such as the two-stage sample-selection consistent estimator (Heckman, 1979) modified by Helpman et al. (2008) to study the firms' two-stage decision-making process of entering the export market and determining export volumes. We deal with the potential endogeneity issue by following Nunn (2007) and applying the propensity score matching technique to model the trade volume. Specifically, we compare the relative exports of firm pairs operating in British common law and French civil law countries that are matched by both firm-level characteristics and country-level control variables. Our main findings are robust to this test, which gives us additional confidence in our results and further evidence of the relationship between institutional quality and export performance at the firm-level.

Acknowledgments

We would like to thank the editor, Dan Berkowitz, two anonymous referees and Kenneth Chan for their useful suggestions that substantially improved the paper. This Project was partially sponsored by a Competitive Earmarked Research Grant (LU3409/06H) from the Research Grants Council of the HKSAR Government and a Direct Allocation Grant from Lingnan University (Funding # DR07B4). The usual disclaimer applies.

References

Acemoglu, Daron, 2005. Constitutions, politics and economics: a review essay on Persson and Tabellini's "The economic effects of constitutions". Journal of Economic Literature 43, 1025–1048.
Acemoglu, Daron, Antràs, Pol, Helpman, Elhanan, 2007. Contracts and technology adoption. American Economic Review 97, 916–943.
Acemoglu, Daron, Dell, Melissa. in press. Productivity differences between and within countries. American Economic Journal: Macroeconomics.
Acemoglu, Daron, Johnson, Simon, 2005. Unbundling institutions. Journal of Political Economy 113 (5), 945–995.
Anderson, James E. 2008. Does Trade Foster Contract Enforcement? NBER Working Paper No. W14045.
Anderson, James, Marcouiller, Douglas, 2002. Insecurity and the pattern of trade: an empirical investigation. Review of Economics and Statistics 84 (2), 342–352.
Antràs, Pol, 2003. Firms, contracts, and trade structure. Quarterly Journal of Economics 118, 1375–1418.
Antràs, Pol, 2005. Incomplete contracts and the product cycle. American Economic Review 95, 1054–1073.
Antràs, Pol, Helpman, Elhanan, 2004. Global sourcing. Journal of Political Economy 112, 552–580.
Barro, Robert, Lee, Jong-Wha, 1993. International comparisons of educational attainment. Journal of Monetary Economics 32 (3), 363–394.
Barro, Robert, Lee, Jong-Wha. 2000. International Data on Educational Attainment: Updates and Implications. CID Working Paper No. 42, Harvard University.
Beck, Thorsten, 2003. Financial dependence and international trade. Review of International Economics 11, 296–316.
Beck, Thorsten, Demirguc-Kunt, Asli, Maksimovic, Vojislav, 2005. Financial and legal constraints to growth: does size matter? Journal of Finance 60 (1), 137–177.
Berkowitz, Daniel, Clay, Karen, 2006. The effect of judicial independence on courts: evidence from the American states. Journal of Legal Studies 35 (2), 399–400.
Berkowitz, Daniel, Moenius, Johannes, Pistor, Katharina, 2006. Trade, law, and product complexity. Review of Economics and Statistics 88 (2), 363–373.
Bernard, Andrew, Eaton, Jonathan, Jensen, Bradford, Kortum, Samuel, 2003. Plants and productivity in international trade. American Economic Review 93, 1268–1290.
Bernard, Andrew, Jensen, Bradford, 1999. Exceptional exporter performance. cause, effect, or both? Journal of International Economics 47 (1), 1–25.
Bernard, Andrew, Jensen, Bradford, 2004. Why some firms export. Review of Economic and Statistics 86, 561–569.
Bernard, Andrew, Jensen, Bradford, Redding, Stephen, Schott, Peter, 2007. Firms in international trade. Journal of Economic Perspective 3, 105–130.
Clerides, Sofronis, Lach, Saul, Tybout, James, 1998. Is learning by exporting important? Micro-dynamic evidence from Colombia Mexico, and Morocco. Quarterly Journal of Economics 113 (3), 903–947.
Costinot, Arnaud, 2005. Contract Enforcement, Division of Labor and the Pattern Of Trade. Mimeograph. Princeton University. 2005.
Cowan, Kevin, Neut, Alejandro. 2007. Intermediate Goods, Institutions and Output per Worker. Working Papers Central Bank of Chile 420, Central Bank of Chile.
Dabla-Norris, Era, Gradstein, Mark, Inchauste, Gabriela, 2008. What causes firms to hide output? The determinants of informality. Journal of Development Economics 85, 1–27.
Dollar, David, Kraay, Aart, 2003. Institutions, trade and growth. Journal of Monetary Economics 50 (1), 133–162.
Eaton, Jonathan, Kortum, Samuel, 2002. Technology, geography and trade. Econometrica 70 (5), 1741–1780.
Grossman, Gene, Helpman, Elhanan, 2002. Integration versus outsourcing in industry equilibrium. Quarterly Journal of Economics 117 (1), 85–120.
Grossman, Gene, Helpman, Elhanan, 2003. Outsourcing versus FDI in industry equilibrium. Journal of European Economic Association 1, 317–327.
Grossman, Gene, Helpman, Elhanan, 2005. Outsourcing in a global economy. Review of Economic Studies 72, 135–159.
Grossman, Sanford, Hart, Oliver, 1986. The costs and benefits of ownership: a theory of vertical and lateral integration. Journal of Political Economy 94, 691–719.
Hart, Oliver, Moore, John, 1990. Property rights and the nature of the firm. Journal of Political Economy 98, 1119–1158.
Heckman, James J, 1979. Sample selection bias as a specification error. Econometrica 47, 153–161.
Helpman, Elhanan, Melitz, Marc, Rubinstein, Yona, 2008. Estimating trade flows: trading partners and trading volumes. Quarterly Journal of Economics 123 (2), 441–487.
Johnson, Simon, Kaufmann, Daniel, McMillan, John, Woodruff, Christopher, 2000. Why do firms hide? Bribes and unofficial activity after communism. Journal of Public Economics 76, 495–520.
Johnson, Simon, Kaufmann, Daniel, Zoido-Lobaton, Pablo, 1998. Regulatory discretion and the unofficial economy. American Economic Review 88 (2), 387-392.
Johnson, Simon, McMillan, John, Woodruff, Christopher, 2002. Property rights and finance. American Economic Review 92 (5), 1335–1356.
Kaufmann, Daniel, Kraay, Aart, Mastruzzi, Massimo. 2009. Governance Matters VIII: Aggregate and Individual Governance Indicators, 1996–2008. World Bank Policy Research Working Paper, No. 4978.
Klein, Benjamin, Crawford, Robert, Alchian, Armen, 1978. Vertical integration, appropriable rents, and the competitive contracting process. Journal of Law and Economics 21, 297–326.

La Porta, Rafael, Lopez-de-Silanes, Florencio, Shleifer, Andrei, Vishny, Robert, 1998. Law and finance. Journal of Political Economy 106, 1113–1155.
La Porta, Rafael, Lopez-de-Silanes, Florencio, Shleifer, Andrei, Vishny, Robert, 1999. The quality of government. Journal of Law, Economics and Organization 15, 222–279.
La Porta, Rafael, Lopez-de-Silanes, Florencio, Shleifer, Andrei, 2008. The economic consequences of legal origins. Journal of Economic Literature 46 (2), 285–332.
Laeven, Luc, Woodruff, Christopher, 2007. The quality of the legal system, firm ownership, and firm size. Review of Economics and Statistics 89 (4), 601–614.
Leuven, Edwin, Sianesi, Barbara. 2003. PSMATCH2: Stata Module to Perform Full Mahalanobis and Propensity Score Matching, Common Support Graphing, and Covariate Imbalance Testing.
Levchenko, Andrei, 2007. Institutional quality and international trade. Review of Economic Studies 74, 791–819.
Manova, Kalina, 2008. Credit constraints, equity market liberalizations and international trade. Journal of International Economics 76, 33–47.
Melitz, Marc, 2003. The impact of trade on intra-industry reallocations and aggregate industry productivity. Econometrica 71, 1695–1725.
Monteverde, Kirk, Teece, David J, 1982. Supplier switching costs and vertical integration in the automobile industry. Bell Journal of Economics 13, 206–213.
Nehru, Vikram, Dhareshwar, Ashok, 1993. A new database on physical capital stock: sources, methodology and results. Rivista de Analisis Economico 8 (1), 37–59. Also World Bank Policy Research Working Paper, WPS1124.
Nunn, Nathan, 2007. Relationship-specificity, incomplete contracts, and the pattern of trade. Quarterly Journal of Economics 122 (2), 569–600.
Rajan, Raghuram, Zingales, Luigi, 1998. Financial dependence and growth. American Economic Review 88, 559–586.
Rauch, James, 1999. Networks versus market in international trade. Journal of International Economics 48, 7–35.
Romalis, John, 2004. Factor proportions and the structure of commodity trade. American Economic Review 94 (1), 67–97.
Rosenbaum, Paul, Rubin, Donald, 1983. The central role of propensity score in observational studies for causal effects. Biometrika 70, 41–55.
Rosenbaum, Paul, Rubin, Donald, 1984. Reducing bias in observational studies using subclassification on the propensity score. Journal of the American Statistical Association 79, 516–524.
Williamson, Oliver, 1979. Transaction cost economics: the governance of contractual relations. Journal of Law and Economics 22, 233–261.
Williamson, Oliver, 1985. The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting. Free Press, New York and London.