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Recommended Citation

Ma, Y., Qu, B., & Zhang, Y. (2012). Complex goods' exports and institutions: Empirics at the firm level. *Review of International Economics*, 20(4), 841-853. doi: 10.1111/j.1467-9396.2012.01059.x

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Institutional Barriers, Trade, and Product Complexity: Empirical Evidence at the Firm Level*

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October 2011

Abstract

This paper analyzes the role of institutions in the exporter's country in promoting the exports. Firm-level evidence from 22 developing and transition countries is provided to show that institutions matter for complex goods. A poor legal system, weak contractual enforcement, and corruption significantly reduce complex goods exports. In contrast, the effect of such institutions on simple goods exports remains ambiguous. Our main results are robust to the use of different econometric methods.

JEL Classification: D23, L14, O17

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1. Introduction

The relation between institutions and trade has been studied by many economists in recent years. One of the significant findings in this area of research is that an absence of contractual enforcement is one of the major obstacles to trade.¹ In a recent study, Berkowitz, Moenius, and Pistor (2006) show how good institutions (located in the exporter's country) can enhance international trade, especially trade in complex products. These highly differentiated products have many characteristics that cannot be fully stipulated in a contract. The authors argue that for complex goods, a country with good institutions will have both lower production costs and transaction costs. An improvement in the institutions in the exporting country will result in an increase in that country's complex goods exports. Under balanced trade, a country with better institutions will tend to export more complex goods and import more simple goods. In contrast, the export of simple goods depends on the relative magnitude of the negative production costs effect and the positive transaction costs effect. This suggests that the effects of an improvement in the institutions quality of a country are ambiguous for the simple goods exports.

Most of the existing studies (including Berkowitz et al., 2006) utilize country-level institutional measures (country averages) to analyze the relation between institutional variables and trade at the country or country-industry level. However, various studies have demonstrated that there can be a significant degree of variation in institutions and law enforcement within a particular country.² For example, Berkowitz and Clay (2006) show that the quality of state courts varies significantly across U.S. states and is persistently affected by the initial conditions of a state. Laeven and Woodruff (2007) find significant variation in the quality of the Mexican legal system across country. Acemoglu and Dell (2010) argue that both *de jure* and *de facto* institutions vary greatly within countries. Micro data analysis at firm-level that takes into

consideration variation in institutions and law enforcement within a country may therefore provide interesting empirical evidence that complements and enhances the existing country-level studies. As Acemoglu (2005) correctly 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 a most promising avenue” (p. 1045).³

In this paper, we extend the study of Berkowitz et al. (2006) by providing firm-level evidence on the link between institutions and trade of complex and simple goods. We focus on the within-country institutional effect by taking account of the striking heterogeneity of firm-level characteristics and institutions. Based on the analysis of a World Bank firm-level survey data from 22 developing and transition countries, we find that a poor legal system, weak contractual enforcement, and corruption in an exporter’s country significantly reduce complex goods exports. However, the effect of institutions on simple goods exports remains ambiguous, a result that is consistent with the theoretical predictions of Berkowitz et al. (2006). Our main results are robust to the use of different econometric methods including SUR and instrumental variable (IV) estimations, and different ways to deal with the zero exports.

The rest of the paper is organized as follows. Section 2 explains our estimation procedure. Section 3 describes the data. Section 4 reports the empirical results and Section 5 concludes the paper.

2. Econometric Model and Hypotheses

We follow the well-established literature on firm level exports to estimate our econometric model (e.g., Bernard and Jensen, 1999, 2004). Institutional variables are added to augment the baseline estimation model adopted in prior empirical studies in the

literature on heterogeneous firms and trade.⁴ Since the dependent variable (export volume) is a variable that takes the value of zero with positive probability, a Tobit model is used for the firm-level export equation. The basic estimation model is specified as follows:

$$q_i = f(\text{age}_i, \text{size}_i, \text{labor productivity}_i, \text{wage}_i, \text{R\&D}_i, \text{institutional variables}_i) \quad (1)$$

where i denotes firm i . We define export volume as $q_i = \ln(\text{export}_i + A)$ to avoid taking the log of zero for non-exporting firms, while A is a parameter estimated by the Tobit model (Eaton and Tamura, 1994; Rauch, 1999). *age* is firm age, *size* is firm size approximated by the log employment level, *labor productivity* is the logarithm of labor productivity, *wage* is log wage rate, *R&D* is the log of one plus expenditure on R&D, and *institutional variables* are the institutional barrier indices at the firm level. Following the previous literature (e.g., Bernard and Jensen, 1999), the explanatory variables of firm characteristics are lagged by one year.⁵ A full set of country dummies and industry dummies are also included in the estimation to control for unobserved factors that may also affect the firm's exports.

Our study focuses on the effects of institutional barriers in the exporter's environment on its export volume. Following Berkowitz et al. (2006), we argue that firms operate in different institutional environments even within the same country. Therefore they are subject to different institutional barriers that may affect their production costs and transaction costs. These factors will in turn have an impact on firm exports. We therefore posit that institutional barriers in the exporter's environment are negatively related to the export volume of the firm, i.e., we expect negative coefficients for the institutional variables. We also hypothesize that the effects of institutional barriers on exports of complex goods and simple goods will differ. Whilst we expect negative coefficients on the institutional variables for complex goods, the signs of the coefficients on the institutional variables for simple goods may be ambiguous.⁶ According to

Berkowitz et al. (2006), this ambiguity is due to two offsetting forces. On the one hand, good institutional quality may reduce the transaction costs faced by firms and therefore promotes exports of simple goods. On the other hand, good institutions may also build up a comparative advantage in the production of complex goods and hence induces firms to engage export activity in complex goods at the expense of simple goods production. The net effect on simple goods exports is therefore an empirical question.

3. The Data

Institutions and Firm Characteristics

Our firm-level data are taken from the cross-sectional database compiled from the World Bank Enterprise Survey. The World Bank randomly surveyed over 10,000 firms from 81 countries during the period 2002 to 2005. Each firm in the dataset was surveyed once in one particular year during this period. This database covers business perceptions and dozens of indicators on the quality of the business environment at the firm level. One of its advantages is that the surveys were conducted by the same organization (the World Bank) using the same methodology, thus ensuring a high degree of comparability across countries. In addition, the database covers a large number of small-to-medium sized firms (most of which are unlisted), a cohort that is often neglected by other studies. Due to missing observations in some key variables, the sample size in our paper is reduced to about 5,000 firms from 22 developing and transition countries (see Part (a) of Table 1 for a list of the 22 countries represented in our sample).

The firms' perceptions of the institutional barriers they face are best indicated by their responses to the following survey questions:⁷

(i) Quality of legal system: "legal system obstacle" (survey question 218r). The firm's response measures the severity of the legal obstacles it faces to its operation and

growth. The five responses from which respondents can choose range from 0 ('no obstacle') to 4 ('very severe obstacle'),

(ii) Contractual enforcement: "percentage of sales to government agencies or state-owned enterprises involving overdue payments" (survey question 247c). A high percentage of overdue payments indicates weaker contractual enforcement,

(iii) Corruption: "corruption obstacle" (survey question 218o). The response to this question indicates the level of corruption in the firm's home country. As for the first question, the five responses from which respondents can choose range from 0 ('no obstacle') to 4 ('very severe obstacle').

It is clear that improvements in all the three aspects of the institutional quality will reduce transaction costs and build a strong comparative advantage in the production of complex goods. Thus we expect a negative relation between these institutional barrier variables and complex goods exports. In contrast, the effects of institutional barrier on simple goods may not be so clear-cut. Among the three institutional variables, improvement on the two of them, i.e., "overdue payments by government agencies or SOEs" and "corruption", among the countries included in our sample will reduce the transaction costs incurred by firms that produce simple goods (a negative relation), since improvements on these two indicators of government institutions protect firm assets from appropriation by the government and SOEs. However, a general reduction in the third variable – "legal system obstacle" – may lead to specialization towards the production and hence export complex goods. That may lower the exports of simple goods. These hypotheses will be put into tests in our empirical study.

Table 1 reports the sample distribution across countries and the summary statistics of the key variables. It shows that institutional barriers vary significantly at the firm

level.⁸ The World Bank Enterprise Survey also provides detailed information for firms such as sales, employment, ownership, corporate governance, location, and R&D.

[INSERT Table 1 here]

[INSERT Table 2 here]

Classification of Complex and Simple Goods

We classify goods into complex and simple goods in line with Rauch (1999).⁹ The World Bank Enterprise Survey reports firm's industry according to the four-digit ISIC industry codes. Based on a concordance table provided by the Statistical Office of the European Communities,¹⁰ we are able to link the ISIC code identified in the enterprise survey to the four-digit SITC code in the classification table provided by Rauch (1999). Rauch (1999) has two classification methods: liberal and conservative. We adopt the conservative method.¹¹ Rauch (1999) classifies four-digit SITC industries into three categories: (1) goods that are traded on organized exchanges, (2) goods that are reference-priced, and (3) goods that are not traded on organized exchanges and do not have reference prices. We regard category (1) as simple goods and category (3) as complex goods. Part (b) of Table 1 and Table 2 report the summary statistics and correlations for the key variables for the firms that produce complex and simple goods.

4. Regression Results

Baseline Regressions

To deal with zero export value problem, we estimate equation (1) with Tobit model. We report the Tobit regression results using the full sample (all goods) in Table 3. The dependent variable is the logarithm of export volume plus A , while A is a parameter estimated by the Tobit model (Eaton and Tamura, 1994; Rauch, 1999; Martin and Pham,

2008).¹² Throughout the paper, we report p -values that are based on White's heteroskedasticity-consistent standard error and are corrected for industry-country clustering. Column 1 of Table 3 reports the estimation result when none of the institutional variables are included. Our finding generally supports the heterogeneous firm theory (e.g., Melitz, 2003) whereby export activities are positively correlated with the firm's productivity. We find that firms that are more productive, younger, and larger, pay higher wages, and spend more on R&D tend to export more. In columns 2 to 4, we add the institutional variables one by one. All three institutional variables have a negative and statistically significant coefficient (at the 5% level). The results remain unchanged when we include all three institutional variables together in the same regression (see the last column of Table 3). These results indicate that institutional barriers are negatively associated with firm exports after controlling for other firm characteristics, a conclusion that is consistent with our hypotheses. The effect of the institutional variables on exports is also quantitatively significant. Columns 5, for example, shows that a one standard deviation increase in the legal system obstacle, the percentage of overdue payments, and corruption corresponds to a 26%, 26%, and 26% decrease in export volume, respectively. This implies that the impacts of institutional quality on exports are also economically significant.

[INSERT Table 3 here]

Complex Goods vs. Simple Goods

In this subsection, we re-estimate the export model for complex and simple goods separately. The results are reported in Table 4 and Table 5 respectively. Similar to the regression results reported in Table 3, in the regressions with complex goods (Table 4), the coefficients of the institutional variables are all negative and statistically significant

(at the 5% level). This result is consistent with the theoretical arguments of Berkowitz et al. (2006). The existence of high quality institutions in exporting countries may reduce transaction costs and build a strong comparative advantage in the production of complex goods, thereby increasing complex goods exports.

[INSERT Table 4 here]

[INSERT Table 5 here]

Turning to simple goods exports equation, the coefficient of legal system obstacle variable is positive and statistically significant; whilst the coefficients of the other two institutional variables are significantly negative (Table 5). We thus provide direct evidence supporting the “ambiguity theory” discussed by Berkowitz et al. (2006). Our empirical findings confirm that improvements on those two institutional quality indicators of “overdue payments by government agencies or SOEs” and “corruption” directly reduce the transaction costs of simple goods production. Thus there is a negative relationship with exports of simple goods. In addition to the possible appropriation of firm assets by the government and SOEs, such assets may be appropriated by other firms in the market, a type of behavior that can be eradicated only when good legal institutions exist.

Our finding of a positive relationship between simple goods exports and the “legal system obstacle” indicator implies that if the quality of legal institutions would be improved (i.e., of the obstacle posed by the legal system can be reduced), it would lead to the development of a comparative advantage in complex goods production. This would result in a redirection of resources used to produce simple goods to complex goods production activities. As a result, complex goods may account for a larger proportion of exports. This specialization effect is more eminent in the case of “legal system obstacle” indicator than the other two indicators. This suggests that compared to the possible

appropriation of firm assets by the government and SOEs, the severity of the legal obstacles a firm faces in its operation and growth is a more important determinant of whether the firm could develop an advantage in complex goods export.

Another interesting finding from the comparison of Table 4 and Table 5 is that the absolute magnitudes of the coefficients of all three institutional variables in complex goods are larger than those of the simple goods. This result is consistent with Berkowitz et al. (2006) since both direct transaction cost and specialization effects work in the same direction in the case of complex goods.¹³

Robustness Check – SUR Estimation

The equations for complex goods and simple goods are estimated separately in the above models. The estimation results may be biased if the error terms in the two equations are somehow correlated. To deal with this concern, we estimate two Tobit equations as a seemingly unrelated regression (SUR) (Zellner, 1962). The estimation results are reported in Table 6. Our main results are robust to the use of this alternative econometric method. Regarding the institutional variables, the coefficients remain statistically significant at the 5% level after adjusting the standard errors.

[INSERT Table 6 here]

Instrumental Variable Estimation

Using a firm-level measure of institutions may introduce endogeneity in the form of omitted variables bias. For instance, there could be some missing variables (e.g., favorable industrial policy) that correlate with both firm-level institution measures and the exports of firms. In our estimation model, we introduced a host of firm characteristics

used in previous research, as well as a full set of industry and country dummies to minimize the possible endogeneity problem related to omitted variables.

Another possible source of endogeneity is reverse causality. While the existing empirical literature gives good support to the proposition that good governance causes better economic performance (Dixit, 2004), there has also been argument that the causation could run in both directions: not only do good institutions cause trade, but trade opportunities may also lead to good institutions. For instance, Dollar and Kraay (2002) report a positive correlation between openness and trade, implying a two-way causation between them. Anderson (2007) develops a theoretical model to show that trade fosters contractual enforcement.

To deal with this endogeneity concern, it is standard practice to use instruments for different aspects of institutional quality. Previous research has utilized various instrumental variables at country level including, among others, legal origins (e.g., Hayek, 1960; La Porta et al., 1998; Acemoglu and Johnson, 2005; Nunn, 2007) and European settler mortality rate (Acemoglu et al., 2001). However, the country-level instrumental variables cannot be used in our study since we have already included a full set of country dummies.

Following Demirguc-Kunt and Detragiache (2002), we use average values of institutional barriers reported by other firms in the same industry and same country as instruments for our firm-level institutional barrier variables. Thus our instruments are firm-specific. These instruments are valid if the institutional variables of the firms in the same industry are correlated since they may face common regulation shocks. To the extent that industry-level variables are exogenous to the firms, we can use these instruments to purge the endogenous components of firm-level institutional barrier variables. Since we have three measures of the institutional barriers (legal obstacle,

overdue payments, and corruption), we have a just identified case with three instrumental variables.

Table 7 reports the results of the Tobit regressions with the abovementioned instrumental variables (IV) for institution quality. First-stage F -statistics indicate that our instruments correlate with institutional barrier variables. The IV estimation results are consistent with our previous findings. The coefficients of institutional barriers are close to those reported in Table 3 to 5. Again we find opposite signs of “legal obstacle” on the exports of simple goods. This gives us additional confidence that our main findings are robust.

[INSERT Table 7 here]

Further Robustness Checks

In this sub-section, we conduct various robustness checks with different model specifications.

Since 63.4% of firms in our sample do not export, as a robustness check, we use alternative methods to deal with the issue of zero trade values. Table 8 reports the estimation results of Heckman selection model (Helpman, Melitz, and Rubinstein, 2008), Poisson model (Santos Silva and Tenreyro, 2007), and OLS estimation with a subsample of only exporters. The Heckman selection model requires a variable that affects fixed trade cost (extensive margin) but not variable trade cost (intensive margin). We use the variable “Licensing obstacles” from Question 218j of the World Bank survey as the exclusion restrictions for the two-stage estimation. The response measures the severity of the obstacles from business licensing and operation permits to the firms’ business.

Table 8 shows that our main estimation results are not sensitive to the use of different econometric models. Nevertheless, the quantitative effects are not exactly the

same in these models. For example, columns (2), (5) and (7) indicate that, a one-standard deviation increase in “legal obstacle” is associated with a reduction of complex goods exports by 23%, 34% and 28%, respectively. All these institutional effects on complex goods exports remain economically significant.

[INSERT Table 8 here]

In addition, since some explanatory variables such as labor productivity and wage rates are closely correlated, we carry out further tests to see if such correlations may affect our estimation results. Table 9 reports the estimation results when wage rates and labor productivity are included individually in the regression models. Our main results remain unchanged.

[INSERT Table 9 here]

5. Conclusions

This paper examines the effects of institutional quality on firm-level exports in transitional and developing countries. Based on an analysis of a cross-sectional database compiled by the World Bank Enterprise Survey of firms from 22 developing countries in the period 2002 to 2005, we find strong empirical firm-level evidence that good institutions increase complex goods exports. However, we find that the effect of institutional quality on exports of simple goods is ambiguous. Whilst our firm-level analysis shows that an improvement in the legal enforcement of overdue payments by government agencies or SOEs and a reduction in the level of corruption leads to an increase in simple goods exports, we find that an improvement in the overall level of legal protection for firms by itself results in a comparative advantage in complex goods production and reduces exports of simple goods.

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Notes:

1. For the relevant literature, refer to Anderson and Young (2000), Anderson and Marcouiller (2002), Levchenko (2007), and Nunn (2007), among others.

2. For instance, the corruption in some regions may be more pervasive than that in other regions; a country may have strong rules and regulations on the books but weak law enforcement in some regions and for some firms.
3. Actually there has been growing interest in studying firm-level institutions across countries (e.g., Johnson, Kaufmann, McMillan and Woodruff, 2000; Johnson, McMillan and Woodruff, 2002).
4. For the relevant literature, refer to Clerides et al. (1998), Bernard and Jensen (1999, 2004), Eaton and Kortum (2002), and Melitz (2003), among others.
5. Our data set is cross sectional. But the survey provides several years' data for some variables including the firm characteristics used in our regression model. This allows us to use lagged values of firm characteristics in the estimation. Our results are not sensitive to whether the lagged values or the current-year values are used in the regressions. The results are available upon request.
6. Ideally, we would have liked to include the institutional variables for the importer's country, but the data we use do not include the export destination, thereby precluding a gravity-type regression.
7. We recognize the limitation of comparing firms' perceptions across countries: what is perceived to be a major obstacle in one country may not be regarded as such in another country.
8. It also varies for firms within the same country. This information is available from the authors upon request.
9. We thank Professor James Rauch for sending us the classification table. Our classification of complex and simple goods is also consistent with Berkowitz et al. (2006).
10. The concordance table can be downloaded from <http://ec.europa.eu/eurostat>.
11. Our main conclusions are robust to the liberal method.
12. We are grateful to Cong Pham for sharing his Stata code with us to estimate the Eaton and Tamura (1994) Tobit model.
13. We thank an anonymous referee for raising this point.

Table 1. Summary Statistics

(a) List of countries in the sample (22)					
Country	No. of firms	Country	No. of firms	Country	No. of firms
Benin	33	Madagascar	151	South Africa	471
Brazil	1510	Malawi	39	Tajikistan	43
Cambodia	19	Mali	44	Uzbekistan	81
Costa Rica	248	Mauritius	117	Zambia	76
El Salvador	461	Moldova	75		
Guatemala	432	Nicaragua	440		
Honduras	421	Oman	61		
Indonesia	18	Poland	67		
Kyrgyzstan	75	Senegal	66	Total	4,948

(b) Firm characteristics						
Variable	No. of firms	Mean	Std. Dev.	Min	Max	
Panel A. All goods						
Exporter dummy	4,948	0.366	0.482	0	1	
Exports ('000 US\$)	4,948	316	728	0	8,460	
Labor productivity (US\$ per labor)	4,948	2,932	5,316	322	24,117	
Firm age (year)	4,948	20.1	16.9	1	77	
Wage rate (US\$)	4,948	703	862	12.7	7,582	
Employment	4,948	289	506	9	18,753	
R&D ('000 US\$)	4,948	48.6	66.8	0	6,402	
Legal obstacle	4,948	1.41	1.43	0	4	
Overdue payments by government or SOEs (%)	4,948	3.23	15.34	0	100	
Corruption	4,948	2.34	1.56	0	4	
Panel B. Complex goods						
Exporter dummy	3,765	0.366	0.482	0	1	
Exports ('000 US\$)	3,765	340	721	0	8,460	
Labor productivity (US\$ per labor)	3,765	3,139	5,374	673	24,117	
Firm age (year)	3,765	20.7	16.7	1	77	
Wage rate (US\$)	3,765	745	917	27.5	7,582	
Employment	3,765	281	498	9	12,500	
R&D ('000 US\$)	3,765	56.0	73.4	0	6,402	
Legal obstacle	3,765	1.24	1.21	0	4	
Overdue payments by government or SOEs (%)	3,765	3.12	15.16	0	100	
Corruption	3,765	2.18	1.52	0	4	
Panel C. Simple goods						
Exporter dummy	1,183	0.367	0.482	0	1	
Exports ('000 US\$)	1,183	239	745	0	7,823	
Labor productivity (US\$ per labor)	1,183	2,273	5,070	322	8,412	
Firm age (year)	1,183	18.2	17.2	1	72	
Wage rate (US\$)	1,183	569	639	12.7	5,725	
Employment	1,183	313	528	12	18,753	
R&D ('000 US\$)	1,183	25.0	28.1	0	3,250	
Legal obstacle	1,183	1.98	1.85	0	4	
Overdue payments by government or SOEs (%)	1,183	3.58	15.90	0	100	
Corruption	1,183	2.85	1.59	0	4	

Notes: The sample size for each country is constrained by the joint availability of observations of the firm characteristics and legal obstacle variables in the World Bank survey data.

Table 2. Correlation Matrices

	1	2	3	4	5	6	7	8	
Panel A. All goods									
1 Log(exports+A)	1								
2 Log(labor productivity)	0.381**	1							
3 Firm age (year)	-0.179*	0.102**	1						
4 Log(wage rate)	0.225**	0.382**	0.086	1					
5 Log(employment)	0.388**	0.285**	0.269*	0.187*	1				
6 Log(R&D)	0.337**	0.271**	0.171	0.240**	0.105*	1			
7 Legal obstacle	-0.102**	-0.061*	0.031	-0.020	-0.112	-0.104	1		
8 Overdue payments by government or SOEs (%)	-0.148**	-0.047	0.005	-0.036*	-0.017	-0.032	0.050*	1	
9 Corruption	-0.113***	-0.003*	-0.035	-0.047	-0.043*	-0.005	0.106**	0.049*	1
Panel B. Complex goods									
1 Log(exports+A)	1								
2 Log(labor productivity)	0.381**	1							
3 Firm age (year)	-0.199**	0.143**	1						
4 Log(wage rate)	0.276**	0.403**	0.106	1					
5 Log(employment)	0.228**	0.351**	0.264*	0.255*	1				
6 Log(R&D)	0.385**	0.346***	0.191	0.249**	0.230*	1			
7 Legal obstacle	-0.207***	-0.072*	0.018	0.051**	-0.089	-0.101	1		
8 Overdue payments by government or SOEs (%)	-0.172**	-0.042	0.004	-0.043	-0.009	-0.048	0.065*	1	
9 Corruption	-0.124**	-0.011*	-0.048	-0.037	-0.054*	-0.009	0.118**	0.048*	1
Panel C. Simple goods									
1 Log(exports+A)	1								
2 Log(labor productivity)	0.380**	1							
3 Firm age (year)	-0.130*	0.02	1						
4 Log(wage rate)	0.170**	0.307**	0.053	1					
5 Log(employment)	0.390***	0.156**	0.284*	0.077*	1				
6 Log(R&D)	0.117	0.141	0.105	0.124	0.133	1			
7 Legal obstacle	0.104**	-0.048	0.072	-0.048	-0.186**	-0.104	1		
8 Overdue payments by government or SOEs (%)	-0.118**	-0.077	0.009	-0.011**	-0.024	-0.003	0.006	1	
9 Corruption	-0.109***	-0.004**	0.007	-0.052	-0.009*	-0.047	0.159**	0.051	1

Notes: *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 3. Determinants of Export Volume (All Goods)

Tobit model					
	Dependent variable: log (A + export volume)				
	1	2	3	4	5
Legal obstacle		-0.157 [0.035]**			-0.114 [0.038]**
Overdue payments			-0.018 [0.011]**		-0.017 [0.028]**
Corruption				-0.143 [0.003]***	-0.167 [0.012]**
Log (labor productivity)	0.914 [0.000]***	0.914 [0.000]***	0.910 [0.000]***	0.913 [0.000]***	0.909 [0.000]***
Firm age	-0.016 [0.031]**	-0.014 [0.053]*	-0.015 [0.033]**	-0.016 [0.062]*	-0.014 [0.029]**
Log (wage rate)	0.186 [0.020]**	0.185 [0.023]**	0.187 [0.024]**	0.185 [0.021]**	0.184 [0.022]**
Log (employment)	1.257 [0.000]***	1.256 [0.000]***	1.257 [0.000]***	1.249 [0.000]***	1.248 [0.000]***
Log (R&D expenditure)	0.150 [0.018]**	0.159 [0.017]**	0.156 [0.015]**	0.149 [0.016]**	0.153 [0.014]**
A	23.159 [0.029]**	23.204 [0.031]**	23.291 [0.028]**	23.207 [0.030]**	23.245 [0.029]**
Country fixed effects	yes	yes	yes	yes	yes
Industry fixed effects	yes	yes	yes	yes	yes
Observations	4,948	4,948	4,948	4,948	4,948
Pseudo R ²	0.154	0.154	0.154	0.154	0.155

Notes: The dependent variable is the log (A + export volume). A is a parameter estimated by the Tobit model (Eaton and Tamura, 1994; Rauch, 1999). P-values are in brackets and are based on the 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 4. Determinants of Export Volume (Complex Goods)

Tobit model					
	Dependent variable: log (A + export volume)				
	1	2	3	4	5
Legal obstacle		-0.171 [0.017]**			-0.125 [0.018]**
Overdue payments			-0.021 [0.006]***		-0.020 [0.017]**
Corruption				-0.181 [0.006]***	-0.185 [0.003]***
Log (labor productivity)	0.928 [0.000]***	0.929 [0.000]***	0.924 [0.000]***	0.923 [0.000]***	0.919 [0.000]***
Firm age	-0.013 [0.056]*	-0.014 [0.036]**	-0.013 [0.032]**	-0.012 [0.051]*	-0.014 [0.056]*
Log (wage rate)	0.222 [0.037]**	0.223 [0.036]**	0.221 [0.035]**	0.209 [0.036]**	0.208 [0.033]**
Log (employment)	1.232 [0.000]***	1.231 [0.000]***	1.232 [0.000]***	1.225 [0.000]***	1.224 [0.000]***
Log (R&D expenditure)	0.171 [0.011]**	0.174 [0.012]**	0.179 [0.006]***	0.170 [0.008]***	0.174 [0.007]***
A	22.118 [0.029]**	22.063 [0.030]**	22.340 [0.027]**	22.244 [0.028]**	22.242 [0.029]**
Country fixed effects	yes	yes	yes	yes	yes
Industry fixed effects	yes	yes	yes	yes	yes
Observations	3,765	3,765	3,765	3,765	3,765
Pseudo R ²	0.171	0.171	0.171	0.171	0.172

Note: Same as in Table 3.

Table 5. Determinants of Export Volume (Simple Goods)

Tobit model					
	Dependent variable: log (A + export volume)				
	1	2	3	4	5
Legal obstacle		0.089 [0.036]**			0.104 [0.025]**
Overdue payments			-0.011 [0.023]**		-0.010 [0.019]**
Corruption				-0.118 [0.012]**	-0.105 [0.030]**
Log (labor productivity)	0.773 [0.000]***	0.780 [0.000]***	0.779 [0.000]***	0.793 [0.000]***	0.800 [0.000]***
Firm age	-0.023 [0.012]**	-0.020 [0.053]*	-0.023 [0.028]**	-0.023 [0.062]*	-0.022 [0.040]**
Log (wage rate)	0.070 [0.094]*	0.073 [0.064]*	0.072 [0.085]*	0.069 [0.073]*	0.070 [0.081]*
Log (employment)	1.263 [0.000]***	1.268 [0.000]***	1.264 [0.000]***	1.260 [0.000]***	1.264 [0.000]***
Log (R&D expenditure)	0.070 [0.276]	0.085 [0.264]	0.086 [0.352]	0.074 [0.272]	0.071 [0.337]
A	25.993 [0.029]**	26.152 [0.027]**	25.735 [0.028]**	25.817 [0.029]**	25.694 [0.028]**
Country fixed effects	yes	yes	yes	yes	yes
Industry fixed effects	yes	yes	yes	yes	yes
Observations	1,183	1,183	1,183	1,183	1,183
Pseudo R ²	0.135	0.135	0.136	0.137	0.137

Note: Same as in Table 3.

Table 6. Tobit SUR Estimation of Complex Goods and Simple Goods

Tobit SUR (seemingly unrelated regressions)								
	Complex goods				Simple goods			
	1	2	3	4	5	6	7	8
Legal obstacle	-0.171 [0.016]**			-0.125 [0.017]**	0.089 [0.036]**			0.104 [0.025]**
Overdue payments		-0.021 [0.005]***		-0.020 [0.016]**		-0.011 [0.024]**		-0.010 [0.019]**
Corruption			-0.181 [0.006]***	-0.185 [0.003]***			-0.118 [0.012]**	-0.105 [0.030]**
Log (labor productivity)	0.929 [0.000]***	0.924 [0.000]***	0.923 [0.000]***	0.919 [0.000]***	0.780 [0.000]***	0.779 [0.000]***	0.793 [0.000]***	0.800 [0.000]***
Firm age	-0.014 [0.036]**	-0.013 [0.031]**	-0.012 [0.050]*	-0.014 [0.055]*	-0.020 [0.051]*	-0.023 [0.027]**	-0.023 [0.060]*	-0.022 [0.038]**
Log (wage rate)	0.223 [0.036]**	0.221 [0.035]**	0.209 [0.036]**	0.208 [0.033]**	0.073 [0.101]	0.072 [0.083]*	0.069 [0.142]	0.070 [0.124]
Log (employment)	1.231 [0.000]***	1.232 [0.000]***	1.225 [0.000]***	1.224 [0.000]***	1.268 [0.000]***	1.264 [0.000]***	1.260 [0.000]***	1.264 [0.000]***
Log (R&D expenditure)	0.174 [0.013]**	0.179 [0.006]***	0.170 [0.008]***	0.174 [0.007]***	0.085 [0.262]	0.086 [0.351]	0.074 [0.271]	0.071 [0.336]
A	22.063 [0.030]**	22.340 [0.027]**	22.244 [0.028]**	22.242 [0.030]**	26.152 [0.027]**	25.735 [0.028]**	25.817 [0.029]**	25.694 [0.028]**
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Industry fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Observations	3,765	3,765	3,765	3,765	1,183	1,183	1,183	1,183
Pseudo R ²	0.171	0.171	0.171	0.172	0.135	0.136	0.137	0.137

Notes: The dependent variable is the log (A + export volume). A is a parameter estimated by the Tobit model (Eaton and Tamura, 1994; Rauch, 1999). The Tobit seemingly unrelated regression (SUR) includes a full set of industry and country dummies. The p-values are based on the 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 7. Instrumental Variables Estimation

IV Tobit regressions	All goods				Complex goods				Simple goods			
	1	2	3	4	5	6	7	8	9	10	11	12
Legal obstacle	-0.187 [0.032]**			-0.125 [0.034]**	-0.167 [0.021]**			-0.132 [0.018]**	0.103 [0.032]**			0.118 [0.029]**
Overdue payments		-0.018 [0.037]**		-0.017 [0.022]**		-0.027 [0.029]**		-0.019 [0.031]**		-0.016 [0.028]**		-0.013 [0.024]**
Corruption			-0.178 [0.025]**	-0.167 [0.019]**			-0.189 [0.016]**	-0.170 [0.021]**			-0.115 [0.014]**	-0.107 [0.026]**
Log (labor productivity)	0.823 [0.000]***	0.791 [0.000]***	0.807 [0.000]***	0.762 [0.000]***	0.978 [0.000]***	0.874 [0.000]***	0.827 [0.000]***	0.905 [0.000]***	0.754 [0.000]***	0.771 [0.000]***	0.789 [0.000]***	0.738 [0.000]***
Firm age	-0.016 [0.034]**	-0.013 [0.036]**	-0.014 [0.073]*	-0.015 [0.033]**	-0.017 [0.038]**	-0.012 [0.034]**	-0.016 [0.071]*	-0.014 [0.086]*	-0.016 [0.072]*	-0.013 [0.035]**	-0.012 [0.027]**	-0.015 [0.032]**
Log (wage rate)	0.156 [0.039]**	0.166 [0.067]*	0.164 [0.013]**	0.159 [0.062]*	0.217 [0.016]**	0.235 [0.031]**	0.270 [0.083]*	0.218 [0.040]**	0.021 [0.261]	0.020 [0.182]	0.031 [0.088]*	0.049 [0.063]*
Log (employment)	1.213 [0.000]***	1.091 [0.000]***	1.119 [0.000]***	1.142 [0.000]***	1.235 [0.000]***	1.067 [0.000]***	0.997 [0.000]***	1.152 [0.000]***	1.132 [0.000]***	1.244 [0.000]***	1.261 [0.000]***	1.141 [0.000]***
Log (R&D expenditure)	0.117 [0.012]**	0.150 [0.016]**	0.169 [0.004]***	0.158 [0.017]**	0.134 [0.005]***	0.190 [0.007]***	0.169 [0.012]**	0.161 [0.023]**	0.088 [0.268]	0.063 [0.387]	0.073 [0.321]	0.085 [0.438]
A	23.434 [0.031]**	15.220 [0.027]**	23.027 [0.026]**	23.133 [0.038]**	22.397 [0.035]**	11.677 [0.028]**	20.063 [0.034]**	22.184 [0.031]**	25.388 [0.019]**	26.902 [0.027]**	26.280 [0.026]**	25.130 [0.029]**
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Industry fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	4,948	4,948	4,948	4,948	3,765	3,765	3,765	3,765	1,183	1,183	1,183	1,183
1st-stage F-test (p-value)	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
Pseudo R ²	0.215	0.244	0.220	0.156	0.217	0.220	0.210	0.173	0.212	0.142	0.139	0.140

Notes: The dependent variable is the log(A + export volume). A is a parameter estimated by the Tobit model (Eaton and Tamura, 1994; Rauch, 1999). The instrumental variables (IV) are the average values of the domestic industry that the firm belongs to (excluding the value of the firm itself) corresponding to their firm-level institutional variables: legal obstacle, overdue payments, and corruption. The 1st-stage F-test is the test of excluded IV in the 1st-stage regression. P-values are in brackets and are based on the White heteroskedasticity-consistent standard errors, which are corrected for industry-country clustering. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 8. Robustness tests

Dependent variable	Heckman model				Poisson model		OLS model	
	Complex goods		Simple goods		Complex goods	Simple goods	Complex goods	Simple goods
	1st-stage	2nd-stage	1st-stage	2nd-stage	Export volume		Log(export volume)	
	Export dummy	Log(export)	Export dummy	Log(export)	5	6	7	8
Legal obstacle	-0.177 [0.012]**	-0.187 [0.019]**	0.104 [0.027]**	0.123 [0.021]**	-0.170 [0.002]***	0.116 [0.018]**	-0.198 [0.007]***	0.127 [0.021]**
Overdue payments	-0.023 [0.016]**	-0.028 [0.007]***	-0.011 [0.015]**	-0.015 [0.027]**	-0.023 [0.009]***	-0.012 [0.014]**	-0.024 [0.024]**	-0.014 [0.025]**
Corruption	-0.178 [0.021]**	-0.214 [0.016]**	-0.122 [0.024]**	-0.179 [0.018]**	-0.231 [0.006]***	-0.184 [0.012]**	-0.221 [0.017]**	-0.181 [0.019]**
Log (labor productivity)	0.182 [0.000]***	0.992 [0.000]***	0.098 [0.036]**	0.854 [0.000]***	1.029 [0.000]***	0.735 [0.000]***	0.983 [0.000]***	0.850 [0.000]***
Firm age	-0.012 [0.020]**	-0.017 [0.021]**	-0.013 [0.037]**	-0.022 [0.035]**	-0.017 [0.025]**	-0.049 [0.016]**	-0.018 [0.014]**	-0.022 [0.017]**
Log (wage rate)	0.078 [0.016]**	0.247 [0.031]**	0.068 [0.021]**	0.122 [0.017]**	0.291 [0.022]**	0.120 [0.011]**	0.211 [0.038]**	0.132 [0.026]**
Log (employment)	0.517 [0.000]***	1.092 [0.000]***	0.461 [0.000]***	1.281 [0.000]***	0.824 [0.000]***	0.939 [0.000]***	1.074 [0.000]***	1.259 [0.000]***
Log (R&D expenditure)	0.073 [0.000]***	0.214 [0.006]***	0.024 [0.424]	0.073 [0.241]	0.203 [0.003]***	0.088 [0.340]	0.216 [0.000]***	0.083 [0.208]
Licensing obstacles	-0.026 [0.017]**		-0.014 [0.026]**					
ρ (inverse Mill's ratio)		0.387 [0.014]**		0.251 [0.032]**				
Exclusive restriction test:								
Licensing obstacles (p-value)		0.455		0.703				
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Industry fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Observations	3,765	3,765	1,183	1,183	3,765	1,183	1,378	434
Pseudo R ²	0.277		0.263					
Adjusted R ²		0.438		0.547	0.583	0.598	0.535	0.534

Notes: The dependent variables are indicated at the heading of each column. The p-values are based on the 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 9: Additional Robustness Tests

Tobit model	1	2	3	4	5	6
	All goods		Complex goods		Simple goods	
	drop out wage	drop out productivity	drop out wage	drop out productivity	drop out wage	drop out productivity
Legal obstacle	-0.123 [0.039]**	-0.106 [0.032]**	-0.104 [0.011]**	-0.116 [0.005]***	0.083 [0.026]**	0.094 [0.032]**
Overdue payments	-0.017 [0.012]**	-0.019 [0.014]**	-0.020 [0.007]***	-0.021 [0.005]***	-0.011 [0.017]**	-0.010 [0.018]**
Corruption	-0.159 [0.024]**	-0.153 [0.015]**	-0.187 [0.003]***	-0.174 [0.001]***	-0.102 [0.021]**	-0.112 [0.029]**
Log (labor productivity)	0.947 [0.000]***		0.965 [0.000]***		0.883 [0.000]***	
Firm age	-0.016 [0.031]**	-0.014 [0.282]	-0.014 [0.035]**	-0.013 [0.094]*	-0.022 [0.053]*	-0.028 [0.036]**
Log (wage rate)		0.242 [0.024]**		0.344 [0.026]**		0.179 [0.017]**
Log (employment)	1.248 [0.000]***	1.427 [0.000]***	1.225 [0.000]***	1.414 [0.000]***	1.275 [0.000]***	1.446 [0.000]***
Log (R&D expenditure)	0.126 [0.004]***	0.176 [0.000]***	0.159 [0.006]***	0.194 [0.000]***	0.050 [0.309]	0.089 [0.152]
A	23.265 [0.030]**	23.929 [0.021]**	22.333 [0.016]**	23.778 [0.012]**	24.894 [0.026]**	26.714 [0.023]**
Country fixed effects	yes	yes	yes	yes	yes	yes
Industry fixed effects	yes	yes	yes	yes	yes	yes
Observations	4,948	4,948	3,765	3,765	1,183	1,183
Pseudo R ²	0.154	0.141	0.171	0.156	0.137	0.130

Notes: The dependent variable is the log (A + export volume). A is a parameter estimated by the Tobit model (Eaton and Tamura, 1994; Rauch, 1999). Tobit regressions include a full set of industry and country dummies. P-values are in brackets and are based on the White heteroskedasticity-consistent standard errors, which are corrected for country-industry clustering. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.