Institutional Compliance by Firms in Transition Economies[*]

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Abstract

This research revisits the effects of a country's institutional framework on individual firms' behavior, in particular focusing on their propensity to comply with legal rules in transition economies. The authors purport to explain the variation in compliance with legal rules and employ a rich data set on thousands of firms from dozens of transition countries to this end. They find that most of the variation emanates from country-wide differences in institutional quality, although some firm characteristics play a role as well. They also find indications that differences across countries are smoothed with income.

1. Introduction

As forcefully emphasized in recent research, differences across countries in the rule of law and legal enforcement are important for economic performance. Recent research efforts have documented this statistically. Thus, the work on legal origins (see, for example, Djankov et al., 2003; Glaeser and Shleifer, 2002; La Porta et al., 2008) shows that differences in legal rules across countries matter for investor protection, financial development, and more generally, efficient resource allocation. Acemoglu et al. (2005) find that legal enforcement of contracts trumps the effect of political institutions on financial development, investment and growth. Yet, the parable of the flat world used by Thomas Friedman in his bestseller (2006) suggests that globalization has erased differences across countries, making them similar economically and culturally (see Leamer, 2007, for pointed criticism and further literature references). This paper purports, therefore, to empirically tackle the significance of cross country differences, specifically focusing on how the rule of law is actually translated to legal compliance by business firms with emphasis on transition economies.

Our data, further detailed below, seem to be especially well suited to deal with this objective. In particular, they contain proxies for law compliance by thousands of business firms from a wide range of transition economies that display large institutional variation. While survey based, these data are invaluable, as internationally comparable measures of compliance are hard to come by. The data have information on several aspects of law compliance, such as the scope of corruption, bribery, and the extent of informality – by which is meant the propensity of firms to hide output.

The null hypothesis – consistent with the "flat world" paradigm – is that most of the variation in informality is driven by firm-level characteristics, whereas the significance of country-level characteristics, in particular a country's institutional quali-

ty, should be marginal. The analysis reveals that many of the available firm-level characteristics are indeed relevant to explain the variation in informality. For example, firm size matters, and smaller firms appear to be hiding a larger share of output; in contrast, exporting firms and those with foreign ownership appear to hide less than otherwise. Yet, we find strong evidence that most of the variation is driven by differences across countries in their respective levels of institutional quality, thus rejecting the null hypothesis in favor of what is implied by our theoretical model. In particular, commonly used measures of institutional strength emerge as the most statistically significant variable in explaining informality and corruption behavior of the firms. Yet, we also find evidence of a convergence club, whereby differences in legal compliance become smaller with a country's income.

This paper is related to recent work that examines the effects of countries' legal institutions on various outcomes – see the review in La Porta et al. (2008) – and, more generally, to work that emphasizes the role of institutional quality in development – see Acemoglu et al. (2005) for a review. Additional important recent efforts in this regard have been directed toward international trade. Thus, Berkowitz et al. (2006) and Rodrik et al. (2004) show that the quality of institutions is an important determinant of trade flows, and the latter paper also draws growth implications from this inference. Examining yet another aspect, Doidge et al. (2007) argue that country-wide variation in institutional quality is responsible for the bulk of variation in corporate governance across business firms. The data they use cover mostly developed economies, and the extent of countries covered is much smaller than here. While the focus in Doidge et al. (2007) is clearly very different from the one examined here, our results are complementary to theirs. The richness of our data, which include a variety of countries, ensures that the results have wide applicability. In work that is more specifically related to the current endeavor, Dabla-Norris et al. (2008) and Friedman et al. (2000) find that institutional quality is an important determinant of informality; this work does not, however, distinguish between firm-level and country-level characteristics, and it ignores other aspects of illegality such as corruption that are studied here. Finally, Fisman and Miguel (2006), examining an aspect of illegal behavior of international diplomats stationed in New York City (violations of car parking regulations), find that it is correlated with their respective countries' corruption indicators. While the authors do not distinguish between individual and country-level characteristics, and their sample can hardly be considered as representative, the flavor of their results is consistent with ours. This is especially gratifying as their evidence, being based on objective data, should be viewed as complementary to this paper's findings.

The remainder of the presentation is organized as follows. The next section describes the data and the empirical approach, followed by the actual empirical analysis in section 3. Section 4 then concludes with brief remarks.

2. Data and Methodology

We use the World Business Environment Survey (World Bank, 2000) and include data for Armenia, Azerbaijan, Belarus, Bosnia, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Lithuania, Moldova, Poland, Romania, Russia, Slovakia, Slovenia, Ukraine, and Uzbekistan. In total, there

Table 1 Variables Definition

Variable	Description
Percentage of sales off the books	Recognizing the difficulties many enterprises face in fully complying with taxes and regulations, what percentage of total sales would you estimate the typical firm in your area of activity keeps "off the books": (0) Up to 30%, (1) more than 30%. *Source:* WBES (2000).
Company is owned by a foreign investor	Dummy variable that takes on the value one if the company is owned by a foreign investor, zero otherwise. *Source*: WBES (2000).
Government owns the company	Dummy variable that takes on the value one if any government agency or state body has a financial stake in the ownership of the firm, zero otherwise. *Source*: WBES.
Exporter	If the firm exports. The variable takes the values: (1) Yes and (0) No. *Source:* WBES (2000).
Number of competitors	Answer to the question: How many competitors do you face in your markets? *Source:* WBES (2000).
Sector: Manufacturing, Services, Agriculture, and Construction	5 dummies: (1) Manufacturing, (2) Services, (3) Agriculture, (4) Construction, and (5) Other (commerce; mining and quarrying; and electricity, gas and water). In all the regressions (5) is the omitted dummy. *Source:* WBES (2000).
Size: Medium and Large	3 dummies: (1) Small: 50-fewer employees, (2) Medium: 51 to 500 employees, and (3) Large: 501 to more employees. In all the regressions (1) is the omitted dummy. *Source:* WBES (2000).
Years since the company was established	Difference between the year in which the interview was taken and the year in which the firm was established. *Source:* WBES (2000).
Log(GDP)	Logarithm of the average GDP for the period 1995–1999. Expressed in Constant 2000 US dollars. *Source:* WDI (2007).
GDP growth (%)	Average rate of GDP growth (%) for the period 1995–1999. *Source:* WDI (2007).
Labor regulations obstacle	Country-level average of the answers to the question: Judge on a four point scale how problematic is labor regulation for the operation and growth of your business? 1 = No obstacle; 2 = Minor obstacle; 3 = Moderate Obstacle; 4 = Major obstacle. *Source:* WBES (2000).
Inflation rate	Average rate of inflation of the consumers' price index for the period 1995–1999. *Source:* WDI (2007).
Effectiveness of the legislative	Index of the effectiveness of the legislature. Ascending scale from 1 to 4 (1 = no legislature; 2 = largely ineffective; 3 = partly effective; 4 = effective). Average of the years 1945 through 1998. *Source:* Botero et al. (2004).

are about 2000 firms in our sample. The data cover enterprises' responses to questions on the business environment as shaped by domestic economic policy, governance, and regulation, as well as assessments of public service quality, firm size, and growth. Our dependent variable defines informality as a dummy variable that takes the value 1 if the response to the question: "Recognizing the difficulties many enterprises face in fully complying with taxes and regulations, what percentage of total sales would you estimate the typical firm in your area of activity keeps 'off the books'?" includes values over 30%, and zero otherwise. We consider both firm-level and country-level controls. Related to the former, we consider type of share ownership, exporting firms, competition, sectors, and firm size. In particular, foreign investors may respect domestic legislation more as they tend to be under more scrutiny. The same goes for firms that share ownership with the government. The expected sign of exporting firms is less obvious. On the one hand, their dealing in the in-

Table 2 Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Percentage of sales off the books	1854	0.44	0.47	0	1
State shares ownership	1854	0.19	0.29	0	1
Foreign shares ownership	1854	0.18	0.40	0	1
Sector: Manufacturing	1854	0.39	0.49	0	1
Sector: Service	1854	0.47	0.50	0	1
Sector: Agriculture	1854	0.06	0.23	0	1
Sector: Construction	1854	0.08	0.28	0	1
If the firm exports	1854	0.49	0.48	0	1
Number of competitors	1854	2.82	0.72	0	9
Firm size: medium	1854	0.44	0.50	0	1
Firm size: large	1854	0.18	0.39	0	1
Log(GDP)	1854	25.75	1.62	22.77	29.79
GDP growth	1854	2.96	2.05	-1.20	8.76
Inflation rate	1854	23.21	45.84	0.76	252.66
Effectiveness of the legislative	1834	1.75	0.74	0.91	3.00
Labor regulations obstacle	1834	2.45	0.43	1.68	3.46
ICRG institutional index	1854	6.54	1.93	3.33	10.00

ternational marketplace may force them to be more transparent, but the fact that they are more open gives them more opportunity to misbehave (Chong and Gradstein, 2006). Related to the number of competitors, we may expect that firms with a higher number of competitors will tend to be attracted by informal transactions. We also include sector dummies for the five industries available in the survey, namely, services, agriculture, manufacturing, and construction. Size dummies are also included. We expect smaller firms, having a higher chance to be outside the institutional system, to be more inclined to informality.

Among the country-level control variables, of primary interest is the ICRG index, which captures the country's institutional quality, and we expect a negative association between institutional quality and the level of informality. Among country-level controls we include gross domestic product, which we expect to yield a negative sign (Chong and Gradstein, 2006). Other controls are the rate of growth of the economy, the rate of inflation, a labor regulation variable, and an institutional monitoring variable. *Table 1* describes all our variables and *Table 2* provides corresponding summary statistics. While we include several country-level variables, there may be some country-specific unobserved factors; the inclusion of a country-specific error term in the random effects model helps avoid this problem. As this methodology assumes that there is an identifier for each cluster of countries, it gives a robust inference, so the regressions presented all have robust standard errors, clustered by country.

3. Results

Table 3 shows the results. There are five specifications denoted in *Table 3*. The first one presents results using firm-specific variables only, where the percentage of sales to the state sector, foreign ownership, and whether the firm operates in other countries have the expected signs and are significant at conventional levels. In this specification, when a firm operates in the manufacturing sector it tends to be more

Table 3 Country and Firm Determinants of Informality
      Probit Regressions with Random Effects

	Dependent variable: Percentage of sales off the books				
	(1)	(2)	(3)	(4)	(5)
Foreign shares ownership	-0.283**		-0.293**		-0.291**
	(0.126)		(0.126)		(0.126)
Operate in other Countries	-0.241**		-0.220*		-0.232*
	(0.121)		(0.121)		(0.121)
Sector: Manufacturing	0.214*		0.222**		0.201*
	(0.112)		(0.110)		(0.110)
Sector: Service	0.101		0.086		0.071
	(0.136)		(0.135)		(0.135)
If the firm exports	-0.061		-0.046		-0.051
	(0.106)		(0.106)		(0.106)
Number of competitors	0.081		0.058		0.067
	(0.094)		(0.094)		(0.094)
Size: Medium	0.055		0.013		0.026
	(0.126)		(0.126)		(0.124)
Size: Large	-0.145		-0.152		-0.149
	(0.145)		(0.145)		(0.145)
% of sales to the State Sector	0.293***		0.266***		0.273***
	(0.097)		(0.097)		(0.097)
Years since the firm was established	0.000		-0.000		0.001
	(0.002)		(0.002)		(0.002)
Log(GDP)		0.120*	0.100	-0.880**	-0.938**
		(0.068)	(0.074)	(0.410)	(0.431)
External Debt (% GDP)		1.399***	1.195**	1.426***	1.233***
		(0.442)	(0.487)	(0.430)	(0.447)
Effectiveness of the legislative		-0.501***	-0.511***	-0.298*	-0.305*
		(0.149)	(0.167)	(0.165)	(0.173)
Labor regulations obstacle		0.077	0.103	0.349	0.360
		(0.192)	(0.219)	(0.214)	(0.223)
ICRG institutional index		-0.213***	-0.227***	-5.029**	-5.230**
		(0.056)	(0.063)	(1.954)	(2.065)
Constant	-0.942***	-2.425	-2.234	21.796**	22.935**
	(0.305)	(1.609)	(1.789)	(9.928)	(10.438)
Observations	1815	1823	1815	1823	1815
Chi2 – firm variables	37.99		34.53		35.60
Chi2 – country variables		47.41	37.93	53.25	47.59
Chi2 – all variables	37.99	47.41	72.50	53.25	83.52
Between countries fit	0.0789	0.241	0.237	0.250	0.246
Within countries fit	0.208		0.215		0.214
Overall fit	0.220	0.241	0.319	0.250	0.326
Rho (portion of variance due to u_i)	0.135	0.00136	0.00532	5.70e-07	4.46e-07
Log likelihood	-491.0	-506.5	-482.1	-503.5	-479.2

Notes: Standard errors in parentheses; (*) significant at 10 percent; (**) significant at 5 percent; (***) significant
  at 1 percent. Chi2-test of joint significance and its corresponding *p*-values are reported for each group
  of variables. Results shown correspond to marginal coefficients of random effects probit regressions.

informal. This result is persistent across specifications that include firm character-
istics. Column 2 controls for country-level variables only. We find that institutions
are associated with the expected negative sign, significant at the 1 percent level. Col-

umn 3 combines firm and country variables. They show that countries' institutions matter more for firms' behavior towards informality than firm-level variables. Chi--squared tests of joint significance are included in each of the five specifications, which allows us to reject the null hypothesis that all firm-level variables, country--level variables, and both together (firm and country level) are jointly equal to zero. Overall, the results presented in this section show that even when some firm-level characteristics are relevant in explaining informality, what really seems to matter is the differences across country-level variables such as the level of external debt, the effectiveness of the legislation and the ICRG institutional index, and more important is the fact that the results do not change much across specifications. Finally, columns 4 and 5 repeat the same exercise under the presumption that endogeneity might be a problem. Two variables were instrumented in these regressions: the labor regulations obstacle and the ICRG institutional index. For both of them, we used as instruments: democratic accountability, internal conflict, regional dummies, and the year of introduction of current electoral rule.

In order to test our results using random effects probit, we run the same specifications from *Table 3* with other cut-off points, and we obtain similar results. Also as a robustness check, in *Table 4* we employ alternative measures of institutional quality with sub-components of the ICRG index, and other governance indicators recently compiled by the World Bank (see Kaufmann et al., 2005).

The results clearly indicate that country-wide differences in institutional quality matter a good deal for individual firms' degree of informality, more so than firm--specific characteristics, as is reflected by the differences in the between-countries fit and the within-countries fit.[1] Overall, we obtain very similar findings as before. Furthermore, the results suggest that there may exist a "convergence club" of richer countries across which firms' behavior is alike, which is consistent with the influential thesis on income convergence across rich countries – see, for example, Barro and Sala-i-Martin, 1995.[2]

The sampling methodology of the WBES does not take into account the economic size of each country, which may obviously bias our findings. To correct for this, we use a randomized sample of the full number of firms in the survey, around ten thousand, and draw a random sample according to the gross domestic product of each country at the time of the survey. Based on the country with the highest GDP value, namely, the United States, we assign a corresponding number of observations for the rest of the countries available. With this random sample, we replicate our empirical specifications and the results obtained are reported in *Table 5*. The findings using a randomized sample indicate that the institutional quality of the country has a negative and statistically significant effect – at conventional levels – over informality. Similar to our previous findings, we find that when an interaction term be-

[1] For the sake of economy we only present the coefficients of our variables of interest as well as the R--squared and chi-statistic values of the joint significance tests. Full results are available upon request.

[2] We also check the robustness of our results by changing the proxy variable of informality to one more related to illegality and corruption. Specifically, the WBES contains information on the frequency of bribery payments made to various government agencies, such as the licensing authority, telephone companies, and tax authorities. Using the corresponding variables as dependent variables, we re-run specifications obtaining similar results as when using the percentage of sales off the book. The reported results include the coefficients of the ICRG variables, the R-squared and the joint significance test chi-values.

Table 4 Informality, Institutions and GDP – Robustness to Institutional Measures

	Institutions	Institutions * * GDP	Chi2 – firm variables	Chi2 – country variables	Chi2 – all variables	Between countries fit	Within countries fit	Overall fit
			Dependent variable: Percentage of sales off the books					
					ICRG sub indices			
Corruption								
(1)	-0.179*** (0.051)		87.31	35.22	153.8	0.275	0.143	0.386
(2)	-2.840** (1.286)	0.142** (0.056)	88.38	11.78	138.9	0.235	0.142	0.321
Rule of Law (0–6)								
(3)	-0.117 (0.081)		89.37	22.29	128.1	0.242	0.160	0.221
(4)	-2.966*** (0.896)	0.142*** (0.038)	89.22	26.19	142.2	0.277	0.166	0.274
					Governance			
Control of Corruption								
(5)	-0.311*** (0.090)		96.53	28.93	143.5	0.234	0.161	0.292
(6)	-3.117*** (1.154)	0.124** (0.040)	94.12	9.88	144.6	0.192	0.158	0.298
Rule of Law								
(7)	-0.301*** (0.092)		89.16	29.45	115.7	0.287	0.162	0.254
(8)	-3.111** (1.236)	0.132** (0.041)	88.94	12.26	121.7	0.260	0.165	0.254

Notes: Clustered by country, indeed robust, standard errors in parentheses; (*) significant at 10 percent; (**) significant at 5 percent; (***) significant at 1 percent. Chi2-test of joint significance is reported for each group of variables. The corresponding *p*-value for each group of variables is 0.00. Results shown correspond to marginal coefficients of random effects probit regressions. In all regressions, the number of countries is 34, and the number of observations is 3522. Except for the ICRG institutional index, specifications used for each pair of regressions are the same used in regressions (3) and (5) of Table 4, respectively.

tween the ICRG institutional index and GDP is added, it becomes positive and statistically significant.

Institutional quality may be endogenous to informality. Furthermore, one could argue that there may also be causality from informal transactions made by firms to the institutional quality of the country. Also, the country-level average perception of firms about labor regulations may also show reverse causality with respect to informality. In order to deal with these potential problems we employ an instrumental variables approach for both variables. The instruments used are country-level variables as the ones that are instrumented, and they are the democratic accountability and internal conflict indices from ICRG, regional dummies, and the year of introduction of the current electoral rule.

The democratic accountability index is related to institutional quality, and the labor regulations, because democratic countries tend to be more stable and are more receptive to the claims and opinions of different social groups, so they tend to have strong institutions, and this also changes the perception of labor regulation. The same goes for internal conflict. If a country has an armed opposition to the government and if the government indulges in arbitrary violence, direct or indirect,

Table 5 Informality, Institutions and GDP – Randomized Sample

	(1)	(2)	(3)	(4)	(5)
			Dependent variable:		
			Percentage of sales off the books		
Foreign shares ownership	-0.447***		-0.457***		-0.454***
	(0.094)		(0.094)		(0.054)
State shares ownership	0.033		0.033		0.027
	(0.123)		(0.122)		(0.177)
Sector: Manufacturing	-0.666		-0.614		-0.562
	(0.643)		(0.643)		(0.773)
Sector: Service	-0.744		-0.746		-0.708
	(0.621)		(0.631)		(0.742)
Sector: Agriculture	-0.725		-0.745		-0.679
	(0.857)		(0.858)		(0.679)
Sector: Construction	-0.645		-0.634		-0.749
	(0.637)		(0.642)		(0.640)
If the firm exports	-0.142*		-0.130		-0.418
	(0.072)		(0.073)		(0.473)
Number of competitors	0.035		0.035		0.039
	(0.089)		(0.099)		(0.043)
Size: Medium	-0.184		-0.129*		-0.176*
	(0.075)		(0.055)		(0.054)
Size: Large	-0.188		-0.193*		-0.186*
	(0.464)		(0.100)		(0.61)
Years since the firm was established	-0.005**		-0.004**		-0.03**
	(0.002)		(0.002)		(0.002)
Log(GDP)		0.087	0.085	-0.090	-0.313*
		(0.062)	(0.062)	(0.145)	(0.187)
GDP growth		0.031	0.029	0.032	0.045
		(0.048)	(0.048)	(0.049)	(0.034)
Inflation rate		0.001	0.001	0.001	0.001
		(0.002)	(0.002)	(0.002)	(0.002)
Effectiveness of the legislative		-0.445***	-0.443***	-0.451***	-0.446***
		(0.122)	(0.122)	(0.102)	(0.131)
Labor regulations obstacle		0.174	0.185	0.298	0.324*
		(0.198)	(0.188)	(0.194)	(0.177)
ICRG institutional index		-0.087**	-0.097**	-1.734**	-1.745**
		(0.042)	(0.043)	(0.618)	(0.409)
ICRG institutional index * GDP				0.056**	0.053**
				(0.028)	(0.033)
Constant	0.464	-2.364	-1.834	7.481	5.067*
	(0.465)	(1.457)	(1.671)	(4.275)	(2.809)
Observations	1815	1815	1815	1815	1815
Chi2 – firm variables	49.27	-	45.55	-	42.13
	0.00		0.00		0.00
Chi2 – country variables	-	36.04	32.84	32.43	33.97
		0.00	0.00	0.00	0.00
Chi2 – all variables	49.67	36.05	69.88	32.43	88.28
	0.00	0.00	0.00	0.00	0.00
Between countries fit	0.109	0.274	0.267	0.286	0.247
Within countries fit	0.129	-	0.148	-	0.144
Overall fit	0.175	0.274	0.305	0.286	0.413
Rho (portion of variance due to u_i)	0.193	0.093	0.0890	0.0840	0.0632
Log likelihood	-1392	-1278	-1184	-1355	-1379

Notes: Clustered by country, indeed robust, standard errors in parentheses; (*) significant at 10 percent; (**) significant at 5 percent; (***) significant at 1 percent. Chi2-test of joint significance and its corresponding *p*-values are reported for each group of variables. Results shown correspond to marginal coefficients of random effects probit regressions.

Table 6 Informality, Institutions and GDP – Instrumental Variables

	Dependent variable: Percentage of sales off the books			
	(1)	(2)	(3)	(4)
Foreign shares ownership		-0.344***		-0.382***
		(0.052)		(0.072)
State shares ownership		-0.284***		-0.280***
		(0.068)		(0.098)
Sector: Manufacturing		-0.126		-0.308
		(0.563)		(0.548)
Sector: Service		-0.278		-0.438
		(0.511)		(0.546)
Sector: Agriculture		-0.211		-0.458
		(0.551)		(0.554)
Sector: Construction		-0.133		-0.278
		(0.546)		(0.550)
If the firm exports		-0.068		-0.098
		(0.071)		(0.061)
Number of competitors		0.074**		0.097**
		(0.035)		(0.045)
Size: Medium		-0.075		-0.096
		(0.099)		(0.059)
Size: Large		-0.274***		-0.277***
		(0.047)		(0.087)
Years since the firm was established		-0.008		-0.002
		(0.008)		(0.002)
Log(GDP)	0.044	0.055	-0.321*	-0.378**
	(0.053)	(0.060)	(0.192)	(0.191)
GDP growth	-0.035	-0.025	-0.001	-0.001
	(0.065)	(0.044)	(0.044)	(0.044)
Inflation rate	0.000	-0.000	0.001	0.000
	(0.004)	(0.002)	(0.002)	(0.002)
Effectiveness of the legislative	-0.255*	-0.243	-0.366***	-0.328**
	(0.135)	(0.366)	(0.139)	(0.139)
Labor regulations obstacle	0.046	0.187	0.056	0.166
	(0.138)	(0.203)	(0.187)	(0.190)
ICRG institutional index	-0.144**	-0.148***	-1.561**	-1.760**
	(0.047)	(0.033)	(0.733)	(0.726)
ICRG institutional index * GDP			0.055*	0.062**
			(0.028)	(0.028)
Constant	-3.295	-0.086	9.038*	10.673**
	(3.474)	(2.610)	(4.970)	(5.027)
Observations	1815	1815	1815	1815
Chi2 – firm variables	-	88.20	-	95.68
		0.00		0.00
Chi2 – country variables	38.15	38.36	39.99	40.20
	0.00	0.00	0.00	0.00
Chi2 – all variables	38.15	133.7	39.99	133.3
	0.00	0.00	0.00	0.00
Between countries fit	0.294	0.264	0.269	0.277
Within countries fit	-	0.170	-	0.168
Overall fit	0.294	0.310	0.269	0.324
Rho (portion of variance due to u_i)	0.0939	0.0954	0.0806	0.0786
Log likelihood	-1857	-1824	-1872	-1822

Notes: See *Table 5*. Two variables were instrumented in these regressions: labor regulations obstacle and ICRG institutional index. For both of them, we used as instruments: democratic accountability, internal conflict, regional dummies, and the year of introduction of current electoral rule.

against its own people, it means that institutions are not strong enough to control the situation. It also means that people, feeling attacked by the government, could bias their opinion about labor or other regulations imposed by the government. Other instruments used are the regional dummies, which we have to include because the first stage regressions of the instrumental approach are run in OLS (as the instrumented variables are continuous), so we need to control for extra country-level variables not considered in our random-effects probit estimations. The last instrument is the year of introduction of the current electoral rule, which is also related to the kind of government the country has, but it is reasonable to expect that this variable is not linked to the dependent variable.

Table 6 shows the instrumental variables findings. We find that country differences in institutional quality have a negative and statistically significant effect over informality, and that these differences across countries are smoothed with GDP.

4. Potentially Omitted Variables

The aim of this section is to assess the robustness of the results in our previous section by following a method developed by Sala-i-Martín (1997), which extends the seminal paper by Levine and Renelt (1992). He develops a robustness test by looking at the entire distribution of the estimator of the variable of interest by focusing on the fraction of the density function lying on each side of zero. If 95 percent of the density function for the estimates of the coefficient of interest lies to the right of zero, one could say that this variable is more likely to be correlated with our dependent variable. Given that zero divides the area under the density in two, this researcher denotes the larger of the two areas $cdf(0)$, regardless of whether it is above or below zero. Under the assumption that the distribution of the coefficient of interest is non-normal the $cdf(0)$ is calculated as follows. We consider a group of n variables classified as: (i) the *dependent variable (y_i),* as measured by income quintiles, (ii) *core explanatory variables ($x_{B,i}$),* or the vector of basic determinants, and (iii) *ancillary variables ($x_{A,i}$)*, representing a set of related auxiliary variables identified as being related to income quintile determination.

Using our benchmark specification, we augment our empirical models by using the pool of ancillary variables X_A. The idea is to choose up to two variables at a time and perform regressions using all the possible combinations based on our pool of ancillary variables. The ancillary variables employed are urban, percentage of female workers, fiscal deficit, inflation rate, rate of growth, income inequality, size of the informal sector, perception of corruption at the firm level, and perception of bureaucratic quality at the firm level. The source for all the variables except the informal sector variable is the World Development Indicators from the World Bank (2006). For the informal sector variable, the source is Chong and Gradstein (2006), as they constructed informality measures based on different economic approaches. We test our basic specification for all possible combinations of ancillary variables and compute the estimates of the coefficient, its variance, the (integrated) likelihood, and the individual $cdf(0)$ for each regression. This is summarized in the following vector: $\left\{ \hat{\gamma}_{I,j}, \hat{\sigma}_{I,j}^2, L_{I,j}, \Phi_{I,j}\left(0 / \hat{\gamma}_{I,j}, \hat{\sigma}_{I,j}^2\right)\right\}$. We compute the aggregate $cdf(0)$ of our coefficient of interest γ_I as the weighted average of all individual $cdf(0)s$

$$\Phi_I(0) = \sum_{j=1}^{M} \omega_{I,j} \Phi_{I,j}\left(0/\hat{\gamma}_{I,j}, \hat{\sigma}_{I,j}^2\right),$$ where the weights, $\omega_{I,j}$, are the integrated like-

lihoods, $\omega_{I,j} = \dfrac{L_{I,j}}{\sum\limits_{k=1}^{M} L_{I,k}}$. The variable of interest is said to be strongly correlated (i.e.,

is robust) with probability of ending up on a determined quintile if the weighted *cdf*(0) is greater than or equal to 0.95. In general, we find that our key results do not change, as all of the coefficients on our variables of interest that yield statistically significant coefficients are also statistically significant under this sensitivity test as well.

5. Conclusions

While firm-level characteristics are relevant to explain the variation in informality, we find evidence that most of the variation is driven by differences across countries in their respective levels of institutional quality. Commonly used measures of institutional strength emerge as the most statistically significant variable in explaining informality and the corruption behavior of firms. Yet, we also find evidence of a convergence club, whereby differences in legal compliance become smaller with a country's income.

APPENDIX

We perform an analysis of the variance by computing a goodness-of-fit measure resembling the calculation of an *R*-squared statistic for each level of analysis. We compute the goodness-of-fit measure for the within and between variations by calculating squared correlation coefficients between the observed and predicted probabilities of our dependent variable on each level of analysis. This allows us to decompose the overall variance explained by the model to the one explained by the firm-level characteristics, independent of the country, and the one explained by the country-specific characteristics. In particular, a probit specification is set, owing to the dichotomous nature of the informality measure that was defined earlier and that is used as the dependent variable. Assuming a normal distribution for the random effects v_i, the basic specification of the probit model is as follows:

$$\Pr\left(y_{i1},...,y_{in_i} \mid X_{i1},...,X_{in_i}\right) = \int_{-\infty}^{\infty} \frac{e^{-v_i^2/2\sigma_v^2}}{\sqrt{2\pi}\sigma_v} \left\{\prod_{t=1}^{n_i} F\left(y_{ic}, X_{ic}\beta_F + Z_c\beta_C + v_i\right)\right\} dv_i$$

$$F(y,z) = \begin{cases} \Phi(z) & if \ \ y \neq 0 \\ 1 - \Phi(z) & otherwise \end{cases}$$

(1)

where, Φ is the cumulative normal distribution, v_i is the random effect, X_{ic} is the non-compliance variable for firm i in country c, Y_{ic} is a vector of firm-specific characteristics, Z_c is a vector of country-wide characteristics, and β_F and β_C are vectors of firm-specific and country-specific coefficients, respectively. Significance of the coef-

ficients β_F and β_C will imply that the respective firm-specific and/or country-specific characteristics matter. A country-specific error term in the random effects model helps avoid the problem originating from country-specific unobserved factors. The reported goodness-of-fit measures for the overall, between, and within variances are computed from the correlation coefficients obtained respectively from the following equations (Chong and Gradstein, 2006):

(i) Overall fit:

$$y_{ij} = \rho_1 * \Pr\left(\hat{y}_{ij} = 1 \mid X\right), \quad \text{where} \quad \Pr\left(\hat{y}_{ij} = 1 \mid X\right) = \Phi\left(\hat{\alpha} + x_{ij}\hat{\beta}\right)$$

(ii) Between-country fit:

$$\bar{y}_i = \rho_2 * \Pr\left(\hat{\bar{y}}_i = 1 \mid X\right), \quad \text{where} \quad \Pr\left(\hat{\bar{y}}_i = 1 \mid X\right) = \Phi\left(\hat{\alpha} + \bar{x}_i\hat{\beta}\right)$$

(iii) Within-country fit:

$$\tilde{y}_{ij} = \rho_3 * \Pr\left(\hat{\tilde{y}}_{ij} = 1 \mid X\right), \quad \text{where} \quad \Pr\left(\hat{\tilde{y}}_{ij} = 1 \mid X\right) = \Pr\left(\left(\hat{y}_{ij} - \hat{\bar{y}}_{ij}\right) = 1 \mid X\right) = \Phi\left(\left(x_{ij} - \bar{x}_i\right)\hat{\beta}\right)$$

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