



ELSEVIER

Journal of Public Economics 76 (2000) 459–493

JOURNAL OF  
PUBLIC  
ECONOMICS

www.elsevier.nl/locate/econbase

## Dodging the grabbing hand: the determinants of unofficial activity in 69 countries

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### Abstract

Across 69 countries, higher tax rates are associated with less unofficial activity as a percent of GDP but corruption is associated with more unofficial activity. Entrepreneurs go underground not to avoid official taxes but to reduce the burden of bureaucracy and corruption. Dodging the ‘grabbing hand’ in this way reduces tax revenues as a percent of both official and total GDP. As a result, corrupt governments become small governments and only relatively uncorrupt governments can sustain high tax rates. © 2000 Elsevier Science S.A. All rights reserved.

*Keywords:* Corruption; Over-regulation; Taxation; Legal system; Unofficial economy

*JEL classification:* H26; K42; O17

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### 1. Introduction

What drives entrepreneurs and large businesses underground? One school of thought identifies high tax rates as the main culprit. In other words, companies that operate in the unofficial economy are simply trying to keep all of their profits for themselves. An alternative view holds that when unregistered economic activity rises, the political and social institutions that govern the economy are to blame.

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According to this theory, bureaucracy, corruption, and a weak legal system bear primary responsibility for driving businesses underground. Firm managers may be willing to be taxed at a reasonable rate, but they are unwilling to put up with constant extortionate and arbitrary demands.

A Western manager who decided against locating a plant in Russia illustrates the logic behind the second view. He explains: ‘It doesn’t matter who it is: fire inspector, zoning committee member, mayor for that region, anybody can come and shut you down in 5 min. The fire guy could come, find fire hazards, and demand \$50,000 into his overseas account. They know that if you shut down production for a few days, you’re going to lose a lot more’ (Wilson, 1996). Faced with this hostile environment, foreign firms may choose to locate elsewhere. However, for local entrepreneurs seeking to avoid the same risks, the usual course is to go underground (Kaufmann, 1997).

This paper evaluates these two theories using 1990s data for tax rates, bureaucracy, corruption, the legal environment, and the size of the unofficial economy in 69 countries.<sup>1</sup> Our analysis reveals no evidence that higher direct or indirect tax rates are associated with a larger unofficial economy. In fact, we find some evidence that higher direct tax rates are associated with a *smaller* underground sector. However, when we control for per capita income, in order to allow for the possibility that richer countries have better-run administrations *and* higher tax rates, the relationship ceases to be significant. By contrast, more bureaucracy, greater corruption, and a weaker legal environment are all associated with a larger unofficial economy, even (in most cases) when we control for per capita income.

This result suggests that poor institutions and a large unofficial economy go hand in hand. It does not, however, resolve the question of which comes first: do poor institutions cause high levels of underground activity, or do high levels of underground activity undermine basic institutions? To address this issue, we use a set of exogenous instrumental variables, developed by La Porta et al. (1999), that measure long-standing linguistic fractionalization, the origins of the legal system, the religious composition of the population, and geographic location (latitude). La Porta et al. (1999) show that these variables are significantly correlated with institutional development across a wide range of countries. The instrumental variable results in our regressions show there is an exogenous component of ‘institutions’ that is significantly correlated with the size of the unofficial economy. This suggests a causal link running from weak economic institutions to a large unofficial economy.

A simple story can explain this result: when faced with onerous bureaucracy, high levels of corruption, and a weak legal system, businesses hide their activities

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<sup>1</sup>Other than for a few OECD countries, there is no time series data on the unofficial economy for any significant time period (Schneider and Enste, 1998).

‘underground’.<sup>2</sup> Consequently, tax revenues fall, and the quality of public administration declines accordingly, further reducing a firm’s incentives to remain ‘official’. Supporting evidence for this story is found in the fact that poor institutions are also associated with lower tax revenue as a share of GDP.

This paper builds on earlier work, in which we focus on establishing a link between institutions and the unofficial economy in the formerly communist countries of Eastern Europe and the FSU, in the OECD, and in Latin America (Johnson et al., 1997, 1998). In this paper we test these findings against the alternative hypothesis that tax rates largely determine the size of the unofficial economy. We also build on the growing literature that examines the implications of institutions for output, growth, and government revenue (Delong and Shleifer, 1993; Knack and Keefer, 1995; Mauro, 1995; Easterly and Levine, 1997; Shleifer, 1997; La Porta et al., 1999). Previous work in this area has shown that poor institutions are correlated with lower government revenue both in absolute terms and as a percent of GDP (La Porta et al., 1999). Our findings help explain how poor institutions undermine the tax base by inducing more activity to move into the unofficial economy.

Section 2 explains the theoretical framework and testable predictions. Section 3 summarizes the available data. Section 4 presents our main results. Section 5 concludes.

## 2. Diversion into the unofficial economy

Consider the following simple model of an entrepreneur’s decision to operate officially or unofficially.<sup>3</sup> The entrepreneur can operate fully in the official economy or divert some resources to the unofficial economy. We model his decision of how to allocate retained earnings,  $Y$ .<sup>4</sup> To the extent he operates officially, these earnings are invested in a project that earns a gross rate of return

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<sup>2</sup>The most detailed and persuasive description of how bureaucratic red tape and corruption affects business is De Soto (1989).

<sup>3</sup>The basic idea is similar to the model of stealing in Johnson et al. (2000), although they deal with the theft of resources from shareholders by managers and do not deal directly with public finance aspects.

<sup>4</sup>The key simplifying assumptions are that this is a one period decision problem and the firm does not save earnings to invest in the future. There is also no capital market, so the firm cannot borrow or issue equity. We have relaxed these assumptions in a dynamic model with debt, but this more complicated analysis does not help with the important public finance issues of this paper (Friedman and Johnson, 1999).

$R(T) > 1$ , where  $T$  is tax revenue.<sup>5</sup> The proceeds of operating officially are taxed at rate  $t$ . There is also a deadweight over-regulation or bureaucracy cost, at rate  $r$  per unit of output.<sup>6</sup>

If the entrepreneur diverts resources underground, he cannot use them in his main production process but instead in another lower productivity activity. Let  $D$  be the amount of resources diverted. To simplify the model we assume that this process directly generates value  $D$  for the entrepreneur.<sup>7</sup> Furthermore, there is a cost of operating underground because the entrepreneur may be caught and punished. This cost is denoted  $kD^2/2$ , where  $k$  is a parameter that measures the effectiveness of the legal system. The idea behind this functional form is that it is easy to divert a small amount of resources but the marginal value of diversion falls as the level of diversion increases.<sup>8</sup> For example, the diversion may become easier to observe for the government or courts.

Note that productivity in the official sector,  $R(T)$ , depends on the level of tax revenues. This assumption is designed to capture the important point that if tax revenues are used wisely they can raise productivity through improved education or better roads or stronger law and order. In our model, the government has two positive functions: it provides productivity-enhancing public goods, represented by  $R(T)$ , and it maintains a legal system that penalizes firms for diverting resources underground, represented by  $k$ . If the legal system is stronger,  $k$  is higher and there is a higher expected penalty for operating underground.<sup>9</sup>

The entrepreneur maximizes utility:

$$\text{Max}_D U(D; R, k, t, r) = \text{Max}[(1 - t - r)(Y - D)R(T) + D - (kD^2/2)].$$

The optimal amount of diversion,  $D^*$ , is found by solving:

<sup>5</sup>We could also assume that this rate of return is higher when  $k$  is higher, i.e. law and order is stronger:  $R'(k) > 0$ . Assuming that  $R$  depends on  $T$  is slightly more general, because it allows for the government to produce productivity-enhancing public goods other than law and order, e.g. education and roads.

<sup>6</sup>The over-regulation or bureaucracy cost is intended to represent costs imposed on business by bureaucrats from which the government obtains no revenue and which do not generate any positive benefits for society. Alternatively, we could refer to this term as corruption. It is quite distinct from regulations that have a positive social impact (e.g. environmental or safety rules).

<sup>7</sup>Strictly speaking, the entrepreneur should be able to earn a return on money invested in the unofficial activity. However, it simplifies our analysis to assume that the gross return in this activity is just equal to 1.

<sup>8</sup>More generally, we just need to assume that the cost of diverting resources is convex. This is necessary to simplify the analysis.

<sup>9</sup>Theoretically,  $k$  could also be high in a dictatorship that shoots people for operating underground. Empirically this does not appear to be the case. Weaker civil liberties are strongly correlated with more unofficial activity. At least for the countries in our sample, this is because dictatorships are corrupt and this corruption affects the legal system also, so prosecutors and judges can be bribed and it is hard to enforce any rules.

$$\frac{\partial U}{\partial D} = 1 - \left(\frac{D^*}{k}\right) - (1 - t - r)R(T) = 0,$$

which yields,

$$\begin{aligned} D^*(R, t, r, k) &= \left(\frac{1}{k}\right) (1 - (1 - t - r)R(T)), \text{ if } D^* < Y \\ &= Y \text{ otherwise.} \end{aligned}$$

We assume that  $(1 - r)R(T) < 1$ , so there is always an incentive to divert a portion of the retained earnings.<sup>10</sup>

The comparative statics predictions are straightforward for the bureaucracy parameter,  $r$ . According to this model, more bureaucracy increases the incentive to divert resources into unofficial activities and thus depresses the overall level of economic activity. In contrast, the relationship between diversion and the tax rate,  $t$ , and the quality of the legal environment,  $k$ , is more complicated. There is an important link through the effect of diversion on government revenue and on the ability of the government to provide important public services, such as legal enforcement.

Government revenue equals the product of the tax rate and production in the official sector,

$$T = tR(T)(Y - D^*).$$

We assume that tax revenue is used to produce ‘law and order’:

$$k = k(T).$$

Higher taxation increases the incentive to divert resources but it may, depending on the nature of the initial equilibrium, also increase the level of law and order and other productivity-enhancing public goods, which reduces the incentive to divert.<sup>11</sup> Bureaucracy is assumed not to generate any government revenue, so more bureaucracy (i.e. higher  $r$ ) simply increases the incentive to hide economic activity.

Consider the simplest case with fixed  $k$  and  $R$ ,  $K(T) = k$  and  $R(T) = R$ . We set  $Y = 1$  to simplify the notation. Then an equilibrium satisfies  $D^* = [1 - (1 - t - r)R]/k$  and thus tax revenue is  $T = tR(1 - D^*)$ . Now assume that  $a = [1 - (1 - r)R]R/k > 0$ , and define  $b = R^2/k$ . The ‘Laffer equation’ that relates tax revenue to the tax rate is now:

$$T(t) = tR(a - tb),$$

<sup>10</sup>This assumption simplifies the analysis without affecting the basic intuition.

<sup>11</sup>For an equilibrium model based on the idea that maintaining a legal system is costly and requires revenue see Johnson et al. (1997). In their model, countries are likely to move to extreme equilibria with either a high or low level of public goods.

which is quadratic in  $t$ . This function peaks at  $t = a/2b$ . It cuts the  $x$  axis in two places:  $T(0) = 0$  and  $T(a/b) = 0$ . In addition, note that  $T(t) = 0$  for  $t > a/b$ .

To understand the implications of these assumptions, consider the example where  $r = 1/5$  and  $R(T) = 9/8$ .<sup>12</sup> In this case  $a = (9/8)(1 - 9/10k)$ ,  $b = (81/64)k$ , and the maximum of  $T(t)$  is at  $(8k(10k - 9)/80)$ . When  $k$  equals  $k_L = 1.3$ , the peak is approximately at  $1/8$ , and when  $k$  equals  $k_H = 1.75$  the peak is approximately at  $3/8$ . These two tax curves are shown superimposed in Fig. 1, with  $t$  on the  $x$ -axis and  $T$  on the  $y$ -axis. The smaller peak is to the left of the larger peak. The larger peak is everywhere above the smaller peak, i.e. most importantly, its slope is steeper for small  $t$ .

Now consider the situation if there is a threshold effect for tax revenues. In this situation, the government needs to raise revenue above a certain level before the legal system begins to function well. This may be because there are fixed costs in setting up a court system or a minimum spending level is needed before the courts can function throughout the country. We can model this with the following function:  $K(T) = k_L$  for  $T \leq 0.04$ , and  $K(T) = k_H$  for  $T > 0.04$ . In this case, the Laffer ‘curve’ looks like the thick lines in Fig. 1 (again  $t$  is on the  $x$ -axis and  $T$  is

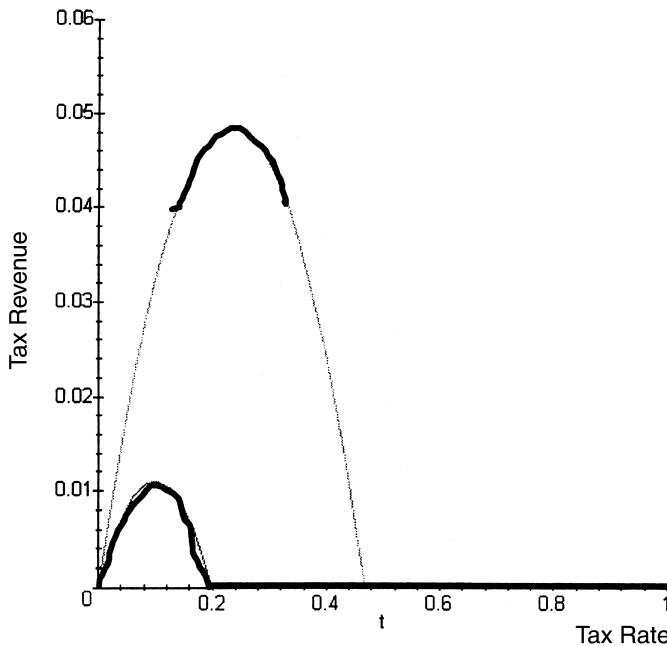


Fig. 1. Relationship between tax revenue and tax rate.

<sup>12</sup>Our results are changed only slightly if  $R(T)$  is not constant. Details are available from the authors.

on the  $y$ -axis). This relationship is actually a correspondence because it is multi-valued under the top peak.

The intuition behind this result is that it is always possible to be in equilibrium on the lower curve. In this case, entrepreneurs expect  $k$  to be low, so they divert more to the underground economy, which means that the government raises relatively little revenue and can only afford to provide  $k$  at a low level. However, there exists another set of equilibria in which entrepreneurs expect  $k$  to be high, so the government is able to raise more revenue and fund a higher level of  $k$ .

The model suggests an important contrast between the effects of bureaucratic over-regulation and corruption on the one hand and tax rates on the other hand. More over-regulation and corruption constitute an unambiguous disincentive to produce in the official sector and should be correlated with a higher share of unofficial activity. We would expect them also to be correlated with lower government revenue as a percent of GDP and a weaker legal environment.

In contrast, higher tax rates have two potentially offsetting effects: the direct effect increases the incentive to hide activity, but the indirect effect — through the provision of a better legal environment — encourages production in the official sector. The model suggests that a higher tax rate will not necessarily be correlated with a higher share of unofficial activity. Higher tax rates will also not necessarily be correlated with government revenue as a percent of GDP or with the strength of the legal environment.

### 3. The data

#### 3.1. Measures of the unofficial economy

Data on the unofficial economy is available for 69 countries: eight Asian countries, four African countries, four Middle Eastern countries, 15 Latin American countries, 20 countries from Europe, US and Australia, and 18 post-communist countries in Eastern Europe and the former Soviet Union (Schneider and Enste, 1998). Table 1 reports two sets of estimates from the Schneider and Enste (1998) data: the first column is one reasonable set of estimates and the second column is estimates that are less favorable to our hypotheses. In the less favorable series we use an alternative set of estimates in which unofficial share numbers are lower for countries with a great deal of bureaucratic hindrance for business and higher for countries with bureaucracies that do not interfere with business. Appendix A explains the differences between the two series in detail.

The data sources differ across regions. The primary source of data on Eastern Europe and the former Soviet Union is Kaufmann and Kaliberda (1996) and Johnson et al. (1997). These authors use data on total electricity consumption to compare unofficial activity across countries. Electricity consumption offers a

Table 1  
Estimates of the share of the unofficial economy<sup>a</sup>

Country name	Initials		Estimates of unofficial economy		Difference between estimates	Source of estimates		Notes
	share1	share2	Base estimate (share1)	Alternative estimate (share2)		share1	share2	
Argentina	ARG	21.8	21.8	21.8	Same estimate	MIMIC 1990–1993	MIMIC 1990–1993	Only one estimate available
Australia	AUS	15.3	15.3	15.3	Same estimate	Electricity 1989–1990	Electricity 1989–1990	Alternative currency demand: 13%
Austria	AUT	5.9	15.0	-9.1		Currency demand 1990–1993	Electricity 1989–1990	Alternative currency demand: 5–9%
Azerbaijan	AZE	60.6	33.8	26.8		Electricity 1995	Electricity 1990–1993	
Belgium	BEL	15.3	22.0	-6.8		Currency demand 1990–1993	Electricity 1990–1993	Alternative currency demand: 19–22%
Bulgaria	BGR	36.2	26.3	9.9		Electricity 1995	Electricity 1990–1993	
Belarus	BLR	19.3	14.0	5.3		Electricity 1995	Electricity 1990–1993	
Bolivia	BOL	65.6	65.6	Same estimate		MIMIC 1990–1993	MIMIC 1990–1993	Only one estimate available
Brazil	BRA	37.8	29.0	8.8		MIMIC 1990–1993	Electricity 1989–1990	
Botswana	BWA	27.0	27.0	Same estimate		Electricity 1989–1990	Electricity 1989–1990	Only one estimate available
Canada	CAN	10.0	13.5	-3.5		Currency demand 1990–1993	Currency demand 1989–1990	Currency demand: 11–15%
Switzerland	CHE	6.9	10.2	-3.3		Currency demand 1990–1993	Electricity 1989–1990	Currency demand: 6–8%
Chile	CHL	18.2	37.0	-18.8		MIMIC 1990–1993	Electricity 1989–1990	
Colombia	COL	35.1	25.0	10.1		MIMIC 1990–1993	Electricity 1989–1990	
Costa Rica	CRI	23.3	34.0	-10.7		MIMIC 1990–1993	Electricity 1989–1990	
Czech	CZE	11.3	13.4	-2.1		Electricity 1995	Electricity 1990–1993	
Germany	DEU	10.4	15.2	-4.8		Currency demand 1990–1993	Electricity 1989–1990	Currency demand: 11–15%
Denmark	DNK	9.4	17.8	-8.4		Currency demand 1990–1993	Electricity 1989–1990	Currency demand: 10–18%
Ecuador	ECU	31.2	31.2	Same estimate		MIMIC 1990–1993	MIMIC 1990–1993	Only one estimate available
Egypt	EGY	68.0	68.0	Same estimate		Electricity 1989–1990	Electricity 1989–1990	Only one estimate available
Spain	ESP	16.1	23.9	-7.9		Currency demand 1990–1993	Electricity 1989–1990	
Estonia	EST	11.8	23.9	-12.1		Electricity 1995	Electricity 1990–1993	
Finland	FIN	13.3	13.3	Same estimate		Electricity 1989–1990	Electricity 1989–1990	Only one estimate available



France	FRA	10.4	13.8	-3.4	Currency demand 1990–1993	Currency demand 1989–1990	Cur. demand: 9–15%. Elect. 1989–1990: 12.5%
Britain	GBR	7.2	13.6	-6.5	Currency demand 1990–1993	Electricity 1989–1990	Currency demand: 9–13%
Georgia	GEO	62.6	43.6	19.0	Electricity 1995	Electricity 1990–1993	
Greece	GRC	27.2	21.2	6.0	Currency demand 1990–1993	Electricity 1989–1990	
Guatemala	GTM	50.4	61.0	-10.6	MIMIC 1990–1993	Electricity 1989–1990	
Hong Kong	HKG	13.0	13.0	Same estimate	Electricity 1989–1990	Electricity 1989–1990	Only one estimate available
Honduras	HND	46.7	46.7	Same estimate	MIMIC 1990–1993	MIMIC 1990–1993	Only one estimate available
Croatia	HRV	23.5	23.5	Same estimate	Discrepancy GDP calculations	Discrepancy GDP calculations	Only one estimate available
Hungary	HUN	29.0	30.7	-1.7	Electricity 1995	Electricity 1990–1993	
Ireland	IRL	7.8	20.7	-12.9	Currency demand 1990–1993	Electricity 1989–1990	Currency demand: 11–16%
Israel	ISR	29.0	29.0	Same estimate	Electricity 1989–1990	Electricity 1989–1990	Only one estimate available
Italy	ITA	20.4	24.0	-3.6	Currency demand 1990–1993	Currency demand 1989–1990	Electricity 1989–1990: 19.6
Japan	JPN	8.5	13.7	-5.2	Currency demand 1990–1993	Electricity 1989–1990	Alternative currency demand: 10.6%
Kazak	KAZ	34.3	22.2	12.1	Electricity 1995	Electricity 1990–1993	
Korea	KOR	38.0	38.0	Same estimate	Electricity 1990–1993	Electricity 1990–1993	Only one estimate available
Lithuania	LTU	21.6	26.0	-4.4	Electricity 1995	Electricity 1990–1993	
Latvia	LVA	35.3	24.3	11.0	Electricity 1995	Electricity 1990–1993	
Morocco	MAR	39.0	39.0	Same estimate	Electricity 1990–1993	Electricity 1990–1993	Only one estimate available
Moldova	MDA	35.7	29.1	6.6	Electricity 1995	Electricity 1990–1993	
Mexico	MEX	27.1	49.0	-21.9	MIMIC 1990–1993	Electricity 1990–1993	
Mauritius	MUS	20.0	20.0	Same estimate	Electricity 1989–1990	Electricity 1989–1990	Only one estimate available
Malaysia	MYS	39.0	39.0	Same estimate	Electricity 1989–1990	Electricity 1989–1990	Only one estimate available
Nigeria	NGA	76.0	76.0	Same estimate	Electricity 1989–1990	Electricity 1989–1990	Only one estimate available
Holland	NLD	11.8	13.5	-1.8	Currency demand 1990–1993	Electricity 1989–1990	
Norway	NOR	5.9	16.7	-10.8	Currency demand 1990–1993	Currency demand 1989–1990	Cur. demand: 14–19%. Elect. 1989–1990: 9%
Panama	PAN	62.1	40.0	22.1	MIMIC 1990–1993	Electricity 1989–1990	

Table 1. Continued

Country name	Initials	Estimates of unofficial economy			Source of estimates		Notes
		Base estimate (share1)	Alternative estimate (share2)	Difference between estimates	share1	share2	
Peru	PER	57.9	44.0	13.9	MIMIC 1990–1993	Electricity 1989–1990	
Philippines	PHL	50.0	50.0	Same estimate	Electricity 1989–1990	Electricity 1989–1990	Only one estimate available
Poland	POL	12.6	20.3	–7.7	Electricity 1995	Electricity 1990–1993	
Portugal	PRT	15.6	16.8	–1.2	Currency demand 1990–1993	Electricity 1989–1990	
Paraguay	PRY	27.0	27.0	Same estimate	Electricity 1989–1990	Electricity 1989–1990	Only one estimate available
Romania	ROM	19.1	16.0	3.1	Electricity 1995	Electricity 1990–1993	
Russia	RUS	41.6	27.0	14.6	Electricity 1995	Electricity 1990–1993	
Singapore	SGP	13.0	13.0	Same estimate	Electricity 1989–1990	Electricity 1989–1990	Only one estimate available
Slovakia	SVK	5.8	14.2	–8.4	Electricity 1995	Electricity 1990–1993	
Sweden	SWE	10.6	17.0	–6.4	Currency demand 1990–1993	Currency demand 1989–1990	Electricity 1989–1990: 10.8%
Thailand	THA	71.0	71.0	Same estimate	Electricity 1989–1990	Electricity 1989–1990	Only one estimate available
Tunisia	TUN	45.0	45.0	Same estimate	Electricity 1989–1990	Electricity 1989–1990	Only one estimate available
Tanzania	TZA	31.5	31.5	Same estimate	Currency demand 1989–1990	Currency demand 1989–1990	Only one estimate available
Ukraine	UKR	48.9	28.4	20.5	Electricity 1995	Electricity 1990–1993	
Uruguay	URY	35.2	35.2	Same estimate	MIMIC 1990–1993	MIMIC 1990–1993	Only one estimate available
USA	USA	13.9	10.5	3.4	Currency demand 1990–1993	Electricity 1989–1990	Currency demand: 6–10%
Uzbekistan	UZB	6.5	10.3	–3.8	Electricity 1995	Electricity 1990–1993	
Venezuela	VEN	30.8	30.0	0.8	MIMIC 1990–1993	Electricity 1989–1990	
Sri Lanka		40.0	40.0	Same estimate	Electricity 1989–1990	Electricity 1989–1990	Only one estimate available
Cyprus		21.0	21.0	Same estimate	Electricity 1989–1990	Electricity 1989–1990	Only one estimate available

<sup>a</sup> Sources: Electricity 1995 is from Johnson et al. (1997, Table 1, seventh column). Electricity 1990–1993 is from Johnson et al. (1997, Table 1), as reported in Schneider and Enste (1998, Table 3.1, first column). Electricity 1989–1990 is from Lacko (1996) as reported in Schneider and Enste (1998, Table 3.1, part 1, first column and Table 3.1, part 3, last column). MIMIC 1990–1993 is from Loayza (1996), also reported in Schneider and Enste (1998, Table 3.1, part 1, second column). Currency demand 1990–1993 is as used in Johnson et al. (1998); sources are discussed in the text of this paper. Currency demand 1989–1990 is from Schneider and Enste (1998, Table 3.1, second column). Alternative currency demand numbers are from Schneider and Enste (1998, Table 3.1, part 3, columns 2 and 3, and Table 3.2, part 2, columns 2 and 3). Tanzania currency demand estimate is from Schneider and Enste (1998, Table 3.1, part 1). Discrepancy GDP calculations, just used for Croatia, from Schneider and Enste (1998, Table 3.1, part 2).

rough measure of overall economic activity; around the world, the short-run electricity-to-GDP elasticity is usually close to one. Measured GDP by definition captures only the official part of the economy, so the difference between overall and measured GDP gives an estimate of the size of the unofficial economy. Johnson et al. (1997) make further adjustments to allow for differences in the elasticity of demand across countries. Schneider and Enste (1998) also report alternative estimates from Lacko (1996) suggesting that the unofficial economy is a bit smaller than estimated by Johnson et al. (1997).<sup>13</sup>

Our primary source of estimates for Latin America is Loayza (1996). Loayza uses the MIMIC (multiple-indicator multiple cause) approach to estimate the size of the informal sector. This statistical method infers the size of the informal sector from both the likely causes and likely effects of the underground economy.<sup>14</sup> The MIMIC method has two steps: the first estimates a relationship between observed indicator variables and underlying causes; and the second uses the link between indicator variables to infer the size of the hidden economy across countries.<sup>15</sup> Schneider and Enste (1998) report a second set of estimates based on Lacko's electricity method. As Appendix A and Table 1 show in detail, there are large differences between these estimates and Loayza's work, but the two series agree that the unofficial economy in Latin America is larger than in most OECD countries.<sup>16</sup>

Our estimates of the unofficial economy share in GDP for OECD countries were obtained primarily from two sources: Schneider (1997) and Williams and

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<sup>13</sup>Lacko's method infers the size of the shadow economy from the household consumption of electricity. For details see Schneider and Enste (1998, pp. 17–19). See also Lacko (1997a,b, 1999).

<sup>14</sup>As underlying causal variables, Loayza uses the highest statutory corporate income tax in the country, an index of government imposed restrictions on labor markets, and Political Risk Services' indices for the quality of the bureaucracy, corruption in government, and rule of law. The proxy variables serving as indicators of the unofficial economy itself (left hand side variables in the first stage of Loayza's procedure) are the rate of value-added tax evasion (Silvani and Grondolo, 1993) and the percentage of the nonagricultural labor force which does not contribute to social security (World Bank, 1995).

<sup>15</sup>The first step is maximum likelihood estimation applied to a reduced form in which the dependent variable is the set of proxy indicators and the explanatory variables are the underlying causes. The coefficients are identified by normalizing the coefficients that relate the latent variable with one of the indicators. In order to obtain estimates of the latent unofficial economy variable, the parameters from the first stage regression are used in a second 'causes' regression (Loayza, 1998). This procedure is very similar to estimating a relationship between observable proxy variables and underlying causes, and then inferring the unobservable dependent variable from its relationship to the proxy variables.

<sup>16</sup>Table 1 shows there are important differences between the estimates for some important countries, such as Chile, Mexico, Russia, and Ukraine. The relative position of some Latin American and former Soviet countries is reversed. Nevertheless, our main results are robust to our choice of data series.

Windebank (1995).<sup>17</sup> Both sources base their estimates on studies that assume the use of cash is correlated with unofficial activities. For Belgium, Germany, Spain, France, Ireland, Italy and the Netherlands we used the simple average from the Schneider (1997) and Williams and Windebank (1995). For Canada and Japan the only estimates we could find were from Bartlett (1990).<sup>18</sup> For Greece and the UK, our data are the average of the estimates by Bartlett (1990) and Williams and Windebank (1995). For Norway and Sweden we averaged estimates by Bartlett (1990) and Schneider (1997). For the United States we averaged Bartlett (1990), Schneider (1997), and the estimate by Cebula (1997).<sup>19</sup> For three countries there was only one available estimate: Portugal (Williams and Windebank, 1995), Switzerland (Schneider, 1997), and Austria (Schneider, 1997). Most of these estimates are for the early 1990s. Schneider and Enste (1998) report alternative estimates of currency demand, but the differences from our series are for the most part quite small (see Appendix A and Table 1).

For Africa and Asia our source is Schneider and Enste (1998). They draw primarily on Lacko's electricity-method, but they also add currency demand-based estimates for Tanzania and Mexico. They also review carefully the available qualitative and anecdotal evidence, and find that the quantitative estimates are reasonable.

### 3.2. Measures of policy

As measures of policy we use expert ratings of the business environment calculated by the Fraser Institute, the Heritage Foundation, Freedom House, Political Risk Services, Price Waterhouse, Flemings (the investment bank), and La Porta et al. (1998). We also use results from surveys of business people conducted by the World Economic Forum's Global Competitiveness Survey, the International Institute for Management Development (IMD), and Impulse magazine. We also use Transparency International's Corruption Perception Index.

Here we briefly review the methodology of each source and country coverage. In most cases we are not able to get exactly 69 observations. We also explain what

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<sup>17</sup>Williams and Windebank use data from Dallago (1990) and European Community (1990). Schneider (1997) uses the 'currency-demand approach', which assumes shadow transactions take place in the form of cash. The paper reports results from several authors, and when the data were not available for 1990 (i.e. Austria, Denmark, Germany, France, Ireland, Italy, Netherlands, Norway, Spain, Sweden, Switzerland, UK, USA) Schneider offers his own calculations. When a range was offered we took the average value.

<sup>18</sup>The Bartlett (1990) article does not list sources or bibliographical references.

<sup>19</sup>Cebula (1997) presents Feige's (1994) data on unreported income based on the General Currency Ration Model (GCR). This method is based on the US government's Internal Revenue Service (IRS) estimate of unreported income for 1973 as an appropriate benchmark, and it also assumes that 75% of unreported transactions are effected in cash and the rest in checkable deposits.

each index measures. The sample size and range of each variable are discussed in more detail when we present the regression results.

The Fraser Institute has measured dimensions of ‘economic freedom’ at 5-year intervals since 1975 for all the countries in our sample, except Azerbaijan, Belarus, Georgia, Kazakhstan, Moldova, and Uzbekistan (Gwarney and Lawson, 1997). We use four of their data series for 1995. Their taxation variable measures the top marginal tax rate and the income threshold at which it applies. ‘Price controls’ measures the extent to which businesses are free to set their own prices. ‘Freedom to compete’ measures the ability of businesses to compete in the marketplace. They also rate the equality of citizens under the law and access to a nondiscriminatory judiciary.

The Heritage Foundation surveys economic freedom every year. We use their ratings from the 1997, 1996 and 1995 Indices of Economic Freedom (Johnson and Sheehy, 1995, 1996; Holmes et al., 1997). Five Heritage Foundation indices are relevant for our study. ‘Taxation’ measures the tax rates on corporate profits, income, ‘and other significant activities’. ‘Regulation’ measures whether a license is required to operate a business and how easy it is to obtain such a license. It also measures whether there is corruption within the bureaucracy. The assessment includes both average and marginal rates, as well as a view of how the tax system is administered. ‘Property rights’ measures the protection of private property against the government and all forms of expropriation.

Freedom House surveys political freedom around the world every year (Karatnycky, 1996). In addition, it provided a review of ‘economic freedom’ around the world in 1996 (Messick, 1996). This freedom ranking is the sum of six different factors according to expert opinion — the freedom to own property, earn a living, operate a business, invest one’s earnings, trade internationally, and participate equally in all aspects of the market economy. In contrast to the Heritage Foundation and the Fraser Institute, Freedom House puts more weight on free trade unions, ability of firms to compete against government-linked companies, and how easily government can suspend the right to do business.<sup>20</sup>

All the countries in our basic sample are covered by the Freedom House civil liberties measure. This measure is based on expert opinion regarding the correct answers to 13 questions regarding different dimensions of civil liberties. Freedom House averages the answers to obtain an overall score.

We use two indices from Political Risk Services: their ‘law and order tradition’ index and ‘corruption’ index. Both measures are based on expert opinions, primarily obtained from qualitative data (Political Risk Services, no date, 1997).

The Global Competitiveness Survey (GCS) is a questionnaire answered by about 3500 managers in 59 countries during 1996–1997 (World Economic Forum, 1996, 1997). The respondents are local firms serving domestic market, local firms

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<sup>20</sup>Thus Singapore does very well on the Heritage Foundation and Fraser Institute measures, but much less well on the Freedom House measure.

exporting and investing abroad, and foreign firms which have made direct investment in that country. Each question asks about one aspect of the business environment and respondents provide a rating of the country on a scale of 1 (poorest rating) to 7 (perfect rating). We use data from three questions. The first asks whether government regulations impose ‘a heavy burden on business competitiveness’. The second asks respondents to rate government regulations from ‘vague and lax’ to ‘precise and fully enforced’. The third asks how common are ‘irregular, additional payments connected with import and export permits, business licenses, exchange controls, tax assessments, police protection or loan applications’.

We also use data on responses to the bribery question in the 1996 Global Competitiveness Survey. This differs from the 1997 survey through having a sample of 49 countries and fewer respondents (about 2000). The original ratings scale is from 1 to 6. Most importantly, the question asked addresses corruption more generally, while the 1997 survey asked more specifically about incidences of bribery closer to their experience.

The Transparency International (1998) index summarizes the results of a maximum of seven survey-based sources per country, of which we use one directly (as described above): Political Risk Services. The other five are surveys conducted by: Political and Economic Risk Consultancy Ltd., Hong Kong; Gallup International; DRI/McGraw-Hill Global Risk Service (two surveys); the World Competitiveness Report from IMD, and an internet survey conducted by Johann Graf Lambsdorff (1998) at Gottingen University, Germany. To be included in the Transparency International published measure, a country must have had at least four polls.

One further measure of bribery is a survey of German business people conducted in 1992–1994 by Peter Neumann and his colleagues at Impulse (a German business publication) (Neumann, 1994). Respondents were typically exporters conducting frequent business with at least one of 103 countries. We use responses to the question about the prevalence of bribes in securing contracts for a particular country. On average 10 people were interviewed for each country, with a minimum of three exporters per country.

For taxation, we use data from Price Waterhouse about the level of personal income tax rates, corporate income tax rates, the VAT (or equivalent) rate, and the social security tax rate on employees and employers (Price Waterhouse, 1997a,b). We also use data from the Institute for International Management (IMD) on the rights and responsibilities of shareholders, government transparency, and the extent to which the bureaucracy hinders business. In 1998, IMD surveyed 4314 firms in 46 countries to compile these measures (IMD, 1998). For measures of corporate governance and shareholder rights, we rely on Flemings (1998) and on La Porta et al. (1998).

### 3.3. *Instrumental variables*

Our model implies an important simultaneity between the quality of economic

institutions on the one hand and the share of the unofficial economy on the other. For example, if the model is correct, more over-regulation increases diversion of resources underground, but this diversion reduces government revenue and undermines economic institutions such as the rule of law. To deal with this issue, we use the set of instrumental variables developed by La Porta et al. (1999).

La Porta et al. (1999) have five sets of variables that can be used as instruments. La Porta et al. (1999, Table 2) use these variables to explain institutional development. We use their independent variables in our first stage regression (i.e. as instruments).

Firstly, they measure ethnolinguistic fractionalization. Secondly, they report the share of each country's population that is Catholic, Muslim, Protestant or other. These fractions sum to 100, and we follow La Porta et al. (1998) in using the Protestant proportion as our base category. Thirdly, they calculate the origin of commercial laws. There are five possible origins: English, French, Scandinavian, German, and socialist. La Porta et al. (1998) code five dummy variables, each of which equals one if a country belongs to a particular legal system and zero otherwise. Every country belongs to at least one system. We use the English system as our base case.<sup>21</sup> The final instrument is the geographical location of countries, as measured by the absolute value of countries' latitudes.

#### **4. Results**

To make our results easier to understand, in the main text we present a summary of our results and some key robustness tests. Appendix B presents regressions using alternative independent variables and also a more complete set of robustness checks, including instrumental variables estimation. We summarize these results in the main text but look in detail only at one variable representing each of the four categories of independent variable: tax rates, over-regulation, legal environment, and corruption.

Table 2 reports OLS results for one variable representing each category of independent variable. It also shows the effects of dropping the MIMIC data from Loayza (1996). We also show the effects of running the same regression just for three regions: Latin America, OECD, and transition countries. The Latin American data are primarily from the MIMIC method, the OECD data are primarily from currency demand estimates, and the transition countries' data are primarily from electricity data. These regional regressions are therefore also checks on the effects of using different methodologies. We unfortunately do not have enough data on Africa or Asia to run separate regressions for those regions.

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<sup>21</sup>We use legal origin only as an instrument in this paper. We are therefore just concerned that it be exogenous with respect to the unofficial economy in the 1990s. We are not concerned here with exactly how legal origin came about or what it really represents.

Table 2  
Summary results<sup>a</sup>

	Independent variables		Regional regressions			Interpretation
	OLS coefficient	Regression without the MIMIC data	Latin America	OECD	Transition	
<b>Tax rates</b>						
Heritage Foundation 1997						
Coefficient	-9.1*	-7.4*	-9.1	-0.6	-4.8	Higher tax rates correlated with smaller unofficial economy but not in the regional regressions
S.E.	(2.5)	(2.9)	(7.7)	(2.6)	(6.1)	
No. of observations	64	50	15	20	15	
<b>Over-regulation</b>						
Heritage Foundation 1997						
Coefficient	12.0*	10.8*	12.5*	3.7*	11.9*	More over-regulation correlated with larger unofficial economy in all regressions
S.E.	(2.4)	(2.8)	(4.8)	(2.3)	(4.3)	
No. of observations	64	50	15	20	15	
<b>Legal system</b>						
Fraser Institute 1995						
Coefficient	-3.9*	-4.1*	-2.4	-1.6*	-3.2	Better legal system correlated with lower unofficial economy but not in transition and Latin American countries alone
S.E.	(0.5)	(0.6)	(1.7)	(0.7)	(3.0)	
No. of observations	61	48	15	20	11	
<b>Corruption</b>						
ICRG Corruption Index 1990s						
Coefficient	-9.7*	-5.5*	-9.5**	-3.4*	-8.9	Less corruption correlated with lower unofficial economy except in transition countries
S.E.	(1.3)	(1.5)	(4.7)	(1.6)	(8.3)	
No. of observations	42	28	15	20	7	

<sup>a</sup> Dependent variable is the share of the unofficial economy (share1 from Table 1).

\*Denotes significance at 5% level.

\*\*Denotes significance at 10% level.



#### 4.1. Tax rates

We have information on eight measures of tax rates from three independent sources. The full set of unofficial economy regressions using this data are in Table 4.

Here we focus on the Heritage Foundation measure of 1997 tax rates, in which a higher score (on a scale of 1 to 5) means more onerous taxation, i.e. higher average and marginal tax rates.<sup>22</sup> Note that OECD countries typically have a score that is *higher* than that for transition economies and for Latin America. For example, in 1997 the US scores 3.5, UK scores 4, and Italy scores 5, while among the transition economies Georgia scores 2.5, Russia scores 3.5, and Ukraine scores 4.5 and in Latin America, Brazil scores 2.5 and Argentina scores 3.5. In other words, according to this measure the US has higher marginal and average tax rates than does Russia. Tables 2 and 4 show that this measure of taxation is significant in 1997 (and in 1995). However, higher tax rates are correlated with a lower share of the unofficial economy. Raising taxation by one point, according to this measure, implies that the share of the unofficial economy falls by 9.1%. Controlling for log GDP per capita reduces the coefficient by about half in all 3 years but it remains significant (see Table 4). In the instrumental variables regression (Table 4), the coefficient on the taxation variable is negative and significant (except when we control for log income in 1997).

Table 2 shows that dropping the MIMIC data does not change the finding that higher tax rates are correlated with a small unofficial economy — the coefficient in the regression (second column of Table 2) falls to  $-7.4$  but remains significant at the 5% level. However, the tax rate variable is not significant in any of the three regional regressions. This may be due to insufficient observations, but it is also possible that the tax rate result in the main regression is caused by cross-region (and cross-methodology) variation.

Summarizing the complete results in Appendix B, higher tax rates are generally correlated with a *lower* share of the unofficial economy. This is true if we use tax rates directly or if we use an index representing the effective tax burden. Richer countries have both higher tax rates and a smaller unofficial economy. Across the countries in our sample, the incentive to go underground to dodge higher tax rates is outweighed by the benefits of remaining official when tax rates are higher. This is probably because, at least for this set of countries, higher tax rates generate revenue that provides productivity enhancing public goods and a strong legal environment.<sup>23</sup>

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<sup>22</sup>This index is an average of income taxes and corporate taxes, adjusted for other taxes such as value-added taxes, sales taxes, and state and local taxes. They analyze both the top income tax rate and the rate that applies to the average taxpayer.

<sup>23</sup>The last two rows of Table 4 show the effects of introducing 'law and order' (representing the level of public goods provision) into the taxation regressions. Any tax variable that is significant in the OLS regression using the same sample becomes insignificant when we introduce this control for the legal environment.

#### 4.2. Over-regulation

The Heritage Foundation's measure of over-regulation is higher, on a scale of 1 to 5, for countries that have regulations that are worse for business. We use this index for 1995 (Table 5) and also for 1997 (in Table 2). In 1995, the Czech Republic and Britain have the best score — they are the only countries in our sample to get a perfect 1. Most OECD countries score 2. A number of East European and Latin American countries score 4 (out of a possible 5). Table 2 shows that a one-point increase in this index is associated with a 12.0% increase in 1997. Table 5 shows that controlling for log GDP per capita reduces the coefficient on the over-regulation variable, to 6.2 in 1995 and to 4.7 in 1997, but in both cases it remains significant (although only at the 10% level in 1997). The over-regulation indices for 1995 and 1997 are also significant in the instrumental variable regressions (Table 5).

Again Table 2 shows that dropping the MIMIC data does not change this result substantially — the coefficient falls to 10.8 and stays significant at the 5% level. The over-regulation variable is also significant in all three of the regional regressions, even though we only have 15 observations for both Latin America and the transition countries.

Summarizing the results in the appendix, every available measure of over-regulation is significantly correlated with the share of the unofficial economy and the sign of the relationship is unambiguous: more over-regulation is correlated with a larger unofficial economy.<sup>24</sup> For all but one of our variables, the coefficient in our basic instrumental variables regression is also significant. For six out of our nine measures, the correlation is significant even once we control for log per capita income. Overall, this is strong evidence that, across countries, more over-regulation is associated with more unofficial activity.

It is important to point out the difference between regulation and over-regulation. The measures we are using, such as that of Freedom House, explicitly focus on the 'pro-business' character of the state and thus include strong rules with respect to the preservation of property rights and contract enforcement.<sup>25</sup> We find that more over-regulation is correlated with more unofficial activity.

This does not imply that sensible regulation, for example concerning pollution or health and safety at work, necessarily are associated with more unofficial activity. At present, we do not have sufficient data to test this point thoroughly, but the anecdotal evidence suggests that many such regulations can be productivity-enhancing when implemented in a sensible manner. This is a topic for further research.

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<sup>24</sup>When we drop the MIMIC data from Loayza (1996), eight out of nine of these measures remain significant. The exception is IMD's measure of whether the bureaucracy is a hindrance to business (see Table 5).

<sup>25</sup>We are grateful to a referee for making this distinction clear to us.

### 4.3. Legal environment

In the Fraser Institute measure of ‘Equality of Citizens under the Law and Access of Citizens to a Non-Discriminatory Judiciary’, a higher score means a ‘better’ legal system, on a scale of 0 to 10.<sup>26</sup> We have this data for 61 countries in our sample. Only Belgium, Holland, Sweden, Norway, Denmark and Switzerland get the top score of 10. Italy, UK and USA score 7.5. Russia scores 2.5 and Brazil scores 0. Table 2 shows that a one-point increase in this index (i.e. an improvement in the legal system) implies a 3.9 percentage point fall in the unofficial economy’s share of total GDP. Controlling for log GDP per capita reduces the coefficient to 2.4 but it remains significant at the 5% level (Table 6). This variable is significant in the basic instrumental variables regression, but not once we control for income.

Dropping the MIMIC data actually increases the coefficient to  $-4.1$  (Table 2). The legal system variable is not significant in the Latin America or transition regressions, but it is significant in the OECD regression.

In summary, the results in the appendix show a weaker legal environment is strongly correlated with a larger share of the unofficial economy in GDP. All five of our legal environment measures are significant in the basic OLS and IV regressions and three of them remain significant when we control for log GDP per capita in both the OLS and IV cases. The results for shareholder rights are much weaker: two out of three measures are significant, although only at the 10% level, and only one is significant in an IV regression. Creditor rights do not appear to be significantly correlated with the unofficial economy, although it is just possible that stronger creditor rights might be associated with a larger unofficial economy.

### 4.4. Corruption

The Political Risk Services index for the 1990s has data on 42 countries. This index runs from 1 to 6, with a higher score still representing less corruption, and in this case the most corruption is reported to be in Paraguay, followed closely by several other Latin American countries. A one-point increase in this index is correlated with a 9.7% fall in the share of the unofficial economy. Controlling for log GDP per capita reduces the coefficient to 6.4, but it remains significant at the 5% level; the  $R^2$  rises from 0.6 to 0.64. In this case, the variable is significant in both the IV regressions.

Dropping the MIMIC data reduces the coefficient to  $-5.5$  but it remains significant at the 5% level (Table 2). This corruption variable is significant in both

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<sup>26</sup>The questions asked are: are citizens equal under the law, with access to an independent, nondiscriminatory judiciary and are they respected by the security forces? The original source is Freedom House, *Survey of Political Rights and Civil Liberties* 1995–96, item 5 on their checklist of 13 civil liberties, with some adjustments.

Table 3  
Regression of tax revenues on taxation, regulation, legal environment, and corruption<sup>a</sup>

Independent variable	Dependent variable									
	Revenue/ official GDP	Revenue/ total GDP	Revenue/ official GDP	Revenue/ total GDP	Revenue/ official GDP	Revenue/ total GDP	Revenue/ official GDP	Revenue/ total GDP	Revenue/ official GDP	Revenue/ total GDP
Log GDP per capita	-0.7 (1.3)	1.1 (1.3)	1.4 (1.5)	2.2 (1.4)	0.9 (1.9)	1.6 (1.9)	-0.14 (2.5)	0.05 (2.4)	-2 (1.6)	-1.7 (1.2)
Taxation										
Heritage Foundation measure of taxation (higher value of index means higher taxes)										
	8.0*	8.6*	8*	7.1*						
	(1.5)	(1.9)	(1.6)	(1.9)						
Regulation										
Heritage foundation (higher value of index means more regulation)										
Regulatory burden										
in 1997:			-5.4*	-4.1	-7*	-5.1*				
			(2.1)	(2.5)	(2.0)	(2.3)				



the Latin American (at the 10% level) and OECD (at the 5% level) regressions. It is not, however, significant for transition countries, probably because this regression only has seven observations.

In summary, the relationship between share of the unofficial economy and rule of law (including corruption) is strong and consistent across eight measures provided by six distinct organizations. Results from all eight of the indices shown in Table 7 suggest that countries with more corruption have a higher share of the unofficial economy. This is true for five of the indices even when we control for income level, for eight of the indices in the basic IV regression, and for three of the indices in the IV regression that also controls for income.

#### 4.5. Public finance

According to our model, higher tax rates could be correlated with either higher or lower government revenue. However, there is an unambiguous prediction for the other three variables. Higher government revenue as a percent of GDP should be correlated with less over-regulation, less corruption, and stronger legal institutions.

Table 3 shows regressions for two measures of tax revenue: as a percent of official GDP and as a percent of total (official plus unofficial) GDP. As right-hand side variables, we use one index for each of our four categories, taxation, over-regulation, legal environment, corruption. We also report results from using the share of the unofficial economy as a regressor. We run each regression with and without controlling for log GDP per capita.

The first four columns show that higher tax rates are actually correlated with higher tax revenues in all specifications. A one-point increase in this taxation index is associated with between 7 and 8.6 percentage point increase in revenue as a percent of GDP. In terms of our model, this suggests that across countries the indirect effect of tax rates on the unofficial economy dominates the direct effect, i.e. higher tax rates can generate revenue that improves the legal environment enough to encourage activity to stay in the official sector. We would caution, however, that this does not mean that raising tax rates in any one country would necessarily increase revenue and reduce unofficial activity.

The remaining columns show that more over-regulation, a weaker legal environment, more corruption, and a larger unofficial economy are all associated with less government revenue. The results are a little weaker when we control for log GDP per capita, and the corruption variable is not significant at all in this case, but most of the coefficients are robust. The unofficial economy variable is significant in all four specifications, implying that a one point increase in the share of the unofficial economy means a fall in tax revenue as a percent of official GDP from 0.3 to 0.5% and as a percent of total GDP from 0.5 to 0.6%.

These results further support our view that weak institutions, but not high tax rates, undermine the government's ability to collect tax revenue. Although our evidence is cross-country rather than time series, it strongly suggests that firms

going underground leads to lower government revenue, and that this in turn reduces the quality of important institutions and thus increases the incentive to go underground.

Why is bad government also small government (La Porta et al., 1999)? We suggest the answer lies first and foremost with the ability of firms everywhere to go underground. Going underground undermines government revenue and reduces the provision of public goods that are important for production in the official sector. In turn this reduces the incentive for entrepreneurs and managers to keep their activities in the official, taxable sector.

## 5. Conclusion

Higher marginal tax rates do not appear to be associated with a larger unofficial economy. Discretion in the application of rules, and the corruption that this produces, seems to have a more important effect. We find smaller unofficial sectors in countries with a lower regulatory ‘burden’ on enterprise, less corruption, a better rule of law, and higher tax revenue.

Both over-regulation and corruption amount to a higher effective tax on official activity and therefore induce firms to move into the unofficial economy. Moving to the unofficial economy undermines public finance and further weakens the ability of the state to protect property rights (particularly from lower level officials).

This does not imply that regulation per se drives activity underground. In fact, it is quite possible that sensible regulations, for example on health and safety at work, contribute to higher productivity. Unfortunately, in much of the world over-regulation by bureaucrats is a serious problem. In addition to producing corruption and distortion, our results strongly suggest that over-regulation drives business underground and thus undermines government revenue and the sensible provision of productivity-enhancing public goods.

In principle, higher tax rates could be an important reason for firms to move into the unofficial economy. In our sample, however, it appears that higher tax rates are associated with more tax revenue, a stronger legal environment, and *less* unofficial activity. We would caution, however, that a great deal depends on how the tax system is administered. Russia is a leading example of a country that has moderate statutory tax rates but a corrupt system of tax administration. The way the Russian tax system is run means that there is a heavy burden on firms and many of them choose to go underground.

## Acknowledgements

We thank Norman Loayza, Friedrich Schneider, Andrei Shleifer, and a referee for helpful suggestions. Simon Johnson gratefully acknowledges support from the MIT Entrepreneurship Center. Authors are responsible for the paper’s views,





Part 2

Log GDP per capita

-9.0*	-9.5*	-9.3*	-8.7*	-8.0*
(1.2)	(1.4)	(1.5)	(1.7)	(1.8)

Average log GNP per capita 1970–1995

-9.1*	-12.6*	-11.6*	-11.4*	-12.1*
(1.5)	(1.8)	(1.5)	(1.8)	(2.1)

Income tax rate (PW) -0.4\* 0.02 -0.9\* -0.2 lower value means lower taxes (this is not an index)

(0.2)	(0.1)	(0.3)	(0.2)
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Corporate tax rate (PW) -0.4 -0.13 -1.3 0.4 lower value means lower taxes (this is not an index)

(0.4)	(0.3)	(0.9)	(0.6)
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VAT tax rate (PW) -0.5 -0.57\*\*\* -1.1\*\* -0.74\* lower value means lower taxes (this is not an index)

(0.5)	(0.34)	(0.6)	(0.3)
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Employee social security tax rate (PW) -0.91\* -0.19 -1.3\* -0.04 lower value means lower taxes

(0.4)	(0.3)	(0.5)	(0.4)
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Employer social security tax rate (PW) 0.3 -0.001 0.2 -0.2 lower value means lower taxes

(0.2)	(0.17)	(0.2)	(0.2)
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$R^2$	0.11	0.66	0.01	0.74	0.02	0.54	0	0.63	0.02	0.49	0.04	0.68	0.15	0.53	0.07	0.66	0.07	0.41	0.04	0.56
No. of observations	36	36	29	29	43	43	35	35	48	48	35	35	37	37	31	31	38	38	29	29

	Coeff.	S.E.	$R^2$	Obs	Coeff.	S.E.	$R^2$	Obs	Coeff.	S.E.	$R^2$	Obs	Coeff.	S.E.	$R^2$	Obs	Coeff.	S.E.	$R^2$	Obs
Dropping MIMIC data	-0.2	(0.3)	0.03	27	-0.04	(0.3)	0.001	29	0.6	(0.6)	0.04	34	-0.6**	(0.3)	0.15	25	0.5*	(0.2)	0.25	30
Using alternative unofficial estimate	-0.2	(0.2)	0.04	36	-0.5	(0.3)	0.08	43	-0.4	(0.3)	0.03	48	-0.7*	(0.3)	0.16	37	0.1	(0.1)	0.02	38
	Coeff.	S.E.	Adjust. $R^2$	Obs	Coeff.	S.E.	Adjust. $R^2$	Obs	Coeff.	S.E.	Adjust. $R^2$	Obs	Coeff.	S.E.	Adjust. $R^2$	Obs	Coeff.	S.E.	Adjust. $R^2$	Obs
with rule of law on right-hand side	-0.02	(0.1)	0.7	32	-0.13	(0.2)	0.76	38	-0.15	(0.2)	0.76	38	-0.11	0.2	0.73	34	0.12	(0.1)	0.69	32
without rule of law (same sample)	-0.46*	(0.2)	0.12	32	-0.37	0.4	0	38	-0.73	0.5	0.04	38	-0.87*	0.4	0.14	34	0.24	(0.2)	0.01	32

<sup>a</sup> Standard errors are in parentheses.

\* Denotes significant at 5% level.

\*\* Denotes significant at 10% level.

\*\*\* Denotes significant at 11% level.

Table 5  
Regressions of unofficial economy (as % of GDP) on measures of regulation<sup>a</sup>

Independent variable	Dependent variable: unofficial economy (share1)																			
	OLS	OLS	IV	IV	OLS	OLS	IV	IV	OLS	OLS	IV	IV	OLS	OLS	IV	IV	OLS	OLS	IV	IV
Part 1																				
Log GDP per capita		-6.9*				-8.2*				-11.2*				-8.5*				-8.2*		
		(1.8)				(1.5)				(1.9)				(1.4)				(1.7)		
Average log GNP per capita 1970–1995				-5.8				-14*					-13.2*				-9.9*			-11.9*
				(3.7)				(2.3)					(1.8)				(1.5)			(1.8)
Regulation																				
Heritage Foundation	(higher value of index means more regulation)																			
Regulatory burden in 1995	10.9*	6.2*	20.0*	11.7*																
	(2.4)	(2.4)	(4.3)	(6.3)																
Heritage Foundation	(higher value of index means more regulation)																			
Regulatory burden in 1997				12.6*		4.7**	17.4*	-4.3												
				(2.4)		(2.5)	(4.0)	(4.7)												
IMD	(higher value of index means less regulation)																			
Bureaucracy is hindrance to business									-2.8*	0.66	-2.5	1.9								
									(1.4)	(1.1)	(1.7)	(1.3)								
WEF	(higher value of index means less regulation)																			
Regulatory burden													-7.7*	-3.5**	-11.0*	-2.3				
													(2.5)	(1.9)	(3.3)	(2.4)				
WEF	(higher value of index means less regulation)																			
Management time with bureaucrats																	-9.8*	-3.1	-10.8*	3.5
																	(2.5)	(2.4)	(3.9)	(3.3)
R <sup>2</sup>	0.36	0.54	0.13	0.5	0.31	0.53	0.24	0.57	0.1	0.56	0.09	0.62	0.22	0.62	0.18	0.72	0.31	0.6	0.18	0.68
No. of observations	40	40	33	33	62	62	50	50	37	37	35	35	36	36	32	32	36	36	32	32
	Coeff.	S.E.	R <sup>2</sup>	Obs	Coeff.	S.E.	R <sup>2</sup>	Obs	Coeff.	S.E.	R <sup>2</sup>	Obs	Coeff.	S.E.	R <sup>2</sup>	Obs	coeff.	S.E.	R <sup>2</sup>	Obs
Dropping MIMIC data	7.2*	(2.6)	0.25	26	10.8*	(2.8)	0.24	50	-2.3	(1.6)	0.07	31	-4.6*	-2.5	0.12	26	-8.9*	(1.4)	0.6	26
Using alternative unofficial estimate	8.4*	(2.0)	0.33	40	8.9*	(2.1)	0.22	64	-2.2	(1.3)	0.08	37	-5.4	(2.1)	0.16	36	-4.5	(2.4)	0.1	36

Part 2																	
Log GDP per capita																	
Average log GNP per capita 1970–1995																	
Freedom House	(higher value of index means less regulation)																
Economic freedom:																	
Fraser Institute	(higher value of index means less regulation)																
Freedom from price controls:																	
Fraser Institute	(higher value of index means less regulation)																
Freedom to compete:																	
Heritage Foundation	(higher value of index means more regulation)																
$R^2$																	
No. of observations																	
Dropping MIMIC																	
data																	
Using alternative																	
unofficial estimate																	

<sup>a</sup> Standard errors are in parentheses.

\* Denotes significant at 5% level.

\*\* Denotes significant at 10% level.

Table 6  
Regressions of unofficial economy (as % of GDP) on measures of legal environment<sup>a</sup>

Independent variable	Dependent variable: unofficial economy (share 1)																							
	OLS	OLS	IV	IV	OLS	OLS	IV	IV	OLS	OLS	IV	IV	OLS	OLS	IV	IV								
Part 1																								
Log GDP per capita	-6.1*				-5.8*				-12.4*				-1.6				-9.7*							
	(1.8)				(1.5)				(1.7)				(1.6)				(2.1)							
Average log GNP per capita 1970–1995			-8				-9.7*				-20.5				-1				-13.4*					
			(2.3)				(2.4)				(3.3)				(3.3)				(3.0)					
Legal system																								
Freedom House	(higher index means worse civil liberties)																							
Civil liberties:	7.4*	3.7*	10.3*	4.3*																				
	(1.1)	(1.5)	(1.3)	(2.1)																				
Fraser Institute	(higher index means better rule of law)																							
Law and judiciary:			-3.9*		-2.4*		-4.5*		-1.1															
			(0.5)		(0.6)		(0.6)		(1.0)															
LLSV	(higher index means more efficient judiciary)																							
Efficiency of judiciary:									-6.6*		-0.96		-7.6*		4.3**									
									(1.2)		(1.1)		(1.4)		(2.2)									
PRS	(higher index means better law and order)																							
Law and order:											-10.2*		-9.1*		-10.4*		-9.6*							
											(0.9)		(1.5)		(1.0)		(2.9)							
Heritage Foundation	(higher index means less property rights)																							
Property rights:																	11.0*		0.4		16.8*		-1.9	
																	(2.1)		(2.9)		(3.0)		(4.7)	
R <sup>2</sup>	0.41	0.5	0.58	0.68	0.49	0.6	0.51	0.65	0.45	0.79	0.44	0.69	0.76	0.77	0.76	0.76	0.32	0.51	0.3	0.62				
No. of observations	67	67	53	53	61	61	53	53	38	38	38	38	42	42	39	39	62	62	50	50				
	Coeff.	S.E.	R <sup>2</sup>	Obs	Coeff.	S.E.	R <sup>2</sup>	Obs	Coeff.	S.E.	R <sup>2</sup>	Obs	Coeff.	S.E.	R <sup>2</sup>	Obs	Coeff.	S.E.	R <sup>2</sup>	Obs				
Dropping MIMIC data	7.0*	(1.1)	0.44	54	-4.1*	(0.6)	0.51	48	-7.2*	(1.4)	0.48	30	-10.0*	(1.7)	0.57	28	10.1*	(2.3)	0.3	49				
Using alternative unofficial estimate	5.4*	(1.0)	0.32	68	-3.2*	(0.5)	0.45	62	-6.0*	(1.1)	0.45	39	-8.0*	(0.9)	0.68	42	6.4*	(1.9)	0.16	63				

Part 2

Log GDP per capita	-10.5*				-11.3*				-13.3*				-13.6*			
	(1.7)				(3.4)				(1.2)				(1.2)			
Average log GNP per capita 1970–1995					-12.4*								-14.9*			
					(1.7)								(1.5)			
Protection of shareholders and creditors																
IMD	(higher index means more rights of shareholders)															
Rights of shareholders:	-3.5**	-0.4	-2.6	1.6												
	(2)	(1.5)	(2.5)	(1.7)												
Flemings	(higher index means stronger corporate governance)															
Corporate Gov:					-7.6	-7.8**	-8.9	-8.1*								
					(5.3)	(4.1)	(5.9)	(3.6)								
LLSV	(higher index means more anti-director rights)															
Anti-director rights:									-3.2	-1.5	-2.4	1.2				
									(2.4)	(1.1)	(4.1)	(2.2)				
LLSV	(higher index means more creditor rights)															
Creditor rights:													1.9	1.3	5.4	4.5*
													(2.4)	(1.1)	(3.5)	(1.8)
$R^2$	0.08	0.56	0.06	0.64	0.12	0.51	0.21	0.73	0.05	0.79	0.57	0.74	0.02	0.8	n.a.	0.73
No. of observations	37	37	35	35	17	17	15	15	38	38	38	38	37	37	37	37
	Coeff.		S.E.		$R^2$		Obs		Coeff.		S.E.		$R^2$		Obs	
Dropping MIMIC data	-3.3	(2.2)	0.7	31	-6.7	(6.2)	0.1	13	-3.2	(2.9)	0.04	30	5.3**	(2.8)	0.11	30
Using alternative unofficial estimate	-3	(1.8)	0.07	37	-4.5	(5.3)	0.05	17	-3.2	(2.1)	0.06	39	2.5	(2.1)	0.04	38

<sup>a</sup> Standard errors are in parentheses.

\* Denotes significant at 5% level.

\*\* Denotes significant at 10% level.

**Table 7**  
**Regression of unofficial economy on measures of corruption<sup>a</sup>**

Independent variable	Dependent variable: unofficial economy (share I)																		
	OLS	OLS	IV	OLS	OLS	IV	IV	OLS	OLS	IV	IV	OLS	OLS	IV	IV	IV			
<b>Part I</b>																			
Log GDP per capita	-10.3*	(1.8)		-11.7*	(2.7)			-4.4*	(2.0)			-6.6*	(2.2)			-7.6*	(2.3)		
Average log GNP per capita 1970–1995			-13.2*	(1.9)		-23.8	(6.9)			-4.5	(3.3)			-13.7*	(3.5)		-11.4*	(2.8)	
IMD: transparency of government	(higher index means more transparent)																		
	-4.1*	(1.6)	-0.5	(1.3)	-4.1*	(2.0)	(1.6)												
PRS: corruption 1985–1995	(higher index means less corrupt)																		
			-7.2*	(0.8)	-1.2	(1.6)	-7.7*	(3.8)	5.1										
ICRG Corruption Index	(higher index means less corrupt)																		
								-9.7*	(1.3)	-6.4*	(1.9)	-11.2*	(1.4)	-7.3*	(3.2)				
Transparency International	(higher index means less corrupt)																		
										-5.0*	(0.7)	-2.0**	(1.2)	-5.6*	(1.9)	1.1			
WEF: regulatory discretion	(higher index means less regulatory discretion)																		
																-8.7*	(1.6)	-2.5	(2.3)
<i>R</i> <sup>2</sup>	0.16	0.56	0.14	0.62	0.67	0.78	0.67	0.69	0.6	0.64	0.6	0.68	0.47	0.54	0.5	0.6	0.46	0.6	0.69
No. of observations	37	37	35	38	38	38	38	38	42	42	39	39	39	59	52	52	36	36	32
	Coeff.	S.E.	<i>R</i> <sup>2</sup>	Obs	Coeff.	S.E.	<i>R</i> <sup>2</sup>	Obs	Coeff.	S.E.	<i>R</i> <sup>2</sup>	Obs	Coeff.	S.E.	<i>R</i> <sup>2</sup>	Obs	Coeff.	S.E.	<i>R</i> <sup>2</sup>
Dropping MIMIC data																			
Using alternative unofficial estimate																			
	-4.3*	(1.8)	0.16	31	-8.4*	(0.9)	0.78	30	-5.5*	(1.5)	0.34	28	-5.0*	(0.8)	0.47	46	-7.2*	(1.3)	0.57
	-3.7*	(1.4)	0.16	37	-6.4*	(0.7)	0.67	39	-7.7*	(1.1)	0.55	42	-3.8*	(0.7)	0.34	36	-5.9*	(1.5)	0.3

Part 2																																																																				
Log GDP per capita					-6*								-6.5*								-5.3*																																															
					(2.4)								(2.1)								(1.9)																																															
Average log GNP per capita 1970–1995									-7.6*								-6.4*								-4.6																																											
									(3.2)								(2.4)								(3.7)																																											
WEF: bribery in 1997	(higher index means less bribery)																																																																			
					-7.6*				-3.5**				-8.7*				-2.8																																																			
					(1.2)				(2.0)				(1.3)				(2.7)																																																			
WEF: bribery in 1996	(higher index means less bribery)																																																																			
					-4.7*				-2.2**				-5.6*				-2.8*																																																			
					(0.9)				(1.1)				(1.1)				(1.4)																																																			
Neumann Foundation: corruption	(higher index means more corrupt)																																																																			
													1.9*				1.1*				2.3*				1.4**																																											
													(0.33)				(0.4)				(0.33)				(0.8)																																											
Impulse's	(higher index means more corrupt)																																																																			
Exporter Bribery Index																									7.2*				4.0*				8.3*				4.9***																															
																													(1.2)				(1.6)				(1.2)				(2.9)																											
$R^2$					0.54				0.62				0.55				0.71				0.49				0.62				0.45				0.65				0.42				0.51				0.53				0.65				0.42				0.51				0.53				0.66			
No. of observations					36				36				32				32				30				30				28				28				48				48				36				36				48				48				36				36			
					Coeff.				S.E.				$R^2$				Obs				Coeff.				S.E.				$R^2$				Obs				Coeff.				S.E.				$R^2$				Obs																			
Dropping MIMIC data					-6.3*				(1.3)				0.51				26				-3.8*				(0.7)				0.57				23				1.8*				(0.4)				0.34				37				6.5*				(1.5)				0.34				37			
Using alternative unofficial estimate					-5.6*				(1.1)				0.43				36				-3.0*				(0.8)				0.33				30				12*				(0.3)				0.32				48				4.4				(0.9)				0.32				48			

<sup>a</sup> Standard errors are in parentheses.

\* Denotes significant at 5% level.

\*\* Denotes significant at 10% level.

\*\*\* Denotes significant at 11% level.

errors and omissions; in particular we would stress that the views expressed here are those of the authors alone.

## Appendix A. Unofficial economy estimates

Our baseline estimates (denoted share1 in Table 1) are the same as those used in Johnson et al. (1998) and use three sets of sources. For developed countries, we use estimates based on currency demand 1990–1993 (explained in the text above); for transition countries, we use the Johnson et al. (1997) estimates for 1995; and for Latin America we use the MIMIC estimates for 1990–1993 from Loayza (1996). For share1 we supplement this information for Asia and Africa with estimates using Lacko's (1996) electricity method, as reported in Schneider and Enste (1998).

Our alternative estimates (denoted share2 in Table 1) are picked to be higher for countries with good regulatory systems and lower for countries with bad regulatory systems (i.e. more over-regulation). However, rather than changing individual values on an ad hoc basis, we instead use alternative sets of estimates. For Latin America, where available we use the electricity-based estimates rather than the MIMIC estimates. For transition economies, we use electricity-based estimates for 1990–1993 rather than for 1995.<sup>27</sup> For most developed countries we use the electricity-based method for 1989–1990 (from Lacko (1996), as reported in Schneider and Enste (1998)), rather than currency demand estimates.

### A.1. Consistency of estimates

Multiple estimates based on currency demand are available for most developed countries. As Table 1 shows, these agree quite closely for most countries.

Electricity-based estimates, using the Lacko (1996), method are also available for most developed countries. In most cases these numbers are similar to the currency demand-based estimates. The largest differences are for Sweden and Spain. For Sweden the electricity estimate is 10.8%, while for currency demand for 1989–1990 it is 17% (although for currency demand 1990–1993 it is 10.6%). For Spain the electricity estimate is 23.9%, while for currency demand 1990–1993 it is 17.3% (but for currency demand 1996–1997 the estimate is 23%).

For nine Latin American countries there are both MIMIC and electricity-based estimates available. The average difference between these estimates is 12.6 percentage points. In four cases the electricity based estimate is higher

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<sup>27</sup>Schneider and Enste (1998) report 1989–1990 and 1990–1993 averages from Johnson et al. (1997). The 1989–1990 numbers are low because communism still existed in most of these countries. For the former Soviet Union, the 1990–1993 estimates are also low relative to what happened later, but they provide a reasonable lower bound.



(Guatemala, Mexico, Costa Rica, and Chile), and in five cases the MIMIC estimate is higher (Panama, Peru, Brazil, Colombia, and Venezuela). The largest difference is for Panama, where the MIMIC estimate of 62.1% is 22.1 percentage points higher than the electricity-based estimate, and the smallest difference is for Venezuela where MIMIC gives 30.8% and the electricity method gives 30.0%.

No currency demand-based estimates are available for Australia, Finland, the transition economies, or any developing countries (except Tanzania and Mexico). For 15 countries we only have a single estimate based on the electricity-method of Lacko (1996) and for 18 transition countries we only have estimates for 1989–1995 from Johnson et al. (1997). However, as Schneider and Enste (1998) discuss in detail, these estimates fit well with the available single country and anecdotal evidence.

## **Appendix B. Alternative measures of independent variables**

In order to make it easier to check our results, we have kept the original signs on variables. The reader should be careful because organizations' ratings differ in whether a high numerical value corresponds to 'better' policies for business and private investment (i.e. less over-regulation or lower taxation). To help understand the scaling for each variable, in addition to the regression results we report individual highest and lowest scores in our sample, as well as the numbers for particularly noteworthy individual cases (Tables 4–7)

More discussion of these regression results was in our unpublished working paper and is available from the authors.

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