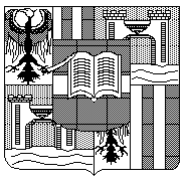

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The Influence of Direct Democracy on the Shadow Economy

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The Influence of Direct Democracy on the Shadow Economy

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Abstract

We analyze, both theoretically and empirically, the influence of direct democratic institutions on the size and development of shadow economies. Our model suggests that, as the extent of direct democracy increases, implemented fiscal policies more nearly reflect the preferences of citizens and so reduce their incentives to operate in the informal sector. This theory implies a negative relationship between the extent of direct democracy and the size of the country's shadow economy. We also theorize that direct democracy has a greater effect in reducing the informal sector when the former is at low or intermediate values and when the electoral system is characterized by a larger district magnitude. An empirical investigation of a sample of 57 democracies confirms our model's predictions.

JEL: O17, P16, H11, H26

Keywords: shadow economy, direct democratic institutions, district magnitude, good governance

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1. Introduction

There is a wide-ranging theoretical and empirical literature that analyzes the link between (various forms of) institutions and economic outcomes. This literature can be divided along two dimensions, one of which is the *types* of institutions and economic outcomes considered. Some authors (Acemoglu et al. 2001) have focused on how a broad set of institutions affect economic development, whereas others (Persson and Tabellini 2003) have concentrated on the effects of specific institutions (e.g., electoral rules and forms of government) on certain fiscal policy outcomes. The other dimension explored in the literature is the direction of *causality* between institutions and economic outcomes. With respect to one of the most important and robust relationships—namely, the link between income and democracy—some authors (e.g., Acemoglu et al. 2005) argue that institutions cause economic growth while others (e.g., Borooah and Paldam 2007; Paldam and Gundlach 2008) conclude that causality runs in the opposite direction and thus it is higher income that leads to more democracy.

This paper belongs to that strand of the literature focusing on how a specific institution affects a certain economic outcome. In particular, our work is a first attempt to analyze theoretically and empirically the influence of direct democratic institutions on the size and development of the informal sector or so-called shadow economy.

Our starting point is that the development of the informal sector can be viewed as a consequence of the failure of public institutions to support an efficient market economy through appropriate provision of public goods and services. This scenario can arise when the government is either wasteful or corrupt but still exerts considerable discretionary power over resource allocation. Citizens who feel overburdened by the state will choose the "exit option" and decide to work in the informal sector as a reaction to inefficient government (Schneider and Enste 2002). Direct democratic institutions provide citizens with the "voice option" over government performance. Such institutions have the potential to constrain, both directly and indirectly, the ability of politicians to extract rents from public spending; hence they can serve as a viable correction mechanism for governments that have demonstrated low accountability. In other words, direct democracy is a way to "de-insulate" politicians.

Our analysis builds on the theory of direct democratic institutions as a disciplining device. We describe a model that links direct democracy and the shadow economy through the fiscal policy choices made by

elected politicians. Direct democratic institutions can contribute positively to the efficiency of the political decision-making process in two ways. First, direct democracy can exert a *direct* effect on policy, as referendums and initiatives can override the distortionary and inefficient decisions of policy makers. Second, direct democratic institutions may also work *indirectly*, as the simple threat of a ballot proposition may be enough to induce elected officials to choose policies closer to the median voter's preferences (Romer and Rosenthal 1978; Matsusaka and McCarty 2001; Hug 2004). In our model, both effects are at work and discussed.

In particular, we propose a framework whereby individuals can allocate their labor between the formal and the informal sector. Production in the formal sector benefits from productive public services and can be taxed by fiscal authorities, whereas production in the informal sector requires only labor and is unobservable by the authorities (and therefore cannot be taxed). The fiscal policy consists of a tax rate and an allocation of government revenues between politician's rents and the provision of public services. An exogenous status quo fiscal policy is assumed to be in place, and the incumbent politician decides whether to change it (i.e., to choose the reformed fiscal policy). The politician runs the risk of not being reelected and of citizens holding a referendum to reject the reformed fiscal policy (i.e., to implement the status quo fiscal policy) if the reform is too inefficient.

The model predicts that more direct democracy favors the implementation of fiscal policies closer to the preferences of citizens; these policies are more efficient and thus reduce individuals' incentives to operate in the informal sector. We also find that direct democracy is likely to exert nonlinear effects on the size of the shadow economy. That is, increasing direct democracy reduces the shadow economy at low or intermediate levels, but the effect of a like increase will probably be limited when direct democratic institutions are already quite good. Our theoretical analysis also suggests that direct democratic institutions interact with other features of the political system, such as the size of the electoral district. In particular, direct democracy is expected to have a greater effect in reducing the shadow economy when the electoral system is characterized by a larger district magnitude, i.e., when there are more legislators elected in a typical voting district. The reason is that larger district magnitude reduces the ability of the citizens to punish the politicians who implement distortionary policies (e.g., Blume et al. 2009). Direct democratic institutions allow for such distortions to be corrected, which should reduce the incentive of citizens to participate in the informal sector.

We then report on an empirical investigation that uses a sample of 57 democracies to test our theoretical predictions. We find that the effect of direct democratic institutions on the shadow economy is negative, nonlinear, and quantitatively important; the results are robust and also depend on the interaction between direct democracy and the size of the electoral district, thus confirming our model-based theory.

This paper is related to two strands of the literature. One has analyzed the effects of direct democratic institutions on certain fiscal policy variables and on citizens' attitudes toward institutions. The other strand has studied the shadow economy's determinants. In both cases, the reported results suggest the existence of a link between direct democracy and the shadow economy, as analyzed in this paper.

Within the literature on shadow economies, some authors (Schneider and Neck 1993; Loayza 1996) argue that high levels of taxes and regulations are the main determinants of informal sector activity, whereas others (Johnson et al. 1997; Friedman et al. 2000; Torgler and Schneider 2009) find that inefficient and discretionary application of regulations and the tax system by government plays a crucial role in the decision to operate unofficially—an even more important role than that played by the burden of taxes and regulations themselves (for a review, see Schneider and Enste 2000).

The existing literature on the economic effects of direct democratic institutions follows two main strands. Several empirical studies, most based either in Switzerland or the United States, evaluate the effect of direct democracy on fiscal policy and government efficiency. The common theme of these works is that the possibility of democratic participation by taxpayers leads public spending to be more efficient and more in line with citizen preferences. For example, Feld and Kirchgässner (2001a,b), Feld and Matsusaka (2003), and Galletta and Jametti (2012) use Swiss data to find that mandatory referendums are associated with less government spending. Matsusaka (1995, 2005) and Blume et al. (2009) obtain similar results using U.S. and cross-country data, respectively. Alt and Lassen (2003), Pommerehne (1990), and Blomberg et al. (2004) find results suggesting that direct democratic institutions reduce rent extraction and improve the efficiency of public good provision.[1] Still other studies have focused on the effects that direct voter participation in political decisions may have on citizens' attitudes toward institutions in terms of tax morale and civic trust in government. The works by Pommerehne and Weck-Hannemann (1996), Frey (1997), Feld and Frey (2002),

[1] Similarly, Pommerehne and Schneider (1978) and Frey (1994) show that popular referendums increase the likelihood that voters control the policy choices of governments.

Feld and Tyran (2002), Torgler (2005), and Hug and Spörri (2011) all find that direct citizens' participation—in the forms of popular referendums and citizen initiatives—can enhance civic virtue and increase tax morale.

In sum, these works suggest that direct democratic institutions have positive effects on fiscal policies and on civic trust in government and tax morale. Given that the literature on shadow economies recognizes the importance of these elements in development of an informal sector, we should anticipate a negative relationship between direct democracy and the size of the shadow economy—which is what we find in this paper.[2]

The rest of the paper is organized as follows. Section 2 presents a theoretical framework that explains the transmission channels through which direct democratic institutions affect the size of the informal sector. The empirical analysis is reported in Section 3, and Section 4 concludes. Some proofs are given in the Appendix; the remaining proofs and some additional material on the empirical analysis are in the Online Appendices.[3]

2. The Model

2.1. The Framework

We consider the economy of a continuum of individuals of measure 1. Following Teobaldelli (2011), we assume that there is a unique final good that can be produced by two sectors, the formal and the informal one. Each agent *i* is a consumer–producer that supplies inelastically 1 unit of labor and can produce the good in the formal sector and also in the informal sector. Production in the informal sector requires labor only and the production function is $y_{i,s} = x_i^{\alpha}$, where x_i is the amount of labor employed by agent *i* in shadow activities. The formal sector production function is Cobb–Douglas with constant returns to scale both in

[2] The analysis developed herein is close in spirit to the works on fiscal decentralization and the shadow economy (Torgler et al. 2010; Teobaldelli 2011) that demonstrate how federal institutions improve fiscal policies as well as government accountability to citizens, both of which end up reducing the informal sector's size. Schneider and Enste (2002) were the first to recognize that proper elements of direct democracy, together with fiscal federalism, might strengthen public trust in political institutions and reduce the size of the shadow economy.

[3] See https://sites.google.com/a/uniurb.it/teobaldelli/

labor $1-x_i$ and in the quantity of public goods and services *G*: $y_{i,f} = (1-x_i)^{\alpha} G^{1-\alpha}$, where $0 < \alpha < 1$.[4]

We also assume that (a) production in the formal sector is perfectly observable by tax authorities and can be taxed at a constant rate $t \in [0,1]$ and (b) production in the unofficial economy is completely unobservable and so cannot be taxed. Therefore, each agent *i* chooses the labor share between the two sectors that maximizes net income:

$$\hat{y}_i \equiv \max_{x_i} y_i = (1-t)(1-x_i)^{\alpha} G^{1-\alpha} + x_i^{\alpha}. \quad (1)$$

The revenues of the public sector are $R = \int_{i=0}^{1} t y_{i,f}\, di = t(1-x)^{\alpha} G^{1-\alpha}$, since all agents are identical and face the same fiscal policy (i.e., $x_i = x$ for all *i*). We use $\gamma \in [0,1]$ to denote the share of revenues spent on productive public services, so $1-\gamma$ is the share of revenues devoted to the politician's rents. In particular, we obtain that $G = \omega\gamma R$, where $\omega \in [0,1]$ represents the politician's efficiency in transforming the revenues into public services. From $R = t(1-x)^{\alpha} G^{1-\alpha}$ and $G = \omega\gamma R$, it follows that the government budget constraint can be written as

$$G = (\omega\gamma\, t)^{1/\alpha}(1-x). \quad (2)$$

Following the approach of retrospective voting models (e.g., Barro 1973; Ferejohn 1986), we consider a framework in which an incumbent politician's total utility is given by

$$V = \lambda(1-\gamma)R + p_R W. \quad (3)$$

The first component is the current monetary rent, with $\lambda \leq 1$ representing the transaction costs associated with rent extraction. In the second component, $W > 0$ denotes the (exogenous) future benefits from being in office and $p_R \in [0,1]$ is the probability of being reelected.

We assume that there is a status quo fiscal policy (t_0, γ_0) and that the politician decides whether or not

[4] We refer to *G* as public goods and services, but it could also be interpreted as publicly provided private goods and services. One justification for hypothesizing that *G* does not enter the informal sector's production function is that informal producers are unable to take full advantage of public services (e.g., social welfare, skill training programs) or government-sponsored credit facilities that could improve the production process. Moreover, according to Loayza (1996) and Johnson et al. (1997), the illegal status of informal agents prevents them from benefitting from government-provided goods and services. Examples of such benefits include being able to secure full enforceable property rights over their capital and output (through the legal and judicial system) and enjoying police protection from crimes committed against that property.

to change that policy.[5] Citizens are able to block reform by referendum. In particular, the timing of events is as follows: (i) The reform policy (t_c, γ_c) is announced; (ii) citizens mobilize (or not) to promote a referendum on the reform;[6] (iii) if a referendum is held, then citizens vote and thereby determine whether or not the reform will be implemented; (iv) if the reform policy is rejected then the status quo policy prevails, but otherwise the reform is implemented; and (v) elections on the politician's reappointment take place.

With respect to previous models of retrospective voting, we introduce two innovations. First, we assume that the probability of reelection is reduced by a factor $1-\phi$ when the politician proposes a reform policy that yields less income to citizens than did the status quo policy. This means that $p_R = 1$ if the maximized income of each agent under the reform policy is no less than its level under the status quo policy (i.e., if $\hat{y}(t_c, \gamma_c) \geq \hat{y}(t_0, \gamma_0)$) and $p_R = \phi$ with $\phi \in (0,1)$ when $\hat{y}(t_c, \gamma_c) < \hat{y}(t_0, \gamma_0)$.[7] Second, we assume that the reduction in the probability of reelection of the politician that results from a referendum, $1-\phi$, is decreasing in the size *m* of the district; that is, $\phi \equiv \phi(m)$ with $d\phi/dm > 0$. This assumption is motivated by our interest in analyzing how some institutional features may interact with direct democracy and affect the level of shadow economy activity. We consider the effect of district magnitude because its importance for political competition and accountability of politicians to citizens has been emphasized by various authors (Persson and Tabellini 2003, Blume et al. 2009).[8]

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[5] The status quo policy is assumed to be chosen randomly by nature at the beginning of the period. In a dynamic setting, the status quo policy could be interpreted as the policy implemented in the previous period.

[6] Direct democracy identifies a variety of political processes that assign to ordinary citizens the right to decide directly on certain political issues through popular votes. All forms of direct democracy deal with the decision of citizens on substantive laws listed on the ballot, which are known as ballot measures or propositions. Ballot measures can concern either the proposal of a new law or the abolition of an old law. There are differences in how propositions are placed on the ballot. We can distinguish between an *initiative*, which allows citizens to propose new laws (constitutional or more ordinary legislation) of varying scopes, and a *referendum*, which is a vote on a law already approved by the legislature. Both forms of direct democracy allow citizens to control the agenda and typically require a predetermined number of signatures from eligible voters to qualify for the ballot. In order to simplify the analysis, we do not distinguish between these types and use the term "referendum" to signify any means of enabling citizens to intervene directly in the political process.

[7] In the standard model of retrospective voting, individuals coordinate on the same retrospective voting strategy; this leads to reelection of the incumbent when the policy provides a utility to voters that exceeds some endogenous threshold. Our setting of the voters' reservation utility at the exogenous level of the status quo policy (rather than allowing it to be endogenous) does not affect the main results; it changes only the rents of the politician and voters. Our assumption that the incumbent's punishment is associated with a strictly positive reelection probability (rather than zero) can be viewed as the reduced form of a more general model in which politicians differ along multiple dimensions (e.g., competence, ideology) and voters do not have the same preferences or information about the politician. Observe also that this assumption is relevant only to our analysis of the interaction between direct democracy and other institutional details.

[8] Persson and Tabellini (2000, 2003) explain the link between district magnitude and the electoral formula in terms of larger districts being associated with proportional electoral systems and smaller districts associated with majoritarian

Finally, we assume that it is costly for citizens to promote a referendum, that this cost is equal for all citizens, and that the cost varies in inverse proportion to the extent of direct democracy. That is, $\eta_i = \eta(\delta)$ for all i with $\partial\eta/\partial\delta \equiv \eta'(\delta) < 0$, where $\delta \in [\underline{\delta}, \overline{\delta}]$ is an index of the level of direct democracy. In this way we capture the notion that higher levels of direct democracy δ correspond with lower costs of mobilizing to organize a referendum. Individual agents are assumed to enjoy a positive nonmonetary benefit ε_i from promoting a referendum if the status quo policy yields for them an income greater than the reformed policy (i.e., if $\hat{y}(t_0, \gamma_0) > \hat{y}(t_c, \gamma_c)$). This payoff differs across agents and is drawn from a continuous and differentiable cumulative distribution function $F(\varepsilon)$, where $F'(\varepsilon) \equiv f(\varepsilon)$. Because each individual has zero mass, none will consider the monetary payoff when deciding whether or not to mobilize for a referendum. Hence, referendums will be promoted only by agents who anticipate a positive net payoff (i.e., agents for whom $\varepsilon_i - \eta \geq 0$). By our preceding assumptions, if the probability $P(\delta)$ that a referendum takes place (when this is convenient for citizens) is increasing in the number of citizens who mobilize, then $P(\delta)$ is increasing in the level of direct democracy: $P'(\delta) \equiv \partial P(\delta)/\partial\delta > 0$.[9]

2.2. Characterizing the Equilibrium: Preliminary Results

In order to characterize the model's equilibrium, we first determine the individual's optimal allocation of labor between sectors. We then identify the politician's optimal behavior in terms of the fiscal policies implemented and their implications for the shadow economy's size. The following lemma describes the quantity of an individual's labor in the shadow economy as a function of the country's fiscal policy.[10]

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systems. Majoritarian elections reduce politicians' rents because voters in marginal districts are more mobile and electoral competition is stiffer, which implies that citizens can punish politicians more severely for wasteful spending.

[9] Our approach recognizes that promotion of a referendum may be characterized by the standard collective action problems (Olson [1965] 1971) typical of rebellions (e.g., Tullock 1971; Silver 1974; Kurrild-Klitgaard 1997); for a review of this literature and open issues, see Kurrild-Klitgaard (2004). For this reason, we assume that the promotion of a referendum involves private costs and benefits related to the process itself. The positive effect of direct democracy on the probability that the referendum takes place can be explained by any framework under which such probability is increasing in number of citizens who mobilize relative to a required threshold. This means that the same result obtains also in a model where direct democracy reduces the number of individuals necessary for the promotion of the referendum. However, it seems reasonable to assume that higher levels of direct democracy are associated with lower thresholds required for a referendum to occur or with simpler and less costly procedures for the promoters.

[10] The next two lemmas are similar to Lemmas 1 and 3, respectively, in Teobaldelli (2011); their proofs, together with those of Lemmas 3–5 and Corollary 1, are given in Online Appendix A.

Lemma 1. *For any fiscal policy* (t,γ), *the optimal quantity of labor employed in the informal sector by each individual is the solution to the maximization problem* (1) *and is equal to*

$$x(t,\gamma) = (\omega\gamma\ t)^{-1/\alpha}(1-t)^{-1/(1-\alpha)}. \tag{4}$$

The amount worked in the informal sector is at its minimum when $t = t_e \equiv 1-\alpha$ *and* $\gamma = \gamma_e \equiv 1$. *This amount is decreasing in* γ*; it is decreasing in t when* $t < 1-\alpha$, *and vice versa. Moreover,* $x \in (0,1)$ *if both* $t \in (0,1)$ *and* $\gamma > 0$, *while* $x = 1$ *for* $t = 0$, $t = 1$, *or* $\gamma = 0$.

Agents choose to allocate their labor across the two sectors by equalizing the respective net marginal productivities. A higher fraction of revenues γ used for the provision of productive public services increases the marginal productivity in the formal sector (relative to the informal one) and reduces the incentive of the agent to supply labor in the shadow economy, which explains why x is monotonically decreasing in γ. Higher taxation has a direct effect on the reduction of the net marginal productivity of labor in the formal sector, where taxes cannot be avoided but also leads to more provision of productive public services which increases the marginal productivity of labor in this sector. When taxation is relatively low, this latter effect dominates and the agents find it optimal to work less in the shadow economy; the former effect prevails at relatively high taxation levels. Because fiscal policies that increase net income are associated with greater marginal productivity in the formal sector and less employment in shadow production, there should be a positive relationship between the individual's amount of labor supplied to the informal sector and the aggregate size of that sector. This result is stated in the following corollary.

Corollary 1. *There is a monotonic negative relationship between the representative agent i's maximized net income* ($\hat{y}_i$) *and the amount of labor supplied to the informal sector; that is,* $d\hat{y}_i/dx_i < 0$. *As a share of aggregate income, the shadow economy's size is positively related to the amount of labor supplied in the informal sector by the representative agent.*

In choosing the reformed fiscal policy, the politician must account for the following effects. First, policies that guarantee more rents reduce production in the formal sector and so reduce government

revenues. Second, the policy reform affects the politician's probability of being reelected, and it can be rejected by voters through a referendum if they perceive it as being too distortionary. In particular, the politician can choose between two possible strategies. One is to select the fiscal policy that maximizes his own current payoff while bearing the risk of a referendum and restoration of the status quo policy; we call this the *nonprevention strategy*. Alternatively, the politician could choose a policy reform that leaves citizens with no incentive to promote a referendum. Then this policy is always implemented and the politician has a higher probability of being reelected, which guarantees future rents. We refer to this as the *prevention strategy*.

Before proceeding in the analysis, we remark that it is never optimal for citizens to promote a referendum when the reform policy (t_c, γ_c) is such that their maximized net income under this policy is (weakly) greater than that corresponding to the status quo policy (t_0, γ_0). That is, citizens should not seek a referendum if

$$\hat{y}(t_0, \gamma_0) \equiv (\omega \gamma_0 t_0)^{(1-\alpha)/\alpha}(1-t)(1-x_0) + x_0^{\alpha} \leq (\omega \gamma_c t_c)^{(1-\alpha)/\alpha}(1-t_c)(1-x_c) + x_c^{\alpha} \equiv \hat{y}(t_c, \gamma_c), \qquad (5)$$

where $x_0 \equiv x(t_0, \gamma_0)$ and $x_c \equiv x(t_c, \gamma_c)$ as defined in (4).[11] If the status quo policy is such that constraint (5) is satisfied also under a policy (t_m, γ_m) that maximizes the politician's current monetary rent, then the politician always find it optimal to implement such a policy and it is never optimal for citizens to promote a referendum. Since the level of direct democracy would be irrelevant in that case, we restrict our attention to scenarios in which (5) is *not* satisfied under the policy (t_m, γ_m).

Our next lemma describes the fiscal policy (t_m, γ_m) that maximizes the politician's current monetary rent, and it shows that such policy is characterized by a tax rate and a share of revenues spent for provision of public services being (respectively) more or less than their counterpart values that maximize the income of citizens, which translates into a larger shadow economy.

Lemma 2. *The fiscal policy maximizing the current monetary rent of the politician solves the problem*

$$\max_{t,\gamma} v \equiv \lambda(1-\gamma)R = \lambda t^{1/\alpha}(\omega\gamma)^{(1-\alpha)/\alpha}(1 \quad \gamma)(1 \quad x)^{1-\alpha} \qquad (6)$$

[11] In writing the maximized net income of the individuals in (5), we have used the government's budget constraint (2) and also that all individuals are identical.

subject to (2), *where* $x \equiv x(t,\gamma)$ *is defined by* (4). *The policy is defined by the following system of equations:*

$$t_m = \frac{1-\alpha}{1-\alpha+\alpha x_m}, \tag{7}$$

$$\gamma_m = 1-\alpha+\alpha x_m; \tag{8}$$

this system has a unique solution, and $x_m \equiv x(t_m,\gamma_m)$ *is given by* (4). *Moreover,* $t_m > t_e \equiv 1-\alpha$ *and* $\gamma_m < \gamma_e \equiv 1$, *which together imply that the amount of labor allocated by each agent to informal activities is greater than the level chosen under the efficient fiscal policy; that is,* $x_m > x_e$.

A politician who follows the prevention strategy chooses the policy that maximizes his own utility subject to the constraint that citizens will have no incentive to promote a referendum. This means that (5) is satisfied (so that there is no risk of the status quo policy being implemented) and that the politician will be reelected. Therefore, the politician's maximization problem is

$$\max_{t,\gamma} V(t,\gamma) \equiv \lambda(1-\gamma)R + p_R W = \lambda t^{1/\alpha}(\omega\gamma)^{(1-\alpha)/\alpha}(1-\gamma)(1-x)^{1-\alpha} + W, \tag{9}$$

subject to (5) and where $p_R = 1$. The solution to this problem is given by the following lemma.

Lemma 3. *The politicians' optimal policy reform* (t_c,γ_c) *under prevention is a policy* $(t_c,\gamma_c) \equiv (t_P,\gamma_P)$ *with* $t_P \in [1-\alpha, t_m]$ *and* $\gamma_P \in [\gamma_m, 1]$, *where at least one of the following two inequalities holds:* $t_P < t_m$; $\gamma_P > \gamma_m$. *The fiscal policy* (t_P,γ_P) *is independent of the level of direct democracy* δ *and is such that constraint* (5) *always holds with equality; that is,* $\hat{y}(t_0,\gamma_0) = \hat{y}(t_P,\gamma_P)$.

Lemma 3 states that the optimal policy reform allowing the politician to avoid a referendum takes intermediate values between the policy (t_m,γ_m) that maximizes his current rents and the policy (t_e,γ_e) that maximizes citizens' net income. Hence the higher the utility of agents under the status quo policy (t_0,γ_0), the closer any acceptable reform policy must be to their preferred one. However, the level of direct democracy δ has no effect on the reform policy because in this case the policy chosen must be such that it is *never* optimal for citizens to promote a referendum.

The politician also has the option of choosing the fiscal policy that maximizes his current monetary rent (*nonprevention strategy*). Then citizens' income from the reform policy is less than the status quo policy (constraint (5) is violated) and voters will punish the politician, which reduces his probability of reelection, $p_R = \phi$. The politician also bears the risk that citizens will promote a referendum and that the status quo policy will then (with probability $P(\delta)$) be reinstated. Therefore, the politician's maximization problem is

$$\begin{aligned}\max_{t,\gamma}\ & \mathrm{E}V(t,\gamma,\delta,\phi) = P(\delta)V(t_0,\gamma_0,\phi) + [1-P(\delta)]V(t,\gamma,\phi) \\ &= P(\delta)[\lambda t_0^{1/\alpha}(\omega\gamma_0)^{(1-\alpha)/\alpha}(1-\gamma_0)(1-x_0)^{1-\alpha}] + [1-P(\delta)][\lambda t^{1/\alpha}(\omega\gamma)^{(1-\alpha)/\alpha}(1-\gamma)(1-x)^{1-\alpha}] + \phi W\end{aligned} \tag{10}$$

where $x_0 \equiv x(t_0,\gamma_0)$. The following lemma characterizes the equilibrium under the nonprevention strategy and shows that the solution to this problem is the same as that to problem (6) reported in Lemma 2.

Lemma 4. *The optimal policy reform for the politician under nonprevention,* (t_N,γ_N)*, corresponds to the policy* (t_m,γ_m) *that maximizes the politician's current monetary rent reported in Lemma 2. Since* $\hat{y}(t_0,\gamma_0) > \hat{y}(t_m,\gamma_m)$*, constraint* (5) *is always violated and a referendum takes place with probability* $P(\delta)$*. The policy implemented is* (t_m,γ_m) *with probability* $1-P(\delta)$*, and it is the status quo policy* (t_0,γ_0) *with probability* $P(\delta)$*. The maximized expected utility of the politician,* $\mathrm{E}V(t,\gamma,\delta,\phi)$*, is decreasing in the level* δ *of direct democracy.*

When the politician's strategy is nonprevention, he implements the policy that maximizes his current rents and takes the risk that a referendum is promoted and the status quo policy reinstated. In this case, more direct democracy improves the quality of the fiscal policy because the status quo policy is implemented more often and citizens' maximized net income under that policy is greater than under the reform policy (a result that follows from the violation of condition (5)).

2.3. Characterizing the Equilibrium: Main Results

Given the results in Section 2.2 on the behavior of individuals and the characteristics of fiscal policies under the politician's possible strategies, it is now possible to derive the politician's optimal behavior (see Lemma 5) as well as the implications for the relationship between direct democracy and the shadow economy's size.

Lemma 5. *There exists a level of direct democracy,* $\delta^* \in [\underline{\delta}, \overline{\delta}]$, *such that the politician chooses the strategy of nonprevention (see Lemma 4) for all* $\delta \leq \delta^*$ *or the strategy of prevention (see Lemma 3) for all* $\delta > \delta^*$.

The intuition for this is that less direct democracy makes it optimal for the politician to implement the reform that maximizes his current rent because the risk that a referendum corrects this is small. With more direct democracy, however, a policy reform that is bad for citizens will probably be cancelled. In this case it is optimal for the politician to implement policies that will not be rejected by voters (which also increases the likelihood of being reelected).

Having established how direct democracy affects the policies that are implemented, we can now analyze its effect on the shadow economy. This is the substance of the following proposition.

Proposition 1. *The presence of direct democracy has a global negative effect on the size of the shadow economy, and this effect is likely to be nonlinear. When the level of direct democracy is relatively low* ($\delta \leq \delta^*$), *more of it reduces the size of the informal sector; however, when the level of direct democracy already is relatively high* ($\delta > \delta^*$), *raising that level has no effect on the informal sector's size.*

Proof. See Appendix.

Proposition 1 states that an improvement in direct democracy reduces the size of the shadow economy—but only at initially low or intermediate levels of it. The reason is that politicians have the incentive to implement distortionary policies that maximize their rents when direct democratic institutions are not well developed; improving such institutions enables the citizens to influence policy more easily, and better policies in turn reduce the incentive to participate in the informal sector. When direct democratic institutions are well developed, however, the politician is kept in check by citizens and so his behavior is unlikely to be affected substantially by further increases in the quality of these institutions.

The following proposition specifies the nature of the interaction between direct democracy and district magnitude as it affects the shadow economy's equilibrium level.

Proposition 2. *The politician is more likely to follow the nonprevention strategy when the electoral system is characterized by a larger district magnitude—that is, when* $\partial\delta^*/\partial m > 0$. *As a result, the negative effect of direct democracy on the size of the shadow economy is greater when district magnitude is larger.*

Proof. See Appendix.

The intuition for this result is that electoral systems characterized by larger districts may reduce political competition and so make it more difficult for voters to punish politicians for implementing bad fiscal policies. This makes the strategy of nonprevention more convenient and, under these conditions, direct democratic institutions play more of a role in correcting bad policies.

In sum, our model makes three main predictions that we shall test econometrically. First, more direct democracy reduces the size of the shadow economy, ceteris paribus. Second, this effect is likely to be nonlinear. In particular, an increase in the quality of direct democratic institutions is likely to reduce substantially the size of the informal sector when these institutions are currently at low or intermediate levels; the effect of such increase should be more limited when direct democracy already is well developed. Third, direct democratic institutions interact with other features of the political system and will reduce the shadow economy's size more significantly when electoral districts are larger.

3. Empirical Evidence

3.1. Data Description and Estimation Approach

We develop a cross-sectional analysis of a sample (from Persson and Tabellini 2003) of 85 countries that can be considered democracies for the period 1990–1998. We consider only democratic countries because direct democratic institutions are likely to work only in relatively stable democracies. Referendums and popular initiatives, even if observed, are expected not to have any effect in an authoritarian regime since they are likely to be manipulated by the government.

In order to reduce the possibility of omitted variables, we run several regressions controlling for a wide range of covariates that might (according to the literature) affect the shadow economy's size and also be correlated with the country's democratic institutional organization. The sources and definitions of all variables used in the analysis are given in the Online Data Appendix.

Data on the informal sector are drawn from the dataset of Schneider (2005), which gives the size of the *shadow economy* as a proportion of official gross domestic product (GDP) for 145 countries over the 1999–2003 period. Our dependent variable is an average of the three available observations for the period indicated; this allows us to cover up to 73 of the countries included in the original sample.

The *direct democracy index* (DDI) is that described in Fiorino and Ricciuti (2007). They derive it from three different sources: Kaufmann (2004) for 43 European countries, Hwang (2005) for 33 Asian countries, and Madroñal (2005) for 17 Latin American countries. Thus there are 57 countries for which we have both the size of the shadow economy and the index of direct democracy (see Table 1). The DDI ranges in value from 1 to 7, with 7 corresponding to countries rated as radical democrat and 1 to countries with the least direct democracy.[12] As pointed out by Fiorino and Ricciuti, the main advantage of using this index is that it provides both a qualitative and a quantitative assessment of direct democracy. In fact, this index reflects both the quality and performance of direct democracy in that it focuses on the two most important and widely used processes (initiatives and referendums) as well as on the integrity of the processes themselves.[13] The disadvantages of the DDI are that it is a subjective measure and that it does not identify the issues addressed by referendums and initiatives.

In testing the hypothesis that better direct democratic institutions reduce the size of the shadow economy, we always include a measure of *district magnitude*. This factor, as explained in the previous section, probably affects the government's accountability to citizens (Persson and Tabellini 2003; Blume et al. 2009).[14]

In the baseline specification we also include the following set of control variables. We always control for the *age of democracy* (years of uninterrupted democratic rule) and the *quality of democracy* (as proxied

[12] The only country ranked as high as 7 is Switzerland, and there are more countries (25) ranked 1 than any other value.

[13] In other words, it allows us to account for even the quality of procedures underlying popular initiatives and referendums intended to propose, approve, amend, or remove laws. In clarifying this point, Fiorino and Ricciuti cite the case of Belarus: even though nine referendums were held in this country from 1995 to 2004, Belarus still receives the lowest possible ranking; the reasons are that (a) the referendums were proposed and used by President Lukashenko to amplify his power at the legislature's expense and (b) a positive outcome was secured thanks to arrests of political adversaries and pressure on citizens.

[14] District magnitude determines how many legislators are elected in a typical voting district. The index used here comes from Persson and Tabellini (2003) and is defined as the ratio of the number of districts to the number of seats in the country's lower house; the index is thus an inverse measure of districts' average size. It takes the value 1 in a UK-style system with (single-member districts) and a value slightly above 0 in an Israeli-style system (a single national district from which all legislators are elected). As discussed in Persson and Tabellini (2000, 2003), district magnitude is strongly correlated with the electoral system (this correlation is 0.84 in our sample): electoral districts tend to be large in proportional systems and small in majoritarian ones.

by the PolityIV index) because the consolidation and quality of democracy may have a positive effect on the quality of government institutions and also on fiscal policies, thereby reducing the incentive of citizens to operate in the informal sector. At the same time, these measures are likely to be correlated with the presence of direct democratic institutions and so their inclusion allows us to better isolate the effect of direct democracy on the shadow economy.[15] For the same reason, we add a measure of the *country size* (the log of land area) and a dummy variable for the *federal* structure as they may be related to the adoption of direct democratic institutions. In our opinion, larger countries may encounter greater difficulties in controlling economic activity, which tends to increase the shadow economy's size; and federal countries seem better able to accommodate their citizens' preferences for higher-quality public spending, which tends to reduce the size of the informal sector (Torgler et al. 2010; Teobaldelli 2011; Dell'Anno and Teobaldelli 2012).

We use an index of *ethnolinguistic fractionalization* because a large literature indicates that ethnic and linguistic cohesion is a determinant of economic performance in terms of both economic output and institutional quality (La Porta et al. 1999; Alesina et al. 2003). We also include the *log of GDP per capita* in 1960 to account for the level of economic development that is related both to institutional quality and to the size of the informal sector.[16] It is often argued that one of the main determinants of the informal sector's growth is heavy tax and regulatory burdens (Loayza 1996; Johnson et al. 1997; Johnson et al. 1998; Friedman et al. 2000). In order to control for these effects, we include in the baseline control set an index of the *burden of regulation* (Kaufmann et al. 2005) that captures the intensity of regulation in the economic system and reflects the ability of government to implement market-friendly policies that promote private sector development. We control for the *size of government* by using central government expenditures (including social security) as a percentage of GDP. Because some have argued that the beneficiaries of welfare payments have incentives to work in the informal sector while receiving these subsidies (e.g., Schneider and Enste 2000), we also add the consolidated central government expenditures on social services and welfare—as a percentage of GDP—to control for the *composition of government expenditure*.

Some works have emphasized that religious beliefs might affect people's attitudes toward the economic

[15] According to Persson and Tabellini (2003), the age of a democracy may have important effects on the policies implemented in that mature democracies might adopt systematically different policies than young ones. For example: welfare-state programs are strongly associated with democracies, but the decision to establish these programs (e.g., public pension systems) may take a long time. Moreover, some important constitutional features may be correlated with the period during which a democratic form of governance was adopted.

[16] We use the GDP of 1960 in order to avoid possible endogeneity problems with respect to the dependent variable.

system and private property and may play an important role in shaping individuals' attitudes regarding ethics, trust, and compliance (Landes 1998; La Porta et al. 1999). Because Protestant traditions are considered to be the most relevant characteristics along these lines (Treisman 2000), our baseline controls include the percentage of the population of the *Protestant* religion. As a robustness check, we also control for two other religious affiliations as a proxy for *culture* (for religion as a proxy of culture, see Paldam 2001): the percentage of the population belonging to the Roman Catholic religion in 1980 and an index for "Confucian, Buddhist, or Zen" religious traditions.

Among the controls that we *add* to the baseline specification are those for some features of political institutions that may be related to direct democracy and the quality of fiscal policy. In particular, we consider the characteristics of the *political system* by including a variable for the electoral rules in place (proportional or majoritarian) and a variable for the form of government (presidential or parliamentary regime). Moreover, we control for *executive constraints* by employing a measure of the operational (de facto) independence of the country's chief executive. These variables aim to capture the extent to which political leaders are insulated from citizens and thus can exercise their discretionary powers at the expense of voters' welfare (Persson and Tabellini 2003).

In addition, we control for *labor market regulation* by including an index that reflects the impact of the minimum wage, hiring and firing procedures, unemployment benefits, and centralized collective bargaining; each of these elements can influence the decisions of workers and firms on going underground. We also include an index of the level of *education* in the society (given by the total enrollment in primary and secondary education as a percentage of the relevant age group), since this factor may affect the incentive of individuals to operate in the informal sector and could also play a role in promoting civic participation and cooperation with others—thus facilitating the support for well-functioning democratic regimes (Lipset 1959; Glaeser et al. 2007). This index can also serve as a proxy for the level of economic development.

We include the *demographic characteristics* of the population—in particular, the percentage of the population between the ages of 15 and 64 and the percentage of the population 65 years old and older—since these factors influence the total amount (and composition) of public expenditures (Persson and Tabellini 2003) and, in turn, the extent of the shadow economy. The degree of *openness* to international trade is also taken into account because the literature on shadow economies suggests that globalization of markets and the

increasing competitiveness of less developed economies, which exhibit lower production costs, can affect a firm's decision to operate in the informal sector (Gerxhani 2004). We also control for legal, historical, and geographical characteristics since these may be correlated with government efficiency, the quality of public goods, government size, and political freedom. In particular, we include variables for *legal origins* (common law, French civil law, German civil law, Scandinavian civil law, or socialist law), for *colonial history* (British, Spanish-Portuguese, or other colonial origins), and for *geographical location* (Africa, East Asia, Latin America, Central America, or the Caribbean).

A society's heterogeneity can affect political dynamics, fiscal policies, and the incentive of individuals to participate in the unofficial sector. We therefore control for heterogeneity within each country by entering (a) an index of *religious fractionalization* (Alesina et al. 2003) and (b) the Gini coefficient of the income distribution as an index of *income inequality*.[17] We also include the Gastil index, which averages the index for *civil liberties* and for *political rights*, as a further robustness check on the quality of democracy and also because these features could well be related to the working of direct democratic institutions.

Finally, we control for the efficiency and the quality of public institutions by including an index of *protection of property rights*, an index of *government effectiveness* (which accounts for perceptions of the quality of public service provision), an index of *government anti-diversion policies* (which measures how effectively government policies support production), an index of the *rule of law*, and an index of *corruption* of government officials.

Our empirical strategy is based on estimating this equation:

$$SE_i = \alpha + \beta_1(DDI_i) + \beta_2(DM_i) + \beta_3(DDI_i \times DM_i) + \beta_4(DDI_i)^2 + \beta_5' Z + \varepsilon_i . \qquad (11)$$

Here SE denotes the size of the shadow economy, DDI the direct democracy index, and DM the district magnitude; the vector Z consists of various control variables, and ε is an error term. The estimation includes the square of the direct democracy index, $(DDI)^2$, to account for nonlinear effects of direct democratic institutions on the shadow economy (as predicted by our model; see Proposition 1);[18] it also includes an

[17] It is worth emphasizing that the index of religious fractionalization measures a society's religious heterogeneity and therefore captures different phenomena than do the variables used for the *type* of religion that is most diffused in the country.

[18] We remark that an absence of nonlinear effects resulting from direct democracy need not be at odds with our model's predictions since the region in which the politician adopts a prevention strategy may simply be too small for such effects to manifest.

interaction term between the direct democracy index and the district magnitude, DDI × DM, to test our hypothesis (Proposition 2) that direct democratic institutions have a greater effect on the size of the shadow economy in countries characterized by larger district magnitudes (Proposition 2). The marginal effect of direct democracy on the size of informal sector can therefore be expressed as

$$\frac{d\mathrm{SE}}{d\mathrm{DDI}} = \beta_1 + \beta_3(\mathrm{DM}) + 2\beta_4(\mathrm{DDI}),$$

and we expect the following signs for the coefficients: $\beta_1 < 0$, $\beta_3 > 0$ (since DM is an *inverse* measure of district magnitude), and $\beta_4 > 0$.

In Online Appendix B we report the results of three additional estimations as a check for robustness: one in which the square of DDI is excluded, one in which both the square of DDI and the interaction term DDI × DM are excluded, and one in which we *include* the square of DM and the square of the interaction term DDI × DM.

3.2. Empirical Results and Their Interpretation

Table 2 provides some descriptive statistics for the main variables employed. The mean size of the shadow economy in the sample is about 31% of GDP, and the average value of the direct democracy index is 3.46. Table 3 reports the correlations among some variables and reveals that all our measures of the quality of democracy are negatively correlated with the shadow economy. In particular, we observe a large negative correlation (−0.57) between direct democratic institutions and the shadow economy, as predicted by the model. Moreover, there is a positive correlation among all measures of democracy employed; the index of direct democracy is correlated (0.36) with the age of democracy and is more highly correlated (0.60) with the quality of democracy. Table 4 reports the average value of the direct democracy index for each quartile of the shadow economy's size distribution and confirms that more shadow economy activity corresponds to lower levels of direct democracy. The average direct democracy index is 4.92 in the first quartile of the distribution and decreases to 2.07 in the last quartile.

The estimate of our baseline specification (where we control for a number of variables) is reported in column 2 of Table 5, which shows that the estimated coefficients have the expected sign: $\beta_1 = -12.45$,

$\beta_3 = 4.83$, and $\beta_4 = 1.03$.[19] The estimated marginal effects for all values of the direct democracy index (with district magnitude at the mean) are reported in Table 6. The marginal effect of direct democracy on the size of the shadow economy at the mean (DDI = 3.46) is negative and statistically significant at the highest values. There is also evidence that this effect is nonlinear: we observe that the absolute marginal effect is 8.73 at the first quartile of the distribution (DDI = 1), is 3.66 at the mean (DDI = 3.46), is 2.55 at the median (DDI = 4), and is 0.49 at the third quartile (DDI = 5). The estimated marginal effects are statistically significant at the 1% level for all values of DDI that do not exceed the median (DDI = 4), yet they are not significantly different from zero for DDI values of 5 or more (i.e., the distribution's third quartile).[20] These findings confirm both the claims in Proposition 1. Furthermore, direct democracy has a meaningful *quantitative* economic effect, since the results suggest that a shift from the first to the third quartile of the distribution corresponds to a reduction in the shadow economy of almost 18%.

It can also be observed that direct democracy's reducing effect on the shadow economy increases with district magnitude, as predicted by our model (Proposition 2). Indeed, the absolute marginal effect of the DDI (at the mean) is 5.31 for the largest possible district magnitude (DM = 0; i.e., of a single national district), an effect that is statistically significant at the 1% level; yet for the lowest possible district magnitude (DM = 1) the DDI effect is only 0.49 and not statistically different from zero.

Next we modify the baseline specification by adding one control variable (or one group of such variables) at a time to generate sixteen further specifications. Columns 3 and 4 of Table 5 report the estimates of specifications where proxies for the political system (electoral system and form of government) and the insulation of policy makers are added to the baseline specification. We can see that the results are unchanged. This is also the case when we include measures of labor regulation, education, demography, and openness to international trade (columns 5, 6, 7, and 8, respectively). Columns 9 and 10 show the robustness of results when legal origins and colonial origins are taken into account, while geographic location, culture, religious fractionalization, and income inequality are included in the estimates whose results are reported in (respectively) columns 11, 12, 13, and 14. Columns 15–19 of the table confirm our results when various

[19] Column 1 shows the estimate when we include only the indexes related to direct democracy and district magnitude; this estimate is reported as a robustness check.

[20] That the estimated marginal effects are positive for DDI values of 6 and 7 is due to the quadratic form used in the estimation; however, these coefficients are not statistically significantly different from zero. Recall that DDI = 7 for only one country (Switzerland).

measures related to institutional quality (viz., protection of property rights, government effectiveness, perception of government anti-diversion policies, rule of law, and perception of corruption) are entered. The same is true when we control for civil liberties and political rights (column 20). The estimates generated by all of these specifications (available from the authors upon request) indicate marginal effects of direct democracy on the shadow economy's size that are strongly similar to the estimates reported for the baseline specification.

In short, these results confirm all of our theoretical predictions: direct democracy has a quantitatively important *negative* effect on the level of shadow economy activity, this effect is nonlinear, and it depends also on district magnitude.

4. Summary and Policy Conclusions

In this paper we have analyzed the influence of direct democratic institutions on the size and development of the shadow economies of 57 countries that have some direct democratic institutions. The main result of our theoretical analysis is that, ceteris paribus, direct democratic institutions have a negative effect on the shadow economy's size. Our model also predicts that this effect should be nonlinear and should interact with other features of the political system (e.g., district magnitude). The empirical investigation confirms these hypotheses. Our econometric results demonstrate that the effect of direct democratic institutions on the shadow economy is negative, nonlinear, and economically meaningful; these results are robust to the inclusion of a wide variety of control variables yet are sensitive to the interaction of direct democracy with other political institutions (here, district magnitude).

What are the policy implications of this work? We believe that the results reported here confirm that direct democratic institutions play an important role in reducing the size and development of the shadow economy by favoring good governance; this should be taken into account in the design of institutions. They also confirm that different institutional features are likely to interact with one another in shaping fiscal policies and economic outcomes. The fact that some political institutions may be substitutes (as in our framework) or complements is an important aspect that should be taken into account when designing an institutional framework.

APPENDIX

Proof of Proposition 1

Corollary 1 establishes a negative relationship between the maximized net income of the representative agent and the size of the shadow economy. Under prevention ($\delta > \delta^*$), higher levels of δ do not change the reformed policy or the maximized net income of the agents; therefore, the size of the shadow economy becomes independent of δ and is related to the level of income under the status quo policy. That is, it's size is $x(\hat{y}(t_0,\gamma_0))$ for all $\delta > \delta^*$ because $\hat{y}(t_0,\gamma_0) = \hat{y}(t_P,\gamma_P)$ (see Lemma 3). Under nonprevention ($\delta \le \delta^*$), the policy implemented is the status quo (t_0,γ_0) with probability $P(\delta)$ and the reformed policy $(t_N,\gamma_N) = (t_m,\gamma_m)$ with probability $1-P(\delta)$. Therefore, the expected size of the shadow economy is $\mathrm{E}x(t_N,\gamma_N,\delta) = P(\delta)x(\hat{y}(t_0,\gamma_0)) + [1-P(\delta)]x(\hat{y}(t_m,\gamma_m))$. From $\hat{y}(t_0,\gamma_0) > \hat{y}(t_m,\gamma_m)$ and Corollary 1 it follows that $x(\hat{y}(t_0,\gamma_0)) < x(\hat{y}(t_m,\gamma_m))$. Since $dP(\delta)/d\delta > 0$, the expected size of the shadow economy will be decreasing in δ; that is, $d\mathrm{E}x(t_N,\gamma_N,\delta)/d\delta < 0$. It is also immediate that $\mathrm{E}x(t_N,\gamma_N,\delta) > x(t_P,\gamma_P)$ irrespective of the value of δ. ■

Proof of Proposition 2

The threshold δ^* is implicitly defined (when it is interior) by $\mathrm{E}V(t_N,\gamma_N,\phi)\big|_{\delta=\delta^*} - V(t_P,\gamma_P) = 0$, where the first term is given by (10) and the second term by (9). Applying the implicit function theorem to this expression yields

$$\frac{\partial \delta^*}{\partial m} = -\frac{\partial \mathrm{E}V(t_N,\gamma_N,\phi)/\partial \delta}{\partial \mathrm{E}V(t_N,\gamma_N,\phi)/\partial m},$$

where $\partial \mathrm{E}V(t_N,\gamma_N,\phi)/\partial\delta < 0$ by Lemma 4. Hence, from

$$\frac{\partial \mathrm{E}V(t_N,\gamma_N,\phi)}{\partial m} = W\frac{\partial \phi}{\partial m} > 0$$

it follows that $\partial\delta^*/\partial m > 0$. The second part of the lemma is a consequence of higher levels of direct democracy having a greater effect under the nonprevention than under the prevention strategy—that is, when $\delta \le \delta^*$ (see Proposition 1). ■

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Table 1: List of countries, size of the shadow economy and direct democracy index

Country	*Shadow economy*	*Direct democracy index*	*Country*	*Shadow economy*	*Direct democracy index*
Argentina	27.13	2	Malaysia	31.63	1
Australia	13.97	6	Mexico	31.70	1
Austria	10.43	5	Nepal	39.63	1
Bangladesh	36.60	2	Netherlands	12.90	6
Belarus	49.27	1	New Zeland	12.57	6
Belgium	21.73	5	Nicaragua	46.77	1
Bolivia	67.83	1	Norway	18.83	5
Brazil	41.00	2	Pakistan	37.80	1
Bulgaria	37.43	5	Paraguay	29.33	3
Chile	20.33	2	Peru	60.37	3
Colombia	41.27	3	Philippines	44.50	6
Costa Rica	27.00	1	Poland	27.93	5
Czech Republic	19.60	5	Portugal	22.37	5
Denmark	17.73	6	Romania	35.97	4
Ecuador	35.40	3	Russia	47.43	1
El Salvador	47.23	2	Singapore	13.40	1
Estonia	39.23	4	Slovak Republic	19.47	6
Finland	17.83	4	Spain	22.40	5
France	14.90	5	Sri Lanka	45.90	1
Germany	16.37	4	Sweden	18.87	5
Greece	28.47	3	Switzerland	9.13	7
Guatemala	51.93	2	Taiwan	26.57	4
Honduras	50.67	1	Thailand	53.37	1
Hungary	25.67	4	Turkey	33.20	2
India	24.30	4	UK	12.47	4
Ireland	15.63	6	Ukraine	53.50	1
Italy	26.60	6	Uruguay	51.47	5
Japan	11.03	4	Venezuela	35.13	3
Latvia	40.63	5			

Table 2: Descriptive statistics of the main variables used

	Obs.	Mean	Std. Dev.	Min.	Max.
Shadow economy (% of GDP)	57	31.08	14.43	9.13	67.83
Direct democracy	57	3.46	1.87	1	7
District magnitude	56	0.37	0.35	0.01	1
Federalism	57	0.25	0.43	0	1
Age of democracy	57	0.21	0.22	0.03	0.81
Quality of democracy	57	7.77	2.66	−2	10
Size of government	56	28.89	11.43	9.74	51.18
Composition of government expenditure	50	9.54	6.67	0.13	22.38
Log of GDP per capita in 1960	57	6.78	0.74	5.17	8.14
Country size	57	12.39	1.67	6.47	16.65
Burden of regulation	57	0.72	0.69	−1.54	1.97
Ethnic fragmentation	57	0.22	0.20	0	0.74
Protestant (% of total population)	57	13.23	25.16	0	97.8

Table 3: Correlation between variables in the baseline specification

	SE	*DDI*	*DM*	*Feder.*	*Quality dem.*	*Age dem.*	*Log GDP*	*Country size*	*Burden reg.*	*Size gov.*	*Comp. gov.ex.*	*Prot.*	*E.L. fract.*
Shadow economy	1												
Direct democracy	−0.57	1											
District magnitude	−0.03	−0.14	1										
Federalism	−0.17	−0.02	0.07	1									
Quality of democracy	−0.37	0.60	−0.19	0.05	1								
Age of democracy	−0.59	0.36	0.05	0.13	0.46	1							
Log of GDP per capita	−0.65	0.65	−0.09	0.27	0.51	0.56	1						
Country size	0.22	−0.16	0.24	0.39	0.12	−0.15	0.02	1					
Burden of regulation	−0.63	0.47	−0.20	0.07	0.48	0.51	0.58	−0.29	1				
Size of government	−0.43	0.61	−0.17	−0.07	0.45	0.28	0.58	−0.20	0.31	1			
Composition gov. exp.	−0.48	0.68	−0.20	0.08	0.48	0.35	0.74	−0.07	0.39	0.87	1		
Protestant	−0.37	0.39	−0.17	−0.07	0.29	0.38	0.52	−0.10	0.45	0.34	0.44	1	
Ethno-linguistic fract.	0.41	−0.18	0.15	0.10	−0.23	−0.22	−0.35	−0.04	−0.17	−0.33	−0.39	−0.14	1

Table 4: Distribution of the size of the shadow economy (S.E.) in the whole sample

	1st quartile 9.13 ≤ S.E. ≤ 18.83	2nd quartile 18.87 ≤ S.E. ≤28.47	3rd quartile 29.33 ≤ S.E. ≤ 41	4th quartile 41.27 ≤ S.E. ≤ 67.83	Total
Average value of direct democracy	4.92	4.13	2.64	2.07	
Total	14	15	14	14	57
	Below the median		Above the median		
Average value of direct democracy	4.52		2.36		
Total	29		28		57

Table 5: OLS cross-country estimates with direct democracy, the square of direct democracy and the interaction term between direct democracy and district magnitude

Dep. var.: *Shadow economy*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Direct democracy	−6.87	−12.45	−10.41	−12.10	−11.37	−12.19	−14.20	−12.13	−11.63	−12.18
	(4.84)	(4.17)***	(5.10)**	(4.18)***	(4.13)***	(4.55)**	(5.31)**	(4.07)***	(5.24)**	(5.80)**
Direct democracy squared	0.21	1.03	0.86	1.00	0.94	1.00	1.25	1.00	0.96	1.01
	(0.57)	(0.50)**	(0.59)	(0.51)*	(0.51)*	(0.54)*	(0.61)**	(0.50)*	(0.60)	(0.69)
District magnitude	−11.05	−23.26	−10.66	−24.44	−24.28	−23.25	−25.55	−21.85	−22.38	−21.07
	(9.39)	(6.54)***	(8.67)	(7.46)***	(7.56)***	(6.57)***	(7.14)***	(6.82)***	(7.30)***	(9.04)**
Direct dem. x *Distr. magn.*	1.43	4.83	3.60	4.91	4.60	4.80	5.20	4.38	4.36	4.15
	(2.58)	(1.76)***	(2.00)*	(1.82)**	(1.87)**	(1.78)**	(1.92)**	(1.75)**	(2.04)**	(2.23)*
P-value joint sign. Dir. dem., Dir. dem .sq. & inter. term	[0.000]	[0.005]	[0.042]	[0.004]	[0.007]	[0.011]	[0.014]	[0.004]	[0.034]	[0.038]
Federalism		−5.63	−6.64	−6.43	−4.93	−5.57	−5.24	−5.38	−3.82	−5.92
		(3.47)	(3.22)**	(3.71)*	(3.53)	(3.56)	(3.46)	(3.57)	(4.11)	(3.33)*
Quality of democracy		1.55	1.36	1.93	1.67	1.50	1.31	1.12	1.69	1.71
		(0.72)**	(0.65)**	(1.21)	(0.75)**	(0.83)*	(0.75)*	(0.76)	(0.85)*	(0.90)*
Age of democracy		−20.01	−17.80	−19.80	−20.68	−19.53	−20.33	−19.56	−17.90	−19.49
		(9.37)**	(8.54)**	(9.27)**	(9.98)**	(10.14)*	(9.30)**	(9.05)**	(8.94)*	(9.53)**
Log of GDP per capita		−3.31	−5.08	−3.35	−5.67	−3.17	−4.57	−2.84	−3.28	−3.51
		(2.78)	(2.52)*	(2.75)	(3.18)*	(2.86)	(3.25)	(2.98)	(3.58)	(3.09)
Country size		−0.06	−0.02	0.02	0.42	0.02	0.03	−0.56	−0.49	0.18
		(1.30)	(1.18)	(1.17)	(1.34)	(1.43)	(1.24)	(1.50)	(1.59)	(1.22)
Burden of regulation		−9.23	−6.85	−9.17	−6.84	−9.04	−8.22	−8.02	−10.80	−9.59
		(2.56)***	(2.73)**	(2.55)***	(3.03)**	(2.76)***	(2.46)***	(2.80)***	(3.64)***	(3.45)***
Size of government		−0.37	−0.29	−0.38	−0.37	−0.35	−0.38	−0.26	−0.51	−0.38
		(0.36)	(0.32)	(0.36)	(0.34)	(0.41)	(0.36)	(0.41)	(0.38)	(0.34)
Composition gov. exp.		1.02	0.97	1.03	1.01	1.01	0.90	0.87	1.23	1.13
		(0.70)	(0.62)	(0.71)	(0.66)	(0.72)	(0.68)	(0.79)	(0.71)*	(0.73)
Protestant		0.03	0.02	0.03	0.04	0.03	0.02	0.02	0.10	0.03
		(0.05)	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.07)	(0.05)
Ethnolinguistic fract.		20.00	19.96	20.52	20.42	20.44	19.10	23.88	17.70	19.55
		(7.02)***	(7.24)***	(6.78)***	(6.92)***	(7.77)**	(6.66)***	(7.56)***	(9.14)*	(7.43)**
Political system			[0.248]							
Executive constraints				−1.48						
				(2.70)						
Labor regulation					1.11					
					(1.70)					
Education						−0.03				
						(0.13)				
Demography							[0.352]			
Openness								−0.04		
								(0.04)		
Legal origins									[0.453]	
Colonial origins										[0.725]
Observations	56	49	49	49	47	49	49	49	49	49
R-squared	0.38	0.78	0.80	0.78	0.78	0.78	0.79	0.79	0.80	0.79

Notes: Robust standard errors in parentheses. When groups of dummies are included as controls, *p*-values for the joint significance of such controls set are reported in brackets. *Significant at 10%; **significant at 5%; ***significant at 1%.

Table 5 – (continued). OLS cross-country estimates with direct democracy, the square of direct democracy and the interaction term between direct democracy and district magnitude

Dep. var.: *Shadow economy*	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Direct democracy	−11.51	−14.01	−12.53	−9.93	−11.39	−13.64	−10.10	−12.14	−14.83	−12.31
	(5.30)**	(4.84)***	(4.25)***	(5.41)*	(4.43)**	(4.10)***	(4.75)**	(3.47)***	(3.96)***	(4.17)***
Direct democracy squared	1.00	1.19	1.03	0.73	0.92	1.37	1.00	1.20	1.57	1.05
	(0.58)*	(0.56)**	(0.51)**	(0.60)	(0.53)*	(0.48)***	(0.55)*	(0.41)***	(0.51)***	(0.51)**
District magnitude	−19.47	−28.18	−23.34	−23.58	−20.76	−8.02	−15.19	−9.78	−5.85	−24.07
	(7.50)**	(8.52)***	(6.70)***	(7.61)***	(6.71)***	(8.22)	(6.87)**	(5.94)	(8.26)	(6.48)***
Direct dem. x *Distr. magn.*	4.27	5.70	4.99	4.90	4.33	2.13	2.53	2.65	2.12	5.00
	(2.03)**	(2.10)***	(1.95)**	(1.82)**	(1.74)**	(1.94)	(1.74)	(1.49)*	(1.81)	(1.75)***
P-value joint sign. Dir. dem., Dir. dem .sq. & inter. term	[0.106]	[0.009]	[0.007]	[0.059]	[0.012]	[0.010]	[0.131]	[0.010]	[0.004]	[0.008]
Federalism	−5.02	−5.79	−5.29	−3.17	−5.80	−5.32	−3.19	−3.17	−4.18	−5.80
	(3.38)	(3.39)*	(3.88)	(3.30)	(3.42)*	(3.37)	(3.55)	(2.52)	(3.07)	(3.55)
Quality of democracy	1.33	1.39	1.53	1.06	1.61	1.43	1.55	1.33	1.37	1.95
	(0.76)*	(0.75)*	(0.73)**	(0.84)	(0.69)**	(0.63)**	(0.83)*	(0.58)**	(0.63)**	(0.93)**
Age of democracy	−18.45	−17.73	−20.29	−15.07	−18.86	−15.31	−10.54	−6.25	−13.04	−19.08
	(9.03)**	(9.56)*	(9.35)**	(9.18)	(9.06)**	(8.19)*	(8.70)	(6.67)	(7.32)*	(9.04)**
Log of GDP per capita	−4.40	−4.58	−2.93	−3.31	−2.56	−4.80	−3.62	−5.42	−7.00	−3.24
	(3.77)	(3.16)	(2.86)	(3.23)	(3.21)	(2.71)*	(4.51)	(2.88)*	(3.40)**	(2.78)
Country size	−0.07	−0.21	−0.17	0.12	−0.05	0.11	0.40	−0.15	−0.02	−0.08
	(1.44)	(1.34)	(1.38)	(1.74)	(1.20)	(1.11)	(1.02)	(0.88)	(1.07)	(1.30)
Burden of regulation	−8.93	−8.21	−9.33	−9.71	−7.88	−0.88	−2.22	3.23	1.33	−8.62
	(2.76)***	(2.77)***	(2.60)***	(2.91)***	(3.32)**	(4.74)	(3.83)	(4.10)	(5.06)	(2.63)***
Size of government	−0.23	−0.46	−0.36	0.01	−0.39	−0.41	−0.06	−0.31	−0.31	−0.43
	(0.31)	(0.38)	(0.37)	(0.31)	(0.36)	(0.34)	(0.33)	(0.30)	(0.32)	(0.38)
Composition gov. exp.	0.91	1.21	1.01	0.32	0.99	1.31	0.65	1.28	1.34	1.19
	(0.63)	(0.77)	(0.72)	(0.46)	(0.71)	(0.71)*	(0.61)	(0.64)*	(0.74)*	(0.75)
Protestant	0.04	−0.01	0.03	0.06	0.03	0.04	0.04	0.07	0.12	0.03
	(0.05)	(0.07)	(0.05)	(0.04)	(0.05)	(0.04)	(0.04)	(0.04)*	(0.05)**	(0.05)
Ethnic fragmentation	21.19	19.38	20.19	19.32	21.66	16.59	13.63	13.10	10.67	18.49
	(7.45)***	(6.89)***	(7.12)***	(9.82)*	(6.82)***	(6.61)**	(8.35)	(5.22)**	(7.41)	(8.14)**
Geography	[0.584]									
Culture		[0.377]								
Religious fractionalization			−2.42							
			(5.56)							
Income inequality				0.11						
				(0.23)						
Protection of property rights					−1.91					
					(2.18)					
Government effectiveness						3.85				
						(2.04)*				
Anti-diversion policies							−40.79			
							(17.72)**			
Rule of law								−11.92		
								(3.18)***		
Corruption									5.18	
									(2.05)**	
Civil liberties and political rights										2.34
										(2.49)
Observations	49	49	49	45	48	48	42	49	48	49
R-squared	0.79	0.79	0.78	0.82	0.79	0.81	0.85	0.85	0.83	0.79

Notes: Robust standard errors in parentheses. When groups of dummies are included as controls, *p*-values for the joint significance of such controls set are reported in brackets. *Significant at 10%; **significant at 5%; ***significant at 1%.

Table 6: Estimated marginal effects for all values of the direct democracy index (baseline regression)

DDI	*1*	*2*	*3*	*3.46*	*4*	*5*	*6*	*7*
Estimated marginal effect	–8.73	–6.67	–4.61	–3.66	–2.55	–0.49	1.58	3.64
Standard error	3.03	2.09	1.26	0.99	0.91	1.44	2.31	3.26
P-value	0.007	0.003	0.001	0.001	0.008	0.738	0.500	0.272