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Beyond the Veil of Ignorance: The Influence of Direct Democracy on the Shadow Economy

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Abstract

In this paper we analyze the influence of direct democratic institutions on the size and development of the shadow economies. The framework developed predicts a negative relationship between the degree of direct democracy and the size of the shadow economy. Countries where direct democratic institutions support democratic life are expected to be characterized by a lower informal sector, *ceteris paribus*. The empirical / econometric investigation of a sample of 56 democracies confirms our core hypothesis and demonstrates that the effect of direct democratic institutions on the shadow economy is negative and quantitatively important; the results are robust and also depend on the interaction of direct democracy with other political institutions, such as district magnitude.

JEL-Code: O170, D780, H110, H260.

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

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1. Introduction

This article is a first attempt to analyze the influence of direct democratic institutions on the size and development of the shadow economy. The basic motivation of our study is that understanding the mapping from institutional arrangements into policy outcomes is an essential precondition for evaluating both economic performances and the attitude of citizens towards the state and the law. For most quite large countries informal sector concerns all politicians and managers around the world and threats to seriously impede government intervention, especially during a period of crisis. At the same time, the quality of government intervention might distort economic activity and alter the social contract between institutions and citizens. Like two sides of the same medal, the development of shadow economy and low quality of governance are likely to be caught in a vicious circle, which is able to worsen state capacity.

Over the past decade the analysis of the shadow economy has attracted increasing interest. Various studies consider institutional characteristics as a key factor in the development of informal sector (Schneider and Enste, 2000; Friedman et al. 2000; Torgler and Schneider 2007; Schneider, 2010). In these studies the authors argue that the inefficient and discretionary application of tax system and regulations by government might play a crucial role in the decision of operating unofficially, even more important than the burden of taxes and regulations. In particular, corruption of bureaucracy and government officials seems to be associated with larger unofficial activities, while a good rule of law, by securing property rights and contracts enforceability, increases the benefits of being formal (e.g. Johnson et al., 1997; Johnson et al., 1998a,b; Dreher and Schneider, 2010).

Our analysis is complementary and new to this field of research. In trying to assess which variables play a role in the state-society interactions underlying informality, we specially paid attention to governance and institutional quality measures, like direct democracy and accountability indexes, rather than to traditional variables, as this approach has been neglected in previous related studies. In particular and for the first time, the aim of this paper is to analyze theoretically and empirically, on a cross-country basis, the effects of direct democratic institutions on the size of the shadow economy. In our opinion, the development of the informal sector can also be considered as a consequence of the failure of public institutions to support an efficient market economy, through appropriate public good provision. This can occur when the government is either wasteful or corrupt, with great discretionary power over the allocation of resources. Citizens who feel overburdened by the state, do not perceive their interests and preferences properly represented in political institutions and lose their trust in the authority. They will choose the “exit option” and decide to work in the informal sector as a reaction to inefficient governments (Schneider and Enste, 2002; Hirschman, 1970). Direct

democratic institutions provide citizens with the “voice option” over government performance. They have the potential to constrain, both directly and indirectly, the ability of politicians to extract rents from public spending, and therefore represent a form of non insulation of politicians. Moreover, direct democracy may act as a valid correction mechanism for the low accountability of governments. A government which self-imposes checks and allow citizens to be actively involved in the policymaking process, indicates that it trusts its constituency and takes into account its preferences. As a consequence, citizens who perceive government as benevolent and recognize their interests properly represented, identify with the state and are more willing to comply. They become more conscious of the opportunities available to eventually complain. Direct democracy might then help altering the incentives of behaving illegally.

The layout of our paper is as follows. Section 2 presents a short literature review. Section 3 deals with theoretical considerations about the costs and benefits of direct democratic institutions and presents a model that provides explanation of the transmission channels trough which direct democracy influences the size of informal sector. In Section 4 we present the empirical evidence, first the data and estimation approach is described, and concrete hypotheses are formulated and finally the empirical results are shown. After that in section 6 a summary is given and three connections are drawn.

2. A Short Literature Review

The existing literature on the economic effects of direct democratic institutions follows two main strands: a number of empirical studies, mainly based either on Switzerland or the United States, evaluated the impact of direct democracy on fiscal policy and government efficiency (Pommerehne, 1978; Pommerehne and Schneider, 1978; Frey, 1994; Matsusaka, 1995, 2004; Feld and Kirchgässner, 2001a,b; Feld and Matsusaka, 2003; Blomberg et al., 2004; Blume et al., 2009), yet other studies have focused on the effects that direct voter participation in political decision may have on citizens attitudes towards institutions, in terms of tax morale and civic trust in government (Pommerehne and Weck-Hannemann, 1996; Frey, 1997; Alm et al. 1999; Schneider and Enste, 2002; Feld and Tyran, 2002; Torgler, 2005; Torgler and Schaltegger, 2005).

The common theme of this literature is that democratic participation possibilities by taxpayers lead public spending to be more efficient and in line with the preferences of citizens. In particular, Pommerehne (1978) and Pommerehne and Schneider (1978) demonstrate that in Swiss cities where citizens’ participation in public decision-making is only indirect, the government and public bureaucracy prove to be unresponsive to voters’ preferences over public expenditures, though these

are taken more and more into consideration as elections approach. Specifically Frey (1994) discusses the properties of direct democratic institutions and argues that popular referendums are effective mechanisms by which the voters can control the policy choices of state governments and express collective preferences. He highlights that in 39 percent of the referendums that took place in Switzerland during the period from 1848 until 1990, the majority's will was different from the established will of the Parliament. Feld and Kirchgässner (2001a,b), taking into account Swiss municipalities, show that mandatory budget referendums are associated with both lower total expenditure per capita and reduced per capita debt. Feld and Matsusaka (2003) estimate regressions for Swiss cantons using panel data from 1990 to 1998 and find evidence that mandatory referendums reduce government spending by 19 percent. With regard to the United States, Matsusaka (1995; 2004) analyzes the impact of initiatives on fiscal policy and finds that state initiatives improve resources allocation. In particular, he concentrates on the effects of initiatives over a 30 year period and observes that initiatives are employed to constrain tax burdens as well as to lower the overall state and local government spending. Blomberg et al. (2004) obtain that over the years 1969–1986, among 48 US states, initiative states were between 20 to 30 percent more effective in providing public capital than non-initiative states, reaching a better economic outcome in terms of higher GDP growth. Blume et al. (2009) try to evaluate the economic effects of direct democracy on a cross-country basis. Considering a sample of 88 countries, they find that the presence of direct democracy institutions is correlated with lower government expenditure, especially in countries with weak democracies.

Although extensive literature on different aspects regarding the shadow economy exists, only very few studies address the influence of direct democratic institutions. Various studies suggest that higher participation rights raise direct political control and boost tax morale. Pommerehne and Weck-Hannemann (1996) find noncompliance to be negatively correlated with direct control of citizens/taxpayers over government budgets for Swiss cantons. Frey (1997) argues that direct citizens' participation, via popular referendums and initiatives, can enhance civic virtue and increase the intrinsic motivation to pay taxes. Schneider and Enste (2002) state that proper elements of direct democracy, together with fiscal federalism, might strengthen public trust in political institutions and foster tax morality. Alm et al. (1999), Feld and Tyran (2002) and Torgler and Schaltegger (2005) provide experimental evidence on the positive link between voting on tax issues and tax compliance. Torgler (2005) using survey data for Switzerland finds that direct democratic rights have a significant positive effect on tax morale.

Our paper is an attempt to bring together these two fields of research and for the first time introduces an innovation by providing a possible theoretical explanation of the transmission

channels through which direct democratic institutions influence the size of informal sector, and by testing the theoretical implications highlighted on a cross-country basis.

3. Theoretical background

Direct democracy identifies a variety of political processes that assign to ordinary citizens the right to directly decide on certain political issues through popular votes. In other words, under direct democracy people can vote directly on laws rather than candidates for office, independently on the wishes of government or parliament.⁴

All forms of direct democracy deal with the decision of citizens on substantive laws listed on the ballot, called *ballot measures* or *propositions*. Ballot measures can concern either the proposal of a new law or the abolishing of an old law. Moreover, there are differences on how propositions come to the ballot. In particular, we can distinguish between *initiatives*, that allow the citizens to propose a new law pertaining to different levels of legislation (constitutional versus ordinary legislation) and related to a variety of scopes; and *referendum*, that is a vote on a law already approved by the legislature. Both these forms of direct democracy allow the citizens to control the agenda and typically require a predetermined number of signatures from eligible voters to qualify for the ballot. On the contrary, *advisory measures*, are placed on the ballot directly by the legislature when the constitution requires popular approval before a law becomes effective or when public opinion needs to be involved. These types of direct democracy significantly vary in the details of their implementation process. For example, final approval may require a majority vote of the electorate or quorum requirements may be established. Moreover, the number of signatures necessary to qualify initiatives or referendum varies among countries. Laws approved under direct democracy may be easy or difficult to amend, depending on whether the intervention of the legislature is required or not (Matsusaka, 2005).

Direct democratic institutions are old and firmly established forms of government in some countries, but they have also spread increasingly over the past few decades becoming a global phenomenon.⁵ This expansion has attracted the interest of several scholars and there is much debate

⁴ This means that direct elections of president and mayors are not part of direct democratic institutions.

⁵ According to the Initiative and Referendum Institute Europe (2005), 517 popular votes on the national level all over the world have been documented between 1991 and 2004, while the Search Engine for direct democracy mentions 432 worldwide referendums and initiatives over the period 1984-1994, and 492 between 1995 and 2004 (Fiorino and Ricciuti, 2007).

about their role. According to Matsusaka (2005), three main theoretical arguments about the costs and benefits of direct democracy deserve particular attention, that is principal-agent problems between the citizens and the government, asymmetric information and issue bundling. It has been emphasized that the agency problems arising between voters and their elected representatives may lead the governments not to act in the interest of their constituencies. In this case, direct democratic institutions might contribute positively to the efficiency of political decision-making process in two ways. First, direct democracy may exert a direct effect on policy, as referendums and initiatives can override the decisions of policymakers by removing their discretion. Second, direct democratic institutions may also work indirectly, as the simple threat of a ballot proposition may be sufficient to induce elected officials to choose policies more close to the preferences of the median voter. In our framework, both effects are at work and discussed.

However, a recurrent criticism to direct democracy is that representative are more likely than the average citizen to have the experience, judgment and information to make the proper policy decision (Maskin and Tirole, 2004). There are complex policy issues where only elected representative have at their disposal the information required to implement a welfare enhancing decision. In these cases, the intervention of voters could constrain the policy choices of government or make governance more inefficient and complex. However, it could be argued that under direct democracy both citizens and their representatives should be better informed, as the use of direct democratic institutions facilitates discussions on policy issues. The existence of the right to directly intervene in policymaking process provides voters with the incentive to stay more informed than in representative democracies, which means that this line of argument is not so sharp-cutting. Finally, it is agreed that initiatives and referendums enable citizens to unbundle specific issues, which forces a closer correspondence between policy outcomes and citizens preferences and promote anti-special interest legislation counteracting the effects of log-rolling in legislatures (Matsusaka, 1995; Besley and Coates, 2003).

Less developed analyses concentrate on the implications of direct democratic institutions for tax evasion and government corruption. The repercussions of direct democracy on citizens attitudes towards government institutions depends on the procedures just discussed. The potential to participate in collective decision-making improves the legitimacy of the political system before citizens and lowers their inclination to cheat on taxes (Feld and Savioz, 1997; Frey, 1997). At the same time, as long as political processes become more transparent and policymakers are considered more accountable, corruption should be less pervasive (Blume et al., 2009).

Our theoretical analysis builds on the theory of direct democratic institutions as a discipline

device. In particular, in the next section we lay out a model linking the impact of direct democracy on the shadow economy through the fiscal policy choices made by elected politicians. The economy consists of individuals who can allocate their labor between two sectors, the formal and the informal one. Production in the formal sector also requires some productive public services and is perfectly observable by the tax authorities. Production in the informal sector relies only on labor and is completely unobservable by the authorities, which implies that it cannot be taxed. The revenues of the public sector can be used to provide both productive public services and rents to politicians. The politician has to decide the level of taxation, provision of public services and rents under the risk that citizens will promote a referendum to reject the reformed fiscal policy.

The model predicts that higher levels of direct democracy favor the implementation of fiscal policies closer to the preferences of citizens; these policies are more efficient and able to reduce individuals incentives to operate in the informal sector. The theoretical analysis also leads to the conclusion that direct democracy is likely to exert nonlinear effects on the size of the shadow economy, i.e., more direct democracy reduces the shadow economy at low or intermediate levels, while the effect of such increase is likely to be limited when direct democratic institutions are already quite good.

3.1 The Model

This paper considers an economy of a continuum of individuals of measure 1. 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 who supplies inelastically 1 unit of labor, which he can allocate between the formal sector ($l_{i,f}$) and the informal one ($l_{i,s}$) so that

$$(1) \quad l_{i,f} + l_{i,s} = 1.$$

The production function in the formal sector is Cobb-Douglas with constant returns to scale in labor and in the quantity of per capita public services g ,⁶ and it is defined as

$$(2) \quad y_{i,f} = l_{i,f}^\alpha g^{1-\alpha},$$

where $0 < \alpha < 1$. Production in the informal sector does not require the input provided by the public sector, so the shadow economy's production function is given by

⁶ It is clear from the production function that the productive input provided by the public sector is essential for production and that there is congestion in the sense that what matters for production is the per-capita level of public services that are assumed to be not excludable in the formal sector (e.g., Barro, 1990).

$$(3) \quad y_{i,s} = al_{i,s}^\beta,$$

where $0 < \beta < 1$ and $a > 0$.

Each agent chooses the optimal allocation of labor between the two sectors and consumes all income produced net of taxes. Income in the formal sector is perfectly observable by the tax authorities and can be taxed at a constant rate $t \in [0, 1]$. In contrast, production in the informal sector is completely unobservable, which implies that it cannot be taxed by the public authorities. Therefore, from (1), (2) and (3) follows that the disposable income of agent i is

$$(4) \quad y_{i,d} = (1-t)(1-l_i)^\alpha g^{1-\alpha} + al_i^\beta,$$

where l_i denotes the amount worked by agent i in the unofficial economy.

The revenues of the public sector are equal to

$$(5) \quad E = \int_{i=0}^1 ty_{i,f} di = \int_{i=0}^1 t(1-l_i)^\alpha g^{1-\alpha} di = t(1-l)^\alpha g^{1-\alpha},$$

where we have used the fact that $l_i = l$ for all i since all agents are identical and face the same fiscal policy. The revenues can be used to provide productive public services and/or to provide rents to politicians. Let G denote the total provision of public services and $\gamma \in [0, 1]$ the fraction of revenues E spent for public services,⁷ so that $1 - \gamma$ denotes the fraction of revenues used for politician's rents. The government budget constraint is thus $G = \gamma E$. If we take into account the unitary mass of the population and the expression for E in (5), the government budget constraint becomes $g = \gamma(1-l)^\alpha g^{1-\alpha}$ and can be rewritten as

$$(6) \quad g = \gamma^{1/\alpha} t^{1/\alpha} (1-l).$$

We shall refer to t and γ as the *fiscal policy variables* to be chosen by the politician, given that g is uniquely determined by the government budget constraint (6).

The total utility of the politician is

$$(7) \quad u = (1-\gamma)E + p_R B,$$

where the first component is the current monetary rent, $B > 0$ are the (exogenous) future benefits from being in office and p_R is the probability of being reelected.

We consider a one period economy with a politician in office. Nature chooses randomly the status quo fiscal policy (t_0, γ_0) at the beginning of the period and the politician decides whether

⁷ Politician's rents are modeled here as a cash transfer, but one could also assume the existence of a nonproductive public good that gives utility to politician only.

changing it or not; we denote with (t_c, γ_c) the reformed policy.⁸ After the policy has been chosen, citizens may mobilize and promote a referendum against the reform. If this takes place, then citizens vote and decide whether the reform can be implemented or not. If the reform is rejected, then the status quo policy is implemented. Finally, elections take place on the reappointment of the politician.

We assume that promoting a referendum is costly for the citizens, and that this cost η_i is equal for all individuals, i.e., $\eta_i = \eta(\delta)$ for all i , where $\delta \in [\underline{\delta}, \bar{\delta}]$ is an index of the level of direct democracy. We also assume that $\partial \eta / \partial \delta \equiv \eta'(\delta) < 0$ which captures the idea that at higher levels of direct democracy correspond a lower cost of mobilization to organize a referendum. Individuals are assumed to enjoy a positive nonmonetary benefit ε_i from promoting a referendum. This payoff differs across agents and has the cumulative distribution function $F(\varepsilon)$, with $F'(\varepsilon) \equiv f(\varepsilon)$. As each individual has zero mass, he will not consider the monetary payoff in deciding whether to mobilize or not for the referendum, so that this will be promoted only by the agents with payoff $\varepsilon_i - \eta \geq 0$. This implies that a referendum will take place only with some probability even when all citizens have an economic gain from blocking the reform and implementing the status quo policy. In order to capture the fact that the incentive of the citizens to promote a referendum may depend on the size of the economic gain from blocking the reform, we assume that only a fraction q of the citizens with net nonmonetary payoff will effectively promote the referendum and that this is given by

$$(8) \quad q(t_c, \gamma_c) = \frac{y_d(t_0, \gamma_0) - y_d(t_c, \gamma_c)}{y_d(t_0, \gamma_0)}.$$

The expression of q in (8) means that the lower is the net disposable income of the reformed policy (t_c, γ_c) relative to the status quo (t_0, γ_0) , and the higher the share of citizens putting effort to promote a referendum. From the above assumptions follows that the probability that a referendum will take place when this optimal for the citizens is

$$(9) \quad P(\delta, t_c, \gamma_c) = q(t_c, \gamma_c)[1 - F(\eta(\delta))],$$

which is decreasing in the citizens' net income $y_d(t_c, \gamma_c)$ from the reformed policy and increasing in the level of direct democracy, since $\eta'(\delta) < 0$.

We now move to characterize the equilibrium of the model and determine the effect of direct democracy on the equilibrium policy and the size of the shadow economy.

⁸ In a dynamic setting, the status quo policy could be interpreted as the policy implemented in the previous period.

3.2 The Equilibrium

We first determine the individual optimal allocation of labor among sectors for any given policy set by the politician. The result is contained in the following lemma.

Lemma 1. *If the government taxes the income produced in the formal sector at rate $t \in (0,1)$ and uses the fraction $\gamma \in (0,1)$ of total revenues for the provision of public services, then the amount of labor employed in the informal sector by each individual is*

$$(10) \quad l(t, \gamma) = \left[\frac{a\beta}{\alpha\gamma^{(1-\alpha)/\alpha} t^{(1-\alpha)/\alpha} (1-t)} \right]^{\frac{1}{1-\beta}}.$$

Moreover, for any given policy (t, γ) , we obtain that

$$(11) \quad \frac{\partial l}{\partial t} = \frac{t - (1-\alpha)}{\alpha(1-t)(1-\beta)} l,$$

and

$$(12) \quad \frac{\partial l}{\partial \gamma} = -\frac{1-\alpha}{\alpha\gamma(1-\beta)} l,$$

with $l \equiv l(t, \gamma)$ defined by (10). This means that $\partial l / \partial \gamma < 0$ and that $\partial l / \partial t \gtrless 0$ for $t \gtrless 1-\alpha$, and that

$l = 1$ for $t = 0$, $t = 1$ or $\gamma = 0$. Therefore, the fiscal policy maximizing the citizens' net disposable income is $t^* = 1-\alpha$ and $\gamma^* = 1$.

Proof. Each agent chooses the labor share between the two sectors maximizing his net disposable income

$$(13) \quad \max_{l_i} y_{i,d} = (1-t)(1-l_i)^\alpha g^{1-\alpha} + al_i^\beta.$$

From the first order condition of problem (13) with respect to l_i , using the government budget constraint (6) and the fact that all individuals are identical (i.e., $l_i = l$ for all i), we obtain the optimal amount of labor employed in the informal sector by each agent is the one reported in (10). The expressions (11) and (12) are obtained from the differentiation of (10) and rearranging terms. ■

Expression (10) makes it clear that the amount worked in the informal sector is monotonically

decreasing in γ and, therefore, takes the minimum value at $\gamma = 1$. Other things equal, the higher is the fraction of revenues γ used for the provision of productive public services, the higher is the marginal productivity in the formal sector (relative to the informal one), and the lower will be the labor supply in the shadow economy. $\gamma = 0$ means that public services are not provided and that there cannot be production in the formal sector, so that $l = 1$, and the same is true when $t = 0$. All labor is employed in the shadow economy if $t = 1$ because all production in the formal sector accrue to the government revenues. The relationship between l and t , for a given γ , is instead nonmonotonic: l is decreasing in t when $t < 1 - \alpha$, it is at its minimum at $t = 1 - \alpha$, and then it becomes increasing in t for $t > 1 - \alpha$. The intuition for this result has to do with the fact that the allocation of labor depends on its relative net marginal productivity across the two sectors, and that an increase in taxation generates two opposite effects affecting the net marginal productivity of labor in the formal sector (while leaving unaffected the marginal productivity in the shadow economy). On the one hand, 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. On the other hand, more taxation means more provision of productive public services and, therefore, a higher marginal productivity of labor in the formal sector. When taxation is relatively low ($t < 1 - \alpha$), the increase in the provision of public services due to an increase of the tax rate generates an increase in the marginal productivity of labor in the formal sector that more than compensate the increase of taxation. This means that the net marginal productivity of labor in the formal sector increases, and the supply of labor in the informal sector goes down. The opposite happens for relatively high levels of taxation (i.e., for $t > 1 - \alpha$). These considerations also suggest the existence of a monotonic relationship between the net disposable income and the level of shadow economy, which is stated in the following corollary.

Corollary 1. *There exists a monotonic negative relationship between the net disposable income of the agent and the labor employed in the shadow economy, i.e., $\partial y_d / \partial l < 0$.*

Proof. From optimal level of labor employed in the informal sector (10) follows that $(t\gamma)^{(1-\alpha)/\alpha}(1-t) = (a\beta/\alpha)l^{-(1-\beta)}$. Substituting this expression in (13) and taking into account of the government budget constraint (6) implies that the maximized net disposable income of each individual is $y_d^* = (a\beta/\alpha)l^{-(1-\beta)}(1-l) + al^\beta$. Taking the derivative of this expression with respect to l leads to $\frac{dy_d^*}{dl} = a\beta l^{-(1-\beta)} \left[1 - (1/\alpha) - \frac{1-\beta}{\alpha} \frac{1-l}{l} \right] < 0$. ■

This result is important because it establishes that any policy increasing the maximized disposable income of the individuals involves an unambiguous negative effect on the labor

employed in the shadow economy. Moreover, the following result will also be useful.

Corollary 2. *The size of the shadow economy is monotonically positively related to the amount of labor employed in the informal sector by the representative agent.*

Proof. Taking into account the unitary measure of the population, the size of the shadow economy is given by al^β / y_d . Since y_d is decreasing in l (see Corollary 1), it is straightforward that this ratio will be increasing in l . ■

We now determine the fiscal policy chosen by a politician maximizing his own utility without the constraint that a referendum will take place. This problem involves the maximization of the utility in (7), subject the government budget constraint (6) and the individuals' reaction function (10). Substituting (6) into (7), this problem can be rewritten as

$$(14) \quad \max_{t, \gamma} u = (1 - \gamma) \gamma^{(1-\alpha)/\alpha} t^{1/\alpha} (1 - l) + p_R B.$$

The solution to problem (14) is summarized in the following lemma.

Lemma 2. *The unconstrained optimal fiscal policy for the politician is setting taxation and the fraction of revenues spent for the provision of the public services at levels*

$$(15) \quad t^s = \frac{1 - \beta + \beta l^s - \alpha l^s}{1 - \beta + \beta l^s},$$

$$(16) \quad \gamma^s = \frac{(1 - \alpha)(1 - \beta + \beta l^s)}{1 - \beta + \beta l^s - \alpha l^s},$$

where $l^s \equiv l(t^s, \gamma^s)$ is given by (10), $t^s > t^* = 1 - \alpha$, and $\gamma^s < \gamma^* = 1$. This implies that the amount of per capita public services provided is less than optimal, $g^s < g^*$, and that the amount of labor allocated by each agent to informal activities is higher than the level chosen under the efficient fiscal policy, $l^s \equiv l(t^s, \gamma^s) > l^* \equiv l(t^*, \gamma^*)$.

Proof. See Appendix A. ■

We now move to characterize the equilibrium of the model by determining the fiscal policy chosen by the politician that maximizes his utility taking into account the possibility of a referendum. In particular, the politician has two possible strategies. One is to select the policy contained in Lemma 2 and bear the risk of a referendum and the implementation of the status quo policy. We call this the *nonprevention strategy*. The other possibility for the politician is choosing a policy that gives no incentive to the citizens to promote a referendum and that improves the utility of the politician. We define this as the *prevention strategy*.

Let us start from the analysis of the prevention strategy. In this case, the politician chooses the fiscal policy solving the maximization problem (15) subject to the constraint that the net disposable income of the agents under the reformed fiscal policy is not lower than the one they would obtain

under the status quo policy, i.e.,

$$(16) \quad y_d(t_0, \gamma_0) \equiv (\gamma_0 t_0)^{(1-\alpha)/\alpha} (1-t)(1-l_0) + al_0^\beta \leq (\gamma)^{(1-\alpha)/\alpha} (1-t)(1-l) + al^\beta \equiv y_d(t, \gamma),$$

where $l_0 \equiv l(t_0, \gamma_0)$ defined in (10). Note that in (16), we have substituted the government budget constraint (6) and used the fact that all individuals are identical as in the proof of Lemma 1. The following lemma characterizes the solution to this problem.

Lemma 3. *The optimal fiscal policy for the politician under prevention, (t_p, γ_p) , solving problem (15) subject to (16), has the following properties. If the constraint (16) is not binding, $y_d(t_0, \gamma_0) \leq y_d(t^s, \gamma^s)$, then the politician chooses the fiscal policy reported in Lemma 2, i.e., $t_p = t^s$ and $\gamma_p = \gamma^s$. If instead the constraint (16) is binding, $y_d(t_0, \gamma_0) > y_d(t^s, \gamma^s)$, then the reformed policy (t_p, γ_p) is such that $t_p \in [1-\alpha, t^s]$ and $\gamma_p \in [\gamma^s, 1]$, where at least one of the following two inequalities hold: $t_p < t^s$, $\gamma_p > \gamma^s$. Moreover, when constraint (16) is binding, this always holds with the equality sign in equilibrium, i.e., $y_d(t_0, \gamma_0) = y_d(t_p, \gamma_p)$. The fiscal policy (t_p, γ_p) is independent on the level of direct democracy δ .*

Proof. The first part of the lemma is immediate; if the constraint is not binding, the politician chooses the unconstrained optimum (t^s, γ^s) described in Lemma 2. If the constraint is binding at (t^s, γ^s) , then the politician needs to increase the utility of the citizens. $t > t^s$ is never optimal because the utilities of the politician and individuals are both decreasing in t , and $t < t^* \equiv 1-\alpha$ is also not optimal because both utilities are increasing in t ; therefore, $t_p \in [1-\alpha, t^s]$ as u and y_d are respectively (strictly) increasing and decreasing in t in this range. $\gamma_p \in [\gamma^s, 1]$ comes from the fact that u and y_d are both (strictly) increasing in γ for all $\gamma < \gamma^s$. $t_p < t^s$ and/or $\gamma_p > \gamma^s$ follows from (16) binding. The last part of the lemma is immediate since δ does not appear in any part of the problem. ■

Lemma 3 states that the policy reform when the politician wants to avoid a referendum takes intermediate values between the optimal policy of the politician, (t^s, γ^s) , and the optimal policy of the agents, $(t^*, 1)$. It is clear that the higher the utility of the agents from the status quo policy (t_0, γ_0) , and the closer the reformed policy will be to the optimal one. It is also worth emphasizing that the level of direct democracy does not have any effect on the reformed policy in this case since the policy chosen has to be such that it is *never* optimal for the citizens to promote a referendum.

The politician has also the option of choosing a fiscal policy and face the risk of a referendum (nonprevention strategy). In this case, the politician maximizes the following expected utility

$$(17) \quad \max_{t, \gamma} Eu(\delta, t, \gamma) = P(\delta, t, \gamma)u(t_0, \gamma_0) + [1 - P(\delta, t, \gamma)]u(t, \gamma),$$

subject the government budget constraint (6) and the individuals' reaction function (10), and where $P(\delta, t, \gamma)$ is defined by (9). The following lemma provides the solution to this problem.

Lemma 4. *The optimal fiscal policy for the politician under nonprevention, (t_N, γ_N) , solving problem (17), has the following properties. As in Lemma 3, if $y_d(t_0, \gamma_0) \leq y_d(t^s, \gamma^s)$, then the politician selects the fiscal policy (t^s, γ^s) reported in Lemma 2; and, similarly, if $y_d(t_0, \gamma_0) > y_d(t^s, \gamma^s)$, the reformed policy (t_N, γ_N) is such that $t_N \in [1 - \alpha, t^s]$ and $\gamma_N \in [\gamma^s, 1]$, with $t_N < t^s$ and/or $\gamma_N > \gamma^s$. The reformed policy does depend on the degree of direct democracy, i.e., $(t_N(\delta), \gamma_N(\delta))$, and more direct democracy pushes the policy to a level closer to the optimal one.*

Proof. The first part of the lemma is straightforward. The optimal solution can be computed using the same steps reported in the proof of Lemma 2 taking into account that $\partial P(\delta, t, \gamma)/\partial t > 0$ and $\partial P(\delta, t, \gamma)/\partial \gamma < 0$ in the relevant range of the parameter space. Moreover, from $\partial P(\delta, t, \gamma)/\partial \delta > 0$ and $u(t_0, \gamma_0) < u(t_N, \gamma_N)$ follows that the maximized expected utility of the politician in (17) is decreasing in the level of direct democracy δ . ■

When the politician follows the strategy of nonprevention, he takes the risk that a referendum is promoted and that the status quo policy is implemented. In this case, the level of direct democracy has two beneficial effects on fiscal policy. A higher level of δ increases the probability that a referendum takes place, and therefore that the more efficient status quo policy is implemented rather than the reformed policy. A higher level of direct democracy also leads the politician to choose a less distortionary policies in order to reduce the incentives of the citizens to promote a referendum.

The following proposition characterizes the optimal behavior of the politician.

Proposition 1. *There exists a level of direct democracy, $\underline{\delta} < \delta^* \leq \bar{\delta}$, such that the politician chooses the strategy of nonprevention described in Lemma 4 for all $\delta \leq \delta^*$, and the strategy of prevention reported in Lemma 3 for all $\delta > \delta^*$.*

Proof. The result comes from the following two facts. The strategy of nonprevention gives the politician the maximal unconstrained utility for the lowest level of direct democracy (as this corresponds to the case where referendums are not allowed), as the fiscal policy implemented is $(t_N, \gamma_N) = (t^s, \gamma^s)$. The expected utility under nonprevention is decreasing in δ , while the utility from prevention is independent on δ and it is always strictly lower than the unconstrained utility $u(t^s, \gamma^s)$. However, it cannot be excluded that the nonprevention strategy always dominates the

prevention one, i.e., $u(t_N(\delta), \gamma_N(\delta)) \geq u(t_P, \gamma_P)$ for all $\delta \in [\underline{\delta}, \bar{\delta}]$, and therefore that $\delta^* = \bar{\delta}$. ■

We can now establish the effect of direct democracy on the level of shadow economy.

Proposition 2. *The presence of direct democracy has a global negative effect on the size of the shadow economy. When the degree of direct democracy is relatively low ($\delta \leq \delta^*$), higher levels of direct democracy reduce the size of the informal sector. When instead direct democracy is relatively high ($\delta > \delta^*$), higher levels have no effects on the shadow economy.*

Proof. Under prevention ($\delta > \delta^*$), higher levels of δ do not change the reformed policy and therefore the size of the shadow economy. From $y_d(t_0, \gamma_0) = y_d(t_P, \gamma_P)$ (see Lemma 3) and Corollaries 1 and 2, follows that the shadow economy under the status quo policy is the same as the one under the reformed policy, unless $(t_P, \gamma_P) = (t^s, \gamma^s)$ because of $y_d(t_0, \gamma_0) < y_d(t^s, \gamma^s)$, and in this latter case the reformed policy generates a smaller informal sector than the status quo policy.⁹ Under nonprevention ($\delta \leq \delta^*$), higher levels of δ lower the size of the shadow economy through the following two channels. First, the reformed policy (t_N, γ_N) implies a shadow economy decreasing in δ (from Lemma 4). Second, $y_d(t_N, \gamma_N) \leq y_d(t_0, \gamma_0)$, and from Corollaries 1 and 2, this also implies that the size of the shadow economy is higher under the nonprevention policy than under the status quo policy; therefore, higher levels of δ reduce the informal sector by making the status quo policy more likely. Finally, the size of the shadow economy under prevention is always lower than under nonprevention. This follows from Corollaries 1 and 2 together with $y_d(t_N, \gamma_N) \leq y_d(t_P, \gamma_P)$. ■

The framework developed suggests that higher degrees of direct democracy improve the fiscal policy implemented by making it more efficient and closer to the preferences of citizens. This in turn increases the net marginal productivity of labor in the formal sector and reduces the incentive of individuals to operate in the shadow economy. The model also predicts the existence of *nonlinear* effects of direct democracy on the size of the informal sector. In particular, an increase in the level of direct democracy is likely to reduce substantially the size of the shadow economy when direct democracy is at low or intermediate levels, while the effect of such increase is more limited when direct democratic institutions are already quite good.

To summarize, the theoretical approach comes to the core hypothesis that predicts a negative relationship between direct democratic institutions and the size of the shadow economy. Countries where direct democracy and its use of popular initiatives and referendums are an essential

⁹ This the case with the status quo policy not binding for the politician and it is not very interesting since the reformed policy is the unconstrained policy of the politician independently on the degree of direct democracy.

component of democratic life, are expected to be characterized by a lower informal sector, *ceteris paribus*. This is our main hypothesis, which will econometrically be tested.

4. Empirical Evidence

4.1 Data Description and Estimation Approach

We develop a cross-sectional analysis on a sample of 85 countries (from Persson and Tabellini, 2003) that can be considered democracies for the period 1990–1998. We consider only democratic countries since direct-democratic institutions are likely to work only in relatively stable democracies. Referendums and popular initiatives, even if observed, are expected not to produce any effect in authoritarian regimes as they are likely to be heavily manipulated by the government. And it is also clear even in democracies that the quality of processes realized improves in a contest of higher level of civil liberties and political freedom.

In order to reduce the possibility of omitted variable, we run several regressions controlling for a wide range of variables which, according to the existing literature, might have an impact on the size of the shadow economy and also be correlated with the country's democratic institutional organization. We avoid describing all variables in detail here; the definition and sources are reported in the Data Appendix.¹⁰

Data concerning the informal sector are drawn from the dataset of Schneider (2005), which provides the size of the shadow economy as a proportion of official GDP for 145 countries over the period 1999–2003. 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 considered in the original sample.

The index of direct democracy (DDI) comes from 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. The DDI lies within a range of values from 1 to 7, with 7 being associated to the countries rated as radical democrat, and 1 to the countries with the lowest level of direct democracy.¹¹ 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. The index, in fact, reflects at the same time the quality of democracy and its performance, as it focuses on the two most important and widely used processes,

¹⁰ The variables that measure governance and institutional quality come from different datasets (Kaufmann et al., 2005; Treisman, 2008; Blaume, 2009).

¹¹ The only country ranked 7 is Switzerland, while the largest group of countries (twenty-five) takes the value 1.

initiatives and referendum, as well as on the quality of the processes themselves.¹² However, the DDI has some disadvantages that have to be discussed. First, it links together the legal possibility of having referendums and initiatives and the actual choice of using them. Second, it does not allow to identify the issues tackled by referendums and initiatives. Finally, the index is a subjective measure of direct democracy, so the criteria followed to construct it remain somehow vague.

In testing the hypothesis that a higher degree of citizens' direct political participation lowers *ceteris paribus*, the size of shadow economies, we use a baseline specification that includes the following control variables:

- (1) We take into account the age of democracy as well as the quality of democracy (proxied by the PolityIV index), as the actual use of direct democracy is more likely to occur in stable and older democracies.
- (2) Moreover, both the quality and the consolidation of democracy go hand in hand with the quality of government institutions and influence the incentive of citizens to operate in the informal sector.
- (3) The baseline regression also contains a measure of district magnitude. The reasoning motivating the inclusion of this variable is that government accountability to the constituents is supposed to be higher when geographic size of the district is small (Blume et al., 2009).
- (4) For the same reason, we add a measure of the country size and a variable for the federal structure. In our opinion, larger countries may encounter greater difficulties in controlling economic activity and this could lead to an increase in the size of shadow economy; while federal countries appear to better encounter the preferences of citizens and secure a higher quality of public spending, being correlated with a lower size of shadow economy (Torgler et al., 2010, Teobaldelli, 2011). The issue is also discussed in Schneider and Enste (2002) who emphasize that a combination of fiscal federalism and appropriate elements of direct democracy might reinforce public trust in political institutions and foster tax morality.
- (5) We also use an index of ethnic fractionalization because a large literature indicates that ethnic heterogeneity is a determinant of economic performance both in terms of output

¹² In other words, it allows taking into account even the quality of procedures underlying the actual use of popular initiatives and referendums to propose, approve, amend and delete laws. In order to clarify this point, Fiorino and Ricciuti mention the case of Belarus as an example: despite 9 referendums had been held in this country from 1995 to 2004, Belarus is characterized by the lowest possible score in the range, as referendums were proposed and used by President Lukashenko in order to amplify its power at the expense of the legislature and a positive outcome was secured thanks to arrests of political adversaries and pressure on citizens. However Belarus is not included in our sample.

and quality of institutions (La Porta et al., 1999; Alesina et al., 2003).

- (6) We then include the log of GDP in 1960 to take into account the level of economic development.¹³
- (7) We employ also the central government expenditures, including social security, as a percentage of GDP to proxy for the size of government, and the burden of regulation, that captures the intensity of regulation in the economic system and reflects the ability of government to implement market-friendly policies promoting private sector development. Both variables are cited in various studies on the hidden economy as the most important determinants of the increase of the shadow economy (Tanzi, 1999; Johnson et al., 1998a,b; Friedman et al., 1999; Schneider and Enste, 2000; Kaufmann et al., 2005).
- (8) We also control for the percentage of the population professing the Protestant religion, since religious beliefs might affect people's attitudes toward the economic system, private property and tax compliance in particular (La Porta, 1997; Landes, 1998):
- (9) Furthermore we consider the characteristics of the political system, by including a variable for the electoral system (proportional or majoritarian electoral rule) and a variable for the form of government (presidential or parliamentary regime). We also consider a measure of the operational (de facto) independence of the Chief Executive. The use of these variables might capture the extent to which political leaders are insulated from citizens and can exert their discretionary power, since more insulated politicians tend to extract rents from public budget at expense of voters welfare. Alternative institutional arrangements provide different levels of checks and balances among the body of the government, and differ in the degree of accountability to voters. Following this reasoning, we can expect that presidential and majoritarian systems are more accountable. Moreover it can be argued that the features of government and electoral systems are able to influence composition and dimension of public expenditure (Persson and Tabellini, 2003), affecting by this way the size of the shadow economy.
- (10) In addition, we control for a measure of labor market regulation and the level of education as these may affect the incentive of the individuals to operate in the informal sector. The latter is also important in promoting civic participation and cooperation with others, so facilitating the support for more democratic regimes (Lipset, 1959;

¹³ The reason for using the GDP of 1960 is to avoid possible endogeneity problems with respect to the dependent variable.

Glaeser et al. 2006).

- (11) We include the demographic characteristics of population, given respectively by the percentage of the population between age 15 and 64, and the percentage of the population aged 65 and older, that can influence the total amount and the composition of public expenditure and have an impact on fiscal policies.
- (12) The degree of openness to international trade is also taken into account since the literature on shadow economy suggests that globalization of markets and increasing competitiveness of third world economies, which exhibit lower production costs, can affect firms decision to operate in the informal sector (Gerxhani, 1999).
- (13) We control for legal, historical, and geographical characteristics by including variables for legal origins (common law, French civil law, German civil law, Scandinavian civil law, and socialist law), for colonial history (British, Spanish-Portuguese, or other colonial origins), and for geographical localization (Africa, East Asia, Latin America, Central America, or the Caribbean), considered crucial factors to evaluate the efficiency of the government, the quality of public goods, as well as the size of government and political freedom.
- (14) Also we use an index of religious fractionalization and income inequality to control for the heterogeneity in the society. We add a control set for the religious affiliation (the percentage of the population belonging to the Roman Catholic religion in 1980, and an index on Confucian, Buddhist or Zen religious traditions) as a proxy for the dimension of culture given that many studies have stressed the role of religion beliefs in shaping individuals attitudes like ethic, trust, tolerance, and compliance (La Porta et al., 1997; Landes, 1998). An index for the civil liberties and political rights is considered as these features can be related to the working of direct democratic institutions.
- (15) 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, that takes into account the perception of the quality of public service provision, an index of government anti-diversion policies, an index for the rule of law, and an index of corruption of government officials.

4.2 Empirical Results and their Interpretation

Table 4.1 provides some descriptive statistics for the main variables employed. The mean size of the shadow economy in the sample is about 31 percent of GDP and the average value of the direct

democracy index is 3.45. Table 4.2 reports the correlation among some variables and reveals that all measures of quality of democracy used are negatively correlated with the shadow economy. In particular, we observe a high 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 highly correlated (0.60) with the quality of democracy. Table 4.3 reports the average value of the direct democracy index for each quartile of the distribution of the size of the shadow economy. The average direct democracy index is 4.92 in the first quartile of the distribution and decreases continuously until 2.07 in the last quartile.

Our empirical strategy is based on two alternative specifications. The first specification takes the following form:

$$SE_i = \alpha + \beta_1 DDI_i + \beta_2' Z_i + \varepsilon_i,$$

where SE and DDI stand for the size of the shadow economy and the index of direct democracy respectively, whereas the Z vector is composed of various control variables and ε_i is an error term. Table 4.4 shows the estimates for this specification.

Column (1) of Table 4.4 shows that an increase of one point in the direct democracy index reduces, on average, the share of the informal sector by 4.63 percentage points. The estimate of our baseline specification where we control for a number of variables is reported in Column (2). We find that the direct democracy coefficient is -2.71 and it is statistically significant at 1% level. This means, for example, that an increase in the direct democracy index by 4 points, which corresponds to a shift from the first to the third quartile of the distribution, reduces the shadow economy by 11 percentage points, i.e., more than one third of the average size of the informal sector in the sample. The estimate also confirms the theoretical prediction that a lower district magnitude is associated with a smaller shadow economy.

Next we modify the baseline specification by adding one control variable (or one group of such variables) at a time to generate eighteen further specifications. Columns (3) and (4) of Table 4.4 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; these estimates confirm the importance of the direct democracy in explaining the size of the informal sector as the size of the direct democracy coefficient is basically unchanged with respect to the baseline specification and its statistical significance is always at standard levels. Including measures of labor regulation, education, demography, and openness to international trade (Columns (5), (6), (7), and (8), respectively) it leaves the results unchanged. 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 Columns (11), (12), (13) and (14) respectively. The estimated coefficient of the direct democracy index is similar to the baseline specification and it is always statistically significant at standard levels. The weakest specifications are the ones that includes the geographic location and income inequality; the statistical significance of the estimated direct democracy coefficient drops to 10% level. The next five columns of Table 4.4, from (14) to (19), confirm the results when various measures related to institutional quality—such as protection of property rights, government effectiveness, perception of government anti-diversion policies, rule of law, and perception of corruption—are employed. The same is true when we control for civil liberties and political rights (see Column (20)).

To summarize, the picture emerges that direct democracy is strongly associated with lower levels of the shadow economy. It is also worth noting that district magnitude is important in explaining the size of the informal sector and we now move to analyze this point more in deep.

In the second specification, we are interested in estimating how direct democratic institutions and the magnitude of district interact each other in determining the size of the shadow economy. In particular, we estimate the following equation:

$$SE_i = \alpha + \beta_1 DDI_i + \beta_2 DISTRICT_M_i + \beta_3 (DDI_i \times DISTRICT_M_i) + \beta_4' Z + \varepsilon_i,$$

where in addition to the variables of the previous specification, the estimation now includes the interaction term between the direct democracy index and the district magnitude ($DDI_i \times DISTRICT_M_i$). The conjecture motivating the inclusion of this variable is that direct democratic institutions and other features of the political process, such as the district magnitude, can either reinforce or substitute each other as potential correction mechanisms for the low accountability of policy-makers.¹⁴ It is therefore interesting to understand how these two political institutions interact each other, namely whether they are complements or substitute.

The inclusion of an interacting term implies that the coefficients β_1 and β_2 capture respectively the impact of direct democracy and district magnitude on the shadow economy only when district magnitude is equal to zero. The marginal effect of direct democracy, ΔDDI , on the size of the shadow economy is now given by $\Delta SE = (\beta_1 + \beta_3 DISTRICT_M) \Delta DDI$. Table 4.5 reports the estimates of this additional specification.

Column (1) of Table 4.5 shows the estimate when we include the direct democracy index, the

¹⁴ As discussed in the Persson and Tabellini's book (see Chapter 8 for details), district magnitude is highly correlated with the electoral system (this correlation is 0.84 in our sample); the electoral districts are large in proportional systems and small in majoritarian ones.

district magnitude and the interaction term of these two indexes only, while the estimate of our baseline specification containing the most important control variables is reported in Column (2). In the baseline specification, we obtain an estimated coefficient of direct democracy equal to -4.03 and an estimated coefficient of the interaction term of 3.19. This implies that the marginal effect of direct democracy is -4.03 for the largest possible district magnitude (*DISTRICT_M*=0, i.e., of a single national district) and -0.84 when the district magnitude is the lowest possible (*DISTRICT_M*=1). In other words, we obtain that the effect of direct democracy on the shadow economy increases with district magnitude. As the average value of district magnitude in the sample is 0.367, the effect of direct democracy evaluated at the mean is $(-4.03 + 3.19 \times 0.367) = -2.86$, which is in line with the results of the first specification.

The estimated coefficient of the direct democracy index is statistically significant at standard levels in all specifications. The coefficient of direct democracy and the interaction term are jointly significant at standard levels in most, but not all, specifications. In particular, when controlling for the political system, colonial origins and rule of law (see Columns (3), (10) and (18) respectively), the joint significance of the two coefficients is at 10%, while they are not jointly statistically significant at standard levels when we control for geography or anti-diversion policies (see Columns (11) and (17) respectively). This can be partly explained with the fact that the anti-diversion policies coefficient reduces the number of observations, while the geography controls are probably highly correlated with the characteristics of the political system.

In sum, these results demonstrate that the effect of direct democracy on the level of shadow economy has a negative influence, is quantitatively important and the results are robust and do depend on district magnitude, too.

5. Summary and Policy Conclusions

In this paper we analyze the influence of direct democratic institutions on the size and development of the shadow economies of 56 countries which have some direct democratic institutions. The main result of our theoretical analysis is that direct democratic institutions have a negative influence on the size of the shadow economy, *ceteris paribus*. The empirical / econometric investigation confirms this hypothesis and the econometric results demonstrate that the effect of direct democratic institutions on the shadow economy is negative and quantitatively important; the results are robust and also depend on the interaction of direct democracy with other political institutions, such as district magnitude.

What policy conclusions can we draw from our results? We have the following three:

- (1) Institutional arrangements, like good governance, are an important factor influencing the size and development of the shadow economy.
- (2) This clearly means that governments should aim to have a proper functioning of state institutions, so that the shadow economy can be reduced.
- (3) Especially direct democratic institutions are quite important in this context. They have a quantitative important effect on the shadow economy; hence policy makers should strengthen them and/or introduce them to a larger extent.

6. References

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Table 4.1: Descriptive statistics of the main variables used

	Obs.	Mean	Std. Dev.	Min.	Max.
<i>Shadow economy (% of GDP)</i>	56	31.17	14.54	9.13	67.83
<i>Direct democracy</i>	56	3.45	1.89	1	7
<i>District magnitude</i>	56	0.37	0.35	0.01	1
<i>Federalism</i>	56	0.25	0.44	0	1
<i>Age of democracy</i>	56	0.21	0.22	0.03	0.81
<i>Quality of democracy</i>	56	7.81	2.67	-2	10
<i>Size of government</i>	56	29.13	11.39	9.74	51.18
<i>Log of GDP per capita in 1960</i>	56	6.79	0.73	5.17	8.14
<i>Country size</i>	56	12.43	1.66	6.47	16.65
<i>Burden of regulation</i>	56	0.71	0.70	-1.54	1.97
<i>Ethnic fragmentation</i>	56	0.22	0.21	0	0.74
<i>Protestant (% of total population)</i>	56	13.41	25.35	0	97.8

Table 4.2: Correlation between direct democracy index, shadow economy, and quality of democracy

	<i>Shadow economy</i>	<i>Direct democracy</i>	<i>District magnitude</i>	<i>Federalism</i>	<i>Age of democracy</i>	<i>Quality of democracy</i>	<i>Size of government</i>	<i>Burden of regulation</i>
<i>Shadow economy</i>	1							
<i>Direct democracy</i>	-0.57	1						
<i>District magnitude</i>	-0.03	-0.14	1					
<i>Federalism</i>	-0.17	-0.02	0.07	1				
<i>Age of democracy</i>	-0.60	0.36	0.05	0.13	1			
<i>Quality of democracy</i>	-0.37	0.60	-0.19	0.05	0.46	1		
<i>Size of government</i>	-0.43	0.61	-0.17	-0.07	0.28	0.45	1	
<i>Burden of regulation</i>	-0.63	0.47	-0.20	0.07	0.51	0.48	0.31	1

Table 4.3: Distribution of the size of the shadow economy (S.E.) in the whole sample

	1 st quartile 9.13 ≤ S.E. ≤ 18.83	2 nd quartile 18.87 ≤ S.E. ≤ 28.47	3 rd quartile 29.33 ≤ S.E. ≤ 41	4 th 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 4.4: OLS cross-country estimates with *direct democracy*.

Dep. var.: <i>Shadow economy</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>Direct democracy</i>	-4.63 (0.84)***	-2.71 (0.96)***	-2.02 (0.90)**	-2.18 (1.01)**	-2.55 (0.94)***	-2.66 (0.95)***	-2.23 (1.04)**	-3.11 (1.05)***	-2.42 (1.06)**	-2.31 (1.06)**
<i>District magnitude</i>		-11.44 (3.39)***	-1.53 (7.16)	-13.17 (3.40)***	-12.99 (4.55)***	-11.58 (3.60)***	-12.04 (3.36)***	-10.75 (3.37)***	-13.57 (5.40)**	-10.01 (3.96)**
<i>Federalism</i>		-10.11 (2.96)***	-10.51 (2.71)***	-11.80 (3.04)***	-9.78 (3.03)***	-10.14 (2.99)***	-8.94 (2.83)***	-8.91 (3.03)***	-9.89 (3.52)***	-9.44 (2.89)***
<i>Quality of democracy</i>		0.21 (0.75)	0.10 (0.70)	1.29 (1.02)	0.28 (0.79)	0.16 (0.81)	-0.23 (0.70)	-0.28 (0.66)	0.04 (0.74)	0.04 (0.76)
<i>Age of democracy</i>		-13.09 (8.17)	-12.28 (7.69)	-12.58 (8.07)	-14.23 (9.28)	-12.74 (8.25)	-11.76 (7.05)*	-13.80 (7.68)*	-13.92 (7.31)*	-13.20 (8.04)
<i>Log of GDP per capita</i>		2.56 (2.63)	-0.78 (2.18)	1.90 (2.55)	1.67 (3.13)	2.73 (2.74)	2.74 (2.79)	2.90 (2.68)	3.21 (3.25)	1.74 (2.94)
<i>Country size</i>		1.68 (1.05)	1.42 (0.95)	1.92 (0.96)*	1.94 (1.17)	1.76 (1.14)	1.76 (0.95)*	0.29 (1.15)	1.54 (1.16)	1.18 (0.97)
<i>Burden of regulation</i>		-6.48 (2.62)**	-3.64 (2.50)	-6.17 (2.60)**	-5.32 (3.65)	-6.28 (2.91)**	-5.28 (2.59)**	-5.06 (2.57)*	-9.57 (3.34)***	-7.40 (3.08)**
<i>Size of government</i>		-0.08 (0.17)	0.07 (0.16)	-0.09 (0.16)	-0.10 (0.17)	-0.07 (0.21)	0.07 (0.20)	0.01 (0.17)	-0.00 (0.19)	0.07 (0.19)
<i>Protestant</i>		-0.04 (0.04)	-0.02 (0.04)	-0.03 (0.05)	-0.03 (0.04)	-0.04 (0.04)	-0.04 (0.04)	-0.04 (0.04)	0.11 (0.08)	-0.01 (0.04)
<i>Ethnic fragmentation</i>		23.21 (7.10)***	21.39 (6.88)***	23.88 (7.14)***	22.73 (7.35)***	23.31 (7.20)***	21.48 (6.16)***	27.92 (7.25)***	22.52 (7.67)***	22.75 (7.35)***
<i>Political system</i>			[0.051]							
<i>Executive constraints</i>				-3.79 (2.32)*						
<i>Labor regulation</i>					0.86 (1.80)					
<i>Education</i>						-0.03 (0.12)				
<i>Demography</i>							[0.151]			
<i>Openness</i>								-0.07 (0.04)*		
<i>Legal origins</i>									[0.194]	
<i>Colonial origins</i>										[0.382]
Observations	57	55	55	55	53	55	55	55	55	55
R-squared	0.36	0.71	0.76	0.73	0.71	0.71	0.74	0.73	0.74	0.73

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 4.4 – (continued). OLS cross-country estimates with *direct democracy*.

Dep. var.: <i>Shadow economy</i>	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
<i>Direct democracy</i>	-1.84 (1.08)*	-2.84 (0.94)***	-2.71 (0.98)***	-2.12 (1.16)*	-2.70 (0.96)***	-2.52 (0.98)**	-1.62 (0.83)*	-1.93 (0.87)**	-2.28 (0.96)**	-2.56 (1.14)**
<i>District magnitude</i>	-9.39 (4.47)**	-9.68 (3.64)**	-11.04 (3.62)***	-10.96 (4.22)**	-9.75 (3.59)***	-8.39 (3.66)**	-10.30 (2.83)***	-4.95 (3.24)	-6.50 (3.88)	-11.56 (3.43)***
<i>Federalism</i>	-9.65 (2.78)***	-10.37 (2.80)***	-9.96 (3.06)***	-8.29 (3.07)***	-9.85 (3.00)***	-9.22 (2.98)***	-5.78 (3.67)	-6.23 (2.84)**	-8.17 (3.12)**	-10.11 (3.00)***
<i>Quality of democracy</i>	-0.07 (0.68)	0.06 (0.74)	0.19 (0.76)	-0.25 (0.81)	0.45 (0.71)	-0.01 (0.74)	0.25 (0.60)	0.02 (0.60)	-0.13 (0.72)	0.37 (0.78)
<i>Age of democracy</i>	-11.62 (6.96)	-11.13 (7.78)	-13.22 (8.13)	-9.51 (7.41)	-12.69 (8.01)	-9.99 (7.71)	-4.97 (7.68)	-0.06 (7.37)	-7.73 (7.26)	-12.74 (8.19)
<i>Log of GDP per capita</i>	2.49 (3.88)	1.44 (2.69)	2.83 (2.80)	1.23 (3.29)	3.44 (2.92)	2.79 (2.77)	4.23 (3.16)	0.83 (2.52)	1.56 (2.91)	2.72 (2.69)
<i>Country size</i>	1.59 (1.05)	1.61 (0.98)	1.62 (1.06)	1.52 (1.30)	1.46 (0.99)	1.55 (1.02)	1.26 (0.77)	1.15 (0.79)	1.47 (1.00)	1.67 (1.05)
<i>Burden of regulation</i>	-7.07 (2.81)**	-6.60 (2.82)**	-6.46 (2.64)**	-7.87 (2.59)***	-4.56 (3.05)	-1.64 (3.86)	-1.89 (3.59)	5.01 (4.15)	0.39 (3.83)	-6.25 (2.69)**
<i>Size of government</i>	0.18 (0.17)	-0.03 (0.17)	-0.08 (0.17)	0.16 (0.21)	-0.10 (0.16)	-0.02 (0.15)	0.21 (0.19)	0.13 (0.14)	0.07 (0.16)	-0.08 (0.17)
<i>Protestant</i>	-0.01 (0.04)	0.00 (0.06)	-0.04 (0.04)	-0.01 (0.04)	-0.03 (0.04)	-0.02 (0.04)	-0.00 (0.03)	0.03 (0.03)	0.03 (0.05)	-0.03 (0.04)
<i>Ethnic fragmentation</i>	23.81 (7.13)***	23.62 (6.75)***	23.50 (7.40)***	25.49 (9.50)**	24.73 (6.54)***	21.29 (6.72)***	19.14 (6.96)***	16.29 (5.33)***	17.33 (7.20)**	22.26 (8.03)***
<i>Geography</i>	[0.057]									
<i>Culture</i>	[0.363]									
<i>Religious fractionalization</i>	-1.91 (6.16)									
<i>Income inequality</i>	0.38 (0.18)**									
<i>Protection of property rights</i>	-3.16 (2.45)									
<i>Government effectiveness</i>	2.62 (1.74)									
<i>Anti-diversion policies</i>	-52.38 (21.67)**									
<i>Rule of law</i>	-12.00 (3.34)***									
<i>Corruption</i>	3.78 (1.43)**									
<i>Civil liberties and political rights</i>	0.92 (2.26)									
Observations	55	55	55	51	54	54	48	55	54	55
R-squared	0.75	0.73	0.71	0.78	0.73	0.73	0.82	0.79	0.74	0.71

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 4.5: OLS cross-country estimates with *direct democracy* and the *interaction term of direct democracy with district magnitude*.

Dep. var.: <i>Shadow economy</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>Direct democracy</i>	-5.35 (1.32)***	-4.03 (1.30)***	-2.81 (1.43)*	-3.57 (1.27)**	-4.00 (1.33)***	-3.97 (1.31)***	-3.51 (1.42)**	-4.39 (1.28)***	-3.33 (1.45)**	-3.32 (1.63)**
<i>District magnitude</i>	-10.39 (8.67)	-22.29 (5.91)***	-8.36 (9.00)	-25.07 (5.84)***	-26.89 (6.90)***	-22.62 (6.14)***	-21.73 (6.07)***	-21.32 (6.62)***	-21.09 (6.76)***	-18.34 (8.89)**
<i>Direct dem. x Distr. magn.</i>	1.32 (2.45)	3.19 (1.77)*	1.77 (1.89)	3.46 (1.66)**	3.71 (1.80)**	3.22 (1.82)*	2.85 (1.81)	3.10 (1.90)	2.15 (2.03)	2.39 (2.27)
<i>P-value joint significance</i>	[0.000]	[0.011]	[0.101]	[0.027]	[0.016]	[0.014]	[0.058]	[0.005]	[0.066]	[0.102]
<i>Federalism</i>		-8.31 (3.47)**	-9.47 (3.15)***	-9.98 (3.45)***	-7.44 (3.67)**	-8.34 (3.50)**	-7.40 (3.26)**	-7.19 (3.39)**	-8.80 (4.07)**	-8.20 (3.32)**
<i>Quality of democracy</i>		0.29 (0.82)	0.15 (0.74)	1.47 (0.94)	0.41 (0.85)	0.22 (0.88)	-0.14 (0.77)	-0.19 (0.76)	0.12 (0.81)	0.09 (0.81)
<i>Age of democracy</i>		-14.92 (8.02)*	-13.38 (7.45)*	-14.52 (7.83)*	-16.81 (9.33)*	-14.44 (8.13)*	-13.49 (6.93)*	-15.57 (7.52)**	-15.74 (7.54)**	-14.67 (8.03)*
<i>Log of GDP per capita</i>		2.67 (2.73)	-0.46 (2.23)	1.97 (2.65)	1.65 (3.27)	2.91 (2.75)	2.52 (2.83)	3.00 (2.80)	3.56 (3.31)	1.88 (2.95)
<i>Country size</i>		1.01 (1.22)	1.07 (1.08)	1.21 (1.08)	1.34 (1.31)	1.12 (1.29)	1.17 (1.10)	-0.33 (1.17)	1.10 (1.35)	0.71 (1.10)
<i>Burden of regulation</i>		-8.25 (2.79)***	-4.85 (3.05)	-8.06 (2.66)***	-6.67 (3.56)*	-7.98 (3.06)**	-6.81 (2.69)**	-6.80 (2.73)**	-10.65 (3.23)***	-8.55 (3.25)**
<i>Size of government</i>		-0.05 (0.17)	0.08 (0.16)	-0.04 (0.16)	-0.07 (0.17)	-0.02 (0.20)	0.07 (0.20)	0.04 (0.17)	0.01 (0.19)	0.07 (0.19)
<i>Protestant</i>		-0.01 (0.05)	-0.01 (0.04)	-0.01 (0.05)	-0.00 (0.05)	-0.01 (0.05)	-0.02 (0.05)	-0.02 (0.05)	0.10 (0.07)	0.01 (0.05)
<i>Ethnic fragmentation</i>		22.90 (6.72)***	21.35 (6.88)***	23.60 (6.57)***	22.24 (7.00)***	23.05 (6.78)***	21.37 (5.87)***	27.53 (6.85)***	22.65 (7.49)***	22.88 (7.26)***
<i>Political system</i>				[0.120]						
<i>Executive constraints</i>				-4.09 (2.06)*						
<i>Labor regulation</i>					1.16 (1.75)					
<i>Education</i>						-0.04 (0.11)				
<i>Demography</i>							[0.231]			
<i>Openness</i>								-0.07 (0.04)*		
<i>Legal origins</i>									[0.407]	
<i>Colonial origins</i>										[0.628]
Observations	56	55	55	55	53	55	55	55	55	55
<i>R-squared</i>	0.38	0.73	0.77	0.75	0.72	0.73	0.75	0.75	0.75	0.74

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 4.5 – (continued). OLS cross-country estimates with *direct democracy* and the *interaction term of direct democracy with district magnitude*.

Dep. var.: <i>Shadow economy</i>	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
<i>Direct democracy</i>	-2.91 (1.55)*	-4.02 (1.31)***	-4.15 (1.38)***	-3.72 (1.46)**	-3.78 (1.35)***	-3.51 (1.51)**	-2.16 (1.15)*	-2.34 (1.28)*	-3.08 (1.39)**	-3.87 (1.43)***
<i>District magnitude</i>	-18.04 (7.42)**	-20.16 (6.84)***	-22.24 (5.97)***	-22.24 (6.84)***	-19.14 (6.31)***	-17.08 (7.96)**	-15.18 (6.15)**	-8.32 (6.56)	-13.42 (6.90)*	-22.8 (5.9)***
<i>Direct dem. x Distr. magn.</i>	2.39 (1.88)	2.86 (1.84)	3.43 (1.93)*	3.24 (1.68)*	2.61 (1.82)	2.24 (2.14)	1.34 (1.56)	0.91 (1.69)	1.78 (1.86)	3.29 (1.74)*
<i>P-value joint significance</i>	[0.181]	[0.011]	[0.014]	[0.049]	[0.02]	[0.04]	[0.158]	[0.104]	[0.064]	[0.034]
<i>Federalism</i>	-8.47 (3.27)**	-8.76 (3.41)**	-7.85 (3.64)**	-6.53 (2.27)*	-8.57 (3.41)**	-8.19 (3.46)**	-4.99 (4.02)	-5.87 (2.98)*	-7.42 (3.44)**	-8.25 (3.47)**
<i>Quality of democracy</i>	0.02 (0.74)	0.11 (0.81)	0.26 (0.83)	-0.14 (0.87)	0.50 (0.77)	0.11 (0.80)	0.31 (0.64)	0.05 (0.63)	-0.04 (0.77)	0.52 (0.81)
<i>Age of democracy</i>	-13.17 (6.99)*	-12.45 (8.03)	-15.34 (7.84)*	-11.51 (7.23)	-14.40 (7.98)*	-12.18 (7.99)	-5.91 (7.81)	-0.98 (7.35)	-9.52 (7.18)	-14.50 (8.00)*
<i>Log of GDP per capita</i>	2.88 (3.93)	1.61 (2.77)	3.25 (2.91)	1.71 (3.31)	3.37 (3.00)	2.89 (2.86)	3.95 (3.33)	0.93 (2.52)	1.85 (2.91)	2.89 (2.78)
<i>Country size</i>	1.15 (1.20)	1.02 (1.15)	0.83 (1.24)	0.99 (1.43)	0.94 (1.13)	1.14 (1.18)	1.03 (0.84)	0.98 (0.85)	1.14 (1.12)	0.99 (1.20)
<i>Burden of regulation</i>	-8.43 (2.96)***	-7.87 (2.87)***	-8.34 (2.77)***	-9.27 (2.73)***	-6.69 (3.35)*	-4.25 (4.64)***	-2.30 (3.67)	4.04 (4.69)	-1.54 (3.97)	-7.99 (2.87)***
<i>Size of government</i>	0.19 (0.16)	-0.02 (0.17)	-0.03 (0.18)	0.15 (0.20)	-0.08 (0.17)	-0.01 (0.16)	0.22 (0.19)	0.13 (0.15)	0.07 (0.16)	-0.04 (0.17)
<i>Protestant</i>	0.00 (0.05)	0.01 (0.06)	-0.01 (0.05)	0.01 (0.05)	-0.01 (0.05)	-0.01 (0.05)	0.01 (0.04)	0.03 (0.04)	0.03 (0.05)	-0.01 (0.05)
<i>Ethnic fragmentation</i>	23.33 (7.06)***	23.07 (6.50)***	23.49 (6.87)***	24.96 (8.99)***	24.20 (6.34)***	21.64 (6.71)***	18.88 (6.93)***	16.48 (5.39)***	18.00 (7.25)**	21.58 (7.66)***
<i>Geography</i>	[0.147]									
<i>Culture</i>		[0.499]								
<i>Religious fractionalization</i>			-4.07 (6.01)							
<i>Income inequality</i>				0.29 (0.17)						
<i>Protection of property rights</i>					-2.32 (2.49)					
<i>Government effectiveness</i>						1.87 (1.96)				
<i>Anti-diversion policies</i>							-51.18 (22.21)**			
<i>Rule of law</i>								-11.52 (3.57)***		
<i>Corruption</i>									3.25 (1.42)	
<i>Civil liberties and political rights</i>										1.27 (2.22)
Observations	55	55	55	51	54	54	48	55	54	55
R-squared	0.76	0.74	0.73	0.79	0.74	0.73	0.82	0.79	0.74	0.73

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%.

Appendix A. Proof of Lemma 2

In finding the solution to problem (14), it is useful to observe two things. First, the objective function takes its minimum value $u = p_R B$ for all extreme values of t and γ . When $t = 0$, $t = 1$, or $\gamma = 0$ there is no production in the formal sector, no government revenues, and hence no resources for politician's rents (and $u = p_R B$). In particular, $\gamma = 0$ means that public services are not provided; this implies that there cannot be production in the formal sector, so that $l = 1$, and the same is true when $t = 0$. All labor is employed in the shadow economy when $t = 1$ because all production in the formal sector would accrue to government revenues. When $\gamma = 1$, all revenues are spent for the provision of public services and, again, $u = p_R B$. Second, when t and γ both take intermediate values, there is always production in the formal sector because the production function satisfies the Inada conditions. This implies that the revenues of the public sector and the nonmonetary rents of the politician are strictly positive—in other words, that $u > p_R B$. These two facts imply that the solution of maximization problem (14) for t and γ is interior. We now show that there exists only one critical point (t^s, γ^s) ; when combined with the previous conditions and the fact that the function u is well-defined in a compact set, this implies that (t^s, γ^s) is also the maximum of our problem.

The critical point (t^s, γ^s) that we seek is defined as the point where the first derivatives of the function u in (14) with respect to t and γ are zero—that is, by the two conditions

$$(A1) \quad \frac{\partial u}{\partial t} = \frac{\partial u}{\partial t} + \frac{\partial u}{\partial l} \frac{\partial l}{\partial t} = 0,$$

and

$$(A2) \quad \frac{\partial u}{\partial \gamma} = \frac{\partial u}{\partial \gamma} + \frac{\partial u}{\partial l} \frac{\partial l}{\partial \gamma} = 0,$$

where $\partial l / \partial t$ and $\partial l / \partial \gamma$ are given by (11) and (12), respectively.

Taking into account (11), condition (A1) is

$$\frac{\partial u}{\partial t} = \frac{1}{\alpha} (1 - \gamma) \gamma^{(1-\alpha)/\alpha} t^{(1-\alpha)/\alpha} \left[(1 - l) - \frac{-1 + \alpha + t}{(1 - t)(1 - \beta)} l \right] = 0;$$

after some manipulations of the expression in brackets, this can be rewritten as

$$(A3) \quad \frac{\partial u}{\partial t} = \frac{(1 - \gamma) \gamma^{(1-\alpha)/\alpha} t^{(1-\alpha)/\alpha}}{\alpha(1 - t)(1 - \beta)} [(1 - t)(1 - \beta) - l(\alpha - \beta(1 - t))] = 0.$$

The sign of $\partial u / \partial t$ matches the sign of the bracketed component, since the remaining components

of (A3) are always strictly positive (recall that t and γ are interior). Therefore, the tax rate satisfying (A1) is implicitly defined by condition (15):

$$t^s = \frac{1 - \beta + \beta l^s - \alpha l^s}{1 - \beta + \beta l^s},$$

with $l^s \equiv l(t^s, \gamma^s)$ as defined by (10).

Using (12), condition (A2) can be written as

$$(A4) \quad \begin{aligned} \frac{\partial u}{\partial \gamma} = & -\gamma^{(1-\alpha)/\alpha} t^{1/\alpha} (1-l) + \frac{(1-\alpha)(1-\gamma)}{\alpha\gamma} \gamma^{(1-\alpha)/\alpha} t^{1/\alpha} \\ & - \frac{(1-\alpha)(1-\gamma)}{\alpha\gamma} \gamma^{(1-\alpha)/\alpha} t^{1/\alpha} l + \frac{(1-\alpha)(1-\gamma)}{\alpha\gamma(1-\beta)} \gamma^{(1-\alpha)/\alpha} t^{1/\alpha} l = 0. \end{aligned}$$

Summing the last two components of (A4) and rearranging terms then yields

$$\frac{\partial u}{\partial \gamma} = \gamma^{(1-\alpha)/\alpha} t^{1/\alpha} \left[-(1-l) + \frac{(1-\alpha)(1-\gamma)}{\alpha\gamma} + \frac{\beta(1-\alpha)(1-\gamma)}{\alpha\gamma(1-\beta)} l \right] = 0,$$

and after some algebra, the expression in (A4) becomes

$$(A5) \quad \frac{\partial u}{\partial \gamma} = \frac{\gamma^{(1-\alpha)/\alpha} t^{1/\alpha}}{\alpha\gamma(1-\beta)} [-\alpha\gamma(1-\beta)(1-l) + (1-\alpha)(1-\gamma)(1-\beta + \beta l)] = 0.$$

The fraction preceding the bracketed component of (A5) is strictly positive, so the fraction of government revenues used to provide public services and satisfying (A4) is implicitly defined by equation (16):

$$\gamma^s = \frac{(1-\alpha)(1-\beta + \beta l^s)}{1 - \beta + \beta l^s - \alpha l^s},$$

with $l^s \equiv l(t^s, \gamma^s)$ as defined by (10).

We now show that t^s and γ^s are unique and that $t^s \in (1-\alpha, 1)$ and $\gamma^s \in (0, 1)$. Consider first the right-hand side of equation (15), and define

$$f(l) \equiv \frac{1 - \beta + \beta l - \alpha l}{1 - \beta + \beta l}.$$

Next observe that $df(l)/dl = -\alpha(1-\beta)/(1-\beta + \beta l)^2 < 0$. At $t = 0$ and $t = 1$, by Lemma 1 we have $l = 1$ and therefore $f(l) = 1 - \alpha$. For any $t < 1 - \alpha$ we have $\partial l / \partial t < 0$ (see again Lemma 1), and together with $df(l)/dl < 0$ this means that $f(l)$ is increasing in t and that $t < f(l)$ for all $t \in [0, 1 - \alpha]$. For any $t > 1 - \alpha$ we have $\partial l / \partial t > 0$, and $df(l)/dl < 0$ implies that $f(l)$ is decreasing in t for all $t \in (1 - \alpha, 1]$. Since $t < f(l)$ for all $t \leq 1 - \alpha$ and since $f(l)$ is decreasing in t for all $t > 1 - \alpha$ (with $f(l) = 1 - \alpha < 1$ at $t = 1$), it follows that the tax rate t^s satisfying equation (15) is unique and that $1 - \alpha < t^s < 1$.

To show that γ^s is unique, consider the right-hand side of equation (16) and define

$$h(l) \equiv \frac{(1-\alpha)(1-\beta+\beta l)}{1-\beta+\beta l-\alpha l}.$$

This function is increasing in l because $dh(l)/dl = \alpha(1-\alpha)(1-\beta)/(1-\beta+\beta l-\alpha l)^2 > 0$. Since l is monotonically decreasing in γ ($dl/d\gamma < 0$, see Lemma 1), it follows that $h(l)$ is also monotonically decreasing in γ (i.e., $dh(l)/d\gamma < 0$). This, together with $h(l) = 1$ at $\gamma = 0$, implies that the solution to equation (16) is unique and that $0 < \gamma^s < 1$.

The critical point (t^s, γ^s) defined by equations (15) and (16) is the maximum of problem (14). Given that the objective function defined in (14) takes the minimum value for all extreme values of t and γ and given that it is well-defined in a compact set, it follows that this function is monotonically increasing in t for $t < t^s$ and monotonically decreasing for $t > t^s$; it is also monotonically increasing in γ for $\gamma < \gamma^s$ and monotonically decreasing for $\gamma > \gamma^s$.

The total amount of public services provided by an unconstrained politician is lower than the level provided by a benevolent one. This result can be shown by observing that (15) and (16) imply that $\gamma^s t^s = 1 - \alpha$. Given the government budget constraint (6), the level of per capita public services provided is

$$g^s = (\gamma^s t^s)^{1/\alpha} (1 - l^s) = (1 - \beta)^{1/\alpha} (1 - l^s),$$

whereas the optimal level is

$$g^* = (\gamma^* t^*)^{1/\alpha} (1 - l^*) = (1 - \alpha)^{1/\alpha} (1 - l^*);$$

here $l^s \equiv l(t^s, \gamma^s)$ and $l^* \equiv l(t^*, \gamma^*)$. Recall from Lemma 1 that l is monotonically decreasing in γ and monotonically increasing in t for $t > 1 - \alpha$. Then, from $\gamma^s < \gamma^*$ and $t^s > t^* = 1 - \alpha$, it follows that $l^s > l^*$ and hence that $g^s < g^*$.

DATA APPENDIX

Shadow economy = SHAD_AV
Direct democracy index = DDI
District magnitude = MAGN
Interaction term district magnitude and direct democracy = MAGNDDI = MAGN*DDI
Square of district magnitude = DDI2 = DDI*DDI
Federalism = FEDERAL
Quality of democracy = POLITYIV
Age of democracy = AGE
Log of the GDP per capita in 1960 = LCGDP_60
Country size = LAREA
Burden of regulation = QREGU_9698
Size of government = CGEXP
Composition of government expenditure = SSW
Protestant = PROT80
Ethnic fragmentation = AVELF
Political system = MAJ, PRES
Executive constraints = XCONST9002
Labor regulation = LABOREGU_03
Education = EDUGER
Demography = PROP1564, PROP65
Openness = TRADE
Legal origins = LEGOR (UK, FR, GE, SO, SC)
Colonial origins = COL_ESP, COL_OTH, COL_UK
Geography = AFRICA, ASIAE, LAAM
Culture = CATHO, CONFU
Religious fractionalization = RELIGION
Income inequality = GINI_8090
Protection of property rights = PROPRIGHT
Government effectiveness = GOVEF
Anti-diversion policies = GADP
Rule of law = LAW_9698
Corruption = GRAFT
Civil liberties and political rights = GASTIL

Fiscal Decentralization = Subnational expenditures (as % total government expenditures) = SNE7200
Autonomy = AUTON
Average size of bottom tier units = SIZEBOT
Ethnic fragmentation = ETHNIC

Note that most of the variables come from Persson and Tabellini (2003). In this case we report this dataset as “source” and the sources they cite as “original source”.

AFRICA: regional dummy variable equal to 1 if a country is in Africa, 0 otherwise. Source: Persson and Tabellini (2003).

AGE: Age of democracy, defined as $AGE = (2000 - DEM_AGE) / 200$ and varying between 0 and 1, with the United States being the oldest democracy (value of 1). Source: Persson and Tabellini (2003).

AREA: Land area of the country in squared kilometers. Source: Data available at www.cepii.fr

ASIAE: regional dummy variable, equal to 1 if a country is in East Asia, 0 otherwise. Source: Persson and Tabellini (2003).

AUTON: dummy variable that takes the value 1 if, under constitution, subnational legislatures have autonomy in certain specified areas - i.e. constitutional authority to legislate - not explicitly subject to central laws, and 0 otherwise. Source: Treisman (2008).

AVELF: index of ethnolinguistic fractionalization, approximating the level of lack of ethnic and linguistic cohesion within a country, ranging from 0 (homogeneous) to 1 (strongly fractionalized) and averaging 5 different indexes. Source: La Porta et al. (1998). For Central and Eastern Europe countries computations follow Mauro (1995) with data from Quain (1999).

CATHO80: percentage of the population belonging to the Roman Catholic religion in 1980. Source: Persson and Tabellini (2003); original source: La Porta et al. (1999).

CGDP_60: real Gross Domestic Product per capita (current prices) in 1960. From the Penn World Table Version 6.1 (variable named *cgdp*). If the data is not available in 1960, I multiply the GDP per capita of U.S. in 1960 with current per capita GDP expressed relative to the United States (variable *y* in the Penn World Table, divided by 100) in the first year available.

CGEXP: Total expenditure of the central government as a percentage of GDP, constructed using the item Government Finance-Expenditures in the IFS, divided by GDP at current prices and multiplied by 100. Source: Persson and Tabellini. Persson and Tabellini (2003); original source: IMF-IFS CD-Rom and IMF-IFS Yearbook.

COL_ESP: dummy variable, equal to 1 if the country is a former colony of Spain or Portugal, 0 otherwise. Source: Persson and Tabellini (2003). Original source: Wacziarg (1996).

COL_OTH: dummy variable, equal to 1 if the country is a former colony of a country other than Spain, or Portugal, or the U.K., 0 otherwise. Source: Persson and Tabellini (2003). Original source: Wacziarg (1996).

COL_UK: dummy variable, equal to 1 if the country is a former UK colony, 0 otherwise. Source: Persson and Tabellini (2003). Original source: Wacziarg (1996).

CONFU: dummy variable for religious tradition, equal to 1 if the majority of population is Confucian-Buddhist-Zen, 0 otherwise. Source: Persson and Tabellini (2003). Original source: Wacziarg (1996), CIA-The World Factbook 2000.

COUNTRY: Name of the country.

CPI9500: corruption perception index, measuring perceptions of abuse of power from public officials. Average of the CPI Index over the period 1995-2000, which ranges from 0 to 10, with higher values denoting more corruption. Source: Transparency International (www.transparency.de) and Internet Center for Corruption Research (www.gwdg.de/~uwvw).

CTRYCD: IMF country code that identifies countries. Source: Persson and Tabellini (2003).

DDI: direct democracy index is a number in the 1 to 7 scale for each category, with 7 being the country rated as radical democrat, and 1 the countries with the lowest level of direct democracy. Source: Fiorino and Ricciuti (2007). Original sources: Kaufmann (2004) for 43 European countries, Hwang (2005) for 33 Asian countries, and Madroñal (2005) for 17 Latin American countries.

DEM_AGE: first year of democratic rule, corresponding to the first year of an uninterrupted string of positive yearly values of the variable polity (see below) until the end of the sample, given that the country was also an independent nation. Does not count foreign occupation during WWII as an interruption of democracy. See POLITY. Source: Persson and Tabellini (2003).

DISTRICTS: the number of electoral districts in a country (including the number of primary as well as secondary and tertiary if applicable). Source: Persson and Tabellini (2003). Original sources: Quain (1999), Kurian (1998), and national sources.

EDUGER: Total enrollment in primary and secondary education in a country, as a percentage of the relevant age group in the country's population. Computed by dividing the number of students enrolled in a given level of education (regardless of age) by the population of the age group that officially corresponds to the given level of education and multiplying the result by 100. Source: Persson and Tabellini (2003); original source: UNESCO.

ETHNIC: Ethnic Fractionalization Index from Alesina, Devleeschauwer, Easterly, Kurlat and Wacziarg (2004). The variable takes values in the range between zero and one that are increasing in the degree of ethnic fractionalization. Source: Alesina et al. (2004).

FBE25: Dummy variable equal to 1 if the country is unitary (i.e. the variable FEDERAL takes a value equal to 0) and the average value of subnational share of total government spending for the years 1972-2000 (SNE7200) is higher than 25% (last quartile of the distribution), and 0 otherwise.

FEDERAL: Dummy variable equal to 1 if a country has a federal political structure, 0 otherwise. Source: Persson and Tabellini (2003), Treisman (2000), Treisman (2008).

GADP: Index of a government's antidiversion policies, measured in 1986–95. The variable is the result of an equal-weighted average of five categories: law and order, bureaucratic quality, corruption, risk of expropriation, government repudiation of contracts. The index ranges from 0 to 1, with higher values corresponding to more effective policies of the government toward supporting production. Source: Persson and Tabellini (2003); original source: Hall and Jones (1999).

GASTIL: Average of indexes for civil liberties and political rights, where each index is measured on a 1–7 scale with 1 representing the highest degree of freedom and 7 the lowest. Countries whose combined averages for political rights and civil liberties fall between 1.0 and 2.5 are designed “free”, those whose averages fall between 3 and 5.5 are designed as “partly free”, and those whose averages fall between 5.5 and 7.0 “not free”. Source: Persson and Tabellini (2003); original source: Freedom House.

GINI_8090: Gini coefficient of income distribution, realized as the average of two data points: the observation closest to 1980 and the observation closest to 1990. When data for only one of the two years are available, only that year is included. Source: Persson and Tabellini (2003); original source: Deininger and Squire (1996).

GOVEF: Index that reflects perception of the quality of public services provision, the quality of bureaucracy, the competence of civil servants, the independence of the civil service from political pressures and the credibility of the government's commitment to policies into a single grouping. Ranges from 0 to 10 with lower values corresponding to more government effectiveness. Source: Persson and Tabellini (2003); original source: Kaufmann et al. (1999).

GRAFT: Index of perceptions of corruption. Ranges from 0 to 10 with lower values corresponding to better outcomes. Source: Persson and Tabellini (2003); original source: Kaufmann et al. (1999).

LAAM: Regional dummy variable, equal to 1 if a country is in Latin America or the Caribbeans, 0 otherwise. Source: Persson and Tabellini (2003).

LABOREGU_03: Index that reflects the impact of minimum wage set by law, the features of hiring and firing practices, the presence of unemployment benefits, the impact of centralized collective bargaining in setting wages and the use of conscripts to obtain military personnel. Ranges from 1 to 10, with higher values representing a lower degree of regulation and is relative to the year 2003. Source: Gwartney and Lawson (2004).

LAREA: Natural logarithm of the variable AREA. Source: Data available on: www.cepii.fr

LAW_9698: Index of the rule of law, reflecting the quality of the legal system. Ranges between -2.5 and 2.5 with higher values corresponding to better outcomes. The index includes perceptions of the predictability and effectiveness of the judiciary, the incidence of crime and the enforceability of contracts. I use average values of the variable for 1996-98. Source: Kaufmann et al. (2005), data available on www.worldbank.org

LCGDP_60: Log of the real GDP per capita in 1960. Obtained taking the log of the variable CGDP_60. Source: Penn World Table Version 6.1

LEGOR (UK, FR, GE, SO, SC): Dummy variables for the origin of the legal system in a country, classifying a country's legal system as having its origins in French civil law (FR), German civil law (GE), Scandinavian law (SC), Socialist law (SO), or Anglo-Saxon common law (UK). Source: Persson and Tabellini (2003); original source: La Porta et al. (1999).

MAGN: inverse of district magnitude, defined as DISTRICTS over SEATS. Source: Persson and Tabellini (2003).

MAJ: Dummy variable for electoral systems equal to 1 if all the lower house is elected under plurality rule, 0 otherwise. Only legislative elections (lower house) are considered. Source: Persson and Tabellini (2003); original sources: Cox (1997), International Institute for Democracy and Electoral Assistance (1997), Kurian (1998), Quain (1998) and national sources.

POLITYIV: Score for democracy ranging from +10 (strongly democratic) to -10 (strongly autocratic). Source: Persson and Tabellini (2003); original source: Polity IV Project

PRES: Dummy variable for the form of government, equal to 1 in presidential regimes, 0 otherwise. Only regimes where the confidence of the assembly is not necessary for the executive (even if an elected president is not chief executive, or if there is no elected president) are included among presidential regimes. Most semi-presidential and premier-presidential systems are classified as parliamentary. Source: Persson and Tabellini (2003); original source: Shugart and Carey (1992).

PROP1564: Percentage of a country's population between 15 and 64 years old in the total population. Source: Persson and Tabellini (2003); original source: World Development Indicators CD-Rom 1999.

PROP65: Percentage of a country's population over the age of 65 in the total population. Source: Persson and Tabellini (2003); original source: World Development Indicators CD-Rom 1999.

PROPRIGHT: Variable that measures the ability of legal system to protect property rights. Refers to 1997 and ranges between 1 and 5 with higher values corresponding to a higher degree of security. Source: La Porta et al. (1999); original source: 1997 Index of Economic Freedom.

PROT80: Percentage of the population in each country professing the Protestant religion in 1980. Source: Persson and Tabellini (2003); original source: La Porta et al. (1999).

QREGU_9698: Measures the intensity of regulation in the economic system and reflects the ability of government to implement market-friendly policies promoting private sector development. The scores of this variable lie between -2.5 and 2.5, with higher scores corresponding to better outcomes. I use average values of the variable for 1996-98. Source: Kaufmann et al. (2005), data available on www.worldbank.org

RELIGION: Religious Fractionalization Index from Alesina, Devleeschauwer, Easterly, Kurlat and Wacziarg (2004). The variable takes values in the range between zero and one that are increasing in the degree of religious fractionalization.

SIZEBOT: Average size of bottom tier units, in thousand square kilometers (i.e., surface area divided by estimated number of bottom tier units). Source: Treisman (2008).

SEATS: number of seats in lower or single chamber for the latest legislature of each country. It is also related to the number of districts in which primary elections are held. Source: International Institute for Democracy and Electoral Assistance (1997), Quain (1999), Kurian (1998) and nationalsources.

SHAD_AV: Variable that measures the size of shadow economy as a percentage of GDP. Has been obtained using the DYMIMIC and the Currency Demand approach (latent estimation approach). I use average values of the variable for 1999-2003. Is available for 145 countries. Source: Schneider (2005).

SNE7200: Average value of subnational share of total government spending for the years 1972–2000. Source: International Monetary Fund's Government Finance Statistics - reported in the World Bank's database of Fiscal Decentralization Indicators.

T_INDEP: Number of years of independence for a country, ranging from 0 to 250. Source: Persson and Tabellini (2003); original source: Wacziarg (1996).

TRADE: Sum of exports and imports of good and services measured as a share of GDP.B Source: Persson and Tabellini (2003); original source: World Bank 2000.

SSW: consolidated central government expenditures on social services and welfare as percentage of GDP, as reported in GFS Yearbook, divided by GDP and multiplied by 100. Source: Persson and Tabellini. Original source: IMF - GFS Yearbook 2000 and IMF - IFS CD-Rom.

XCONST9002: Executive Constraints. Measure of operational (de facto) independence of the Chief Executive. Average over 1990–2002 period for variable XCONST. It ranges from 1 (minimum degree of constraint) to 7 (maximum degree of constraint). The ranking decreases in the degree of insulation of the Executive. Source: Polity IV dataset.