

SHADOW ECONOMY AND FEDERALISM

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Shadow Economy and Federalism

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Abstract

This paper analyzes the relationship between shadow economy and federalism. The theoretical analysis leads to the conclusion that the shadow economy should be lower in a federal state with respect to a unitary state. This result comes from the fact that the competition between jurisdictions leads policy-makers to adopt more efficient policies which, in turn, increase the return of the activities in the formal sector relative to the informal one. The results of a cross-sectional empirical analysis in a sample of 73 countries confirm the theoretical predictions. Federal countries have a size of shadow economy relative to GDP between 9 and 12 percent lower than non-federal ones.

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1 Introduction

Shadow economy is a widespread and continuously increasing phenomenon around the world and represents a challenging task for governments that have to deal with it. Understanding this issue is important for several reasons. First, because it affects the allocation of country's resources and may have a strong impact on the formal economy through the competitive process in markets where both official and unofficial firms operate. Second, the informal sector causes the distortion of official indicators on which social and economic policies are based. Third, the lack of tax compliance weakens the ability of governments to collect resources directed to finance the provision of public goods and social welfare programs. This may in turn undermine income redistribution and economic growth as well as the ability of the institutions to be credible. Hence, understanding the dimensions, the causes and the possible consequences of this phenomenon is worth pursuing (see Schneider and Enste, 2000, for a comprehensive review of the literature on this topic).

Dealing with the study of such a phenomenon exhibits a number of difficulties, firstly as the fact is actually hidden and secondly as there is a terminological misunderstanding about the concept, often indicated in a wide-ranging way such as *hidden*, *shadow*, *black*, *illegal*, *parallel*, *unofficial*, *informal*, *underground economy*, attributing to the idea different meanings. In the present work, I will use the terms "shadow economy", "informal sector", "unofficial activity" and "underground economy" as synonyms referred to the same phenomenon. I will also use the definition in Schneider (2005), according to which the shadow economy includes all economic activities regarding the production of legal goods and services, either from monetary or barter transactions, unreported to the state (tax) authorities in order to avoid taxes and social security regulations compliance.

The aim of this work is to analyze the relationship between shadow economy and federalism. The idea is to understand which is the effect of certain institutions on the incentives of the individuals to operate in the informal sector. In particular, I compare two organization of society. One is a political system where the decisions about taxation and provision of public goods is taken at a centralized level. The other one is a federal state where these decisions are taken at a jurisdictional level. The prediction of the theoretical analysis imply that a federal system should have a lower size of the shadow economy with respect to a centralized one. This result comes from the competition among jurisdictions and the mobility of the agents that induces the politicians of the various jurisdictions to adopt policies closer to the socially optimal one. This increases the productivity of labor in the formal sector and therefore reduces

the incentives for the individuals to operate in the shadow economy.

The economy is composed by individuals that can allocate their labor between two sectors, the formal and the informal one. Production in the formal sector has constant returns to scale in labor and the per capita productive public good and it is perfectly observable by the tax authorities. Production in the informal sector requires only labor and has marginal decreasing productivity. This product is completely unobservable by the authorities and this implies that it cannot be taxed. The decisions about taxation and provision of public goods can be taken at a centralized level or at a decentralized level (federal system). The government, at a centralized or at a decentralized level, can tax production in the formal economy at a constant rate. The revenues can be used for the provision of the productive public good or for providing rents to the politician. I assume also that agents can move freely across jurisdictions.

The fiscal policy implemented at a centralized level implies a tax rate higher than the socially optimal one, a relatively high fraction of revenues wasted for politicians' rents and the provision of the productive public goods lower than the optimal level. In a federal state, the competition among jurisdictions and the mobility of individuals act as a constrain to the politicians that will adopt efficient policies. The closer the fiscal policy is to the efficient one and the more productive is the formal sector relative to the informal one. This is because the production in the formal sector benefit from a higher provision of the productive public good and it is negatively affected by taxation, while the shadow sector is relatively insulated by the fiscal variables as it neither benefits from the public good nor it is hurt by taxation. The main result drawn from this model is that the size of the shadow economy is lower in federal system than in a centralized one.

I then perform an empirical analysis to test the main prediction of the model about the existence of a negative relationship between the size of the shadow economy and federalism. The results of a cross-sectional analysis confirm this prediction. In particular, I present the OLS estimations on data drawn from different dataset. I employ the sample compiled by Persson and Tabellini (2003), while the data for the informal sector come from the dataset of Schneider (2005) which provides the size of the shadow economy, as a proportion of official GDP, for 145 countries from 1999-2003, and covers up to 73 countries of the sample used. The findings of the cross-country regressions indicate that in federal countries the size of shadow economy is on average about 9 percent lower than non federal countries. This result is highly statistically significant and becomes even stronger, rising up to 12 percentage points, when controlling for a wide range of variables.

The literature on the shadow economy is wide and heterogeneous, and it is possible to identify two different approaches in the determination of the causes of the increase in the informal sector. The first one considers the raise of the burden of taxes and regulations as the most important causes of the increase of the shadow economy (e.g. Schneider and Neck, 1993; Lemieux et al., 1994; Loayza, 1996). Following this view, when governments intervene in the economy with an excessive regulatory system, being formal implies high costs both to access the markets, because of the license fees and registration requirements, and to remain in the market, because of the compliance with the whole array of taxes and regulations, especially those related to workers' welfare (minimum wages, fringe benefits, social security, etc.). The second approach is more focalized in considering institutional quality as key factor of development of the informal sector. It is argued that the inefficient and discretionary application of tax system and regulation 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 probably exposure to bribe of government officials seem to be associated with larger unofficial activity, while a good rule of law, by securing property rights and contracts enforceability increase the benefits of being formal (Johnson et al., 1997; Johnson et al., 1998a,b; Friedman et al., 1999; Dreher and Schneider, 2006). My work is related to this branch of literature that considers the development of shadow economy as a failure of public institutions in promoting an efficient market economy, by addressing the question of how the government intervention might affect economic performance.

The paper is organized as follows. Section 2 describes the analytical framework. Section 3 and 4 presents the theoretical results, and Section 5 describes the results of the empirical analysis. Section 6 concludes.

2 Basic Model

I consider a society composed by a continuum of individuals of measure 1. Each agent i is a consumer-producer that supplies inelastically 1 unit of labor. He can choose to allocate labor between the formal and the informal sector

$$l_{i,f} + l_{i,s} = 1, \tag{1}$$

where $l_{i,f}$ is the supply of labor in the formal sector and $l_{i,s}$ is the amount of labor employed in the shadow economy. The production function in the formal sector is Cobb-Douglas with

constant returns to scale

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

where $0 < \alpha < 1$ and g is the quantity of per capita public services provided to each consumer-producer by the public sector.¹ The production in the informal sector does not require the input provided by the public sector and the production function is given by

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

where $0 < \beta < 1$ and a is a positive constant.

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 $t \in [0, 1]$. The production in the informal sector is instead completely unobservable and, therefore, cannot be taxed by the public sector.² Therefore, using (1), (2) and (3) the net disposable income of agent i can be written as

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

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

We compare two organizations of society. One corresponds to a centralized economy where the decisions about taxation and provision of the productive public services are taken at a centralized level. The other one is a federal state where taxation and public service provision are assigned to the each jurisdiction. In this case, the economy consists of R jurisdictions and I denote with n_r the number of individuals in the generic jurisdiction $r = 1, \dots, R$, so that $\sum_{r=1}^R n_r = 1$. I assume that agents can move freely between jurisdictions if they find it beneficial. To simplify the analysis, with no loss of generality, I assume that there are no migration costs.

The revenues of the public sector (state or jurisdiction) can be used for the provision of productive public services or to provide rents to politicians.³ In a centralized economy, the

¹It is clear from the production function that the productive input provided by the public sector is essential for production. Moreover, there is congestion because 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).

²The framework proposed in this paper, characterized by a formal sector that benefit from public services and that pays taxes while the informal sector can hide production to fiscal authorities but which does not benefit from public services, is common in the literature. Johnson et al. (1997) argue that public goods and services with the above characteristics correspond, for example, to all services from which firms that operate in the unofficial economy can be excluded from as courts, police or the administrative assistance from the government. Another way to distinguish the formal and the informal sector can be find in Loayza (1996), which models the official economy as the sector that pays taxes and that fully benefit from public services while the informal sector benefits only partially from public services and pays a fee if discovered.

³One may assume the existence of a non productive public good which does not provide utility to citizens and that gives utility only to politicians.

revenues of the state are given by

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

where I have used the fact that all agents are identical and, therefore, $l_i = l$ for all i . I denote with $\gamma \in [0, 1]$ the fraction of government revenues E that the policy-maker decides to spend for the public services and $1 - \gamma$ represents the fraction of revenues that are used for politician's rents and that do not provide any utility to the citizens (e.g. Niskanen, 1977; Brennan and Buchanan, 1980; Oates and Schwab, 1988). Total rents of the politician in a centralized economy are

$$u = (1 - \gamma) E + B \quad (6)$$

where $B > 0$ is a constant non-monetary benefit. Taking into account (5), the government budget constraint $g = \gamma E$ becomes

$$g = \gamma t (1 - l)^\alpha g^{1-\alpha}, \quad (7)$$

which can be rewritten as

$$g = \gamma^{1/\alpha} t^{1/\alpha} (1 - l). \quad (8)$$

If the economy is organized as a federal state, taxation and provision of public services are made in each jurisdiction. In this case, denoting with γ_r the fraction of revenues that jurisdiction r uses to finance the provision of public services, the rent of the politician in jurisdiction r is

$$u_r = (1 - \gamma_r) E_r + B_r \quad (9)$$

where $B_r = B$ if $n_r > 0$, and 0 otherwise.⁴ The revenues of jurisdiction r are given by

$$E_r = \int_{i=0}^{n_r} t_r y_{r,i,f} di = \int_{i=0}^{n_r} t_r (1 - l_{i,r})^\alpha g_r^{1-\alpha} di = n_r t_r (1 - l_r)^\alpha g_r^{1-\alpha} \quad (10)$$

where t_r and g_r are the tax rate and the per capita public services provided in jurisdiction r respectively. In (10), I have again used the fact that $l_{i,r} = l_r$ for all agents in jurisdiction r . The amount worked in the shadow economy can instead be different across jurisdictions due to

⁴When there is no population in the jurisdiction, the jurisdiction does not exist and, therefore, also the non monetary benefit is zero. Clearly, the non monetary benefit is instead always positive in a centralized society. As it will be clear later, the existence of such a benefit has only the function of guarantee a positive utility to the politicians of the regions that implement the optimal policy, so avoiding weakly dominated strategies.

the possible different fiscal policies implemented by the various jurisdictions. The government budget constraint of jurisdiction r is $g_r = \gamma_r E_r / n_r$, and can be rewritten as

$$g_r = \gamma_r^{1/\alpha} t_r^{1/\alpha} (1 - l_r). \quad (11)$$

It is worth emphasizing that in our framework what matters for the level of production and size of the shadow economy is the level of per capita public services provided to each consumer-producer by the public sector. A comparison of the government budget constraints (8) and (11) makes clear that this level depends on the policy chosen by the central government or by the federal states and that there are no ex-ante advantages for any of the two forms of state organization.⁵

In deciding the fiscal policy, politicians (at the central as well as at the federal level) maximize a weighted average of their utility and the utility of the median voter (e.g. Panizza, 1999). Therefore, in a unitary state the politician maximize

$$\max_{\{t, \gamma\}} U = (1 - \delta) u + \delta y_d \quad (12)$$

and, in a federal state, politicians of each local government maximize

$$\max_{\{t_r, \gamma_r\}} U_r = (1 - \delta) u_r + \delta y_{d,r} \quad (13)$$

where $\delta \in [0, 1]$. When $\delta = 0$, the politician maximizes only his own utility (i.e. he has no constraints in the policy choice), and when $\delta = 1$ he maximizes the utility of the median voter. Hence, δ can also be interpreted as a measure of the quality of democracy of the country, with higher δ corresponding to a more democratic society. We are also implicitly assuming that the quality of democracy represented by the parameter δ is independent on the institutional structure (unitary or federal) adopted.

3 Characterization of the Equilibrium: Preliminary Results

Before analyzing the equilibrium under the two different organizations of the society, I derive some preliminary results.

Let us first determine the optimal allocation of labor of the individuals for any given policy pursued by the central government or by the government of the jurisdiction (under the assumption in this latter case that individuals cannot move in other jurisdictions). It is immediate

⁵This is also guaranteed by the fact that, by assumption, the production of public services does not generate externalities outside the jurisdiction and the production of the public services is not characterized by increasing or decreasing returns to scale.

from the homogeneity of individuals, and the central government and jurisdictions budget constraints, (8) and (11), that a given policy vector $(t; \gamma)$ leads to the same reaction function of the individuals independently on what is the level of government that applies it. Therefore, in what follows, I consider a policy made by the central government but the results also apply to the federal case.

Lemma 1 *If the public sector taxes at rate t the income produced in the formal sector and uses the fraction γ of total revenues for the provision of public services, then the amount of labor employed in the informal sector by each individual is*

$$l(t, \gamma) = \left[\frac{a\beta}{\alpha\gamma^{(1-\alpha)/\alpha} t^{(1-\alpha)/\alpha} (1-t)} \right]^{\frac{1}{1-\beta}}. \quad (14)$$

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

$$\max_{\{l_i\}} y_{i,d} = (1-t)(1-l_i)^\alpha g^{1-\alpha} + al_i^\beta. \quad (15)$$

From the first order condition of (15) with respect to l_i , using the central government budget constraint (8) 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 expressed in (14). ■

Expression (14) makes clear that, other things equal, the amount worked in the informal sector is monotonically decreasing in γ and, therefore, takes the minimum value at $\gamma = 1$. The intuition is clear: other things equal, the higher the fraction of revenues γ used for the productive public services, the higher the marginal productivity in the formal sector (relative to the informal one) and the lower will be labor supply in the shadow economy. 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 when $t > 1 - \alpha$. For the analysis developed below, it is also useful to determine the derivative of l with respect to t and γ . After some algebra, we obtain

$$\frac{\partial l}{\partial t} = \frac{t - (1 - \alpha)}{\alpha t (1 - t) (1 - \beta)} l(t, \gamma) \quad (16)$$

and

$$\frac{\partial l}{\partial \gamma} = -\frac{1 - \alpha}{\alpha \gamma (1 - \beta)} l(t, \gamma), \quad (17)$$

with $l(t, \gamma)$ defined by (14).

We now determine the solution of a benevolent government in a centralized and in a federal state. This corresponds to the case where $\delta = 1$ in (12) or (13), which means that politicians

maximize the utility of the median voter and, given that all individuals are identical, of the society. Therefore, the maximization problem of the benevolent government in a centralized economy is

$$\max_{\{t,g,\gamma\}} U \equiv y_d = (1-t)(1-l)^\alpha g^{1-\alpha} + al^\beta \quad (18)$$

subject to the government budget constraint (8) and the individuals' reaction function. Substituting the government budget constraint (8) into (18), the objective function becomes

$$\max_{\{t,\gamma\}} U \equiv y_d = \gamma^{(1-\alpha)/\alpha} t^{(1-\alpha)/\alpha} (1-t)(1-l) + al^\beta. \quad (19)$$

The objective function (19) is monotonically increasing in γ and, therefore, the optimal solution is $\gamma^* = 1$. Using the envelope theorem,⁶ the first order condition with respect to t is

$$\frac{\partial y_d}{\partial t} = (1-l) \gamma^{(1-\alpha)/\alpha} t^{(1-\alpha)/\alpha} \left(\frac{1-\alpha}{\alpha} \frac{1-t}{t} - 1 \right) = 0 \quad (20)$$

and can be rewritten as

$$\frac{\partial y_d}{\partial t} = \gamma^{(1-\alpha)/\alpha} t^{(1-\alpha)/\alpha} (1-l) \frac{1-\alpha-t}{\alpha t} = 0, \quad (21)$$

which implies that the optimal taxation is $t^* = 1 - \alpha$.⁷ Again, it is immediate to show that the results in a federal state are identical. The following lemma summarizes these results.

Lemma 2 *A benevolent government ($\delta = 1$) at a centralized as well as at a jurisdictional level set the tax rate $t^* = 1 - \alpha$ and employ all revenues for the provision of the public services, $\gamma^* = 1$. The utility of the politician is equal to the non-monetary benefit, $u = B$, and the labor employed by each agent in the informal sector is at the minimum value, $l^* = \left[a\beta/\alpha^2 (1-\alpha)^{(1-\alpha)/\alpha} \right]^{1/(1-\beta)}$.*

Proof. In the text. ■

It is worth noting that the solution under a benevolent social planner for t and γ is the same as the one of the benevolent government, but the planner also sets the labor employed in the two sectors by each agent. The amount of labor for the informal sector set by the planner is

$$l_{sp} = \left[\frac{a\beta}{\gamma^{(1-\alpha)/\alpha} t^{(1-\alpha)/\alpha} (1-t)} \right]^{\frac{1}{1-\beta}} \quad (22)$$

which is lower than the one determined by (14) given that $\alpha < 1$. This comes from the fact that the planner can internalize the fact that, if all agents work more in the formal sector, for

⁶We remind that l is set optimally by each agent which implies that $\partial l/\partial t = 0$.

⁷It can be easily verified that (t^*, γ^*) is a maximum of (19) and that the second order conditions are satisfied.

any level of t and γ , the revenues of the public sector increase, the per capita level of public services increase and, therefore, also the marginal productivity and the employment in the formal sector are higher. The benevolent government instead is constrained to the reaction function of the individuals that cannot coordinate to work more in the formal sector. This form of externality (e.g. Barro, 1990) implies that the first-best solution of the planner cannot be replicated by the benevolent government that can only adopt the second-best solution choosing the level of taxation $t^* = 1 - \alpha$ and $\gamma^* = 1$.

We now determine the optimal fiscal policy when the politician maximizes his own utility only (i.e., $\delta = 0$). The maximization problem of the politician in a centralized government is given by (6) subject to the government budget constraint (8), and the individuals' reaction function (14).⁸ Substituting (8) into (6), the maximization problem of the policy maker in a centralized society becomes

$$\max_{\{t, \gamma\}} U \equiv u = (1 - \gamma) \gamma^{(1-\alpha)/\alpha} t^{1/\alpha} (1 - l) + B. \quad (23)$$

To determine the solution of problem (23), it is useful to notice that the objective function takes the minimum value $u = B$ for all extreme values of t and γ .⁹ When $t = 0$ there are no government revenues and therefore there are no resources for political rents (and $u = B$). The same happens when $t = 1$ because all individuals work in the informal sector and government revenues are zero. For any t , there is no provision of public services if $\gamma = 0$ and, therefore, there is no production in the formal sector, government revenues are zero, and there is no possibility for the politician to obtain non-monetary rents ($u = B$). When $\gamma = 1$ there are no expenses for politician's rents and, again, $u = B$. When t and γ take intermediate values, the production in the formal sector is always positive as the production function in the formal sector satisfies the Inada conditions. This implies that the revenues of the public sector as well as the non-monetary rents of the politician are positive which implies that $u > B$. This means that the maximization problem (23) has an interior solution for t and γ . I now show there exists only one critical point and, given that u is well-defined in a compact set, this point is the maximum point of (23).

The first order condition of problem (23) with respect to taxation is

$$\frac{\partial U}{\partial t} = \frac{\partial U}{\partial t} + \frac{\partial U}{\partial l} \frac{\partial l}{\partial t} = 0 \quad (24)$$

⁸The problem in a federal state is identical, i.e. it is given by (9) subject to the government budget constraint (11) and this leads to the same solution.

⁹It is worth noting that whatever the policy implemented, the size of population is unchanged and, therefore, the policy maker always obtain the non-monetary benefit B .

where $\partial l/\partial t$ is given by (16). Therefore,

$$\frac{\partial U}{\partial t} = \frac{1}{\alpha} (1 - \gamma) \gamma^{(1-\alpha)/\alpha} t^{(1-\alpha)/\alpha} (1 - l) - (1 - \gamma) \gamma^{(1-\alpha)/\alpha} t^{1/\alpha} \frac{t - (1 - \alpha)}{\alpha t (1 - t) (1 - \beta)} l = 0 \quad (25)$$

or

$$\frac{\partial U}{\partial t} = \frac{1}{\alpha} (1 - \gamma) \gamma^{(1-\alpha)/\alpha} t^{(1-\alpha)/\alpha} \left[(1 - l) - \frac{(-1 + \alpha + t) l}{(1 - t) (1 - \beta)} \right] = 0. \quad (26)$$

After some manipulation of the expression in the square brackets, (26) can be rewritten as

$$\frac{\partial U}{\partial t} = \frac{(1 - \gamma) \gamma^{(1-\alpha)/\alpha} t^{(1-\alpha)/\alpha}}{\alpha (1 - t) (1 - \beta)} [(1 - t) (1 - \beta) - l (\alpha - \beta (1 - t))] = 0. \quad (27)$$

Given that the component outside the square bracket of (27) is always positive, the sign of $\partial U/\partial t$ is equal to the component inside the square bracket.¹⁰ Therefore, the optimal tax rate is implicitly given by

$$t^s = \frac{1 - \beta + \beta l - \alpha l}{1 - \beta + \beta l} \quad (28)$$

where $l \equiv l(t^s)$ is defined by (14). It can be easily verified that $1 - \alpha < t^s < 1$ and, therefore, the tax rate chosen by the policy maker in a centralized state that maximizes his rents is higher than the one set by a benevolent government.

The first order condition with respect to γ is

$$\frac{\partial U}{\partial \gamma} = \frac{\partial U}{\partial \gamma} + \frac{\partial U}{\partial l} \frac{\partial l}{\partial \gamma} \quad (29)$$

where $\partial l/\partial \gamma$ is given by (17). Therefore,

$$\begin{aligned} \frac{\partial U}{\partial \gamma} &= -\gamma^{(1-\alpha)/\alpha} t^{1/\alpha} (1 - l) + \frac{1 - \alpha}{\alpha} (1 - \gamma) \gamma^{((1-\alpha)/\alpha)-1} t^{1/\alpha} (1 - l) + \\ &\quad + (1 - \gamma) \gamma^{(1-\alpha)/\alpha} t^{1/\alpha} \frac{1 - \alpha}{\alpha \gamma (1 - \beta)} l \\ &= 0 \end{aligned} \quad (30)$$

that can be rewritten as

$$\begin{aligned} \frac{\partial U}{\partial \gamma} &= -\gamma^{(1-\alpha)/\alpha} t^{1/\alpha} (1 - l) + \frac{(1 - \alpha) (1 - \gamma)}{\alpha \gamma} \gamma^{(1-\alpha)/\alpha} t^{1/\alpha} + \\ &\quad - \frac{(1 - \alpha) (1 - \gamma)}{\alpha \gamma} \gamma^{(1-\alpha)/\alpha} t^{1/\alpha} l + \frac{(1 - \alpha) (1 - \gamma)}{\alpha \gamma (1 - \beta)} \gamma^{(1-\alpha)/\alpha} t^{1/\alpha} l \\ &= 0. \end{aligned} \quad (31)$$

Summing the last two components of (31) and rearranging terms, we obtain

$$\frac{\partial U}{\partial \gamma} = \gamma^{(1-\alpha)/\alpha} t^{1/\alpha} \left[-(1 - l) + \frac{(1 - \alpha) (1 - \gamma)}{\alpha \gamma} + \frac{\beta (1 - \alpha) (1 - \gamma)}{\alpha \gamma (1 - \beta)} l \right] = 0 \quad (32)$$

¹⁰Notice that the expression outside the square brackets is always positive when γ and t are interior.

and, after some algebra

$$\frac{\partial U}{\partial \gamma} = \frac{\gamma^{(1-\alpha)/\alpha} t^{1/\alpha}}{\alpha \gamma (1-\beta)} [-\alpha \gamma (1-\beta)(1-l) + (1-\alpha)(1-\gamma)(1-\beta+\beta l)] = 0. \quad (33)$$

From the square bracket of (33), the optimal fraction of revenues used to provide public services is implicitly defined by

$$\gamma^s = \frac{(1-\alpha)(1-\beta+\beta l)}{1-\beta+\beta l-\alpha l} \quad (34)$$

where $l \equiv l(\gamma^s)$ is given by (14). It is straightforward that $0 < \gamma^s < 1$.¹¹

The point (t^s, γ^s) is a critical point and for the above considerations it is a maximum. The utility of the politician maximizing its own utility without constraints is $u(t^s, \gamma^s)$ where u is given by (23) and t^s and γ^s are expressed implicitly by (28) and (34). The taxation chosen when politician has no constraints is higher than that one correspondent to the benevolent politician $t^s > t^* = 1 - \alpha$, and only a fraction of resources are now spent for the productive public services, $\gamma^s < \gamma^* = 1$.

Lemma 3 *A politician maximizing his rents ($\delta = 0$) at a centralized level sets the tax rate $t = t^s > t^* = 1 - \alpha$ defined in (28), and employs a fraction $\gamma = \gamma^s < \gamma^* = 1$ of revenues for the provision of the public services as defined in (34). The utility of the politician and the labor employed by each agent in the informal sector are defined by (23) and by (14) with $t = t^s$ and $\gamma = \gamma^s$ respectively.*

Proof. In the text. ■

It also worth noting that the total amount of public services provided by an unconstrained politician is lower than the one provided by the benevolent government. This result can be shown by observing that (28) and (34) imply that $\gamma^s = (1 - \alpha) / t^s$ and therefore that

$$\gamma^s t^s = (1 - \alpha). \quad (35)$$

Using the government budget constraint (8), the amount of per capita public services provided is

$$g^s = (\gamma^s t^s)^{1/\alpha} (1 - l^s) = (1 - \alpha)^{1/\alpha} (1 - l^s) \quad (36)$$

¹¹ $\gamma^s > 0$ comes from the fact that the denominator $1 - \beta + \beta l - \alpha l > 0$ as it is immediate that the numerator is always positive. The denominator is always positive when $\beta \geq \alpha$. When $\beta < \alpha$, we can consider the case where the denominator $1 - \beta + \beta l - \alpha l$ takes its minimum value, i.e. when $l = 1$. In this case, $1 - \beta + \beta l - \alpha l = 1 - \alpha$, which is always positive because $\alpha < 1$. That $\gamma^s < 1$ comes from the fact that $l < 1$ and therefore the numerator of (34) is always lower than the denominator.

while the optimal one is

$$g^* = (\gamma^* t^*)^{1/\alpha} (1 - l^*) = (1 - \alpha)^{1/\alpha} (1 - l^*). \quad (37)$$

It is immediate to verify that $g^s < g^*$ as $l^s > l^*$. In fact, the individuals' reaction function (14) is such that l is monotonically decreasing in γ while it is monotonically increasing in t when $t > 1 - \alpha$. Given that $\gamma^s < \gamma^*$ and $t^s > t^* = 1 - \alpha$, it follows that $l^s > l^*$ and, therefore, $g^s < g^*$.

4 The Equilibrium in a Centralized and in a Federal State

I now determine the policy chosen by the public sector in a centralized and in a federal state.

Proposition 1 *The policy chosen by a centralized government is (t^c, γ^c) . $t^c(\delta)$ is decreasing in δ with $t^c(0) = t^s > t^*$ and $t^c(1) = t^* = 1 - \alpha$. $\gamma^c(\delta)$ is increasing in δ with $\gamma^c(0) = \gamma^s$ and $\gamma^c(1) = \gamma^* = 1$.*

Proof. The maximization problem of the politician is

$$\max_{\{t, \gamma\}} U = (1 - \delta)u + \delta y_d \quad (38)$$

subject to the central government budget constraint (8), and the individuals' reaction function (14). It is straightforward to verify that the maximization problem (38) is a convex combination of the maximization problems in (18) and (23), i.e. of a government maximizing the utility of the median voter ($\delta = 1$) and the one maximizing his rents only ($\delta = 0$). The objective function in (18) is monotonically increasing in t for all $t < t^*$, and monotonically decreasing for all $t > t^*$, while it is monotonically increasing in γ . The objective function in (23) is monotonically increasing in t for all $t < t^s$, and monotonically decreasing for all $t > t^s$; it is monotonically increasing in γ for all $\gamma < \gamma^s$, and monotonically decreasing for all $\gamma > \gamma^s$. These two facts imply that the solution to (38) is a fiscal policy (t^c, γ^c) given by a convex combination of the solutions to (18) and (23) characterized in Lemma (2) and (3), i.e. (γ^*, t^*) and (t^s, γ^s) respectively, with the weight given by δ . Hence, when $\delta = 0$, the maximization problem corresponds to a fully insulated politician, $t^c(0) = t^s$ and $\gamma^c(0) = \gamma^s$, and when $\delta = 1$, the maximization problem corresponds to a benevolent politician, $t^c(1) = t^*$ and $\gamma^c(1) = \gamma^*$. For any $0 < \delta < 1$, $t^* < t^c(\delta) < t^s$ and $\gamma^c < \gamma^c(\delta) < \gamma^*$. ■

The result in Proposition 1 makes clear that, unless the politician is fully benevolent, the policy chosen by a central government is not the socially optimal one. The next Remark clarifies this point.

Remark 1 For any $\delta < 1$, the fiscal policy implemented by a central government implies a tax rate higher than the socially optimal one ($t^c > t^* = 1 - \alpha$), and a fraction of revenues used to finance the productive public good lower than the socially optimal one ($\gamma^c < \gamma^* = 1$).

I now move to the analysis of the policy chosen in a federal system. Before stating the result, it is useful to note that the maximization problem of the politician in the generic jurisdiction r is

$$\max_{\{t_r, \gamma_r\}} U_r = (1 - \delta) u_r + \delta y_{d,r} \quad (39)$$

subject to the government budget constraint (11), and the individuals' reaction function (14). However, the policy-maker has also to take into account that each individual can move to another jurisdiction, at zero cost, if he finds this beneficial. The rent of the politician in jurisdiction r is

$$u_r = (1 - \gamma_r) \gamma_r^{(1-\alpha)/\alpha} t_r^{1/\alpha} n_r (1 - l_r) + B, \quad \text{with } r = 1, \dots, R \quad (40)$$

where (t_r, γ_r) is the fiscal policy adopted, $l_r \equiv l(t_r, \gamma_r)$ is given by (14), and n_r is the number of individuals in jurisdiction r *after* the fiscal policy is chosen.

Proposition 2 *The policy chosen by the government of each jurisdiction r in a federal system corresponds to the socially optimal one, i.e. $t^r = t^* = 1 - \alpha$ and $\gamma^r = \gamma^* = 1$ for all $r = 1, \dots, R$.*

Proof. In order to show that the Nash equilibrium is such that the policy-maker of each jurisdiction chooses the socially optimal fiscal policy (t^*, γ^*) , I first show that there are no profitable deviations for any player. Then, I show that for any other policy there are profitable deviations which implies that the equilibrium is unique.

Assume that the politicians all jurisdictions choose the policy (t^*, γ^*) , i.e. $(t_r, \gamma_r) = (t^*, \gamma^*)$ for all $r = 1, \dots, R$. This policy implies that the rent of the politician in jurisdiction r is $u_r = B$ and the maximized disposable income of the individuals $y_{d,r}$ is at the highest value (that I denote as $y_{d,r}^*$), so that $U_r = (1 - \delta) B + \delta y_{d,r}^*$. Now consider the politician of jurisdiction j choosing a policy (t_j, γ_j) where $t_j \neq t^*$ and/or $\gamma_j \neq \gamma^*$. The individuals in jurisdiction j will find optimal to move to other jurisdictions because $y_{d,j}(t_j, \gamma_j) < y_{d,r}^*$. Given that $n_j = 0$, $u_j = 0 < B$ and this in turn implies that $U_j(t_j, \gamma_j) < U_j(t^*, \gamma^*)$, which shows that there are no profitable deviations from the policy (t^*, γ^*) .

In order to show that the equilibrium is unique, first notice that any equilibrium has to be such that there is no incentives for the individuals to move from one jurisdiction to another

one, as it is never optimal for the politician of a jurisdiction to have zero population. This requires that fiscal policies are such that the maximized disposable income of the agents is equalized across jurisdictions, i.e. $y_{d,j}(t_j, \gamma_j) = y_{d,r}(t_r, \gamma_r)$ for all $j \neq r$. Consider now the set of fiscal policies $\{(t_r, \gamma_r)\}_{r=1}^R$ that satisfy this property.¹² I now show that the policy-maker of jurisdiction r can improve its utility by implementing the fiscal policy (t_r, γ'_r) , where $\gamma'_r = \gamma_r + \varepsilon$ with $\varepsilon > 0$ and small enough.¹³ Such a fiscal policy increases the maximized disposable income of the agents in region r (as there is more provision of the productive public good with the same level of taxation) and induces the individuals of the other jurisdictions to move in jurisdiction r , so that total population in jurisdiction r is 1. Using (40), it is straightforward to show that this deviation is convenient for the policy-maker because

$$u_r(t_r, \gamma_r) = n_r \Lambda_r + B$$

with $\Lambda_r(t_r, \gamma_r) \equiv (1 - \gamma_r) \gamma_r^{(1-\alpha)/\alpha} t_r^{1/\alpha} (1 - l_r)$, and $l_r \equiv l_r(t_r, \gamma_r)$ given by (14), while

$$u_r(t_r, \gamma'_r) = \Lambda'_r + B$$

with $\Lambda'_r(t_r, \gamma'_r) \equiv (1 - \gamma'_r) (\gamma'_r)^{(1-\alpha)/\alpha} t_r^{1/\alpha} (1 - l'_r)$ and $l'_r \equiv l'_r(t_r, \gamma'_r)$. It is immediate to verify that there is always an $\varepsilon > 0$ such that $n_r \Lambda_r < \Lambda'_r$. This implies that $u_r(t_r, \gamma_r) < u_r(t_r, \gamma'_r)$, and in turn that $U_r(t_r, \gamma_r) < U_r(t_r, \gamma'_r)$. This prove that the above Nash equilibrium is unique.

■

Proposition 1 and 2 define the fiscal policy adopted in a centralized and in a federal country. The following proposition analyzes the implications for the size of the shadow economy.

Proposition 3 *The size of the informal sector in a federal country is always lower than that one in a centralized country.*

Proof. This result follows by combining Lemma 1, Proposition 1 and 2. It is immediate to verify from (14) that $l(t^*, \gamma^*) < l(t^c, \gamma^c)$ because $t^* < t^c$ and $\gamma^c < \gamma^*$.¹⁴ ■

The result in Proposition 3 comes from the fact that the amount of labor employed in the informal sector by each individual, reported in (14), is minimal when the fiscal policy is the socially optimal one, which is implemented in the federal system. The intuition behind this

¹²It is immediate that $(t_r, \gamma_r) \neq (t^*, \gamma^*)$ for any $r = 1, \dots, R$ because otherwise there would be an incentive for the agents of some jurisdiction to move into others.

¹³If $\gamma_r = 1$, one may think as a deviation to a fiscal policy (t'_r, γ_r) , where $t'_r = t_r + \varepsilon$ with $\varepsilon > 0$ if $t_r < t^*$ and $\varepsilon < 0$ if $t_r > t^*$. The same argument explained below applies.

¹⁴It is clear that this result holds for all $\delta < 1$. When $\delta = 1$, i.e. the government is fully benevolent, the size of the shadow economy is the same in both political systems because the socially optimal policy is always adopted.

result is clear. The competition among jurisdictions and the mobility of the individuals imply that the fiscal policy set in a federal system is closer to the optimal one. In a centralized system, the politician can extract more rents from the individuals and this implies a higher level of taxation and a greater share of revenues devoted to unproductive purposes. This in turn implies that the formal sector is relative less productive than the informal one if compared with the situation of a federal system.

5 Empirical Evidence

5.1 Data description

The theory presented in this paper suggests the existence of a negative relationship between federalism and the size of the shadow economy. Federal countries are expected to have a smaller informal sector. In order to test this prediction, I perform a cross-sectional analysis for the following two reasons. First, federalism is an institutional feature which generally does not change over time. Second, the data on the size of the shadow economy is available only for few years. I employ the sample compiled by Persson and Tabellini (2003), which has the advantage of excluding the countries that cannot be considered as democracies for the period 1990-98 (this leads to a sample of 85 countries). In fact, as Downes (2000) observes, under a dictatorship, a federal state becomes basically unitary since the units lose their autonomy.

The data relative to 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 for the period 1999-2003.¹⁵ The dependent variable employed in the empirical analysis (SHAD_AV) is an average of the observations available for the period indicated and allows us to cover up to 73 countries of the sample used.

The index of federalism employed is a dummy variable reflecting whether a country has or not a federal structure. This variable is set to 1 for the countries which have a federal structure, and to 0 otherwise. The index is taken from Persson and Tabellini (2003) and is based on the definition of federalism provided by Downes (2000). This author in turns refers to the Riker's (1964, p.11) classification of a federal state as one under which "(1) [at least] two levels of government rule the same land and people, (2) each level has at least one area of action in which it is autonomous, and (3) there is some guarantee (even though merely a statement in the constitution) of the autonomy of each government in its own sphere." This definition has been

¹⁵The measure for the size of the shadow economy has been obtained using the DYMIMIC and the Currency Demand approach (latent estimation approach - for more details see Schneider, 2005 and Schneider and Enste, 2000).

widely used in the economics as well as political science literature (see, for example, Elazar, 1995, and Treisman, 2000). Following this definition, the countries in the present dataset which can be classified as federal are Argentina, Australia, Austria, Brazil, Canada, Germany, India, Malaysia, Mexico, Pakistan, Russia, Switzerland, USA and Venezuela.¹⁶

In order to reduce the possibility of omitted variables, I control for a wide number of variables which, on the base of the existing literature, can affect the size of the shadow economy. Appendix A provides a detailed description of the variables used and their sources. Where not expressly specified or indicated in brackets, the source of the variables is Persson and Tabellini (2003).

In order to control for the level of economic development, I include in the regressions the variable `LCGDP_60` which represents the natural logarithm of the per capita GDP in 1960 (from Penn World Table Version 6.1). The reason of using the GDP in 1960 is to avoid possible endogeneity problems.¹⁷ As an alternative measure of economic development it is possible to use the variable `EDUGER` which accounts for the level of scholarship within a country. This variable is obtained considering the total enrolment in primary and secondary school as a percentage of the relevant age group in the population.¹⁸

Country size has also been shown to be an important explanatory variable in decentralization regressions. As Downes (2000) and Fisman and Gatti (2002) suggest, larger countries tend to adopt a more decentralized systems to better meet the preferences of their citizens. At the same time, larger countries may encounter greater difficulties in controlling economic activity and this can lead to further increase the size of informal sector. To control for these effects, I use the log of the geographic area measured in square kilometers (`LAREA`).¹⁹ I also include in the baseline specification an index of quality of democracy (`GASTIL`) obtained as an average value of the indexes of civil liberties and political rights, which range from 1 to 5, with 1 representing the highest degree freedom and 5 the lowest level for democratic coun-

¹⁶I exclude from the list of federations Belgium and Spain. Actually Belgium became officially federal in 1994, only a few years before the observations available for the size of the shadow economy. The reason why I prefer not considering Belgium among the countries classified as federations is that it takes some time before a federal reform affects the size of the informal sector. However, classifying Belgium as a federal country or excluding it from the sample, do not influence the estimates. For what concerns Spain, it is a country often classified as a proto-federation. As in the previous case, considering Spain as a federal country or excluding it from the sample, do not influence the estimates.

¹⁷However, using the variable `LYP` from the dataset of Persson and Tabellini, which represents the log of the average per capita GDP for the period 1990-98, instead of the `LCGDP_60`, leads to the same results.

¹⁸The inclusion of this variable is also meant to capture the extent to which the level of instruction can affect the decision of operating in the informal sector.

¹⁹Alternatively, it is possible to control for the log of population (`LPOP`) or the density of population (`DENSITY`). Using both indexes does not change the results.

tries.²⁰ Moreover, it is often argued that high quality democracies promote development by safeguarding property rights, while citizens in countries where the quality of democracy is low face a higher probability to be expropriated by the government and this can act as a further incentive to operate in the informal sector (see Przeworski and Limongi, 1993).²¹

I also use a number of other explanatory variables which are generally considered as some of the most important causes of the increase of the shadow economy (e.g. Tanzi, 1982, 1999; Johnson et al., 1998a,b; Friedman et al., 1999; Schneider and Enste, 2000; Kaufmann et al., 2005). One of the main determinant of the growth of the informal sector is the high level of tax burden. To control for this effect, I include in the regression the variable TOPTAX which represents the top marginal tax rate for each country in 1994 and that is taken from La Porta et al. (1999).

The rise of the burden of social security contributions, increased regulation in the official economy especially of labor market, social transfers and the quality and quantity of publicly provided good and services are key factors for the explanation of the shadow economy. To capture the effects of these important features, I consider the following set of control variables. 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 this variable for the period 1996-98. Several empirical works predict that countries with more general regulation of their economies tend to have a higher size of shadow economy (see, Johnson et al., 1997, 1998a,b; Friedman et al., 1999). The measure of the influence of labor regulation on the informal sector is given by the variable LABOREGU_03 (from Gwartney and Lawson, 2004). This index, ranging from 1 to 10, with higher values representing a lower degree of regulation, is relative to the year 2003 and reflects the impact of the 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. In order to control for the extent to which social welfare system might provide negative incentives for beneficiaries to work in the official sector of the economy, I use the variable TRANSUB (from La Porta et al., 1999). This variable is an index measuring the total amount of welfare transfers and benefits received

²⁰Countries whose Gastil index falls between 1 and 2.5 are considered “free”, between 3 and 5.5 “partly free” and between 5.5 and 7 “not free”. Persson and Tabellini include in their sample only those countries whose average Gastil index for the period 1990-98 is lower than 5.

²¹On the other hand, where the quality of democracy is lower, the citizens are unable to punish policymakers by vote.

by individuals as a percentage of GDP and is obtained as average values of the observations for the period 1975-95. It is argued that the beneficiaries of welfare payments have incentives to work in the informal sector while receiving these subsidies, since their overall income become higher (see Schneider and Enste, 2000). Moreover, the variable welfare transfers is also a rough measure of the size of the public sector and of the average level of taxation.

The variables PROP1564 and PROP65 allows us to control for the demographic characteristics of each country. PROP1564 represents the percentage of population between 15 and 64 years old in the total population; PROP65 is the percentage of population over the age of 65 in the total population. As suggested by Persson and Tabellini (2003), demographic characteristics influence the total amount and the composition of public expenditure and can have an important impact on fiscal policies.²²

A number of other variables measuring the efficiency and the quality of public institutions have been shown to be relevant in explaining shadow economy. As pointed out by Schleifer and Vishny (1993), Dreher and Schneider (2005) and Johnson et al. (1998a,b) a discretionary application of regulations and laws might induce citizens to lose confidence in institutional arrangement creating incentives to operate in the informal sector. In this case, it is not an increase in regulation that stimulates the size of shadow economy, but the public use of laws and regulations for private benefits. To control for these effects, I include in the analysis the variable GOVEF, which reflects the perceptions of citizens about the efficiency of government in delivering services, the efficient implementation of government decisions, the bureaucratic quality, the presence of political pressure on civil servants, the accountability of government and the competence of public servants. This variable ranges between 1 and 10 with higher values reflecting negative perceptions. Moreover, I use two variables reflecting the quality of the legal system. The variable LAW_9698 is an index of the rule of law ranging between -2.5 and 2.5, with higher values corresponding to better outcomes. I use average values of the variable for 1996-98. The index includes perceptions of the predictability and effectiveness of the judiciary, the incidence of crime and the enforceability of contracts. The second variable is PROPRIGHT (from La Porta et al., 1999) and measures the ability of legal system to protect property rights. It refers to 1997 and ranges between 1 and 5 with higher values corresponding to a higher degree of security.

²²The relation between shadow economy and public expenditure can be controlled using other variables like CGEXP which represents central governments expenditures as a percentage of GDP, CGREV which is the central government revenues as a percentage of GDP, and SSW which indicates consolidated central government expenditures on social services and welfare as a percentage of GDP. Including these variables in the regressions as alternative indices to TRANSUB and PROP1564 and PROP65 leads to the same results.

Another kind of failure of governance is the presence of corruption, commonly defined as the exercise of public power for private benefit. The measure of corruption used here is the variable GRAFT, which expresses the perceptions about government officials corruption as a lack of respect for rules which govern business and political arena, and ranging from the frequency of demand special or illegal payments to get things done, to policy protection or bribes connected with licenses and taxes assessment. This index varies from 0 to 10 with higher values corresponding to higher perceptions of corruption.²³ It is argued that corruption encourage people to move from the official economy into the informal sector (e.g. Bovi, 2002). In addition, corruption can influence the level and quality of public goods provided by the government, inducing people to be less available to pay for them.²⁴

Another variable used is GADP and it measures the quality of the institutional environment over the period 1986-95. This variable is the average of five different indicators: law and order, bureaucratic quality, corruption, risk of expropriation and government repudiation of contracts. It varies from 0 to 1, with higher values indicating better policies, that is the perceptions of structural policies and institutional environment supporting the production of output rather than its diversion (see Hall and Jones, 1999).

The variable AGE measures the number of years with uninterrupted democratic rule and varies from 0 to 1, with US being the oldest democracy. Considering the age of democracy allows us to control for the consolidation and quality of institutions. I also consider in the analysis other variables accounting for institutional, economic, political, geographical, historical and cultural characteristics of each country in order to evaluate empirically their impact on government performance. First of all, I consider each country's legal origin, dividing national legal traditions into common law (LEGOR_UK), French civil law (LEGOR_FR), German civil law (LEGOR_GE), Scandinavian civil law (LEGOR_SC) and socialist law (LEGOR_SO). According to La Porta et al. (1999) and Glaeser and Schleifer (2003), the law tradition of each country affects the efficiency of the government, the quality of public goods, as well as the size of government and political freedom. In fact, while civil law developed as a mean for the State to create institutions to expand its power and extract resources, English common law tradition

²³ Another index of corruption is the variable CPI9500, realized by the Transparency International Organization. Using this variable in the regression leads to the same results.

²⁴ The relationship between the size of shadow economy and corruption seems to be twofold. Johnson et al. (1998a,b) and Friedman et al. (1999) suggest that going underground is complementary to bribery, while Rose-Ackermann (1997), Choi and Thum (2004) and Dreher et al. (2005) point to a substitute process between shadow economy and corruption. The empirical results of Schneider and Dreher (2005) show that more corruption and bribery is related to a larger informal sector in low income countries, while in high income countries it is possible to observe the opposite relationship.

was created by the Parliament and the aristocracy at the expense of the Crown to limit the power of the sovereign. As a result, in the former system governments are expected to be more interventionist, less efficient and with more corrupted bureaucracies than in the latter ones.

The variables MAJ and PRES classify a country on the basis of its political system. MAJ is a dummy variable for electoral system, equal to 1 if the electoral rule is proportional, and 0 otherwise. PRES is a dummy variable for the form of government, equal to 1 in presidential regimes, and 0 otherwise. Persson and Tabellini, among others, argue that the form of government and the electoral system can affect the composition and the dimension of the public expenditure, affecting by this way the size of shadow economy. At the same time, the use of these variables might capture the extent to which politicians could not have a sincere interest in implementing policies to reduce the size of shadow economy, since many voters benefit from unofficial activities and this might be strategic to secure their reelection.

In order to take into account the historical features, I include variables which distinguish countries on the basis of their colonial heritage. COL_UK, COL_ESP and COL_OTH are dummy variables for British, Spanish-Portuguese or other colonial origins.²⁵ Several studies emphasize the influence of colonial heritage on institutional outcomes like the choice of a federal political structure, or political and legal system.²⁶ I also take into account the geographical location of countries. AFRICA is a dummy variable equal to 1 if a country is in Africa, ASIAE is a dummy variable equal to 1 if a country is in East Asia, LAAM is a dummy variable equal to 1 if a country is in Latin America, Central America or the Carribeans. As pointed out by Persson and Tabellini, geography as well as history tend to strongly correlated with public expenditure.

I also consider an index of openness to the international trade and an index of income distribution. The variable TRADE reflects the number of years a country has been open to international trade and is defined as the sum of exports and imports of good and services measured as a share of GDP. The literature on shadow economy suggests that globalization of markets and increasing competitiveness of third world economies, which exhibit lower production costs, might affect firms decision to operate in the informal sector (see Gerxhani, 1999). As a variable of income distribution, I use the Gini index. This variable (GINI_8090) is computed as the average of two data observations: the observation closest to the 1980 and the

²⁵ Additional variables indicating colonial origins, discounted by the year since independence, are COL_UKA, COL_ESPA and COL_OTHA. Using these variables does not change the results.

²⁶ The legal transplantation that followed colonization is important to explain institutional development and in particular the capacity to form stable governments and bureaucracies efficient as well as free from political influence (Mauro, 1995).

observation closest to the 1990.

Finally, I use two additional variables related to cultural characteristics of each country. First, as a proxy for the dimension of culture, that may affect government performances, I consider religion. The variables CATHO_80 and PROTH_80 denote respectively the percentage of the population belonging to the Roman Catholic religion and the percentage of the population professing the Protestant religion in 1980 respectively. CONFU is a dummy variable equal to 1 if the majority of population is Confucian, Buddhist or Zen, and 0 otherwise. As suggested by La Porta et al. (1997) and Landes (1998), religion is very important in the determination of the policy and it may be also related to fundamental institutions. These authors provide some evidence that “hierarchical religions” like, for instance, Catholicism and Islam, are related to less efficient governments and are detrimental to development, as a consequence of excessive power and interventionism. Moreover, religious beliefs might affect people’s attitudes towards the economic system, private property and tax compliance. Second, I use the variable ETHNIC which denotes the degree of ethnic fractionalization within a country. This index, constructed by Alesina et al. (2003), measures the probability that two randomly selected people from a given country will not belong to the same ethno-linguistic group.²⁷ The variable takes values between 0 and 1 with higher values indicating a higher degree of fractionalization. Several empirical works find that ethnic conflict is an important determinant of the institutional quality, inefficient governments and growth failures of many country (e.g. Mauro, 1995; Easterly and Levine, 1997; La Porta et al., 1999). In more ethnically fragmented societies public governments are more interventionists but the public good provision tends to be less efficient, bureaucracies are more corrupted and the protection of property right is less secure with disappointing economic outcomes (see, for example, Schleifer and Vishny, 1993). At the same time, the decision of adopting a political federal structure might come from the need to solve the conflict that ethno-linguistic fractionalization foster (Downes, 2000).

5.2 Empirical results

Tables 1a and 1b provide descriptive statistics on the relationship between shadow economy and federalism. We observe that federal countries exhibit a lower size of shadow economy. In particular, Table 1a shows that non federal countries have an average size of shadow economy of 33.77 percent relative to GDP, whereas in federal countries the size is around one-quarter of

²⁷As a robustness check, I have also used the variable AVELF, realized by Easterly and Levine (1997), which is another measure of the level of lack of ethnic and linguistic cohesion within a country.

GDP. This difference is statistically significant at the 5% level. Table 1b reports federal and non federal countries in each quartile of the distribution of the size of shadow economy. We can notice that as the size of the shadow economy increases, the number of federal countries decreases, whereas for non federal countries the opposite is true. Table 1c provides descriptive statistics for other variables used in the analysis.

Tables 2, 3 and 4 present the results of OLS regressions. The basic specification is

$$Y_i = \alpha + \beta_1 X_i + \beta_2' Z_i + \varepsilon_i$$

where Y and X represent respectively the size of shadow economy (SHAD_AV) and the federal political system (FEDERAL) respectively, while Z is the vector of the control variables.

Column (1) of Table 2 reports the unconditional relationship between federalism and shadow economy and shows that federal countries have on average a shadow economy of about 8.75 percent lower than non federal ones and this difference is statistically significant at the 5% level. Column (2) reports results of the specification where I include three control variables accounting for countries' characteristics, such as the level of economic development (LCGDP_60), the quality of democracy (GASTIL) and the country size (LAREA). Again, the result confirms that, other things equal, federal countries have a lower level of shadow economy. The inclusion of these controls implies that the estimated coefficient of our variable of interest is higher (11.70 rather than 8.75) and also the statistical significance improves. The level of economic development of the country does not seem exert a statistically significant impact in explaining the size of shadow economy, while both the country size and the quality of democracy have a highly statistically significant impact and enter in the regression with the expected sign. Larger countries and less consolidated democracies have a higher level of shadow economy.

Column (3) reports the results of the regression chosen as baseline specification. Following the literature on the shadow economy, two additional control variables are included. These are the top tax rate of each country (TOPTAX) and the regulatory burden of markets (QREGU_9698). Results are unchanged as the coefficient for federalism is 12.84 points and is statistically significant at 1%. The correlation between taxation and shadow economy is negative and strongly significant (1%) indicating that higher tax rates are associated with less unofficial activity. This result, even if apparently surprising, supports Johnson's et al. (1998a,b) findings which indicate that it is not necessarily higher taxes that increase the size of informal sector, but the inefficient and discretionary application of the tax system by government authorities. Countries with more general regulation of their economic activity tend to

have a higher size of the unofficial economy and also this result is consistent with the results obtained by Johnson et al. (1997) and Friedman et al. (1999).

In order to check the robustness of the results, I include a number of variables that, in principle, might be related to shadow economy and federalism. Starting from column (4), I include in the baseline specification one (or a group of) control variable at a time and run 18 further specifications. As we will see, federalism results always strongly associated to a lower level of shadow economy. In particular, the average size of shadow economy in federal countries is generally 12 percent lower with respect to non federal ones, and this result is always statistically significant at highest levels.

Columns (4), (5), (6) and (7) show the results when the amount of public transfers and subsidies (TRANSUB), the burdens of regulation (LABOREGU_03), the demographic characteristics (PROP1564 and PROP65) and the level of education (EDUGER) respectively are added to the baseline specification. With the exception of the labor regulation, these additional control variables are not statistically significant at standard levels.

Table 3 reports the results for other seven specifications where variables describing various features of institutional quality are added in the baseline specification. Column 1 shows that a better rule of law (LAW_9698) is related to a lower shadow economy. As I have already pointed out, a relatively noninterventionist government, which keeps regulation and taxes low, is generally associated to a lower level of the unofficial economy. Another feature of a good government is efficiency however. In fact, when a government intervenes, it can create distortions leading to corruption or bureaucratic delays. The results suggest that more corruption (GRAFT) and more inefficient bureaucracies (GOVEF) lead to a greater size of informal sector, whereas a more secure protection of property rights (PROPRIGHT) seems to be not relevant in explaining the size of the unofficial economic activity. The coefficient of the variable GADP, which summarizes a number of different measures of institutional quality, confirms that there is a negative correlation between the quality of institutions and the size of the unofficial economy. The age of democracy (AGE), which reflects the consolidation of democratic institutions and that can be considered a proxy of their quality, is negatively correlated with the size of shadow economy. Legal origins (LEGOR_UK, LEGOR_FR, LEGOR_GE, LEGOR_SC and LEGOR_SO) also seem to have a statistically significant (at 10% level) impact on explaining the size of the informal sector.

Finally, Table 4 shows the results when the variables describing the political system (MAJ and PRES), the degree of openness to international trade (TRADE), the geographical local-

ization (AFRICA, ASIAE, LAAM), the colonial origins (COL_UK, COL_ESP, COL_OTH), the religion (CATH80, PROT80, CONFU), the degree of income inequality (GINI_8090), and ethno-linguistic fractionalization (ETHNIC) are employed. While these additional controls are generally not statistically significant at standard levels, the coefficient of our variable of interest remains unchanged and highly significant.

6 Concluding Remarks

This paper has analyzed the relationship between shadow economy and federalism from a theoretical as well as an empirical point of view. I have shown that a federal political system has a lower level of the informal sector relative to a centralized one. This result comes from the competition among jurisdictions and the mobility of the agents that induces the politicians of the various jurisdictions to adopt fiscal policies, in terms of taxation and public good provision, closer to the socially optimal one. In turn, this increases the productivity of labor in the formal sector and reduces the incentives for the individuals to operate in the shadow economy.

The results of a cross-sectional analysis confirm this prediction. The findings of the cross-country regressions on a sample of 73 countries indicate that in federal countries the size of shadow economy is on average about 9 percent lower than non federal countries. This result is highly statistically significant and becomes even stronger, rising up to 12 percentage points, when controlling for a wide range of variables.

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Table 1a. Descriptive statistics of the size of shadow economy as % of GDP.

Variable: Shadow economy as % of GDP					
	Obs	Mean	Std. Dev.	Min	Max
Federal Countries	14	25.02	12.82	8.6	47.43
Non federal Countries	59	33.77	14.02	11.03	67.83
Total	73	32.09	14.15	8.6	67.83

Table 1b. Descriptive statistics. Distribution of the size of shadow economy in the whole sample.

	1 st quartile 8.6≤shadow economy≤19.5	2 nd quartile 19.6≤shadow economy≤31.7	3 rd quartile 32.5≤shadow economy≤41.2	4 th quartile 41.3≤shadow economy≤67.8	Total
Federal Countries	USA, Suisse, Austria, Australia, Canada, Germany	India, Argentina, Malaysia, Mexico	Venezuela, Pakistan, Brazil	Russia	
Non federal Countries	Japan, UK, N. Zeland, Netherlands, Singapore, France, Ireland, Denmark, Finland, Norway, Sweden, Slovak R.	Czech R., Chile, Belgium, Portugal, Spain, Israel, Hungary, Taiwan, Italy, Costa Rica, Poland, Greece, South Africa, Paraguay	Namibia, Dominican R., Turkey, Botswana, Fiji, Ecuador, Romania, Bangladesh, P. N. Guinea, Bulgaria, Jamaica, Estonia, Nepal, Latvia, Malawi	Colombia, Ghana, Uganda, Philippines, Sri Lanka, Senegal, Nicaragua, El Salvador, Belarus, Zambia, Honduras, Uruguay, Guatemala, Thailand, Ukraine, Peru, Zimbabwe, Bolivia	
Federal Countries	6	4	3	1	14
Non federal Countries	12	14	15	18	59
Total	18	18	18	19	73
	Below the median		Above the median		
Federal Countries	10		4		14
Non federal Countries	26		33		59
Total	36		37		73

Table 1c. Descriptive statistics.

	Obs	Mean	Std. Deviation	Min	Max
<i>Log of the GDP per capita in 1960</i>	73	6.68	0.79	4.78	8.13
<i>Country size</i>	73	12.43	1.73	6.47	16.65
<i>Quality of democracy</i>	73	2.59	1.21	1	4.89
<i>Marginal top tax rate</i>	62	40.71	12.57	0	65
<i>Burden of regulation</i>	73	0.62	0.70	-1.54	1.97
<i>Education</i>	72	88.56	18.09	40.05	117.11

Table 2

OLS cross-country estimates. Dependent variable: shadow economy.

	OLS						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Federalism</i>	-8.75 (3.82)**	-11.70 (3.22)***	-12.84 (2.82)***	-12.80 (3.13)***	-12.30 (2.56)***	-11.54 (2.96)***	-13.09 (2.88)***
<i>Log of the GDP per capita in 1960</i>		-2.19 (1.93)	-0.24 (2.15)	-0.25 (2.43)	-0.78 (2.29)	0.07 (2.41)	0.09 (2.07)
<i>Country size</i>		2.33 (1.08)**	2.20 (0.81)***	2.08 (0.86)**	2.01 (0.79)**	1.91 (0.80)**	2.23 (0.82)***
<i>Quality of democracy</i>		6.77 (1.33)***	3.80 (1.50)**	4.19 (1.68)**	3.78 (1.47)**	3.46 (1.66)**	3.52 (1.79)*
<i>Marginal top tax rate</i>			-0.43 (0.11)***	-0.45 (0.12)***	-0.46 (0.11)***	-0.37 (0.12)***	-0.42 (0.11)***
<i>Burden of regulation</i>			-6.72 (3.03)**	-7.31 (3.31)**	-7.13 (3.19)**	-5.17 (2.84)*	-6.34 (3.28)*
<i>Transfers and subsidies</i>				0.10 (0.21)			
<i>Labor regulation</i>					-1.57 (0.83)*		
<i>Demographic characteristics</i>						[0.29]	
<i>Education</i>							-0.06 (0.10)
<i>Observations</i>	73	73	62	58	61	61	61
<i>R-squared</i>	0.06	0.58	0.73	0.73	0.75	0.74	0.73

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

Table 3
 OLS cross-country estimates. Dependent variable: shadow economy.

	OLS						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Federalism</i>	-10.03 (3.00)***	-11.73 (2.63)***	-9.25 (2.73)***	-12.74 (3.05)***	-11.51 (2.78)***	-11.97 (2.54)***	-11.09 (3.31)***
<i>Log of the GDP per capita in 1960</i>	0.14 (2.19)	0.38 (2.07)	2.29 (2.23)	-0.54 (2.39)	0.50 (2.06)	0.60 (2.14)	-1.07 (2.27)
<i>Country size</i>	1.65 (0.70)**	1.91 (0.74)**	1.38 (0.66)**	2.18 (0.81)***	1.82 (0.76)**	2.24 (0.78)***	1.97 (0.89)**
<i>Quality of democracy</i>	2.80 (1.58)*	3.64 (1.46)**	2.00 (1.39)	3.47 (1.53)**	3.33 (1.55)**	3.21 (1.50)**	4.00 (1.52)**
<i>Marginal top tax rate</i>	-0.26 (0.12)**	-0.36 (0.11)***	-0.19 (0.10)*	-0.43 (0.10)***	-0.34 (0.11)***	-0.41 (0.10)***	-0.40 (0.11)***
<i>Burden of regulation</i>	0.27 (4.37)	-1.73 (3.38)	-3.59 (2.90)	-6.31 (3.91)	-2.98 (3.17)	-6.12 (3.01)**	-6.54 (3.09)**
<i>Rule of law</i>	-7.19 (2.95)**						
<i>Efficiency of public sector</i>		2.49 (1.28)*					
<i>Anti-diversion policies</i>			-40.43 (12.15)***				
<i>Protection of property rights</i>				-0.80 (2.01)			
<i>Corruption</i>					2.21 (1.06)**		
<i>Age of democracy</i>						-10.86 (4.69)**	
<i>Legal origins</i>							[0.10]
<i>Observations</i>	62	62	60	60	62	62	62
<i>R-squared</i>	0.76	0.74	0.80	0.73	0.75	0.74	0.75

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

Table 4

OLS cross-country estimates. Dependent variable: shadow economy.

	OLS						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Federalism</i>	-12.26 (2.55)***	-11.82 (2.95)***	-11.80 (3.15)***	-12.34 (2.67)***	-12.27 (2.68)***	-11.81 (3.24)***	-12.90 (2.92)***
<i>Log of the GDP per capita in 1960</i>	-1.73 (2.26)	-0.39 (2.23)	-0.57 (2.27)	-0.83 (2.14)	-1.15 (2.24)	-0.93 (2.21)	-0.24 (2.19)
<i>Country size</i>	2.25 (0.85)**	1.34 (1.00)	1.89 (0.84)**	1.63 (0.80)**	2.07 (0.80)**	1.95 (0.98)*	2.16 (0.79)***
<i>Quality of democracy</i>	3.87 (1.41)***	4.49 (1.52)***	3.62 (1.46)**	3.88 (1.44)***	4.44 (1.45)***	3.59 (1.65)**	3.65 (1.71)**
<i>Marginal top tax rate</i>	-0.32 (0.13)**	-0.42 (0.11)***	-0.28 (0.15)*	-0.34 (0.13)**	-0.36 (0.12)***	-0.33 (0.17)*	-0.42 (0.10)***
<i>Burden of regulation</i>	-4.62 (2.95)	-5.30 (3.13)*	-5.70 (2.92)*	-6.22 (2.96)**	-5.93 (3.07)*	-6.03 (3.09)*	-6.66 (3.13)**
<i>Political system</i>	[0.10]						
<i>Openness to International trade</i>		-0.04 (0.03)					
<i>Geography</i>			[0.35]				
<i>Colonial origins</i>				[0.17]			
<i>Religion</i>					[0.38]		
<i>Income inequality</i>						0.16 (0.15)	
<i>Ethnic fractionalization</i>							1.63 (7.36)
<i>Observations</i>	62	62	62	62	62	59	62
<i>R-squared</i>	0.75	0.73	0.75	0.75	0.74	0.73	0.73

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

Appendix A. Variables description and sources.

Variable	Description	Source
AFRICA	Regional dummy variable equal to 1 if a country is in Assume, 0 otherwise.	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).	Persson and Tabellini (2003)
AREA	Land area of the country in squared kilometers.	Data available on www.cepii.fr
ASIAE	Regional dummy variable equal to 1 if a country is in East Asia, 0 otherwise.	Persson and Tabellini (2003)
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 five different indexes.	Persson and Tabellini (2003); original source: La Porta et al. (1999)
B_DELAY	Indicator of bureaucratic delays (red tape). Scale from 0 to 10. low ratings indicate lower levels of red tape in the bureaucracy of the country. The data is the average of the years between 1972 and 1995. The index is published three time per year.	La Porta et al. (1999)
CATHO80	Percentage of the population belonging to the Roman Catholic religion in 1980.	Persson and Tabellini (2003)
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.	Persson and Tabellini (2003); original source: IMF – IFS CD-Rom and IMF – IFS Yearbook
CGREV	Total revenues of the central government as a percentage of GDP, constructed using the item Government Finance-Revenues in the IFS, divided by GDP at current prices and multiplied by 100.	Persson and Tabellini (2003); original source: IMF – IFS CD-Rom and IMF – IFS Yearbook
CGDP_60	Real Gross Domestic Product per capita (current prices) in 1960. 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.	Penn World Tables Version 6.1
COL_ESP	Dummy variable, equal to 1 if the country is a former colony of Spain or Portugal, 0 otherwise.	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, Portugal or the U.K., 0 otherwise.	Persson and Tabellini (2003); original source: Wacziarg (1996)
COL_UK	Dummy variable, equal to 1 if the country is a former U.K. colony, 0 otherwise.	Persson and Tabellini (2003); original source: Wacziarg (1996)

Variable	Description	Source
COL_ESPA	Spanish colonial origin, discounted by the number of years since independence (T_INDEP) and defined as: $COL_ESPA = COL_ESP * (250 - T_INDEP) / 250$.	Persson and Tabellini (2003); original source: Wacziarg (1996)
COL_OTHA	Variable defined as: $COL_OTH * (250 - T_INDEP) / 250$.	Persson and Tabellini (2003); original source: Wacziarg (1996)
COL_UKA	Variable defined as: $COL_UK * (250 - T_INDEP) / 250$.	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.	Persson and Tabellini (2003)
COUNTRY	Name of the country.	Persson and Tabellini (2003)
CPI9500	Corruption perception index, measuring perceptions of abuse of power by public officials. Average, over 1995-2000, of the CPI, which ranges from 0 to 10, with higher values denoting more corruption.	Persson and Tabellini (2003); original source: Transparency International (www.transparency.de)
CTRYCD	Code that identifies countries.	Persson and Tabellini (2003)
DEM_AGE	First year of democratic rule, corresponding to the first year of an uninterrupted string of positive yearly values of the variable <i>polity</i> (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.	Persson and Tabellini (2003) from Polity IV Project
DENSITY	Measures the density of population. Is obtained as a ratio between POP e AREA.	
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.	Persson and Tabellini (2003), from UNESCO

Variable	Description	Source
ETHNIC	Ethnic Fractionalization Index. The variable takes values in the range between 0 and 1 that are increasing in the degree of ethnic fractionalization.	Alesina et al. (2004)
FEDERAL	Dummy variable equal to 1 if a country has a federal political structure, 0 otherwise. Belgium and Spain are not considered as federal countries.	Persson and Tabellini (2003)
FEDERAL_BE	Variable defined as FEDERAL, including Belgium among federal countries.	Treisman (2000)
FEDERAL_SP	Variable defined as FEDERAL, including Spain among federal countries.	Treisman (2000)
FEDERAL_BS	Variable defined as FEDERAL, including both Belgium and Spain among federal countries.	Treisman (2000)
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.	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".	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.	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.	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.	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 Caribbean, 0 otherwise.	Persson and Tabellini (2003)

Variable	Description	Source
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.	Gwartney and Lawson (2004)
LANGUAGE	Linguistic fractionalization index. The variable takes values in the range between 0 and 1 that are increasing in the degree of linguistic fractionalization.	Alesina et al. (2004)
LAREA	Natural logarithm of the variable <i>area</i> .	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.	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.	Penn World Tables 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).	Persson and Tabellini (2003); original source: La Porta et al. (1999)
LPOP	Natural logarithm of the variable POP.	Persson and Tabellini (2003); original source: World Bank (2000)
LYP	Natural logarithm of real GDP per capita in constant dollars expressed in International prices, base year 1985. data through 1992 are taken from Penn World Tables 5.6; data for 1993-1998 are computed from data from the World Development Indicators.	World Bank, <i>World Development Indicators</i> ; Penn World Tables, Version 5.6
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 hose) are considered.	Persson and Tabellini (2003); original sources: Cox (1997), International Institute for Democracy and Electoral Assistance (1997), Kurian (1998), Quain (1998) and national sources
POLITY	Score for democracy ranging from +10 (strongly democratic) to -10 (strongly autocratic).	Persson and Tabellini (2003); original source: Polity IV Project

Variable	Description	Source
POP	Total population expressed in million.	Persson and Tabellini (2003); original source: World Bank (2000)
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.	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.	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.	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.	La Porta et al. (1998); original source: <i>1997 Index of Economic Freedom</i>
PROT80	Percentage of the population in each country professing the Protestant religion in 1980.	Persson and Tabellini (2003); original source: La Porta et al. (1998)
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.	Kaufmann et al. (2005), data available on www.worldbank.org
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.	Schneider (2005)
SSW	Central government expenditures consolidated on social services and welfare as a percentage of GDP, divided by GDP and multiplied by 100.	Persson and Tabellini (2003); original source: IMF – GFS Yearbook 2000

Variable	Description	Source
T_INDEP	Number of years of independence for a country, ranging from 0 to 250.	Persson and Tabellini (2003); original source: Wacziarg (1996)
TOPTAX	Top marginal tax rate for each country in 1994.	La Porta et al. (1998); original source: <i>Economic Freedom of the World, 1975-1995</i>
TRADE	Sum of exports and imports of good and services measured as a share of GDP.	Persson and Tabellini (2003); original source: World Bank 2000
TRANSUB	Total of transfers and subsidies of central government as a percentage of GDP. Is an average of values available for 1975-1995 (scale:1-100).	La Porta et al. (1998); original source: <i>Economic Freedom of the World, 1975-1995</i>
YRSOPEN	Index for openness to international trade in a country, compiled by Sachs and Werner (1995), measuring the fraction of years during 1950-1994 that the economy in the country has been open. Ranges between 0 and 1.	Persson and Tabellini (2003); original source: Hall and Jones (1999)

