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REGULATION AND RENT-SEEKING: THE ROLE OF THE DISTRIBUTION OF POLITICAL AND ECONOMIC POWER *

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Abstract

It is shown that the joint distribution of economic and political power plays a key role in determining regulatory and tax policies of national and subnational governments. If both economic and political power are evenly distributed across individuals, then regulatory and tax policies are efficient, but if they are unevenly distributed and positively correlated, then regulatory policy is used by subnational governments to redistribute income in favour of individuals with higher economic and political power at the expense of productivity and output. Consequently, the national government has to raise the tax rate to finance public expenditure. Moreover, if there exists a positive correlation between economic and political power, then the higher the fiscal gap, the larger the gap between equilibrium and efficient policies because subnational governments underestimate more the fall of public revenues caused by inefficient policies.

Keywords: Fiscal gap, rent-seeking, regulation, and economic and political power.

JEL classification: H77, H11, H71.

*The authors gratefully acknowledge financial support from Xunta de Galicia research program GPC2013-045 and the European Regional Development Fund (ERDF), as well as from the Spanish Ministry of Economy and Competitiveness research program ECO2013-48884-C3-1-P.

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1. Introduction

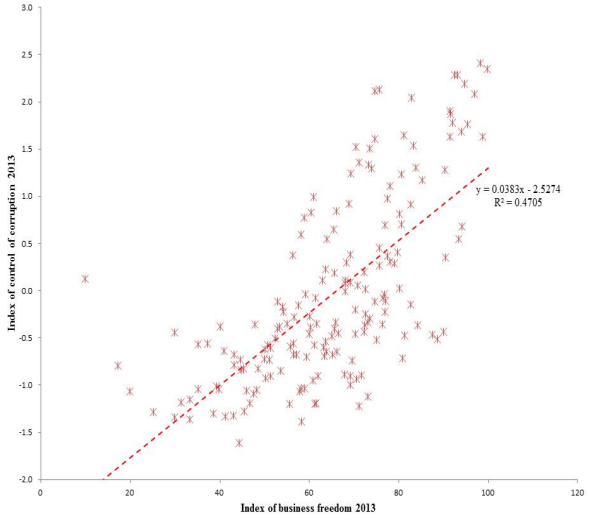
The role of government regulation of economy is controversial. Regulation may enhance productivity and output protecting against diversion (Hall and Jones (1999) and Acemoglu et al. (2001)) or correcting market failures (Pigou (1932)), but it may also be used for rent-seeking (Tullock (1967)), reducing social welfare and redistributing income among individuals. As pointed out by Hall and Jones (1999), "Regulations and laws may protect against diversion, but they all too often constitute the chief vehicle of diversion in an economy."

As pointed out by Olson (2000), we need to understand the logic of power in order to understand prosperity of nations. Olson (2000) argues that individuals with coercive power will implement predatory policies if they have a tiny or restricted participation in society, whereas they will implement policies fostering prosperity if they have an inclusive interest. The willingness of government to use regulation to redistribute income among individuals might crucially depend on the ability of different groups of individuals to influence the government -we call it political power- and to capture the rents generated by regulation -we call it economic power. Therefore, to understand the regulatory policy requires to take into account the distribution of power in society.

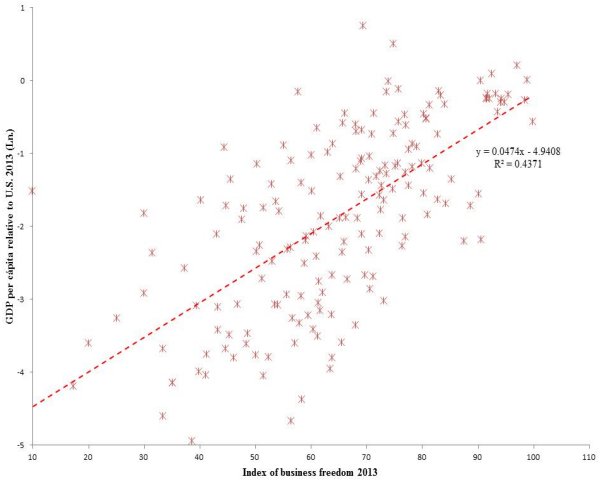
Some cross-country empirical evidence suggests that more regulation is related to more corruption and lower productivity. The relationship between the index of business freedom elaborated by the Heritage Foundation and the index of control of corruption elaborated by the World Bank is positive (see Figure 1.(a)). The index of business freedom is also positively correlated with GDP per capita (see Figure 1.(b)).[1] The index of business freedom is a component of a general index of economic freedom elaborated by the Heritage Foundation, and its inverse can be seen as a proxy of the extent to which business activities are regulated. The index of control of corruption is taken from the worldwide governance indicators elaborated by the World Bank (see Kaufmann et al. (2010), www.govindicators.org). This index reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. We use a sample of 175 countries for year 2013.

Some empirical evidence also suggests that regulatory quality and corruption are related to the distribution of political power in society. The relationship between the index

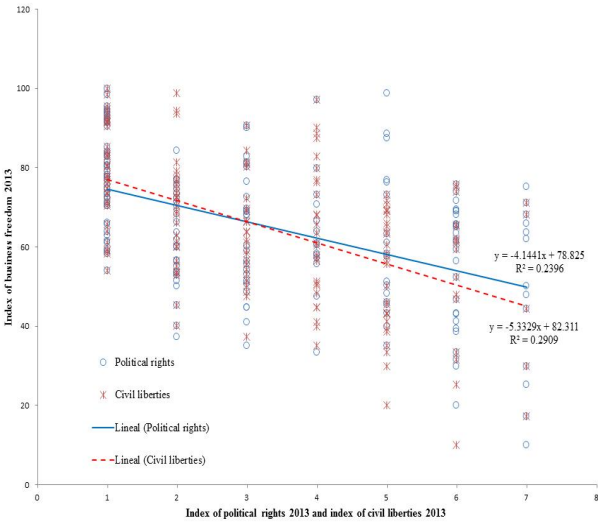
[1]Data on business freedom and GDP per capita are provided by the Heritage Foundation (www.heritage.org).



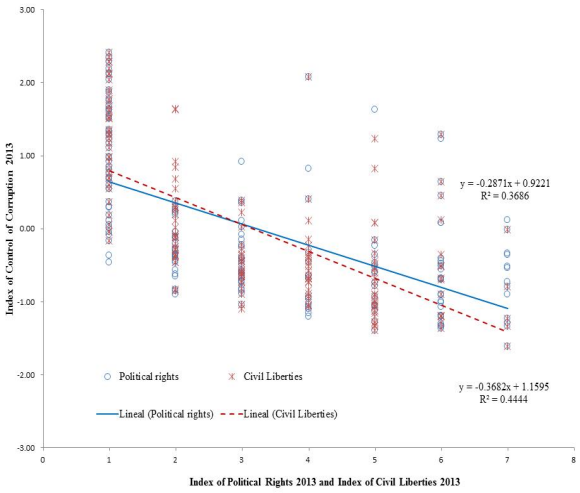
(a) Business freedom and control of corruption.



(b) Business freedom and GDP per capita.



(c) Business freedom, political rights & civil liberties.



(d) Corruption, political rights and civil liberties.

Figure 1: Business freedom, control of corruption, GDP, political rights and civil liberties.

of business freedom and two index of political freedom -the index of political rights and the index of civil liberties both elaborated by Freedom House (www.freedomhouse.org)- is displayed in Figure 1.(c).[2] Assuming that political and economic powers are more evenly distributed in a society in which citizens benefit from higher political freedom, then the relationships displayed in Figure 1.(c) suggest that taking into account the distribution of power is important to understand the regulatory policy of governments. Moreover, the indexes of political rights and civil liberties are also significatively correlated with the index of control of corruption (see Figure 1.(d)), which suggests a positive relationship between economic and political power.

The objective of this paper is to explore how the distribution of economic and political powers across individuals influences regulatory and tax policies in a context in which regulations affect productivity and they are used for rent-seeking by individuals owning different economic and political power. To this end, a model with a continuum of atomistic subnational governments and a national government is developed. The national government sets a common tax rate to all subnational jurisdictions and each subnational government sets the regulatory level in its jurisdiction. A fiscal gap exists because a local public good is financed with own tax revenues of the subnational government and with transfers from the national government. Regulation affects productivity of all individuals and generates income transfers among them. Individuals in each jurisdiction differ in their ability to capture the rents created by regulation (i.e. their economic power). The national government maximizes the sum of utilities of all individuals and subnational governments maximize the weighted sum of utilities of all individuals belonging their jurisdiction. The weights that individuals have may reflect their ability to influence government (i.e. their political power).

In this framework, it is shown that the joint distribution of economic and political power across individuals plays a key role in determining both regulatory policy and tax policy. In particular, if economic power and political power are positively correlated, then subnational governments are willing to carry out an inefficient regulatory policy in order to redistribute income towards groups of individuals with higher economic and political power. Productivity and output fall due to the inefficient regulatory policy, which leads the national government to raise the tax rate over its efficient level in order to finance public expenditure. However, if there is no correlation between economic and political power, then subnational governments do not obtain any gain from income redistribution

[2]A lower value of these indexes means a better condition of political rights and civil liberties.

and they implement an efficient regulatory policy maximizing output. Consequently, national government can set the lowest required tax rate to finance an efficient level of public expenditure. In particular, if all individuals have the same economic power and/or the same political power, then the covariance between both variables is zero and subnational governments can not obtain any gain using regulation to redistribute income among individuals and they implement the efficient regulatory policy.

In our model, as in the models of Weingast et al. (1981), Inman (1988), Zhuravskaya (2000) and Careaga and Weingast (2003), the revenue sharing system between different levels of government creates a common pool problem which provokes that subnational governments do not internalize all consequences of their policies. This problem of incentives - which is called "fiscal law of $1/n$" by Careaga and Weingast (2003) following the results of Weingast et al. (1981)- impels subnational governments to ignore the negative consequences of regulation on productivity and output.[3] However, from our results it follows that the incentive problems arising from the existence of a fiscal gap can be soften by an even distribution of economic and political powers.

We assume that the national government is benevolent because in doing so we can focus our attention on the distortions caused by an uneven distribution of political and economic power on the regulatory policy and its influence on the otherwise efficient tax policy. The hypothesis of a benevolent national government could be justified on the basis of that regulatory policy might be more complex and intricate than fiscal policy. Consequently, tax policy would not suffer from so many agency problems as regulatory policy because it might be better monitored by citizens than regulatory policy. Therefore, assuming that a benevolent national government sets taxes, we are implicitly assuming that fiscal policy is perfectly monitored by citizens. However, our results do no crucially depend on this assumption. In particular, we show that if subnational governments decide fiscal and regulatory policies then they choose inefficient fiscal and regulatory policies in order to benefit their favourite groups of individuals.

Accordingly -and accepting that economic power and political power are more evenly distributed in democratic countries-, our results are consistent with the findings of Djankov et al. (2002) according to which countries with more democratic and limited governments regulate entry more lightly and countries with higher regulation also display higher levels of corruption, which is a way of rent-seeking. Mauro (1995) presents robust econometric

[3] A higher fiscal gap could incentive bad policies through other channels. For example, Gadenne (2013) and Brollo et al. (2013) attribute bad policies to an asymmetric information problem.

evidence of the negative effect of corruption on investment and growth.

A lot of empirical works relate bad and excessive regulation to worse economic performance. Some works find a negative impact of regulations on growth, Loayza et al. (2005), Djankov et al. (2006), Jalilian et al. (2007) and Barseghyan (2008). Other works find that heavier regulation is associated with larger unofficial economies Djankov et al. (2002), Botero et al. (2004) and Djankov and Ramalho (2009), higher unemployment Botero et al. (2004) and Djankov and Ramalho (2009), lower labor force participation Botero et al. (2004), more economic volatility Loayza et al. (2005), less benefits of trade openness Freund and Bolaky (2008), and lower creation of new firms Klappera et al. (2008).

Our result is related to the Velasco's (2000) result according to which high budget deficits might be due to the competition between different groups of individuals for the redistribution of public resources that are "common property". A key assumption in his analysis is that each group can impose to the government its desired policy (i.e. it has the ability to influence government). Our analysis is not focused on government deficits but on regulatory and tax policies. However, it is shown that the implemented regulatory and tax policies will crucially depend on the ability of groups of individuals to influence government decisions. Bouton, Gassner and Verardi (2008) find that a higher fiscal gap is positively associated to higher inequality in income distribution for the set of OECD countries. They argue that, once the maximum size of government is reached, the increase of subnational expenditures is carried out at the expense of national government redistributive expenditures. However, our model provides other possible and complementary explanation to this relationship. In particular, in our model, a higher fiscal gap might result in a higher subnational government regulation, which redistributes income among individuals, and income inequality might increase. Our model also provides a possible explanation for the strong regulatory activity of Spanish regions reported by Marcos and Santaló (2010) and Marcos et al. (2010). In particular, Spanish regional governments might be using regulations to benefit some groups of individuals owning some type of economic and political power. The Spanish case is described below in Section 3.

The approach taken in this paper can be connected with the recent literature on political economy and institutions. Acemoglu et al. (2005) and Acemoglu and Robinson (2012) develop a theory of institutional evolution and its interaction with the economic performance of nations. According to these authors, inclusive institutions foster prosperity of most of the individuals in a society, but extractive institutions are the product

of political systems that create private gains for elites (i.e. fostering rent-seeking), even if by doing so they impoverish the broader society. In our model, individuals differ in their ability to capture rents (we call it economic power) and in their ability to influence government decisions (we call it political power). Both dimensions of power are largely determined by institutional factors. Our model could be seen as an attempt to analyze how the joint distribution of economic and political power could influence regulatory and tax policies. In particular, our analysis shows that institutions favouring an even distribution of economic and political power among individuals can encourage implementation of efficient policies fostering prosperity.

The paper is organized as follows. Some features of decentralization are described in Section 2. The Spanish case is described in Section 3. The economy is described in Section 4. In Section 5 we characterize the regulatory and tax policies implemented by national and subnational governments in a Nash symmetric equilibrium and we compare them with the efficient policies. The influence of the joint distribution of economic and political power -as well as that of the fiscal gap- on regulatory and tax policies is analyzed in Section 6. Finally, Section 7 concludes.

2. Decentralization

The subnational Doing Business reports elaborated by the World Bank capture differences in business regulations and their enforcement across locations in a single country. They make clear that business regulations can vary a lot within a country. [4] These regulations could be being used for rent-seeking. Using a sample of 80 countries, Fan et al (2009) find that larger subnational bureaucracies are associated with greater demands on business licensing and more frequent and costly bribery.

There is some empirical evidence of that decentralization of policy autonomy is increasing around the world. Using data taken from an study of Henderson (2000), Rodden (2004) reports that in 1975 21% of the central governments in Henderson's sample (43 countries) lacked override authority and that by 1995 the figure soared to 60%. Moreover, he shows that there is an unmistakable trend towards increasing influence for local and regional governments in some policy areas as education, infrastructures and local policing.

Taxing power of subnational governments differs across countries and, at least in some countries, it is very limited. Subnational tax revenues as a percentage of total tax revenues

[4] See `http://www.doingbusiness.org/reports/subnational-reports`.

and the percentage of subnational tax revenues over which subnational governments have full discretion on rates and reliefs for 10 OECD countries are displayed in Table I.[5] The percentage of tax revenues over which the subnational government have full power to tax can be obtained by multiplying both figures. This percentage ranged in 2011 from 0% in Italy and Germany (it also was very small in Belgium, Austria and Mexico) to 35% in Canada. It was relatively high in the United States (20.9%) and Switzerland (24.2%) and it taken an intermediate value in Australia (15.3%) and Spain (13.2%). However, in no case it reached 40%.

In order to have a more accurate view of taxing power of subnational governments in different countries, it must be taken into account that in some countries subnational governments have restricted discretion on taxes and reliefs and that in some countries the split of revenues depends on tax sharing agreements between national and subnational governments. In particular, in year 2011, 93.6% of German lander tax revenue was the result of a split requiring subnational government consent. This figure was 35.4% in Italy and 39.7% in Spain. The Italian regions have a restricted discretion on taxes affecting 47.1% of their tax revenues and the Spanish regions have a restricted discretion on taxes affecting 2.8% of their tax revenues.

Local governments, which are not included in Table I, must also be analyzed in order to have a more accurate view of fiscal decentralization and taxing power of subnational governments. In particular, local governments in Canada, the United States and Switzerland have a wide power to set tax rates on an important fraction of tax revenues. However, taxing power of local governments in OECD countries generally is lower than taxing power of state or regional governments.

The magnitude of the fiscal gap substantially differs across countries in Table I, being large among some of them. The ratio of inter-governmental transfer revenue as a percentage of total subnational revenue (which can be a measured of fiscal gap) ranged in year 2011 from 80.75% in Belgium to 16.85% in Germany (see Table I). Using a large sample of developed and developing countries, Gadenne and Singhal (2013) find that on average only 38% of subnational government revenues are raised through subnational taxes. They also report that in the period 1996-2010 the fiscal gap -which they defines as the share of subnational revenues that is not covered by subnational tax revenues- remained roughly stable in developed countries but increased in developing countries from 49% to 62%.

[5]The included subnational governments in Table I are Provinces (Canada), Regions (Spain and Italy), States (Mexico, United States, Belgium, Australia and Switzerland) and Landers (Austria and Germany).

Table I: **Taxing power and fiscal gap of subnational governments.**

% of their tax revenues on which subnational governments have full discretion on taxes and reliefs (Subnational tax revenues as a % of total tax revenues) Inter-governmental transfer revenue as % of total subnational revenues					
	2011	2008	2005	2002	1995
Australia	100.0 (15.3) –	100 (14.9) –	100 (14.9) –	100 (15.3) –	– (19.0) –
Austria	38.8 (1.6) 80.8	39.1 (1.6) 81.8	38.7 (1.6) 80.8	40.4 (1.6) 84.7	44.7 (1.8) 78.2
Belgium	100.1 (5.3) 65.6	101.7 (5.1) 67.4	99.5 (5.1) 67.2	103.7 (4.3) 67.8	100.0 (1.8) 77.8
Canada	88.9 (39.7) 19.6	91.0 (38.7) 18.3	91.2 (37.9) 18.9	92.0 (37.3) 14.5	– (37.1) 18.2
Germany	0.0 (21.3) 16.9	0.0 (22.9) 13.6	0.0 (21.4) 15.6	0.0 (21.8) 15.6	– (21.6) 16.8
Italy	0.0 (11.7) –	0.5 (12.3) –	0.0 (11.3) –	0.0 (11.3) –	– – –
Mexico	90.1 (2.5) 72.15	96.9 (1.9) 72.9	97.8 (2.1) 73.9	97.3 (2.4) –	100 2.1 –
Spain	57.3 (23.1) 53.5	56.8 (22.4) 58.9	57.6 (21.8) 55.7	55.6 (18.3) 59.0	19.0 (4.8) 72.0
Switzerland	100 (24.2) 25.7	100 (24.3) 25.2	100 (24.8) 30.0	100 (24.3) 30.6	89.7 (23.8) 24.4
United States	100 (20.9) 19.7	100 20.6 16.8	100 (20.1) 17.4	100 (19.7) 18.0	– (19.9) 15.8

Source: OECD Fiscal Decentralization Database. Subnational governments are Regions (Spain and Italy), Landers (Austria and Germany) and States (Belgium, Australia, Switzerland, United States, and Mexico).

Some empirical evidence indicates that dependence of the subnational governments on transfers from the national government encourages rent-seeking and reduces economic activity. Gadenne and Singhal (2013) find that there is a negative correlation between the fiscal gap and GDP per capita across countries. Zhuravskaya (2000), using data of 35 large cities in 29 regions of Russia for the time period 1992-1997, finds that private firm creation is lower in cities more depending on regional transfers than in cities keeping more of the tax revenues collected in their jurisdiction. Careaga and Weingast (2003) report that Mexican real GDP grew rapidly between 1940 and 1980 (6.8% per year) when the fiscal gap of Mexican federalism was relatively small, but in the eighties Mexico became a highly centralized state with a much higher fiscal gap and between 1980 and 1994 Mexican growth slowed considerably to just 2.3% per year. After 1994 the Mexican growth improved somewhat at the same time as the fiscal gap decreased and the degree of electoral competence increased. Fisman and Gatti (2002) find a positive relationship between the proportion of U.S. states' revenues derived from federal transfers and the number of convictions of public employees for abuse of public office. Brollo et al. (2013), using data of Brazilian municipalities, find that larger federal transfers to local governments increase political corruption and reduce the quality of candidates for mayor. Gadenne (2013) finds that both quality and quantity of education infrastructures provided by Brazilian local governments rise as their tax revenues increase, but they do not as their transfer revenues increase. Shleifer (1997) reports that Polish local governments primarily rely on local taxes, which encourages them to develop policies fostering local economic prosperity, but Russian local governments do not do it because their revenues depend primarily on transfers. Fan et al. (2009) find that giving local governments a larger stake in locally generated income can reduce their bribe extraction.

3. The Spanish case

The Spanish political system is designed around a distribution of powers between central and regional legislatures. In Spain, the legislative and regulatory powers of municipal governments are much more limited and largely conditioned by the regional and central regulations.

Using objective proxies for legislative and regulatory activity such as the number of pages and number of new norms published in the Spanish regional legislative reporters, Marcos and Santaló (2010) and Marcos et al. (2010) report a strong and increasing regulatory activity of Spanish regional governments in the period 1978-2009. They also

find that this heavy regulatory activity has had a strong negative impact on regional innovation and productivity. The Doing Business in Spain 2015 Report elaborated by the World Bank measures business regulations and their enforcement in 17 autonomous communities and two autonomous cities. This report shows that, except for construction permits, all regions perform below the European Union average, and none performs in the top 25% as measured by Doing Business.

Spanish regions have a fairly limited capacity to set taxes. Previously to the beginning of this century it even was much more limited (see Table I). This capacity is mainly exercised by the national government. The percentage of tax revenues over which Spanish regions have full power to tax was 13.2% in 2011, but it just was 1% in 1995. Moreover, Spanish fiscal gap also is relatively large (see Table I). In particular, inter-governmental transfer revenues represented 53.5% of total revenues of autonomous communities in 2011. This figure exceeded 70% before the beginning of this century.

Some authors have pointed out the strong connection between the Spanish economic and political elites, which characterizes the so-called crony-capitalism (see, for example, Molinas (2013)). Kredler and Pijoan-Mas (2014a, 2014b) elaborate several indexes of crony-capitalism using data on the origin of the fortunes of multimillionaires in a sample of 15 countries. The indexes indicate that Spanish crony-capitalism enjoys good health. In particular, the ratio of the number of multimillionaires in rent-seeking intensive sectors to the total number of multimillionaires in Spain is 57.7%, which is the second highest rate of a list headed by Mexico (60%).[6] According to the index of control of corruption elaborated by the World Bank, in 2011 Spain is ranked 24th in the list of 34 OECD countries. The average value of this index for OECD countries was 1.26 in 2011, while the value of the Spanish index was 0.81.

There is not much empirical evidence on the distribution of economic and political power in the Spanish regions. However, a recent work by Güell et al. (2015) on social mobility in Catalonia using data on surnames can provide some evidence. From their work, it can be concluded that people with a more-Catalonian surname likely have higher human capital and they are relatively more represented in Catalonian parliament and government than people with a less-Catalonian surname.[7] In particular, using data

[6]The other countries included in the list are Mexico (50%), Chile (50%), Turkey (45.8%), United Kingdom (44.7%), Australia (41.4%), Japan (29.6%), Canada (28.1%), United States (22.4%), France (20.9%), South Korea (14.8%), Italy (14.3%), Netherlands (14.3%) and Germany (7.1%).

[7]A more-Catalonian surname is defined as a surname relatively more abundant in Catalonia than in the rest of Spain. See also Güell and Rodríguez-Mora (2015).

on surnames, Güell and Rodríguez-Mora (2015) elaborate an Index of Catalonian identity and they find that the value of this index is 0.37 in Catalonia, 0.55 between parliamentarians of the Catalonian Parliament, 0.59 between members of the Catalonian government and 0.59 between senior Catalonian government officials. This empirical evidence is consistent with a positive correlation between economic and political power in Catalonia.

4. The Economy

The country is made up by a continuum of measure one of identical subnational jurisdictions and a national government. Each subnational government chooses the regulatory level, $\phi \geq 0$, and provides a public good in its jurisdiction. Productivity depends on the regulatory level. Regulations can also be used by subnational governments to transfer income among individuals with different ability to capture the rents generated by regulation. The national government sets a common tax rate, $0 \leq \tau \leq 1$, for all jurisdictions. Fiscal revenues are used to fund the local public good. The national government collects a fraction $0 < \beta < 1$ of the tax receipts in each jurisdiction and the subnational government collects a fraction $1 - \beta$. The national government shares out evenly its receipts among jurisdictions.

4.1. Individuals, Regulation and Income Transfers

Each jurisdiction is populated by a continuum of individuals. Each individual is distinguished by its type, which is drawn from a distribution function $F : R \to [0, 1]$ with density function f.

The utility function of an individual of type ε of jurisdiction i is quasi-linear, $u(c_\varepsilon, g) = c_\varepsilon + v(g)$, where c_ε is consumption of an individual of type ε of jurisdiction i and g is public expenditure in jurisdiction i.[8] Function v is such that for all $g > 0$, $v'(g) > 0$, $v''(g) < 0$, $\lim_{g\to 0} v(g) = 0$, $\lim_{g\to 0} v'(g) = \infty$ and $\lim_{g\to\infty} v'(g) = 0$.

An individual of type ε is endowed with a unit of labor which allows him to obtain $Ay(\phi)$ units of output, where $A > 0$, $\lim_{\phi\to 0} y(\phi) = 0$, $y'(\phi) > 0$ for all $0 < \phi < \phi^*$, $y'(\phi) < 0$ for all $\phi^* < \phi < \overline{\phi}$, $\lim_{\phi\to\overline{\phi}} y(\phi) = 0$ and $y''(\phi) < 0$ for all $\phi \in \left(0, \overline{\phi}\right)$. Therefore, there exists a strictly positive regulatory level maximizing output, $0 < \phi^* < \overline{\phi}$, which is given by $y'(\phi^*) = 0$.

[8] We omit the subscript denoting the jurisdiction in order to save notation because all jurisdictions are identical.

It is reasonable to assume that productivity increases for low regulatory levels and it decreases for high regulatory levels. Some regulations -as those securing property rights and enforcing contracts- have a positive effect on economic outcomes. As pointed out by Besley and Ghatak (2010), security of property rights affects efficiency of resource allocation preventing rent-seeking, facilitating trade in assets and improving collateralizability of assets. Using cross-country data, Acemoglu et al. (2001) show that protection against expropriation risk fosters productivity. Moreover, some regulations can also enhance productivity by correcting some market failures. However, as pointed out in the introduction, regulation can also be used for rent-seeking, which results in income redistribution and discourages productivity. Murphy et al. (1993) explore the reasons why rent-seeking is not merely redistributive, but also detrimental to growth. Empirical evidence cited in the introduction suggests that excessive regulation affects negatively productivity. On one hand, rent-seeking affect negatively productivity because resources are wasted in unproductive activities oriented towards capturing rents or deterring rent-seeking. On the other hand, rent-seeking works as a tax on production discouraging innovation, capital accumulation, entry of new firms and employment, which are the so-called deadweight losses.[9]

A subnational government redistributes a fraction $0 < p(\phi) < 1$ of subnational aggregate output across individuals of its jurisdiction using regulation. Subnational aggregate transfers are equal to subnational aggregate output multiplied by the fraction of redistributed output, $p(\phi) Ay(\phi)$, where $p(\phi) \in (0,1)$ for all $\phi \in \left(0, \overline{\phi}\right)$. Therefore, aggregate transfers are a function of the regulatory level. It is assumed that $\lim_{\phi \to 0} p(\phi) \geq 0$, $\lim_{\phi \to \overline{\phi}} p(\phi) > 0$, $p'(\phi) < 0$ for all $0 < \phi < \widetilde{\phi}$, $p'(\phi) > 0$ for all $\widetilde{\phi} < \phi < \overline{\phi}$. Moreover, it is assumed that $t(\phi) \equiv p(\phi) y(\phi)$ is such that $t'(\phi) > 0$ for all $0 < \phi < \widehat{\phi}$, $t'(\phi) < 0$ for all $\widehat{\phi} < \phi < \overline{\phi}$, and $t''(\phi) < 0$ for all $\phi \in \left(0, \overline{\phi}\right)$. There is a strictly positive regulatory level maximizing income transfers, $0 < \widehat{\phi} < \overline{\phi}$, which is given by $t'\left(\widehat{\phi}\right) = 0$. It is easy to show that if $p'(\phi^*) > 0$ then $\widehat{\phi} > \phi^*$, while if $p'(\phi^*) < 0$ then $\widehat{\phi} < \phi^*$. If it would be assumed that $p(\phi)$ is a strictly increasing function of the regulatory level then $\widehat{\phi} > \phi^*$. However, we allow p to be a decreasing function for low regulatory levels (for example, when regulations consist in rules protecting property) and an increasing function for high

[9]There is a debate in the rent-seeking literature on the relative importance of both effects (deadweigth losses and waste of resources). Posner (1975) evaluated empirically both effects for a monopoly in a partial equilibrium framework. Barelli and De Abreu Pessôa (2012) evaluate the relative importance of the waste of resources and the deadweight losses in a neoclassical growth model.

regulatory levels.

Consumption of an individual of type ε is equal to his income after taxes and net transfers $c_\varepsilon = (1-\tau)(Ay(\phi) + t_\varepsilon)$, where t_ε are the net transfers of an individual of type ε, which are a function of its type and the aggregate transfers, $t_\varepsilon = (\eta(\varepsilon) - 1) At(\phi)$, where $\eta : \varepsilon \in R \to R_+$. Therefore, consumption of an individual of type ε is given by

$$c_\varepsilon = (1-\tau) A (y(\phi) + (\eta(\varepsilon) - 1) t(\phi)). \tag{1}$$

Function t determines the magnitude of the rents generated by regulation, while function η represents the ability of an individual to capture these rents and it represents the economic power of an individual of type ε. The sum of income transfers across individuals must be zero, then $E(\eta(\varepsilon)) = \int_{\varepsilon \in R} \eta(\varepsilon) \mathrm{d}\, F(\varepsilon) = 1$. It is assumed that income coming from redistribution is taxed at the same tax as income coming from productive activities. It could be found examples of transfers which are taxed (the rents generated by a legal monopoly or some labour regulations, for example) or which are not taxed (some social benefits, for example). The main results along this paper do not depend on if transfers are taxed or not.

4.2. Fiscal Revenues

The total national tax revenues are the sum of tax revenues in all jurisdictions,

$$r = \tau \int_0^1 Ay(\phi_i)\, di. \tag{2}$$

The national government collects a fraction $0 < \beta < 1$ of tax revenues in each jurisdiction and a subnational government collects a fraction $1 - \beta$. National government shares out evenly its revenues among subnational jurisdictions. The subnational government budget is balanced,

$$g = \beta r + (1-\beta)\tau Ay(\phi), \tag{3}$$

which states that the revenues of a subnational government equal its public expenditure. Revenues of a subnational government are the sum of transfers from the national government, βr, and own tax revenues, $(1-\beta)\tau Ay(\phi)$.

4.3. Regulation and Subnational Governments

A subnational government takes transfers from the national government and the tax rate as given and chooses the regulatory level in order to maximize a weighted sum of utilities of all individuals in its jurisdiction,

$$\max_{\phi} \int_{\varepsilon \in R} \left[c_{\varepsilon} + v\left(g\right) \right] \omega\left(\varepsilon\right) \mathrm{d}\ F\left(\varepsilon\right),$$

subject to its budget constraint (3) and the individual budget constraint (1). The function $\omega\left(\varepsilon\right)$ is the relative weight given to individuals of type ε by the subnational government, and $\omega\left(\varepsilon\right)$ verifies $E\left(\omega\left(\varepsilon\right)\right) = \int_{\varepsilon \in R} \omega\left(\varepsilon\right) \mathrm{d}\ F\left(\varepsilon\right) = 1$. The weight $\omega\left(\varepsilon\right)$ could be viewed as the ability of individuals of type ε to influence the subnational government. We call it political power of individuals of type ε.

The first order condition of the subnational government maximization problem is

$$\left(1-\tau\right) \sigma_{\eta,\omega} t'\left(\phi\right) = -\left[\left(1-\tau\right) + \tau\left(1-\beta\right) v'\left(g\right) \right] y'\left(\phi\right), \tag{4}$$

where $\sigma_{\eta,\omega}$ is the covariance between economic power, η, and political power, ω.[10] It is a measure of how much political and economic power change together. Therefore, the regulatory policy of subnational governments depends on the joint distribution of political and economic power.

The following assumption guarantees that the maximization problem of a subnational government is convex. Therefore, the first order condition (4) characterizes a maximum if it does exist.

Assumption 1 $\sigma_{\eta,\omega} \geq 0$.

Assumption 1 imposes that correlation between economic and political power is no negative. However, $\sigma_{\eta,\omega} \geq 0$ is a sufficient condition, but not necessary, for convexity. In order to guarantee convexity it is necessary to impose that $\sigma_{\eta,\omega}$ is not too much negative.

However, the reason to assume a positive covariance is not only technical but also economic. On one hand, some empirical evidence mentioned in the introductory section holds this assumption. In particular, the relationship between the index of control of corruption and the indexes of political rights and civil liberties displayed in Figure 1.(d).

[10] The covariance between η and ω is $\sigma_{\eta,\omega} = E\left(\eta,\omega\right) - E\left(\eta\right) E\left(\omega\right)$ and $\sigma_{\eta,\omega} = \int_{\varepsilon \in R} \eta\left(\varepsilon\right) \omega\left(\varepsilon\right) dF\left(\varepsilon\right) - 1$ since $E\left(\eta\right) = E\left(\omega\right) = 1$.

On the other hand, we are considering regulation as a one-dimensional variable. However, regulation is multidimensional because there is a wide range of alternative regulations to choose. Individuals with greater political power will choose those regulations that redistribute income in their favor. Therefore, it is reasonable to assume that economic and political power are positively correlated.

A subnational government equals its marginal welfare gain due to the redistribution of income generated by regulation (the left-hand side of (4)) and its internalized marginal welfare loss due to the fall of output generated by regulation (the right-hand side of (4)). The term $(1-\tau)\,\sigma_{\eta,\omega}t'(\phi)$ is the weighted marginal increase of aggregate disposable income caused by regulation and, since the utility function of individuals is linear in private consumption, it is the marginal welfare gain obtained by a subnational government due to the redistribution of income generated by regulation.[11] The term $-\left[(1-\tau)+\tau(1-\beta)\,v'(g)\right]y'(\phi)$ represents the marginal welfare loss internalized by a subnational government due to reduction in private consumption and public expenditure caused by regulation. If output decreases in a unit due to shift regulation from its efficient level, then disposable income is reduced by $(1-\tau)$ units and public expenditure is reduced by τ units. Since the utility function of individuals is linear in private consumption, welfare of a subnational government is also reduced by $(1-\tau)$ units because reduction in private consumption and it is reduced by $\tau v'(g)$ units due to the reduction in public expenditure. However, a subnational government only takes into account that its revenues are reduced by $\tau(1-\beta)$ units because only a fraction $(1-\beta)$ of its public expenditure is financed with its own tax collection. Therefore, a subnational government does not internalize all consequences of regulation.

4.4. Tax Rate and National Government

The national government takes the regulatory policy of subnational governments as given and chooses the tax rate, τ, in order to maximize the sum of utilities of all individuals in all jurisdictions,

$$\max_{\tau}\int_0^1\int_{\varepsilon\in R}\left[c_\varepsilon+v(g)\right]\mathrm{d}\,F(\varepsilon)\,\mathrm{d}\,i,$$

[11] Assuming that $p'(\phi)>0$ and $y'(\phi)<0$ and taking into account that $t'(\phi)=p'(\phi)\,y(\phi)+p(\phi)\,y'(\phi)$, redistributed income rises with higher regulation because a higher fraction of income is redistributed (first addend $p'(\phi)\,y(\phi)$), but, at the same time, aggregate income decreases, which reduces redistributed income (second addend $p(\phi)\,y'(\phi)$).

subject to the individual budget constraint (1) and the fiscal budget constraints (2) and (3).

The first order condition of the national government maximization problem is

$$\int_0^1 v'(g_i)\left[\beta\int_0^1 Ay(\phi_i)\,\mathrm{d}\,i+(1-\beta)\,Ay(\phi_i)\right]\mathrm{d}\,i=\int_0^1 Ay(\phi_i)\,\mathrm{d}\,i, \tag{5}$$

which equals the marginal welfare gain from increased public expenditure and the marginal social welfare loss due to reduction in private consumption.

5. Symmetric equilibrium and efficiency

In this section, we characterize the policies implemented by national and subnational governments in a Nash symmetric equilibrium and we compare them with the efficient policies. The proofs of all propositions in this and next section are in the appendix.

5.1. Efficiency

A necessary condition to implement an efficient allocation is to maximize output. Therefore, the efficient regulatory level, ϕ^*, must be such that $y'(\phi^*)=0$. Moreover, efficiency also requires allocating resources to maximize utility of individuals. Therefore, it must be verified that the marginal utility of private consumption equals the marginal utility of public expenditure, $v'(g^*)=1$. The efficient tax rate is given by $g^*=\tau^* Ay(\phi^*)$, which is the lowest tax rate that allows to finance the efficient public expenditure. The efficient tax rate between 0 and 1 whether A is large enough. The following assumption guarantees that $0<\tau^*<1$:

Assumption 2 $A>\frac{g^*}{y(\phi^*)}$

The following proposition provides the necessary and sufficient conditions characterizing an efficient allocation.

Proposition 1 *Under Assumption 1 and Assumption 2, a feasible allocation* (c,g)*, where* $c:\varepsilon\in R\to c_\varepsilon\in R_+$*, is an interior efficient allocation if and only if:*

(i) The regulatory level is such that output is maximized, $\phi=\phi^*>0$ *such that* $y'(\phi^*)=0$*, and*

(ii) the tax rate is the lowest rate that allows to finance the efficient level of public expenditure, $0<\tau=\tau^*<1$ *such that* $v'(\tau^* Ay(\phi^*))=1$*.*

Definition 1 *The regulatory level that maximizes output, ϕ^* given by $y'(\phi^*) = 0$, is called the efficient regulatory level.*

Definition 2 *The lowest tax rate that allows to finance the efficient public expenditure, τ^* solving $v'(\tau^* Ay(\phi^*)) = 1$, is called the efficient tax rate.*

5.2. Symmetric equilibrium

In a symmetric equilibrium all subnational governments set the same regulatory level. Therefore, output, $Ay(\phi)$, income redistribution, $At(\phi)$, and public expenditure, $g = \tau Ay(\phi)$, are the same across jurisdictions. Moreover, β is the fiscal gap in a symmetric equilibrium, i.e. the fraction of subnational public expenditure do not funded by own tax revenues.

The first order condition of the national government maximization problem in a symmetric equilibrium is

$$v'(\tau Ay(\phi)) = 1. \tag{CG}$$

Substitution of (CG) into (4) yields

$$(1 - \tau\beta) y'(\phi) + (1 - \tau) \sigma_{\eta,\omega} t'(\phi) = 0, \tag{LG}$$

which characterizes the behavior of subnational governments in a symmetric equilibrium. Equations (CG) and (LG) implicitly define the tax rate, τ^e, and the regulatory level, ϕ^e, in a symmetric equilibrium.

Taking into account that $g = \tau Ay(\phi)$, the following proposition follows from equation (CG).

Proposition 2 *Under Assumption 1 and Assumption 2, public expenditure in a symmetric equilibrium is equal to the efficient public expenditure, $g^e = g^*$.*

Therefore, public expenditure in a symmetric equilibrium always equals the efficient public expenditure. It only depends on the preferences of individuals regardless the level of private consumption or other economic determinants because we have assumed that the utility function of all individuals is quasi-linear.

The following proposition states that there exists a unique symmetric equilibrium.

Proposition 3 *Under Assumption 1 and Assumption 2, there exists a unique symmetric equilibrium. This equilibrium satisfies (i) $\tau^* \leq \tau^e < 1$, (ii) $\phi^* \leq \phi^e \leq \widehat{\phi}$ whenever $\widehat{\phi} \geq \phi^*$ and (iii) $\widehat{\phi} \leq \phi^e \leq \phi^*$ whenever $\widehat{\phi} \leq \phi^*$.*

The equilibrium regulatory level is between the efficient regulatory level, which maximizes output, and the regulatory level that maximizes income redistribution. A regulatory level out of this interval could not be a symmetric equilibrium because subnational governments could increase at the same time output and income redistribution. Consequently, the required tax rate to finance the efficient public expenditure is equal or higher than the efficient tax rate.

The following proposition states that the regulatory level and the tax rate in the symmetric equilibrium are equal to the efficient regulatory level and the efficient tax rate whether the regulatory level that maximizes output is equal to the regulatory level that maximizes redistribution.

Proposition 4 *Under Assumption 1 and Assumption 2, if* $\widehat{\phi} = \phi^*$ *then the regulatory level in the symmetric equilibrium is equal to the efficient regulatory level,* $\phi^e = \phi^*$*, and the tax rate in the symmetric equilibrium is equal to the efficient tax rate,* $\tau^e = \tau^*$*.*

The case in which both regulatory levels are equal is not very interesting because subnational governments do not face any trade-off between efficiency and distribution. The reason is that they can maximize output and income redistribution at the same regulatory level. The following corollary follows from Proposition 4.

Corollary *Under Assumption 1 and Assumption 2, if* $\widehat{\phi} = \phi^*$ *then output in the symmetric equilibrium is maximum,* $y(\phi^e) = y(\phi^*)$*.*

5.3. The distribution of economic and political power

The covariance between economic and political power, $\sigma_{\eta,\omega}$, determines the gains that a subnational government could achieve from the redistribution of income generated by regulation. The following proposition states that if political and economic power are uncorrelated then subnational governments implement the efficient regulatory level and the national government sets the efficient tax rate.

Proposition 5 *Under Assumption 2, if* $\sigma_{\eta,\omega} = 0$ *then the regulatory level in the symmetric equilibrium is equal to the efficient regulatory level,* $\phi^e = \phi^*$*, and the tax rate in the symmetric equilibrium is equal to the efficient tax rate,* $\tau^e = \tau^*$*.*

If there is no correlation between political and economic power then a subnational government can not take advantage of income redistribution generated by regulation because the rents generated by regulation do not mainly go to its favourite groups of individuals. Therefore, it sets the efficient regulatory level maximizing output and, consequently, the

national government can set the lowest required tax rate to finance the efficient public expenditure. The following corollary follows from Proposition 5.

Corollary *Under Assumption 2, if* $\sigma_{\eta,\omega} = 0$ *then output in the symmetric equilibrium is maximum,* $y(\phi^e) = y(\phi^*)$.

If all individuals have the same political power (i.e. $\omega(\varepsilon) = 1$ for all ε), then the covariance between political and economic power is 0. The same can be said for the economic power, if all individuals have the same economic power (i.e. $\eta(\varepsilon) = 1$ for all ε), then the covariance between political and economic power is 0. Therefore, the following corollary follows from Proposition 5.

Corollary *Under Assumption 2, if* $\omega(\varepsilon) = 1$ *and/or* $\eta(\varepsilon) = 1$ *for all* ε, *then the regulatory level in the symmetric equilibrium is equal to the efficient regulatory level,* $\phi^e = \phi^*$, *and the tax rate in the symmetric equilibrium is equal to the efficient tax rate,* $\tau^e = \tau^*$.

A subnational government giving equal weight to all individuals (i.e. $\omega(\varepsilon) = 1$ for all ε) is not interested in favouring any particular group of individuals and it does not obtain any gain from income redistribution. If all individuals have the same economic power (i.e. $\eta(\varepsilon) = 1$ for all ε), regulation can not benefit the groups of individuals preferred by the subnational government. Therefore, in both cases, it does not use regulation in order to redistribute income. Consequently, it sets the efficient regulatory level which maximizes output.

The following proposition states that if a subnational government faces a trade-off between efficiency and income redistribution and there is a strictly positive correlation between economic and political power, then in a symmetric equilibrium the regulatory level differs from its efficient level. Furthermore, the tax rate will be greater than the efficient tax rate.

Proposition 6 *Under Assumption 2, if* $\sigma_{\eta,\omega} > 0$ *and* $\widehat{\phi} \neq \phi^*$, *then the tax rate in a symmetric equilibrium is higher than the efficient tax rate,* $\tau^* < \tau^e < 1$, *and if* $\widehat{\phi} < \phi^*$ *(resp.* $\widehat{\phi} > \phi^*$*), then the regulatory level in a symmetric equilibrium is lower (resp. higher) than the efficient regulatory level,* $\widehat{\phi} < \phi^e < \phi^*$ (resp. $\phi^* < \phi^e < \widehat{\phi}$).

The following corollary follows from Proposition 6.

Corollary *Under Assumption 2, if* $\sigma_{\eta,\omega} > 0$ *and* $\widehat{\phi} \neq \phi^*$, *then output in a symmetric equilibrium is strictly lower than maximum output,* $y(\phi^e) < y(\phi^*)$.

If the regulatory level that maximizes income redistribution, $\widehat{\phi}$, and the regulatory

level that maximizes output, ϕ^*, are different, then subnational governments face a trade-off between efficiency and redistribution because to increase income redistribution requires to reduce output. In this case, if economic and political power are positively correlated, then a subnational government facing a trade-off between efficiency and income redistribution sets a regulatory level which differs from the efficient regulatory level. The reason is that it wishes to benefit groups of individuals by mean of income redistribution generated by regulation. In response, the national government sets a tax rate higher than the efficient tax rate in order to finance the efficient public expenditure. If the regulatory level that maximizes redistribution, $\widehat{\phi}$, is higher (resp. lower) than the regulatory level that maximizes output, ϕ^*, then subnational governments exceed (resp. do not reach) the efficient regulatory level in order to carry out a little more redistribution, but they do not reach (resp. they exceed) the regulatory level that maximizes income redistribution.

REMARK: negative covariance

It is assumed that the covariance between economic and political power is not negative. However, this covariance could be negative, but not too much negative in order to guarantee that the first order condition (LG) characterizes a maximum. If $\sigma_{\eta\omega}$ is negative, then it follows from the first order condition (LG), the intermediate value theorem, and properties of functions $t(\phi)$ and $y(\phi)$ that, in an symmetric equilibrium, if $\widehat{\phi} > \phi^*$ (resp. $\widehat{\phi} < \phi^*$) then the equilibrium regulatory level is lower (resp. higher) than ϕ^* for all $0 < \tau < 1$. Therefore, even if $\sigma_{\eta\omega}$ is negative, subnational governments implement an inefficient regulatory level. The reason of this behavior of subnational governments is that they want to reduce income redistribution to avoid prejudicing their favourite groups of individuals. Consequently, output in a symmetric equilibrium is lower than maximum output and the national government has to set a tax rate higher than the efficient tax rate in order to fund an efficient level of public expenditure.

5.4. Some alternative specifications

It could be assumed that the benevolent national government sets regulations and subnational governments set taxes. In this case, the first order condition of the national government is

$$(v'(g) + 1 - \tau)\, y'(\phi) = 0,$$

which implies that the benevolent national government chooses the efficient regulatory level, ϕ^*. In a symmetric equilibrium, the first order condition of a subnational govern-

ment is

$$v'(g) = \frac{1 + \sigma_{\eta,\omega} p(\phi^*)}{1 - \beta},$$

which implies that $g < g^*$ and $\tau < \tau^*$. If $\sigma_{\eta,\omega} > 0$ then subnational governments set a lower tax rate than the efficient tax rate because it benefits individuals with higher economic power. Therefore, if the instrument of policy in the hands of subnational governments is the tax rate, then they use it to benefit their favourite groups of individuals. They are the higher-income groups because they are the groups more benefited by regulations. Consequently, they would be the groups more harmed by high taxes.

Notwithstanding, there is another reason for subnational government to keep low public expenditure and taxes. If subnational public expenditure is financed with transfers of the national government -i.e. the fiscal gap is positive- then subnational governments reduce taxes in order to benefit people in their jurisdiction. However, free-riding of all subnational governments provokes a reduction of aggregate fiscal revenues and, consequently, public expenditure is lower than its efficient level. Therefore, in this case, fiscal policy would be inefficient in the presence of a positive fiscal gap even whether $\sigma_{\eta,\omega} = 0$.

Alternatively, it could be assumed that both policies are chosen by subnational governments. In this case, the first order conditions of a subnational government in a symmetric equilibrium are

$$(1 - \beta) v'(g) = 1 + \sigma_{\eta,\omega} p(\phi) \tag{6}$$

and

$$(1 - \tau) \sigma_{\eta,\omega} t'(\phi) = -[1 + \tau \sigma_{\eta,\omega} p(\phi)] y'(\phi) \tag{7}$$

From (7), the intermediate value theorem and properties of functions $p(\phi)$, $y(\phi)$, and $t(\phi)$, it follows that if $\widehat{\phi} > \phi^*$ (resp. $\widehat{\phi} < \phi^*$) and $\sigma_{\eta,\omega} > 0$ then, in a symmetric equilibrium, the regulatory level is $\phi^* < \phi < \widehat{\phi}$ (resp. $\widehat{\phi} < \phi < \phi^*$) for any $0 < \tau < 1$. From (6), taking into account properties of function $v(g)$ and that $0 < p(\phi) < 1$ for any $\phi \in \left(0, \overline{\phi}\right)$, it follows that $g < g^*$. The required tax rate to finance a level of lower public expenditure than the efficient level could be higher or lower than the efficient tax rate. On one hand, the tax rate in a symmetric equilibrium would be higher than the efficient tax rate because output is lower, but, on the other hand, the tax rate would be lower because public expenditure also is lower. Which one effect predominates depends on the forms of the functions.[12]

[12]The behaviour of a single non-benevolent central government that decides both regulatory and fiscal policies would be characterized by equations (6) and (7) assuming that $\beta = 0$.

This alternative specification shows that, even if subnational governments have tax power, they use the regulatory policy to redistribute income to their favourite groups of individuals. Moreover, they reduce public expenditure in order to avoid an excessive taxation. If their favourite groups are able to capture the rents generated by regulation, then they use regulatory policy to benefit them. The groups favoured by regulatory policy also are the high-income groups and subnational governments wish to keep taxes low in order not to harm them. For this reason, subnational governments choose a low level of public expenditure. Moreover, the higher the fiscal gap, the lower public expenditure is. The reason is the free-riding behavior of subnational governments, which has been commented above. As in previous specification of the model, fiscal policy would be inefficient in the presence of a positive fiscal gap even whether $\sigma_{\eta,\omega} = 0$.

If it is assumed that transfers are not taxed then the first order condition of the subnational government is

$$\sigma_{\eta,\omega} t'(\phi) = -(1 - \tau\beta)\, y'(\phi).$$

The first order condition of the national government is $v'(g) = 1$. Therefore, if $\sigma_{\eta,\omega} > 0$ and $\widehat{\phi} \neq \phi^*$ both regulatory policy and fiscal policy are inefficient. The main results along this paper are the same.

It was assumed that subnational governments do not take into account that total national tax revenues are affected by their regulatory choices. In the model, this happens because there is a continuum of subnational governments, each one being an infinitesimal part of the aggregate. However, in an environment with N subnational governments, subnational governments will take into account the impact of their regulatory choices on the total national tax revenues. In this case, the first order condition of a subnational government is

$$(1 - \tau)\, \sigma_{\eta,\omega} t'(\phi) = -\left[(1 - \tau\beta) + \frac{\beta\tau}{N}\right] y'(\phi)$$

The main results along this paper are the same. The only important difference is that the number of subnational jurisdictions affects the regulatory level and, consequently, the tax rate in equilibrium. In particular, the higher the number of subnational jurisdictions, the greater the distortions caused by a positive covariance and by a fiscal gap.

It was assumed that subnational governments and the national government play a simultaneous game. Alternatively, it could be assumed that they play a sequential game in

which the national government moves first. In a symmetric equilibrium, public expenditure in all jurisdictions is the same, $g = \tau A y(\phi)$. Therefore, in a symmetric equilibrium, the first order condition of a subnational government is

$$(1-\tau)\,\sigma_{\eta,\omega} t'(\phi) = -\left[(1-\tau) + \tau(1-\beta)\,v'(\tau A y(\phi))\right] y'(\phi), \tag{8}$$

which implicitly defines the optimal choice of the regulatory level for a subnational government as a function of the tax rate set by the national government, $\phi = \Phi(\tau)$. The national government sets the tax rate in order to maximize its objective function subject to $\phi = \Phi(\tau)$. The first order condition of the national government is

$$1 - v'(\tau A y(\phi)) = \frac{y'(\phi)\,\Phi'(\tau)}{y(\phi)}\left[1 - \tau + \tau v'(\tau A y(\phi))\right]. \tag{9}$$

From the two previous equations it follows that if $\sigma_{\eta,\omega} = 0$ then subnational governments set an efficient regulatory level and, consequently, the national government sets the lowest required tax rate to finance an efficient level of public expenditure. However, from equation (8), the intermediate value theorem and properties of functions $t(\phi)$, $y(\phi)$ and $v(g)$, it follows that if $\sigma_{\eta,\omega} > 0$ then subnational governments implement a inefficient regulatory level $\phi^* < \Phi(\tau) < \widehat{\phi}$ (resp. $\widehat{\phi} < \Phi(\tau) < \phi^*$) for any tax rate $\tau \in (0,1)$ set by the national government whether $\phi^* < \widehat{\phi}$ (resp. $\widehat{\phi} < \phi^*$). Moreover, it follows from (9) that, in equilibrium, public expenditure differs from efficient public expenditure. The reason is that the sequential structure of the game implies that the benevolent national government uses the fiscal policy to offset the inefficiency caused by the regulatory policy of subnational governments.

6. Comparative statics

In this section, we perform some exercises of comparative statics. In particular, we analyze how policies respond to changes in the fiscal gap, productivity, and the distribution of economic and political power.

6.1. Economic and political power, regulation and the tax rate

The following proposition states that if subnational governments face a trade-off between efficiency and redistribution, then a higher covariance between political and economic

power implies a higher gap between efficient and equilibrium regulatory policies. Consequently, the required tax rate to finance efficient public expenditure is higher.

Proposition 7 *Under Assumption 1 and Assumption 2, if* $\widehat{\phi} \neq \phi^*$*, then an increase of* $\sigma_{\eta,\omega}$ *implies (i) an increase of the tax rate in the symmetric equilibrium and (ii) an increase (resp. a decrease) of the regulatory level in the symmetric equilibrium whenever* $\widehat{\phi} > \phi^*$ (resp. $\widehat{\phi} < \phi^*$).

The higher covariance, $\sigma_{\eta,\omega}$, the larger the gains from income redistribution for a subnational government. Therefore, it is willing to increase the gap between efficient and equilibrium policies in order to achieve a higher income redistribution. The larger the gap, the higher the required tax rate to finance the efficient public expenditure because of lower output. The following corollary follows from Proposition 7.

Corollary *Under Assumption 1 and Assumption 2, an increase of* $\sigma_{\eta,\omega}$ *reduces output in the symmetric equilibrium.*

6.2. Fiscal gap, regulation and tax rate

The following proposition states that if economic and political power are uncorrelated or if subnational governments do not face a trade-off between efficiency and distribution, then both the regulatory level and the tax rate do not depend on the fiscal gap. The reason is that subnational governments implement the efficient regulatory level and the national government sets the efficient tax rate. Both the efficient regulatory level and the efficient tax rate do not depend on how subnational governments are financed

Proposition 8 *Under Assumption 1 and Assumption 2, if* $\sigma_{\eta,\omega} = 0$ *and/or* $\widehat{\phi} = \phi^*$*, then the regulatory level and the tax rate of symmetric equilibrium do not depend on the fiscal gap,* β*.*

The following proposition states that if there is a positive correlation between political and economic power and subnational governments face a trade-off between efficiency and redistribution, then the gap between the efficient regulatory level and the equilibrium regulatory level is larger the higher the fiscal gap is. Hence, the larger the fiscal gap, the lower output in a symmetric equilibrium. Consequently, the larger the fiscal gap, the higher the required tax rate to finance the efficient public expenditure.

Proposition 9 *Under Assumption 2, if* $\sigma_{\eta,\omega} > 0$ *and* $\widehat{\phi} \neq \phi^*$*, then an increase of the fiscal gap,* β*, implies (i) an increase of the tax rate in the symmetric equilibrium and*

(ii) an increase (resp. a decrease) of the regulatory level in the symmetric equilibrium whenever $\widehat{\phi} > \phi^*$ *(resp.* $\widehat{\phi} < \phi^*$*).*

The existence of a fiscal gap implies that subnational governments do not internalize the whole consequences of regulation. If the fiscal gap increases, then a higher fraction of subnational government revenues depends on transfers from the national government. Therefore, the larger the fiscal gap, the fall of fiscal revenues due to the decrease of output generated by an inefficient regulatory policy is more underestimated by subnational governments,and, consequently, also the welfare loss due to reduced public spending. That is to say, the larger the fiscal gap, the higher their willingness to shift the regulatory level from its efficient level and to sacrifice output in order to achieve a higher income redistribution. The following corollary follows from Proposition 9.

Corollary *Under Assumption 2, if* $\sigma_{\eta,\omega} > 0$ *and* $\widehat{\phi} \neq \phi^*$*, then an increase of the fiscal gap,* β*, reduces output in the symmetric equilibrium.*

6.3. Productivity, regulation and tax rate

The following proposition states that if subnational governments face a trade off between efficiency and distribution, whether the fiscal gap is lower than 1 and whether there is a positive correlation between political and economic power, then an exogenous increase in productivity involves a lower equilibrium tax rate and a higher difference between efficient and equilibrium regulatory policies.

Proposition 10 *Under Assumption 1 and Assumption 2:*

(i) A increase of A implies a lower tax rate in the symmetric equilibrium.

(ii) If $\sigma_{\eta,\omega} = 0$ *or* $\widehat{\phi} = \phi^*$ *or* $\beta = 1$*, then the regulatory level in the symmetric equilibrium does not depend on A.*

(iii) If $\sigma_{\eta,\omega} > 0$ *and* $0 < \beta < 1$ *then an increase of A implies an increase (resp. a decrease) of the regulatory level in the symmetric equilibrium whenever* $\widehat{\phi} > \phi^*$ *(resp.* $\widehat{\phi} < \phi^*$*).*

If productivity exogenously increases, then the required tax rate to finance the efficient public expenditure is lower because, given a regulatory policy, output increases. Consequently, the national government reduces the tax rate (point (i) of Proposition 10). The welfare of a subnational government is reduced in $\tau v'(g)$ units due to the reduction in public expenditure caused by the fall of output generated by the increase of the gap between equilibrium and efficient regulatory policies. A lower tax rate implies that

this loss is smaller. If the fiscal gap is lower than 1, then this smaller loss is partially internalized by subnational governments. When there are potential gains from income redistribution (i.e. $\sigma_{\eta,\omega} > 0$) then subnational governments are willing to sacrifice more output for greater income redistribution. Consequently, they increase the gap between equilibrium and efficient regulatory policies (point (iii) of Proposition 10). However, if subnational governments are completely financed with transfers from the national government (i.e. the fiscal gap is 1), then they do not internalize this effect and the regulatory level does not change with a change in A. Moreover, if subnational governments can not obtain potential gains from income redistribution (i.e. $\sigma_{\eta,\omega} = 0$) or if they do not face a trade-off between efficiency and redistribution (i.e. $\widehat{\phi} = \phi^*$), then they choose the efficient regulatory level regardless the value of A (point (ii) of Proposition 10).

Transfers generated by regulation depend on A just as productivity does. This means that, besides the effect of A on the regulatory policy described above, there are other two effects. However, these two effects exactly offset. On the one hand, a higher A implies that subnational governments are willing a lower gap between equilibrium and efficient regulatory policies because reduction of output caused by a gap is higher. On the other hand, a higher A implies that subnational governments are willing a higher gap between equilibrium and efficient regulatory policies because the increase of income redistribution generated by a gap is higher.

7. Conclusion

We have developed a model which allows for the analysis of the impact on fiscal and regulatory policies of the joint distribution of political and economic power across individuals. We have shown that the joint distribution of political and economic power across individuals is a key determinant of policies. In particular, a higher correlation between economic and political power leads to a higher inefficiency of both policies.

In our model, subnational governments decide regulatory policy in their jurisdictions and the national government sets a common tax rate to all jurisdictions. There exists a fiscal gap because public expenditure of subnational governments is financed by own tax revenues and transfers from the national government. Individuals in a jurisdiction differ in their ability to influence subnational governments –we call it political power- and in their ability to capture the rents generated by regulation –we call it economic power. Subnational governments can use regulation to redistribute income in favour of groups of individuals with higher political and economic power. However, to implement

income redistribution involves to reduce output. Therefore, subnational governments face a trade-off between efficiency and income redistribution. In this framework, we have compared regulatory and tax policies implemented in a Nash symmetric equilibrium with the efficient policies.

In this framework, if there is no correlation between economic and political power of individuals, then subnational governments do not use regulations to redistribute income among individuals and implement an efficient regulatory policy, which maximizes output. Consequently, the national government can set the lowest required tax rate to finance efficient public expenditure. Efficient regulatory and tax policies do not depend on the fiscal gap.

However, if political and economic power are positively correlated, then subnational governments obtain gains redistributing income by mean of regulation in favour of individuals with higher economic and political power. Therefore, subnational governments implement inefficient regulatory policies leading to a reduction in productivity and output. Consequently, the national government has to raise the tax rate over its efficient level in order to finance public expenditure. Namely, even a benevolent national government could set high taxes in order to finance an efficient level of public expenditure if regulatory policies used with redistributive purposes create economic distortions that adversely affect productivity and output.

The higher the correlation between political and economic power, the greater the gap between equilibrium and efficient policies. Moreover, if there exists a positive correlation between economic and political power, then the higher the fiscal gap, the larger the gap between equilibrium and efficient policies because subnational governments underestimate more the fall of public revenues caused by inefficient policies.

A lesson for the design of institutions can be deduced from our analysis. An institutional design sharing out evenly political and economic power across individuals reduces government incentives to use regulatory policy to redistribute income at the expense of productivity and output. Therefore, such institutional design could contribute to the efficiency of public policies. In particular, fiscal gaps might be needed to achieve efficiency because they might correct vertical or horizontal imbalances. However, they may be the source of inefficiencies because they can give rise to problems of incentives. This contradiction could be overcome with an institutional design sharing out evenly political and economic power across individuals.

Appendix

Proof of Proposition 1: Let AY be aggregate output of all jurisdictions, $AY = A\int_0^1 y(\phi_i)\mathrm{d}\ i$. The utility function of an individual is $u(c_{\varepsilon,i}, g_i) = c_{\varepsilon,i} + v(g_i)$ and his resource constraint is $c_{\varepsilon,i} + g_i = AY + T_{\varepsilon,i}$,where $\int_0^1 \int_{\varepsilon\in R} T_{\varepsilon,i}\ \mathrm{d}\ F(\varepsilon)\ \mathrm{d}\ i = 0$.Utility of an individual is maximized if and only if $g_i = g^*$ for all i such that $v'(g^*) = 1$. Output is maximized if and only if $\phi_i = \phi^*$ for all i such that $y'(\phi^*) = 0$, then $AY^* = Ay(\phi^*)$. Let τ^* be such that $g^* = \tau^* Ay(\phi^*)$, $0 < \tau^* < 1$ if and only if $A > \frac{g^*}{y(\phi^*)}$. Utility of an individual is $u\left(c^*_{\varepsilon,i}, g^*\right) = (1-\tau^*)(Ay(\phi^*) + T_{\varepsilon,i}) + v(g^*)$.

Let $\widetilde{Y}$ be such that $A\widetilde{Y} = A\int_0^1 y(\phi_i)\ \mathrm{d}\ i$ with some $\phi_i \neq \phi^*$ and let $\widetilde{\tau}$ be such that $g^* = \widetilde{\tau}A\widetilde{Y}$, then $\tau^* < \widetilde{\tau}$. Utility of an individual is

$$u(\widetilde{c}_{\varepsilon,i}, g^*) = \begin{cases} (1-\widetilde{\tau})\left(A\widetilde{Y} + T_{\varepsilon,i}\right) + v(g^*) & \text{if } 0 \leq \widetilde{\tau} \leq 1 \\ v(g^*) & \text{if } \widetilde{\tau} > 1 \end{cases}.$$

The sum of transfers must be 0, $\int_0^1 \int_{\varepsilon\in R} T_{\varepsilon,i}\ \mathrm{d}\ F(\varepsilon)\ \mathrm{d}\ i = 0$. Then,

$$\int_0^1 \int_{\varepsilon\in R} u\left(c^*_{\varepsilon,i}, g^*\right) \mathrm{d}\ F(\varepsilon)\ \mathrm{d}\ i = (1-\tau^*)Ay(\phi^*) + v(g^*) >$$
$$> \int_0^1 \int_{\varepsilon\in R} u(\widetilde{c}_{\varepsilon,i}, g^*)\,\mathrm{d}\ F(\varepsilon)\ \mathrm{d}\ i = \begin{cases} (1-\widetilde{\tau})A\widetilde{Y} + v(g^*) & \text{if } 0 \leq \widetilde{\tau} \leq 1 \\ v(g^*) & \text{if } \widetilde{\tau} > 1 \end{cases}$$

Therefore, if the regulatory level is ϕ^* and the tax rate is τ^*then it is always possible to find a transfer scheme across individuals such that all individuals improve with regard to an allocation with a regulatory level $\phi \neq \phi^*$ and any transfer system. If the regulatory level is ϕ^* and the tax rate is τ^*then the sum of individual utilities is maximum for any transfer scheme. Therefore, it is not possible to find other regulatory level and/or other transfer scheme such that some of the individuals improves without others being worse off.□

Proof of Proposition 2: The efficient level of public expenditure is given by $v'(g) = 1$. Then, Proposition 2 follows from (CG) and $g = \tau Ay(\phi)$.□

Proof of Proposition 3: Differentiating (CG) we obtain

$$\frac{\mathrm{d}\ \tau}{\mathrm{d}\ \phi} = CG'(\phi) = -\tau\frac{y'(\phi)}{y(\phi)}$$

which:

(1.1) For all $\tau > 0$ and all $0 < \phi < \overline{\phi}$, $CG'(\phi) \leq 0$ (resp. $CG'(\phi) \geq 0$) if and only if $y'(\phi) \geq 0$ (resp. $y'(\phi) \leq 0$) if and only if $\phi \leq \phi^*$ (resp. $\phi \geq \phi^*$).

(1.2) It follows from (1.1) that the minimum value of the tax rate, τ^*, implicitly defined by equation (CG) is given by

$$v'\left(\tau^* Ay\left(\phi^*\right)\right) = 1, \tag{10}$$

and under Assumption 1 $\tau^* \in (0,1)$.

It follows from (1.1) and (1.2) that:

(A) $CG\left(\phi\right) > 0$ for all $0 < \phi < \overline{\phi}$, $CG'\left(\phi\right) \leq 0$ for all $0 \leq \phi \leq \phi^*$, $CG'\left(\phi\right) \geq 0$ for all $\phi^* \leq \phi \leq \overline{\phi}$ and $0 < CG\left(\phi^*\right) < 1$.

Let be

$$H\left(\phi,\tau\right) = \left[1-\tau\beta\right] y'\left(\phi\right) + \left(1-\tau\right)\sigma_{\eta,\omega} t'\left(\phi\right). \tag{11}$$

(3.1) For any $0 \leq \tau \leq 1$,

$$\frac{\partial H\left(\phi,\tau\right)}{\partial \phi} = \left[1-\tau\beta\right] y''\left(\phi\right) + \left(1-\tau\right)\sigma_{\eta,\omega} t''\left(\phi\right) \leq 0$$

for all $\phi \in \left(0,\overline{\phi}\right)$ since $t''\left(\phi\right) < 0$ and $y''\left(\phi\right) < 0$ for all $\phi \in \left(0,\overline{\phi}\right)$.

(3.2) $H\left(\phi^*,1\right) = 0$.

Differentiating (LG), we obtain

$$\left.\frac{\mathrm{d}\,\tau}{\mathrm{d}\,\phi}\right|_{\phi=\phi(\tau)} = LG'\left(\phi\right) = -\frac{1-\tau}{1-\beta}\frac{1}{y'\left(\phi\left(\tau\right)\right)}\left.\frac{\partial H\left(\phi,\tau\right)}{\partial \phi}\right|_{\phi=\phi(\tau)},$$

where $\phi\left(\tau\right)$ such that $H\left(\phi,\tau\right) = 0$.

(4.1) If $\widehat{\phi} \leq \phi^*$ then $t'\left(\phi^*\right) \leq y'\left(\phi^*\right) = 0$ and $y'\left(\widehat{\phi}\right) \geq t'\left(\widehat{\phi}\right) = 0$ since $t''\left(\phi\right) < 0$ and $y''\left(\phi\right) < 0$ for all $\phi \in \left(0,\overline{\phi}\right)$. Therefore, if $\sigma_{\eta,\omega} \geq 0$, for any $0 \leq \tau \leq 1$, $H\left(\phi^*,\tau\right) \leq 0$ and $H\left(\widehat{\phi},\tau\right) \geq 0$. Let $\phi\left(\tau\right)$ be such that $H\left(\phi,\tau\right) = 0$ then $\widehat{\phi} \leq \phi\left(\tau\right) \leq \phi^*$ because $\frac{\partial H(\phi,\tau)}{\partial \phi} \leq 0$ for all $\phi \in \left(0,\overline{\phi}\right)$. If $\widehat{\phi} \leq \phi\left(\tau\right) \leq \phi^*$ then $y'\left(\phi\left(\tau\right)\right) \geq 0$ and if $0 \leq \tau \leq 1$ then $\left.\frac{\mathrm{d}\,\tau}{\mathrm{d}\,\phi}\right|_{\phi=\phi(\tau)} \geq 0$.

(4.2) Let $\widetilde{\phi}$ be $H\left(\widetilde{\phi},0\right) = 0$, if $\widehat{\phi} \leq \phi^*$ then $\widetilde{\phi} \geq \widehat{\phi}$ because $y'\left(\widehat{\phi}\right) \geq t'\left(\widehat{\phi}\right) = 0$.

(B_1) From (3.2), (4.1) and (4.2) it follows that if $\widehat{\phi} \leq \phi^*$then $LG(\phi^*) = 1$ $LG\left(\widetilde{\phi}\right) = 0$ for some $\widehat{\phi} \leq \widetilde{\phi} \leq \phi^*$and $LG'(\phi) \geq 0$ for all $\widetilde{\phi} \leq \phi \leq \phi^*$.

(4.3) If $\widehat{\phi} \geq \phi^*$ then $t'\left(\phi^*\right) \geq y'\left(\phi^*\right) = 0$ and $y'\left(\widehat{\phi}\right) \leq t'\left(\widehat{\phi}\right) = 0$ since $t''\left(\phi\right) < 0$ and $y''\left(\phi\right) < 0$ for all $\phi \in \left(0,\overline{\phi}\right)$. Therefore, if $\sigma_{\eta,\omega} \geq 0$, for any $0 \leq \tau \leq 1$, $H\left(\phi^*,\tau\right) \geq 0$ and $H\left(\widehat{\phi},\tau\right) \leq 0$. Let $\phi\left(\tau\right)$ be such that $H\left(\phi,\tau\right) = 0$ then $\phi^* \leq \phi\left(\tau\right) \leq \widehat{\phi}$ because $\frac{\partial H(\phi,\tau)}{\partial \phi} \leq 0$ for all $\phi \in \left(0,\overline{\phi}\right)$. If $\phi^* \leq \phi\left(\tau\right) \leq \widehat{\phi}$ then $y'\left(\phi\left(\tau\right)\right) \leq 0$ and if $0 \leq \tau \leq 1$ then

$\frac{\mathrm{d}\,\tau}{\mathrm{d}\,\phi}\Big|_{\phi=\phi(\tau)} \leq 0.$

(4.4) Let $\widetilde{\phi}$ be $H\left(\widetilde{\phi},0\right)=0$, if $\widehat{\phi}\geq\phi^{*}$ then $\widetilde{\phi}\leq\widehat{\phi}$ because $y'\left(\widehat{\phi}\right)\leq t'\left(\widehat{\phi}\right)=0$.

(B_2) From (3.2), (4.3) and (4.4) it follows that if $\widehat{\phi}\geq\phi^{*}$then $LG(\phi^{*})=1$, $LG\left(\widetilde{\phi}\right)=0$ for some $\phi^{*}\leq\widetilde{\phi}\leq\widehat{\phi}$ and $LG'(\phi)\leq 0$ for all $\widetilde{\phi}\leq\phi\leq\phi^{*}$.

Proposition 3 follows from the intermediate value theorem and (A), (B_1) and (B_2).□

Proof of Proposition 4: If $\widehat{\phi}=\phi^{*}$ then $t'(\phi^{*})=y'(\phi^{*})=0$ and

$$H(\phi^{*},\tau)=[1-\tau\beta]\,y'(\phi^{*})+(1-\tau)\,\sigma_{\eta,\omega}t'(\phi^{*})=0$$

for any $0\leq\tau\leq 1$. The tax rate of symmetric equilibrium is then given by

$$\alpha v'\left(\tau^{e}Ay\left(\phi^{*}\right)\right)=1, \tag{12}$$

then $\tau^{e}=\tau^{*}$.□

Proof of Proposition 5: If $\sigma_{\eta,\omega}=0$ then equation (LG) is $y'(\phi)=0$, therefore $\phi^{e}=\phi^{*}$. The tax rate of symmetric equilibrium is then given by $v'\left(\tau^{e}Ay\left(\phi^{*}\right)\right)=1$, then $\tau^{e}=\tau^{*}$. And under Assumption 1 $0<\tau^{*}<1$.□

Proof of Proposition 6: If $\sigma_{\eta,\omega}>0$ Proposition 6 follows from Proposition 3 and properties of functions $y(\phi)$, $t(\phi)$ and $v\left(A\tau y(\phi)\right)$.□

Proof of Proposition 7: Differentiating (LG) and (CG) we obtain after a little of algebra

$$\frac{\mathrm{d}\,\phi}{\mathrm{d}\,\sigma_{\eta,\omega}}\Big|_{\phi=\phi(\tau)}=\frac{\frac{1-\tau\beta}{\sigma_{\eta,\omega}}y'\left(\phi\left(\tau\right)\right)}{\left(1-\tau\beta\right)y''\left(\phi\left(\tau\right)\right)+\left(1-\tau\right)\sigma_{\eta,\omega}t''\left(\phi\left(\tau\right)\right)-\frac{\tau(1-\beta)}{1-\tau}\frac{\left[y'(\phi(\tau))\right]^{2}}{y(\phi(\tau))}}$$

and

$$\frac{\mathrm{d}\,\tau}{\mathrm{d}\,\sigma_{\eta,\omega}}\Big|_{\phi=\phi(\tau)}=-\tau\frac{y'\left(\phi\left(\tau\right)\right)}{y\left(\phi\left(\tau\right)\right)}\,\frac{\mathrm{d}\,\phi}{\mathrm{d}\,\sigma_{\eta,\omega}}\Big|_{\phi=\phi(\tau)},$$

where $\phi(\tau)$ such that $H\left(\phi\left(\tau\right),\tau\right)=0$. From properties of functions y and t follows that $y''\left(\phi\left(\tau\right)\right)<0$ and $t''\left(\phi\left(\tau\right)\right)<0$. If $\sigma_{\eta,\omega}>0$ and $\widehat{\phi}>\phi^{*}$ then $\phi(\tau)>\phi^{*}$ then $y'\left(\phi\left(\tau\right)\right)<y'\left(\phi^{*}\right)=0$ and then, for any $0<\tau<1$, $\frac{\mathrm{d}\,\phi}{\mathrm{d}\,\sigma_{\eta,\omega}}\Big|_{\phi=\phi(\tau)}>0$. Therefore, $\frac{\mathrm{d}\,\tau}{\mathrm{d}\,\sigma_{\eta,\omega}}\Big|_{\phi=\phi(\tau)}>0$ for any $0<\tau<1$. If $\sigma_{\eta,\omega}>0$ and $\widehat{\phi}<\phi^{*}$ then $\phi(\tau)<\phi^{*}$ then $y'\left(\phi\left(\tau\right)\right)>y'\left(\phi^{*}\right)=0$ and then, for any $0<\tau<1$, $\frac{\mathrm{d}\,\phi}{\mathrm{d}\,\sigma_{\eta,\omega}}\Big|_{\phi=\phi(\tau)}<0$. Therefore, $\frac{\mathrm{d}\,\tau}{\mathrm{d}\,\sigma_{\eta,\omega}}\Big|_{\phi=\phi(\tau)}>0$ for any $0<\tau<1$.□

Proof of Proposition 8: If $\sigma_{\eta,\omega}=0$ and/or $\phi^{*}=\widehat{\phi}$ then, under Assumption 1, it follows

from Proposition 4 and Proposition 5 that $\phi^e = \phi^*$ and $\tau^e = \tau^*$. Both τ^* and ϕ^* do not depend on β (Proposition 1). Proposition 8 follows.□

Proof of Proposition 9: Differentiating (LG) and (CG), we obtain after a little of algebra

$$\left.\frac{\mathrm{d}\ \phi}{\mathrm{d}\ \beta}\right|_{\phi=\phi(\tau)} = \frac{\tau y'\left(\phi\left(\tau\right)\right)}{-\frac{\tau(1-\beta)}{1-\tau}\frac{\left[y'(\phi(\tau))\right]^2}{y(\phi(\tau))} + \left(1-\tau\beta\right)y''\left(\phi\left(\tau\right)\right) + \left(1-\tau\right)\sigma_{\eta,\omega}t''\left(\phi\left(\tau\right)\right)}$$

and

$$\left.\frac{\mathrm{d}\ \tau}{\mathrm{d}\ \beta}\right|_{\phi=\phi(\tau)} = -\tau\frac{y'\left(\phi\left(\tau\right)\right)}{y\left(\phi\left(\tau\right)\right)}\left.\frac{\mathrm{d}\ \phi}{\mathrm{d}\ \beta}\right|_{\phi=\phi(\tau)},$$

where $\phi\left(\tau\right)$ such that $H\left(\phi\left(\tau\right),\tau\right)=0$. From properties of functions y and t follows that $y''\left(\phi\left(\tau\right)\right)<0$ and $t''\left(\phi\left(\tau\right)\right)<0$. If $\sigma_{\eta,\omega}>0$ and $\widehat{\phi}>\phi^*$ then $\phi\left(\tau\right)>\phi^*$ then $y'\left(\phi\left(\tau\right)\right)<y'\left(\phi^*\right)=0$ and then, for any $0<\tau<1$, $\left.\frac{\mathrm{d}\ \phi}{\mathrm{d}\ \beta}\right|_{\phi=\phi(\tau)}>0$. Therefore, $\left.\frac{\mathrm{d}\ \tau}{\mathrm{d}\ \beta}\right|_{\phi=\phi(\tau)}>0$ for any $0<\tau<1$. If $\sigma_{\eta,\omega}>0$ and $\widehat{\phi}<\phi^*$ then $\phi\left(\tau\right)<\phi^*$ then $y'\left(\phi\left(\tau\right)\right)>y'\left(\phi^*\right)=0$ and then, for any $0<\tau<1$, $\left.\frac{\mathrm{d}\ \phi}{\mathrm{d}\ \beta}\right|_{\phi=\phi(\tau)}<0$. Therefore, $\left.\frac{\mathrm{d}\ \tau}{\mathrm{d}\ \beta}\right|_{\phi=\phi(\tau)}>0$ for any $0<\tau<1$.□

Proof of Proposition 10: If $\sigma_{\eta,\omega}=0$, and/or $\widehat{\phi}=\phi^*$ then ϕ solving equation (LG) is $\phi^e=\phi^*$ and it does not depend on A. If $\beta=1$ then the locus (LG) is $y'\left(\phi\right)+\sigma_{\eta,\varepsilon}t'\left(\phi\right)=0$ which does not depend on A or τ. Therefore, (ii) follows.

Differentiating (LG) and (CG), we obtain after a little of algebra

$$\left.\frac{\mathrm{d}\ \phi}{\mathrm{d}\ A}\right|_{\phi=\phi(\tau)} = -\frac{\left(1-\beta\right)}{1-\tau}\frac{y'\left(\phi\left(\tau\right)\right)}{\left(1-\tau\beta\right)y''\left(\phi\left(\tau\right)\right)+\left(1-\tau\right)\sigma_{\eta,\omega}t''\left(\phi\left(\tau\right)\right)}\left.\frac{\mathrm{d}\ \tau}{\mathrm{d}\ A}\right|_{\phi=\phi(\tau)}$$

and

$$\left.\frac{\mathrm{d}\ \tau}{\mathrm{d}\ A}\right|_{\phi=\phi(\tau)} = -\frac{\tau}{A}\frac{1}{1-\tau\frac{1-\beta}{1-\tau}\frac{\left[y'(\phi(\tau))\right]^2}{y(\phi(\tau))[(1-\tau\beta)y''(\phi(\tau))+(1-\tau)\sigma_{\eta,\omega}t''(\phi(\tau))]}},$$

where $\phi\left(\tau\right)$ such that $H\left(\phi\left(\tau\right),\tau\right)=0$. From properties of functions y and t follows that $y''\left(\phi\left(\tau\right)\right)<0$ and $t''\left(\phi\left(\tau\right)\right)<0$. Therefore $\left.\frac{\mathrm{d}\ \tau}{\mathrm{d}\ A}\right|_{\phi=\phi(\tau)}<0$ for all $0<\tau<1$. If $\sigma_{\eta,\omega}>0$ and $\widehat{\phi}>\phi^*$ then $\phi\left(\tau\right)>\phi^*$ then $y'\left(\phi\left(\tau\right)\right)<y'\left(\phi^*\right)=0$ and then, for any $0<\tau<1$, $\left.\frac{\mathrm{d}\ \phi}{\mathrm{d}\ A}\right|_{\phi=\phi(\tau)}>0$. If $\sigma_{\eta,\omega}>0$ and $\widehat{\phi}<\phi^*$ then $\phi\left(\tau\right)<\phi^*$ then $y'\left(\phi\left(\tau\right)\right)>y'\left(\phi^*\right)=0$ and then, for any $0<\tau<1$, $\left.\frac{\mathrm{d}\ \phi}{\mathrm{d}\ A}\right|_{\phi=\phi(\tau)}<0$.□

References

ACEMOGLU, D., and J.A. ROBINSON J. (2012), *Why Nations Fail: The Origins of Power, Prosperity, and Poverty*, Crown Publishers, New York.

ACEMOGLU, D., S. JOHNSON, and J.A. ROBINSON (2005), Institutions as the Fundamental Cause of Lon-Run Growth, *Handbook of Economic Growth*, Volume IA, Aghion Ph. and Durlauf S.N. (Eds.), Elsevier B.V.

ACEMOGLU, D., S. JOHNSON, and J.A. ROBINSON (2001), The Colonial Origins of Comparative Development: An Empirical Investigation, *American Economic Review* **91(5)**, 1369-1401.

BARELLI, P., and DE S. ABREU PESSÔA S. (2012), Rent-seeking and capital accumulation, *Economic Inquiry* **50 (2)**, 397-417.

BARSEGHYAN, L. (2008), Entry Costs and Cross-Country Differences in Productivity and Output, *Journal of Economic Growth* **13**, 145-167.

BESLEY, T., and M. GHATAK, (2010), Property rights and economic development, in *Handbook of Development Economics*, Volume 5, Rodnik D. and Rosenzweig M. (Eds.), Elsevier B.V. 4525-4595.

BOTERO, J., S. DJANKOV, R. LA PORTA, F. LOPEZ-DE-SILANES, and A. SHLEIFER (2004), The regulation of labor, *Quarterly Journal of Economics* **119 (3)**, 1339-1382.

BOUTON, L., M. GASSNER, and V. VERARDI (2008), Redistributing income under fiscal vertical imbalance, *European Journal of Political Economy* **24**, 317-328.

BROLLO, F., T. NANNICINI, R. PEROTTI, and G. TABELLINI (2013), The Political Resource Curse, *American Economic Review* **103(5)**, 1759-1796.

CAREAGA, M., and B.R. WEINGAST (2003), Fiscal federalism, good governance, and economic growth in Mexico, in Rodrik, Dani (Ed.), *Search of Prosperity: Analytic Narratives on Economic Growth*, Princeton University Press, Princeton.

DJANKOV, S., and R. RAMALHO (2009) Employment laws in developing countries, *Journal of Comparative Economics* **37**, 3-13.

DJANKOV, S., C. MCLIESH, and R. M. RAMALHO (2006), Regulation and growth, *Economics Letters* **92**, 395-401.

DJANKOV, S., R. LA PORTA, F. LOPEZ-DE-SILANES, and A. SHLEIFER (2002). The regulation of entry, *Quarterly Journal of Economics* **117**, 1-37.

FAN, C.S., C. LIN, and D. TREISMAN, (2009), Political decentralization and corruption: Evidence from around the world, *Journal of Public Economics* **83(1-2)**, 14-34.

FISMAN, R., and R. GATTI (2002), Decentralization and corruption: Evidence from U.S. federal transfer programs, *Public Choice* **113**, 25-35.

FREUND, C., and B. BOLAKY (2008), Trade, regulations, and income, *Journal of Development Economics* **87**, 309-321.

GADENNE, L. (2013), Tax Me, But Spend Wisely: Sources of Public Finance and Government Accountability, mimmeo, University College London, `https://sites.google.com/site/lgadenne/home/research`

GADENNE L., and M. SINGHAL (2013), Decentralization in Developing Countries, NBER Working Paper, 19402.

GÜELL, M., J.V. RODRíGUEZ-MORA, and CH.I. TELMER (2015), The Informational Content of Surnames, the Evolution of Intergenerational Mobility, and Assortative Mating , *Review of Economic Studies* **82(2)**, 693-735.

GÜELL, M., and J.V. RODRíGUEZ-MORA (2015), De los apellidos catalanes, avalaible On-line in `http://nadaesgratis.es/admin/de-los-apellidos-catalanes`.

HALL, R.E., and CH.I. JONES (1999), Why Do Some Countries Produce So Much More Output Per Worker Than Others?, *Quarterly Journal of Economics* **114(1)**, 83-116.

HENDERSON, V. (2000), The Effects of Urban Concentration on Economic Growth, NBER Working Paper W7503.

INMAN, R.P. (1988), Federal Assistance and Local Services in the United States: The Evolution of a New Federalist Fiscal Order, in Rosen, H. S. (ed.) *Fiscal Federalism: Quantitative Studies*, University of Chicago Press, Chicago.

JALILIAN, H., C. KIRKPATRICK, and D. PARKER (2007), The Impact of Regulation on Economic Growth in Developing Countries: A Cross-Country Analysis, *World Development* **35(1)**, 87-103.

KAUFMANN, D., A. KRAAY, and M. MASTRUZZI (2010). The Worldwide Governance Indicators : A Summary of Methodology, Data and Analytical Issues, World Bank Policy Research Working Paper 5430.

KLAPPERA, L., L. LAEVENA, and R. RAJANC (2006), Entry regulation as a barrier to entrepreneurship, *Journal of Financial Economics* **82**, 591-629.

KREDLER, M., and J. PIJOAN-MAS (2014a), Capitalismo extractivo: España frente al espejo de la OECD, avaliable in http://nadaesgratis.es/josep-pijoan-mas/.

KREDLER, M., and J. PIJOAN-MAS (2014b), Como se amasa una fortuna en España, avaliable in http://nadaesgratis.es/josep-pijoan-mas/.

LOAYZA, N., A.M. OVIEDO, and L. SERVÉN (2005), Regulation and macroeconomic performance,World Bank Policy Research Working Paper 3469.

MARCOS, F., and J. SANTALÓ (2010), Regulation, innovation and productivity, IE Business School Working Paper WP10-04.

MARCOS, F., J. SANTALÓ, and A. SÁNCHEZ-GRAELLS (2010), Measuring regulatory intensity by the Spanish regions 1978-2009, *Revista para el Análisis del Derecho* **4**, 1-39.

MAURO, P. (1995), Corruption and Growth, *Quarterly Journal of Economics* **110(3)**, 681-712.

MOLINAS, C. (2013), Qué hacer con España. Ed. Destino.

MURPHY, K.M., A. SHLEIFER, and R.W. VISHNY (1993), Why is rent-seeking so costly to growth?, *American Economic Review* **83**, 409-414.

OLSON, M. (2000), *Power And Prosperity: Outgrowing Communist And Capitalist Dictatorships*, Basic Books.

PIGOU, A.C. (1932) *The Economics of Welfare*, London: Macmillan and Co.

POSNER, R.A. (1975), The Social Cost of Monopoly and Regulation, *Journal of Political Economy* **83**, 807-827.

RODDEN, J. (2004), Comparative Federalism and Decentralization: On Meaning and Measurement, *Comparative Politics* **36(4)**, 481-500.

SHLEIFER, A. (1997), Government in Transition, *European Economic Review* **41**, 385-410.

SUBNATIONAL DOING BUSINESS (2015), Doing Business in Spain 2015, The World Bank, avaliable On-line.

TULLOCK, G. (1967), The Welfare Costs of Tariffs, Monopolies and Theft, *Western Economic Journal* **5**, 224-232.

VELASCO, A. (2000), Debts and Deficits with Fragmented Fiscal Policymaking, *Journal of Political Economy* **76**, 105-125.

WEINGAST, B.R., K.A. SHEPSLE, and C. JOHNSEN (1981), The political economy of benefits and costs: A neoclassical approach to distributive politics, *Journal of Political Economy* **89**, 642-664.

ZHURAVSKAYA, E. (2000), Incentives to provide local public goods: Fiscal federalism Russian style, *Journal of Public Economics* **76 (3)**, 337-368.