Political Polarization, Fiscal Decentralization, and Fiscal Efficiency

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Abstract

The literature on fiscal decentralization (FD) has been thriving, while its welfare implications under political diversity has not yet been explored formally in a satisfactory way. This paper attempts to fill this gap by presenting a formal model where, given a degree of FD, the central government chooses the general tax rate to maximize a weighted sum of local utilities and local governments choose their tax collection effort. The non-cooperative solution of the model reveals that while the tax rate increases with the extent of FD and political unison, local tax collection effort decreases in both. Regional spillovers have a negative effect on local tax collection efficiency and a positive effect on the optimal tax rate. We find that the central government utility peaks at a lower level of FD than the case with no spillovers, which lends support for the decentralization theorem. While the model indicates that polarization and income inequality have clear negative effects on welfare in case of spillovers.

Keywords: Fiscal decentralization; political polarization; fiscal efficiency

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1. Introduction

The literature on the welfare and efficiency effects of fiscal decentralization (FD) is vast, starting with Tiebout (1956) and further expanding after Oates's (1972) *decentralization theorem*. The main postulate of the literature is that local governments (LG) are in a better position to know and respond to the local preferences and, hence, they are more effective in deciding on the type and the size of public good provision than the central government (CG). This view is complemented with the argument that LGs can be more accountable for their decisions and more transparent in their actions than the CG, through which administrative transaction costs can be reduced. The more heterogeneous the society, the greater variation regional preferences tend to exhibit, providing greater justification for FD as an institutional mechanism to achieve fiscal efficiency.

Given local capacity constraints and the dependence on the central transfers[1], however, the central government tends to prioritize the use of its budget strategically, specifically with the objectives of redistribution towards its constituency and/or to maximize its re-electability. Empirical evidence supports that the electoral incentives are indeed systematically related to distributive choices.[2] Since ideology or political priorities play a central role in prioritizing the areas of public spending, political proximity of a locality to the central administration may affect notably the flow of transfers it receives. Well-designed, transparent transfer mechanisms are therefore crucial for eliminating the discretionary and political aspects of the redistributive policies.[3]

Besides fiscal rules, the nature of the electoral system, legislation and party structures may play a role on the effectiveness of FD in delivering fiscal efficiency (see, for example, Inman and Rubinfeld, 1997 and Besley and Coate, 2003). These factors also define the environment within which, interactive with various other structural and economic factors, the extent of FD is determined.[4] O'Neill (2003) argues that the adoption of FD is linked

[1]The indicators of fiscal decentralization of the World Bank demonstrate that central transfers constitute a sizable share of local government resources even in developed countries.

[2]See, for example, Dellmuth and Stoffel (2012), who provide relevant evidence for the use of European structural funds in Germany. See also Inman and Rubinfeld (1996), Khemani (2007) and Sato (2007) for a broader discussion of the political economy of intergovernmental transfers.

[3]Ma (1997) discusses the types of fiscal transfer rules. In a cross-sectional study, Neyapti (2013) shows that fiscal rules have significant effects on the fiscal disciplining impact of FD.

[4]North and Weingast (1989) conjecture decentralization as an institutional mechanism to constrain the fiscal policies of the opposition in case the incumbent party faces a high probability of losing the elections.

with optimizing the political power via securing higher political support in sub-national elections.[5] Studies that investigate the relationship between such political factors and the outcomes of FD have failed to reveal a significant relationship, however (see, for example, Eaton, 2001).[6] By contrast, the positive association of both democracy and governance quality with the desired outcomes of FD has been well-reported in the literature.[7]

The political economy literature challenges the decentralization theorem by asking whether the theorem survives after relaxing the assumptions of benevolence of the government and the uniformity of the public good provision under centralization. Besley and Coate (2003) argue that, when regional and central governments bargain for delegation, centralization does not necessarily imply uniformity of public good provision; they show that centralization can welfare dominate FD even when regions are heterogeneous and there are no spillovers. Lockwood (2008) argues that the decentralization theorem fails only when the benevolence assumption is replaced by direct democracy or majority voting; decentralization can be welfare-dominating even when regions are homogeneous and there are positive externalities. Gonzalez et al. (2006) argue that the welfare effects (measured by the extent of political business cycles) of FD, vis-à-vis centralization, depends on the extent of the political rents of the central government in a majority voting model. Janeba and Wilson (2011) argue that optimal fiscal decentralization is affected by tax competition and spillovers.

The current paper investigates the welfare implications of the optimal tax choice of a central government that faces a given level of FD and regions that are heterogeneous in their income levels and political views.[8] The framework differs from the foregoing models first in that it is not a voting model. Second, rather than comparing the centralized versus decentralized fiscal regimes, we consider that FD can take any value along the continuum between zero and one. The third feature that differs from the earlier studies is that while we assume uniform local preferences, their weights in the central government's utility function are measured by local governments' political proximity (p) to the central

[5] In federal states, the allocation of power is specified in constitution whose amendment may require either regional votes or referendum.

[6] Smoke, Gómez, and Peterson (2006) point at the important role of a combined public finance, public policy and political science approaches to assess the potential benefits of FD from a historical perspective.

[7] See, for example, Stepan (1999), De Mello and Barenstein (2001), Arzaghi and Henderson (2005), Kyriacou and Roca-Sagalés (2011) and Altunbaş and Thornton (2012).

[8] As in Besley and Coate (2003) and Lockwood (2008), the centrally determined tax rate is uniform across the economy.

government.

The primitives of the current model borrows from Aslim and Neyapti (2017, AN henceforth).[9] As different from AN, however, the central government in the current model chooses the optimal level of general tax rate (t), facing an exogenously given level of ϕ.[10] As in AN, local governments choose optimally their local tax collection effort, and the solution of the model implies that t is positively related with ϕ, while it is negatively related with the local tax collection effort.[11] Our model yields the following novel findings. First, t increases in political unison, or cohesion, defined as the sum of p's (P) across the regions. It is also observed that the negative effect of ϕ on tax collection efficiency increases in both ϕ and P. Simulations reveal that tax revenue is positively affected by P, while it peaks at an intermediate level of ϕ. Therefore, the higher is P the more likely it is to observe tax rates increasing as ϕ approaches to one. We also observe that both income distribution and politically weighted utility of the central government implied by the model peak at some intermediate level of ϕ. These findings conform to the *decentralization Laffer-curve* of AN and the consensus arising in the recent fiscal decentralization literature.

As an extension, we solve the model with spillovers in a leader-follower framework, where the leader is the representative LG. Spillovers decrease the optimal tax collection effort and increase the optimal tax rate, with an ambiguous effect on the tax revenues. We observe that the optimal level of ϕ is lower for the central government with spillovers than without, yielding support for the decentralization theorem . We also observe that welfare, measured by representative local utility, declines with increased polarization and income inequality. In what follows, Section 2 presents the model and its solution. Section 3 presents the comparative statics results, simulations and an extension for the case of spillover effects. Section 4 provides some evidence on the model's findings and Section 5 concludes.

[9] In a static non-strategic game framework, AN investigate the welfare effects of a benevolent central government's choice of the optimal degree of FD (ϕ), facing a representative local government that chooses optimally the local tax collection effort. The solution of the model indicates that the highest level of welfare obtains at some intermediate, rather than extreme, levels of ϕ; they call this result as *decentralization Laffer-curve*. AN also note that in case of regional spillovers, income distribution improves monotonically as ϕ decreases, yielding support for the decentralization theorem.

[10] Note that choosing the tax rate is tantamount to choosing the share of local transfers from a central pool of revenues.

[11] In this setup, the optimal choice of ϕ by the central government is trivial because, when the central government is politically oriented, it is optimal to centralize all the public good provision; hence, the optimal ϕ is zero.

2. The Model

We consider the optimal choices of the central and local governments that face a common level of FD. The economy is closed, the private sector is the passive agent, information is symmetric across the agents and the model is static, where the incomes of each region (Y_i) are given. The benchmark model assumes that there are no spillovers, which we relax later. Total spending in region i, which is denoted by $\tilde{Y}_i$,[12] is the sum of the private (C_i) and the public sector spending. Public sector consists of the local and the central government spending, denoted by G_i^L and G_i^C, which can be considered as the level of local and pure public good provisions, respectively.

$$\tilde{Y}_i = C_i + G_i^L + G_i^C \tag{1}$$

where

$$C_i = (1 - [a_i\phi + (1-\phi)]t)Y_i; G_i^L = \phi a_i t Y_i; \text{ and } G_i^C = (1-\phi)t\hat{p}_i \sum_i Y_i \tag{2}$$

for all i ($i = 1, \ldots, n$). The first expression in Equation (2) shows private consumption as the after tax income, where tax is paid to either the local government (by $a_i\phi t Y_i$) or to the center (by $(1-\phi)tY_i$), and t ($t \in [0,1]$) is the tax rate set by the central government.

The second expression in Equation (2) shows that the local government is assumed to follow a balanced budget rule. Local government spending (G_i^L) is a fraction of the local tax revenue ($a_i t Y_i$), where the fraction is determined by the extent of fiscal decentralization: $\phi \in [0,\ 1]$. When $\phi = 1$, all of the tax revenue is collected and, hence, all the public expenditure is made by the local governments. When $\phi = 0$, on the other hand, the central government is the sole public spending and revenue collection entity. The *effective tax rate* for region i (t_i) is given by:

$$t_i = [a_i\phi + (1-\phi)]t \tag{3}$$

where $t_i \in [0,1]$, and a_i is the relative tax collection effort, or capacity, of local government

[12] Total spending ($\tilde{Y}_i$) differs from income (Y_i) by the amount of transfers made by the central government. However, for the whole economy, $\sum_i \tilde{Y}_i = \sum_i Y_i$, since the overall government budget balances.

i vis-à-vis the central government. The upper bound of a_i can be less or greater than one as it is measured relative to the tax collection effort of the central government. a_i may exceed one when the local people cooperates more with the local government than the central government in the provision of the local public good. Conversely, it can be less than one in case of a common pool or moral hazard problem or simply lack of local capacity.[13]

While the above features of the model is directly taken from AN, the main departure from the AN model is in regard to G_i^C, given by the last expression in Equation (2). Equation (2) indicates that the central government (CG) spending in locality i is $\hat{p}_i$ share of the total tax revenue pool, where $\hat{p}_i = (p_i / \sum_i p_i)$ and $p_i \in [0, 1]$ represents the proximity of region i to central government's political ideology.[14] Because the total of p_i's need not add up to one, in order for the central government budget to hold, each regions share of the central pool of revenues is weighted by $\sum_i p_i$ so that $\sum_i \hat{p}_i = 1$. Hence, total central government spending is as follows:

$$G^C = \sum G_i^C = (1 - \phi)t \sum_i Y_i. \tag{4}$$

In the extreme case of a non-ideological or purely benevolent government, p_i's are identical across the regions and $\sum_i p_i = n$; in that case central spending in each region is an equal share of the revenue pool: $G_i^C = (1 - \phi)\frac{t}{n} \sum_i Y_i$.[15]

Thus, G_i^C and G_i^L differ in two respects: in the extent of political proximity between CG and LG$_i$, and in tax collection ability of LG$_i$ relative to the center. The total tax revenue is given by the expression:

$$T = t \sum_i (a_i \phi + (1 - \phi))Y_i, \tag{5}$$

which is also equivalent to total government spending, G, where $G = \sum_i G_i^L + G^C$. Hence, the overall government budget constraint holds, so do the central and the local governments'.

[13]Corruption has been widely investigated in the FD literature, both in country specific and cross-sectional studies. See, for example, De Mello (2000), Freinkman and Plekhanov (2009) and Treisman (2006).

[14]We assume that the citizens of a given locality are homogeneous.

[15]Note that as different from AN, we consider that CG delivers local, rather than pure, public good and hence $G^C \neq G_i^C$.

We hypothesize that, absent a strictly enforced and a fair transfer mechanism, the central government has an incentive to reallocate resources to those regions that are close to its own political ideology.[16] Considering that many countries indeed lack such a transfer mechanism, p_i is a key parameter to analyze the role of the redistributive effect of the relative political positions of the LGs. Net transfers to any region i is therefore given by the following expression between the initial income and after-tax incomes:

$$\left(\tilde{Y}_i - Y_i\right) = (1-\phi)t\frac{p_i}{\sum_i p_i}\left(\sum_i Y_i\right). \tag{6}$$

In what follows, we describe the optimization problems of LGs and the CG. The solution of the non-cooperative game, defined by the optimal values of a_i's and t, yields the Nash equilibrium.[17] We then present the comparative statics and explore the welfare and income distribution implications of the model.

2.1. A Representative Local Government's Problem

The problem of the LG is the same as in AN: the representative local government chooses the tax collection effort, which is composed of the private and public (local and central) spending in its own region. LG_i's utility gains from G_i^L and G_i^C are identical since we assume that the LGs do not distinguish between the local and pure public good. Even though they are treated differently, open-ended central transfers to local governments justifies this assumption. The local government is assumed to maximize a log-linear utility function:

$$\max_{a_i} \; U_i^{LG} = \alpha \ln C_i + \beta \ln G_i^L + \beta \ln G_i^C \tag{7}$$

[16] Neyapti (2013) provides empirical evidence that fiscal rules, such as balanced budget rules, improve efficiency of FD.

[17] We also explore the solution to a non-cooperative game between the three agents: local governments, the central government and a social planner (SP), which has a similar problem as the central government above except with p_i=1/2. This scenario is based on the joint solution of the local and central government problems, which, however, fails to yield a solution. That is, there is no common set of parameters that satisfies the set of optimal solutions for the general tax rate, the level of fiscal decentralization and the level of local public good provision (or local tax collection effort). The problem of SP and LG, on the other hand, is separately analyzed in AN.

subject to the constraints given in Equations (2) and (3). Hence, the unconstrained problem becomes:

$$\max_{a_i} \; U_i^{LG} = \alpha \ln((1-t_i)Y_i) + \beta \ln(\phi a_i t Y_i) + \beta \ln((1-\phi)t\hat{p}_i \sum_i Y_i) \tag{8}$$

The first order condition of the problem is:

$$a_i = \left(\frac{\beta}{\alpha+\beta}\right)\frac{1-t+\phi t}{\phi t} \tag{9}$$

2.2. Central Government's Problem

The central government chooses t to maximize the aggregate utility across the regions, given a level of ϕ.[18] The objective function of the central government differs from a sum of the LG's objective function by the relative utility weights on G_i^L's:

$$\max_{t} \; U_i^{CG} = \sum_i \left(\alpha \ln C_i + p_i \beta \ln G_i^L + \beta \ln G_i^C\right) \tag{10}$$

subject to the constraints given in Equations (2) and (3). Hence, the problem becomes:

$$\max_{t} \; U_i^{CG} = \sum_i \left(\alpha \ln((1-t_i)Y_i) + p_i \beta \ln(\phi a_i t Y_i) + \beta \ln((1-\phi)t\hat{p}_i \sum_i Y_i)\right) \tag{11}$$

The following first order condition is obtained for each i, assuming $i \in \{1, 2\}$:

$$\alpha\left(\frac{\phi(1-a_1)-1}{(1-t\phi a_1)-t(1-\phi)} + \frac{\phi(1-a_2)-1}{(1-t\phi a_2)-t(1-\phi)}\right) + \beta\left(\frac{p_1+p_2+2}{t}\right) = 0 \tag{12}$$

Using symmetry, and defining *political unison* as $P = p_1 + p_2$, we find:

$$t = \frac{\beta(P+2)}{(1-\phi(1-a_i))(2\alpha+\beta(P+2))} \tag{13}$$

Equations (9) and (13) stand for the best responses of the LG and the CG, respectively, to the other player's action.

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[18] The inclusion of p_i is similar to Lockwood (2008) inclusion of special interest groups in the utility function.

Lemma 1. The joint solution of Equations (9) and (13) for $i \in \{1, 2\}$ yields the following solutions:

$$t^* = \frac{\beta P}{(1-\phi)(2(\alpha+\beta)+\beta P)}; \text{ and } a_i^* = \frac{2(1-\phi)}{\phi P}. \tag{14}$$

Using Equation (3) and the optimal a_i and t expressions in Equation (14), we obtain: $t_i = \beta(P+2)/(2(\alpha+\beta)+\beta P)$.

For a given of set of feasible values $\{\alpha, \beta, \phi, P\}$, the above solutions yield a set of single values for $\{t^*, a_i^*\}$, with the following exception.[19] For $a_i^* = 0$, Equation (13) implies a feasible set of t^* values corresponding to: $0 < \phi < (2\alpha/(2\alpha + \beta(P + 2)))$. However, $a_i^* = 0$ also implies that $\phi = 1$, the case of full decentralization, which is not feasible as it implies, combined with $a_i^* = 0$, that $T = 0$; that is zero tax collection and thus zero public good provision. Hence, we conclude that corner solutions are not feasible and thus the joint solution of the problem shown by Lemma 1 exists and is unique.

3. Comparative Statics

In this section we investigate how the underlying model parameters $\{\alpha, \beta, \phi,$ and P (or p_i) $\}$ affect the optimal choices of the central and local governments. Table 1 presents the signs of the partial derivatives of the optimal solutions given in Equation (14).

Table 1: Signs of the Partial Derivatives
(see Appendix 1 for the proof)

	t^*	a_i^*
ϕ	+	-
p_i	+	-
α	-	0
β	+	0

[19] Both reaction functions are negatively sloped. Hence, the uniqueness of the optimal solutions hinges on the absence of corner solutions. Equation (9) rules out the possibility that $t = 0$ as it makes a_i undefined.

Table 1 shows that ϕ affects t^* positively, but a_i^* negatively. The first of these can be explained by need of the government to compensate for the second effect; t^* increases as ϕ increases in order to compensate for the negative effect of a reduction in a_i^* on the tax revenue. Hence, an increase in ϕ increases the utility from G_i^L and G_i^C, compensating for the loss in the utility resulting from reduced disposable income of the private sector, and thus in C_i.

Proposition 1. An increase in ϕ leads to a decrease in a_i^*, but an increase in t^*.

Corollary 1. The negative response of a_i^* to ϕ increases in both ϕ and P.

In view of these opposing effects, the net impact of ϕ on the tax revenue, when evaluated based on the optimal values of t and a_i, are ambiguous. The sign of this effect is therefore investigated via simulations in the next section.

Table 1 also indicates that political proximity, p_i, has a negative effect on a_i^*, and a positive effect on t^*; the same results hold for political unison (P). These opposing effects can be explained as follows. Ceteris paribus, the central government derives higher utility from G_i^L the higher is pi (see Equation (10)), which compensates for the utility loss arising from a decrease in C_i that arises in response to an increase in t^*. C_i also falls in a_i that is reduced by the local government that receives higher transfers as p_i increases, which increases its utility as well (see Equation (7)). Intuitively, this also means that CG is willing to accept a greater degree of crowding out of the local private spending the greater is p_i. The net effect of P on the effective tax rate and total tax revenue, however, are ambiguous and will be explored via simulation analysis.

Proposition 2. The greater is p_i (or P), the higher is t^*, and the lower is a_i^*.

We also observe that increasing p_i (or P) increases the negative relationship between ϕ and a_i^*.

Corollary 2. The negative response of a_i^* to ϕ increases in p_i (or P).

Thus, it would be optimal for a central government facing a greater degree of political unison to tax more. Since the response is the reduction in a_i^*, however, the net effect of p_i on the effective tax rate t_i, or the tax revenue (T) is ambiguous. Hence, we further explore and comment on this effect via simulation analysis also.

Table 1 also shows that the optimal tax rate is positively related with the utility share of the public good (β), and negatively with that of the private good (α). The explanation is straightforward from the utility of the central government (U^{CG}) that increases in t^*, the higher the utility share of the public spending and the lower is the share of private spending.[20]

Proposition 3. t^* increases in β, but decreases in α.

The results are the same in nature when t is replaced with T; the higher the utility share of the public good, the higher is the tax revenue.

3.1. Simulations

The above comparative statics leave the effects of the model parameters on the effective tax rate, tax revenue and the rest of the model aggregates ambiguous. In this section, we investigate how $\{\tilde{Y_1}/\tilde{Y_2}, t_i, T, U^{LG}$ and $U^{CG}\}$ respond to the changes in the model parameters: $\{\phi, P, \alpha$ and $\beta\}$, where $\tilde{Y_1}/\tilde{Y_2}$ denotes the income distribution and U^{LG} denotes the utility of the local government. To obtain data on income distribution, we fix Y_1 arbitrarily and define Y_2 as its multiple, denoted by x. Thus, assuming $x \in [0.1, 5]$, we let the income level of region 1 to be as small as the one-tenth or as large as five times that of the region 2. As reported in Table 2, we simulate the optimal solutions for the feasible ranges of the underlying model parameters, given the constraints: $\{\phi, p_i, \alpha, \beta\} \in [0, 1]$; and the feasibility constraints for the optimal t: $t^* \in [0, 1]$ and for the remaining endogenous variables: $\{a_i^*, t_i, a_i^* t^*, C_i, G, G_i^C, G_i^L, Y_i, \tilde{Y_i}\} \in \mathbb{R}_+$, for all i. The dataset we thus obtain using the Matlab software is composed of 410,310 observations. Based on this dataset, we make the following additional observations (see Appendix 2).

[20]While a_i^* does not have a direct relationship with α and β, simulations show that total tax collection effort increases in α and decreases in β strictly (not shown, the results are available from the author upon request).

Table 2: Calibration of the Parameters

Parameter	Range	Increment
x	[0.1, 5]	0.5
ϕ	[0.1, 1]	0.1
α	[0.1, 1]	0.1
β	[0.1, 1]	0.1
p_i	[0.1, 1]	0.1

Based on the simulation data, we first observe that the tax revenue (T) shows a positive trend in the t^* as expected; due to the utility maximization rate of tax, we only observe the rising portion of the traditional Laffer curve (see Figure 1.a).

Remark 1. T increases in t^*.

On the other hand, T first increases and then decreases in ϕ. More precisely, t^* increases in ϕ for $\phi \lesssim 0.5$ so much as to overcompensate for the reduced tax collection effort. For $\phi \gtrsim 0.5$, however, the reduction in a_i^* dominates the increase in t^*. This observation lends a strong support to the decentralization Laffer-curve relationship proposed in AN. Figures 1.b and 1.c also demonstrate that U^{LG} (also U^{CG} which is not shown)[21] and $(\tilde{Y}_1/\tilde{Y}_2)$ all depict a similar relationship with ϕ as T does. These results also conform to the recent consensus in the fiscal decentralization literature: the extreme values of ϕ do not contribute to fiscal efficiency and welfare.

Remark 2. Tax revenue depicts a decentralization Laffer-curve relationship.

Next, we turn to the relationship of political unison (P) and the endogenous variables of the model. Simulations reveal that neither t_i nor total tax revenue show a direct relationship with P (or p_i) (see Figure 2). This observation is in lines of Proposition 2.

Remark 3. *T increases in P, despite a decrease in fiscal efficiency (i.e. an increase in t^*, overcompensating a decrease in a_i^*).*

Note that *political unison* and *political polarization* (denoted by σ_P)[22] are not entirely opposite concepts; rather, there is a double-peaked hump-shaped relationship between

[21]We consider that a representative U^{LG} better represents welfare than U^{CG} since the latter is politically weighted.

[22]The empirical literature suggests that *polarization* is more relevant for macroeconomic outcomes than *fractionalization*.

them when σ_P is measured as $(p_1 - p_2)^2$.[23] We consider P as a measure of political cohesion, or, the degree to which the society's political choices, on the aggregate, is in accord with that of the central government. The variable σ_P, on the other hand, measures the degree to which the local governments are diverted from each other with respect to their political views. Hence, for example, for $p_1 = p_2 = 0.5$; P is one but σ_P is zero; for $p_1 = p_2 = 0.7$, P is 1.4 but σ_P is still 0. On the other hand, for $p_1 = 0.1$ and $p_2 = 0.9$, P is still 1 but σ_P is 0.81. We therefore investigate the relationship between σ_P and the model's endogenous variables next.

Simulations reveal that in contrast to P, there is a negative relationship between σ_P and T (Figure 3.a). Similar to P, however, there is no clear relationship between σ_P and the effective tax rate (Figure 3.b). Hence, it is clear that the negative relationship between σ_P and tax collection effort (Figure 3.c) leads to the result observed for T. These findings indicate that it is more difficult for a central government to perform its redistributive role when the society is more polarized.

Remark 4. Both T and fiscal efficiency decrease in σ_P.

Given the opposing implications of P and σ_P on fiscal efficiency reported above, we next explore the welfare and distributional effects of these exogenous factors within the current model. We observe that income distribution worsens as P increases for $P < 1$, but improves as P increases for $P > 1$; the greater is political cohesion the better is income distribution for $P > 1$ (see Figure 4.a). On the other hand, income distribution denoted by $\tilde{Y_1}/\tilde{Y_2}$ worsens monotonically as σ_P increases (see Figure 4.b).

Remark 5. $\tilde{Y_1}/\tilde{Y_2}$ increases in σ_P but falls for high levels of P.

We next look at the effects of P and σ_P on the local and the central government's utilities as these relations are not clear at the onset. While the simulation results do not yield clear-cut results either, we observe that U^{CG} tends to increase in P and decrease in σ_P. (see Figures 5.a and 5.b). On the other hand, there is no clear effect of both P and σ_P on the utility of the local governments (not shown).

Figures 6.a and 6.b shows the simulation results with regard to the $\tilde{Y_1}/\tilde{Y_2}$ and utility relationships. We observe that while U^{CG} peaks at a level of $\tilde{Y_1}/\tilde{Y_2}$ and then falls as it increases, U^{LG} does not show this relationship (see Figures 6.a and 6.b). This may

[23] The upper bounds of σ_P and P are equal to 1 and 2, respectively, in the simulations for $i \in \{1, 2\}$.

indicate that, despite its political orientation, an optimizing central government cares about equitable income distribution. This is supported by the next observation that the total tax collection effort falls at high levels of $\tilde{Y_1}/\tilde{Y_2}$ (Figure 7.a). Tax revenues, on the other hand, show a continuous increase as income distribution improves (Figure 7.b).

Remark 6. There is a threshold level of $\tilde{Y_1}/\tilde{Y_2}$ where both T and U^{CG} peaks at and declines thereafter.

3.2. Introducing Spillovers Across Regions

This section investigates how spillovers of local public goods across the regions alter the findings of the benchmark model. We consider two scenarios for the joint solution of the LG and CG problems. In the first, the LGs and the CG engage in a non-cooperative strategic game, and in the second, they play a leader-follower duopoly game. In the first scenario, we explore two cases: in the case of asymmetric information, where only the LG's are fully informed about the extent of the spillovers (s_i) and the CG assumes the s_i's to be zero, the problem remains the same as in the benchmark model. In the case of full information, however, the optimal solution to the simultaneous-move game does not yield any feasible solution for t.

As a second scenario, we consider that LG takes the reaction function of CG to choose a_i optimally. The LGs' objective function with spillover effects is given by:

$$\max_{a_i} \; U^{LG}_{i,spillover} = \alpha lnC_i + \beta \left(lnG^L_i + s_i \left[lnG^L_j + lnG^C_j \right] \right) + \beta lnG^C_i \, , \tag{15}$$

where $i, j = 1, \ldots, n$ and $s_i \in [-1, 1]$ stands for the degree of spillover on region i of the total public spending in region j. Assuming full information about the spillovers across the regions, the central government's problem becomes[24]:

$$\max_{a_i} \; U^{CG}_{i,spillover} = \sum_{i,j=1, i \neq j} \left(\alpha lnC_i + p_i \beta (lnG^L_i + s_i \left[lnG^L_j + lnG^C_j \right]) + \beta lnG^C_i \right) . \tag{16}$$

As in the benchmark model, both of the above problems are subject to the constraints given by Equations (2) and (3), and $n = 2$ is assumed for the simplicity of the solution.

[24]Not taking into account the spillovers from G^C across localities does not alter the optimal solutions.

The solution of the first order condition of the CG's problem, assuming symmetry across the regions, yields the following expression for t:

$$t = \frac{\beta \sum_i (p_i(1+2s_i)+1)}{(1+\phi(a_i-1))\,(2\alpha+\beta\sum_i(p_i(1+2s_i)+1))} \tag{17}$$

Substituting Equation (17) into Equation (15), the solution of the LG's problem yields:

$$a^*_{i,spillover} = \frac{1-\phi}{\phi(1+2s_i)} \tag{18}$$

Substituting $a^*_{i,spillover}$ back in Equation (17) yields:

$$t^*_{spillover} = \frac{\beta(1+2s_i)\sum_i(p_i(1+2s_i)+1)}{2(1-\phi)(1+s_i)(2\alpha+\beta\sum_i(p_i(1+2s_i)+1))} \tag{19}$$

The comparative statics is reported in Appendix 3 and summarized in Table 3, which matches with the signs summarized in Table 1, with the exception that p_i has no effect on $a^*_{i,spillover}$. This means that, unlike in the benchmark case, the response of $a^*_{i,spillover}$ is not affected by p_i and $t^*_{spillover}$ reflects all the adjustment to the changes in p_i so as to maximize U^{CG}. Consistently, U^{CG} increases as both T increases and income distribution improves, as in the benchmark case.

Two observations additional to those reported in Table 1 pertain to the effect of the regional spillovers; while $t^*_{spillover}$ responds positively to s_i, the sign of the effect is reversed for $a^*_{i,spillover}$. The interpretation of this is similar to the opposing effects of ϕ on a^*_i and t^* in the benchmark case: an increase in the spillovers induces the CG to increase the optimal tax rate in reaction to the reduced incentives it generates for LGs to exert effort to collect taxes. This implies that, ceteris paribus, the effects of spillovers on the effective tax rate, tax revenue and thus income distribution are not certain. Appendix 3 shows that both of these effects increase in ϕ, indicating that the higher is ϕ, the bigger is the opposing effects of the s_i on $a^*_{i,spillover}$ and $t^*_{spillover}$.

Table 3: Signs of the Partial Derivatives
(see Appendix 3 for the proof)

	$t^*_{spillover}$	$a^*_{i,spillover}$
ϕ	+	-
p_i (or P)	+	0
α	-	0
β	+	0
s_i	+	-

Proposition 4. The higher is s_i, the higher is $t^*_{spillover}$ and the lower is $a^*_{i,spillover}$.

We perform a simulation analysis to compare the rest of the model implications with those of the benchmark case.[25] As implied by the opposite signs for $t^*_{spillover}$ and $a^*_{i,spillover}$ in Table 3, the simulations show no direct relationship between the s_i's and T. Like T, U^{CG} does not portray a direct relationship with s_i, but we observe that, U^{LG} increases in s_i for $s_i > -0.2$.[26]

Next, we investigate the relationships between ϕ, the derived parameters of the model (P and σ_P) and the endogeneous variables. We report these results in Table 4 to facilitate a comparison with the benchmark case. It is notable that, in the case of spillovers, t_i shows an inverted-U shape relationship with ϕ, as does T in both cases. This indicates that up to some high level of ϕ (ϕ=0.8), the response of $t^*_{spillover}$ to ϕ dominates that of $a^*_{i,spillover}$; the same observation holds for T. We also observe a threshold level of ϕ ($\phi \cong 0.3$) at which U^{CG} peaks, although the similar relationship between ϕ with U^{LG} observed in the benchmark case disappears under spillovers. Hence, even though the welfare effect, based on U^{LG}, of ϕ becomes ambiguous, CG, as the agent who chooses institutions, has the incentive to set $\phi \cong 0.3$. It therefore appears to be no coincidence that the OECD average of the expenditure decentralization is exactly 0.3.[27]

[25] The size of the dataset obtained from the simulations is 2,220,173, which result from the addition of two spillover effects: $s_i \in [-1, 1]$, with the increments of 0.1, to the parameters reported in Table 2; in order to economize on the run-time, we increase the increments of α and β to 0.2.

[26] Figures based on the simulations of the model with spillovers are available form the authors upon request.

[27] Authors' calculations, based on the World Bank, "Fiscal Decentralization Indicators", `http://www1.worldbank.org/publicsector/decentralization/fiscalindicators.htm` .

Remark 7. In a model with regional spillovers, it is optimal for a politically-oriented CG to choose $\phi = 0.3$.

As for the relationship of $a^*_{i,spillover}$ and with $\tilde{Y}_1/\tilde{Y}_2$, we observe the reverse of the benchmark case; $a^*_{i,spillover}$ increases and decreases as $\tilde{Y}_1/\tilde{Y}_2$ increases (income distribution worsens). This reversal, we argue, is due to the opposite impacts of spillovers on $a^*_{i,spillover}$ and; as $\tilde{Y}_1/\tilde{Y}_2$ increases, the LGs have to increase $a^*_{i,spillover}$ that falls in s_i, in order to compensate for the decrease in U^{LG}, which starts falling for $\tilde{Y}_1/\tilde{Y}_2 > 1$. The implication of these for t_i remains and for T turns ambiguous.

We also observe that, as different from the ambiguous result in the benchmark case, both t_i and T increase in P, as consistent with Table 3 that reports that $t^*_{spillover}$ responds positively to P whereas $a^*_{i,spillover}$ does not react to it at all. In contrast to the benchmark case, T does not show a direct relationship with σ_P, however. Hence, we conclude that the presence of spillovers point at the important role of political cohesion for increasing the tax revenues.

Table 4: Comparing the Implications of the Benchmark Model to the Case of Spillovers

	a_i^*		t^*		t_i		T		U^{CG}		U^{LG}		$\tilde{Y}_1/\tilde{Y}_2$	
	$s_i = 0$	$s_i = 1$	$s_i = 0$	$s_i = 1$	$s_i = 0$	$s_i = 1$	$s_i = 0$	$s_i = 1$	$s_i = 0$	$s_i = 1$	$s_i = 0$	$s_i = 1$	$s_i = 0$	$s_i = 1$
P	-	0	+	0	?	+	?	+	+	+	Inv-U	Inv-U	Inv-U	?
σ_P	-	0	+	0	?	?	-	?	-	Inv-U	+	-	+	?
ϕ	-	-	+	+	0	Inv-U	Inv-U	Inv-U	Inv-U	Inv-U	Inv-U	?	Inv-U	?
$\tilde{Y}_1/\tilde{Y}_2$	-	+	+	-	?	?	+	?	Inv-U	Inv-U	?	Inv-U	...	...

We next observe that spillovers render the negative relationship between U^{CG} and σ_P observed in the benchmark case into one of an inverted-U relationship, indicating that a politically oriented CG benefits from polarization up to some level, $\sigma_P = 0.5$ to be specific. On the other hand, in contrast to the benchmark case, U^{LG} is observed to decline in σ_P and its inverted-U relation with P remains as before. We therefore consider that it is reasonable to focus on the representative U^{LG} for the welfare implications of the model. We observe that U^{LG}, thus welfare, reaches its highest level at full income equality. We also observe that the links between both P and σ_P and income distribution observed in the benchmark case become ambiguous under spillovers.

Remark 8. A politically oriented CG benefits from σ_P up to an intermediate level.

Taking stock of the above findings, we argue that, in lines with the consensus emerging in the literature, it is clear that the welfare effects of FD vary greatly with respect to the structural factors such as political factors and spillover effects. Considering that political orientation affects the policy makers' decision making and regional spillovers are a reality, the essence of our model's implications can be summarized as follows. First, the effective tax rate, fiscal efficiency and redistributable resources clearly increase with political unison. While welfare and income distribution do not portray a clear relationship with FD, the central government utility are observed to improve at an intermediate, rather than at extreme values of FD, which is consistent with the observed level of FD in developed countries.

4. Empirical Evidence

This section examines the empirical evidence on some of the relationships implied by the foregoing model. Given the difficulties in obtaining the data on the general tax rate (t), local tax collection effort (a_i) and political unison, we focus on testing of the implications that concern the relationships among the remaining model variables; particularly, political polarization, FD, tax revenue and income distribution. We specifically explore the following implications of the benchmark model: i) tax revenue and FD (Remark 2) depicts an inverse-U relationship and; ii) income inequality and polarization are positively related (Remark 4).

We employ a graphical analysis to test these relationships. Our panel data set comprises the following measures of the above variables for a cross-section of countries since the 1980s, where the data is available. For the degree of fiscal decentralization, we utilize the expenditure decentralization figures, expressed as subnational government shares; the source is the Fiscal Decentralization Indicators dataset of the World Bank. As a proxy for political polarization, we use the ethnolinguistic and religious fractionalization and polarization measures constructed by Montalvo and Reynal-Querol (2005). We use the GINI figures, to measure income distribution, and tax revenues as percentege of GDP, both of which we obtain from the WDI dataset of the World Bank. Figures 8 and 9 in Appendix 4 are based on this data.

Figure 8 shows a strong support for Remark 2 that is based on the simulation results shown in Figure 1.b, as well as those coming from the simulations of the model's extension with spillovers. The figure demonstrating that the size of tax revenues, relative to GDP, first increases and then declines in FD. The graph has only one outlier: Israel over about ten years available in the 1970s and 1980s. The resemblance of Figure 8 to Figure 1.b is otherwise remarkable and compelling about the novelty of the current model's predictions, as well as the decentralization Laffer-curve that is quoted initially in AN.

The evidence summarized in Figure 9 (Appendix 4) also provides strong support for the model's implication shown by Figure 4.b and reported as Remark 5. Besides confirming the positive relationship between income inequality and ethnolinguistic polarization, we make the following additional observations. First, the evidence clearly shows that as polarization increases, the rate at which income distribution worsens appears to be diminishing. Secondly, we observe that the relationship between GINI and ethnolinguistic fractionalization, rather than polarization, appears to show and inverted-U relationship, conforming to the literature that argues that polarization rather than fractionalization has harmful welfare effects. We obtain similar pictures when we use the measures of religious polarization and fractionalization instead of the ethnolinguistic dimension, which we therefore do not report.

5. Conclusions

We consider a heterogeneous society to investigate formally the impact of the extent of fiscal decentralization (FD) on the optimal choice of the tax rate by the central government and the optimal tax collection effort by the local governments. Heterogeneity is introduced in the form of local income levels and political proximity to the central government. The solution of the strategic non-cooperatively game between the local and central governments reveals that optimal tax collection effort and optimal tax rate are negatively related with each other. They are also affected by fiscal decentralization in the opposite ways: while the first responds negatively to FD, the latter responds positively to it. The model reveals that the tax revenue depicts an inverted-U relationship with FD, indicating that its effect on optimal tax rate dominates that on optimal tax effort up to an intermediate level of FD and the reverse dominates thereafter. The decentralization Laffer-curve, in the terms of Aslim and Neyapti (2017), is also supported by the simulations of the model, by showing that both tax revenues and income distribution shows a non-linear relationship to FD. The empirical evidence we present here also supports this finding. The extension of the model reveals that spillovers increase the tax rate but reduce the tax collection efficiency, which supports the decentralization theorem,.

To repraise, we demonstrate formally that when the local and the central governments act strategically, increasing FD does not lead to efficiency gains monotonically. Rather, political unison, polarization and spillovers affect the effectiveness of FD. Given that the CG is politically oriented and benefits from some intermediate degree of polarization in case of spillover effects, we focus on a representative LG's utility, which falls in polarization, as measure welfare by in the current model. In view of this, the current paper demonstrates that welfare improves in income equality. As the recent literature points out, transfer rules that target equality is necessary to increase welfare effects of FD.[28] The findings of the current study indicate that these institutions are more important in countries where polarization is higher.

[28]See, for example, Akin, Bulut-Cevik, and Neyapti (2015), and Neyapti and Bulut-Cevik (2014) for the role of transfer rules and equalization target on the efficiency effects of FD. Shah (2006), Budina et al. (2012) and Neyapti (2013) are examples of the studies that emphasize the role of the fiscal rules.

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Appendix

Appendix 1: Comparative Statics

First order derivatives:

$$\frac{\partial t^*}{\partial p_i} = \frac{2\beta(\alpha+\beta)}{(1-\phi)(2(\alpha+\beta)+\beta P)^2} > 0; \ \frac{\partial t^*}{\partial \phi} = \frac{\beta(p_1+p_2)}{(\phi-1)^2(2(\alpha+\beta)+\beta P)} > 0$$

$$\frac{\partial t^*}{\partial \alpha} = \frac{2\beta(p_1+p_2)}{(\phi-1)(2(\alpha+\beta)+\beta P)^2} < 0; \ \frac{\partial t^*}{\partial \beta} = \frac{2\alpha(p_1+p_2)}{(1-\phi)(2(\alpha+\beta)+\beta P)^2} > 0$$

$$\frac{\partial a_i^*}{\partial \phi} = -\frac{2}{\phi^2 P} < 0; \ \frac{\partial a_i^*}{\partial p_i} = \frac{2(\phi-1)}{\phi P^2} < 0$$

Second order derivatives:

$$\frac{\partial^2 a_i^*}{\partial \phi^2} = \frac{4}{\phi^3 P} > 0; \ \frac{\partial^2 a_i^*}{\partial \phi \partial P} = \frac{2}{\phi^2 P^2} > 0; \ \frac{\partial^2 a_i^*}{\partial P^2} = \frac{4(1-\phi)}{\phi P^3} > 0$$

Appendix 2: Simulation Results

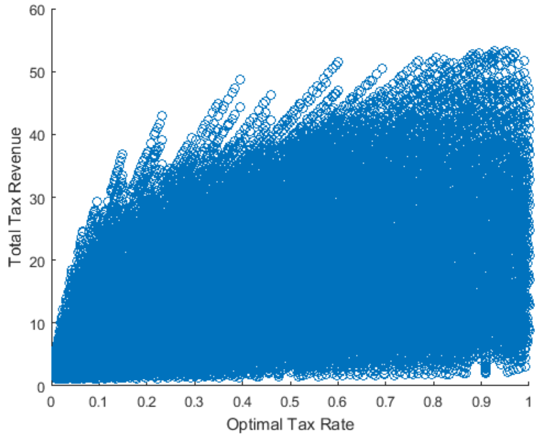


Figure 1.a: Total Tax Revenue and Optimal Tax Rate

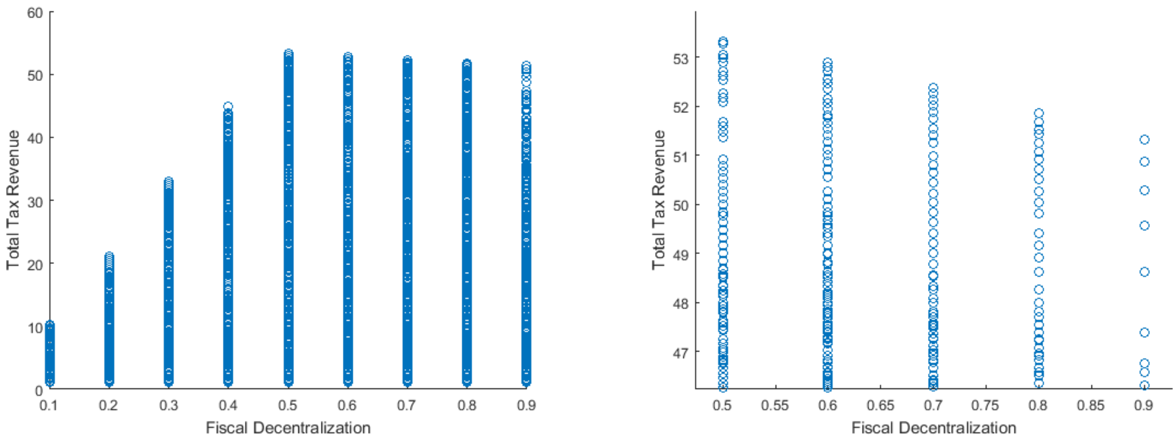


Figure 1.b: Total Tax Revenue and Fiscal Decentralization

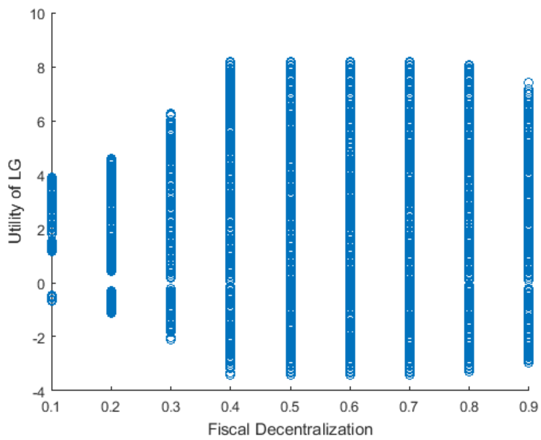


Figure 1.c: Utility of LG and Fiscal Decentralization

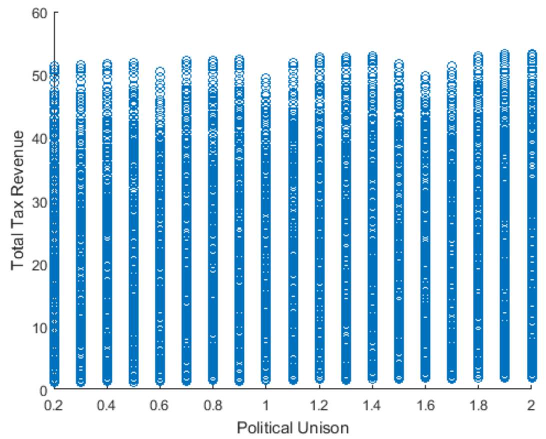
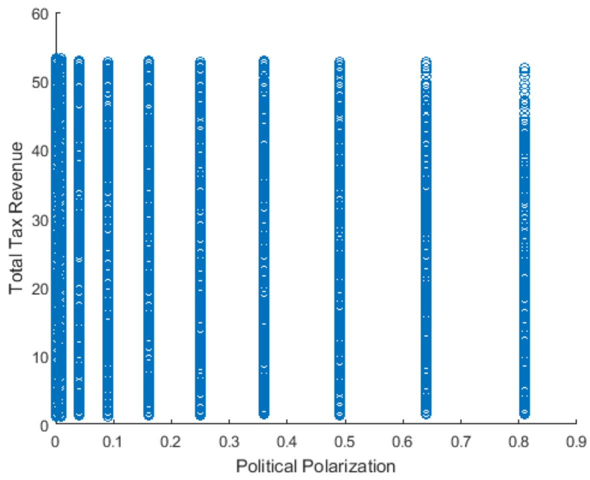


Figure 2: Total Tax Revenue and Political Unison



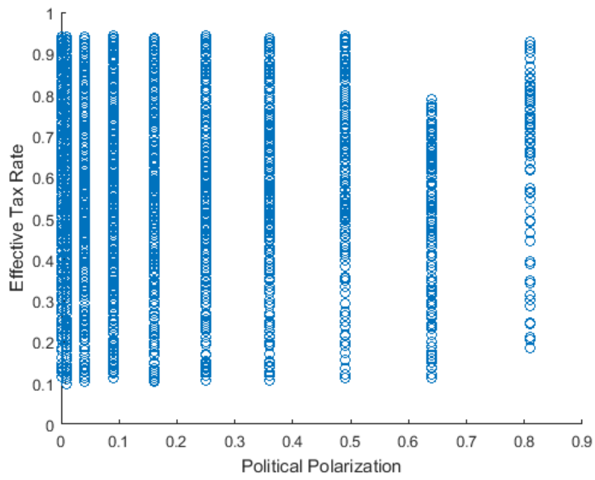


Figure 3.a: Total Tax Revenue and Political Polarization

Figure 3.b: Effective Tax Rate and Political Polarization

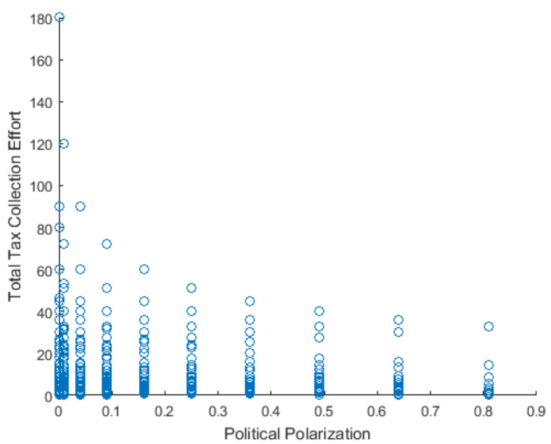


Figure 3.c: Total Tax Collection Effort and Political Polarization

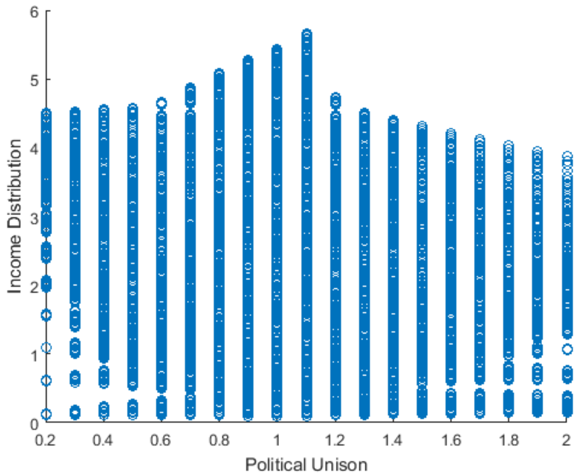


Figure 4.a: Income Distribution and Political Unison

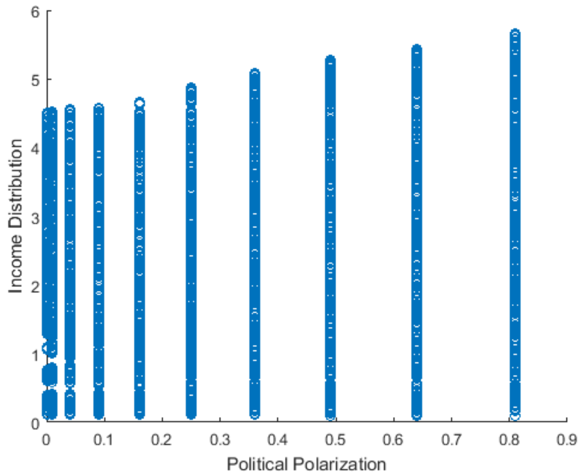


Figure 4.b: Income Distribution and Political Polarization

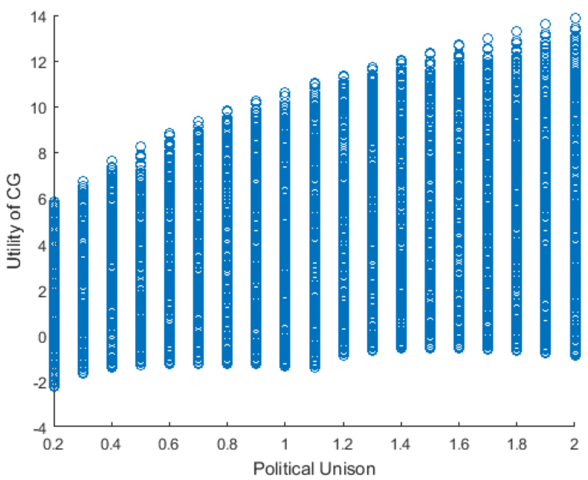


Figure 5.a: Utility of CG and Political Unison

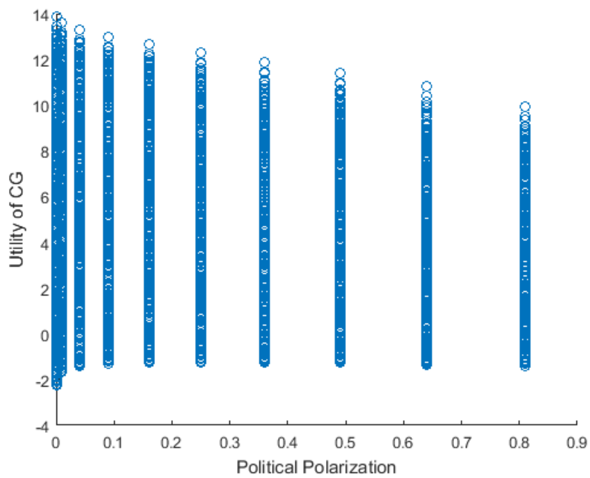


Figure 5.b: Utility of CG and Political Polarization

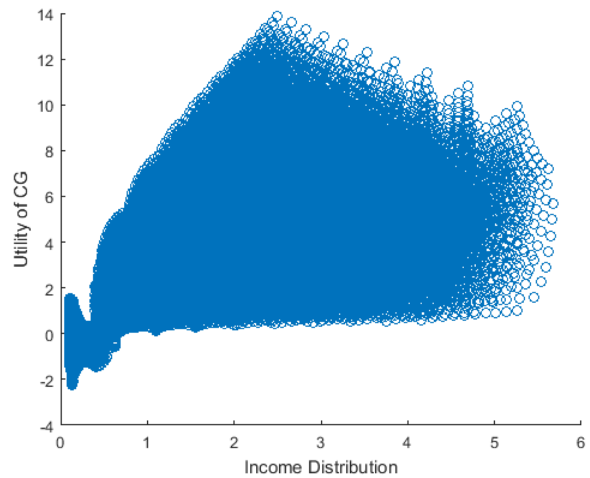


Figure 6.a: Utility of CG and Income Distribution

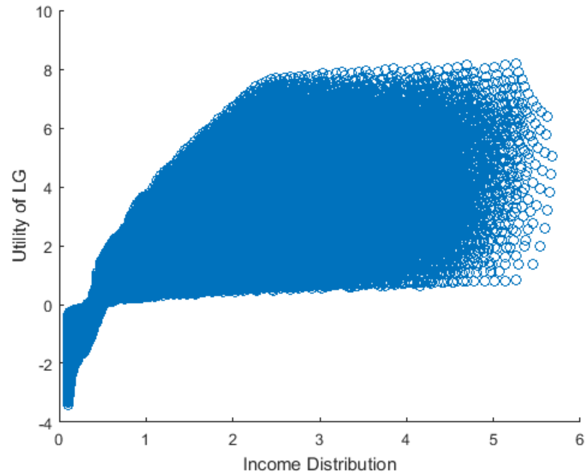


Figure 6.b: Utility of LG and Income Distribution

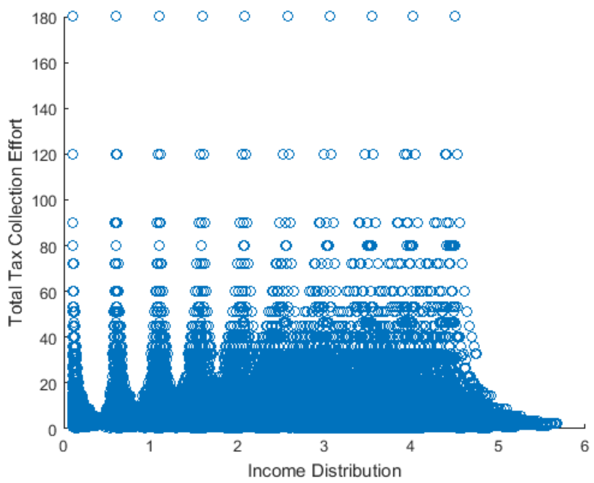


Figure 7.a: Total Tax Collection Effort and Income Distribution

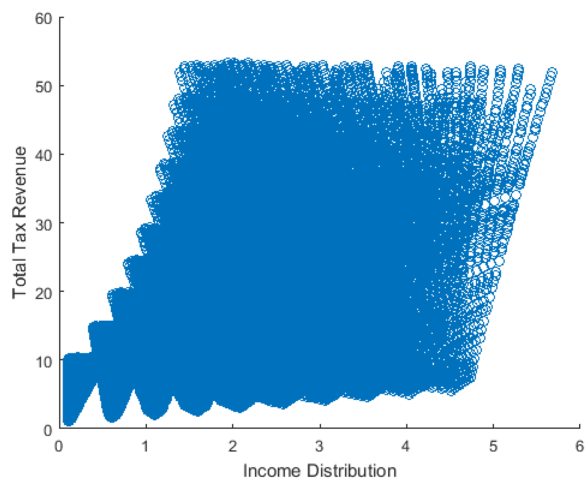


Figure 7.b: Total Tax Revenue and Income Distribution

Appendix 3: Comparative Statics with Spillover Effects

First order derivatives:

$$\frac{\partial a^*_{i,spillover}}{\partial \phi} = -\frac{1}{\phi^2(1+2s_1)} < 0; \quad \frac{\partial a^*_{i,spillover}}{\partial s_i} = \frac{2(\phi-1)}{\phi(1+2s_1)^2} < 0$$

$$\frac{\partial t^*_{i,spillover}}{\partial \phi} = \frac{\beta(1+2s_i)\sum_i(p_i(1+2s_i)+1)}{2(\phi-1)^2(1+s_i)(2\alpha+\beta\sum_i(p_i(1+2s_i)+1))} > 0$$

$$\frac{\partial t^*_{i,spillover}}{\partial s_i} = \frac{\beta(\beta(\sum_i(p_i(1+2s_i)+1))^2+2\alpha(2+P(3+4s_i(2+s_i))))}{2(1-\phi)(1+s_i)^2(2\alpha+\beta\sum_i(p_i(1+2s_i)+1))^2} > 0$$

$$\frac{\partial t^*_{i,spillover}}{\partial p_i} = \frac{\alpha\beta(1+2s_i)^2}{(1-\phi)(1+s_i)(2\alpha+\beta\sum_i(p_i(1+2s_i)+1))^2} > 0$$

$$\frac{\partial t^*_{i,spillover}}{\partial \alpha} = \frac{\beta(1+2s_i)\sum_i(p_i(1+2s_i)+1)}{(\phi-1)(1+s_i)(2\alpha+\beta\sum_i(p_i(1+2s_i)+1))^2} > 0$$

$$\frac{\partial t^*_{i,spillover}}{\partial \alpha} = \frac{\beta(1+2s_i)\sum_i(p_i(1+2s_i)+1)}{(\phi-1)(1+s_i)(2\alpha+\beta\sum_i(p_i(1+2s_i)+1))^2} > 0$$

$$\frac{\partial t^*_{i,spillover}}{\partial \beta} = \frac{\alpha(1+2s_i)\sum_i(p_i(1+2s_i)+1)}{(1-\phi)(1+s_i)(2\alpha+\beta\sum_i(p_i(1+2s_i)+1))^2} > 0$$

Second order derivatives:

$$\frac{\partial^2 a^*_{i,spillover}}{\partial \phi \partial s_i} = \frac{2}{\phi^2(1+2s_i)^2} > 0$$

$$\frac{\partial^2 t^*_{i,spillover}}{\partial \phi \partial s_i} = \frac{\beta(\beta(\sum_i(p_i(1+2s_i)+1))^2+2\alpha(2+P(3+4s_i(2+s_i))))}{2(\phi-1)^2(1+s_i)^2(2\alpha+\beta\sum_i(p_i(1+2s_i)+1))^2} > 0$$

Appendix 4: Empirical Evidence

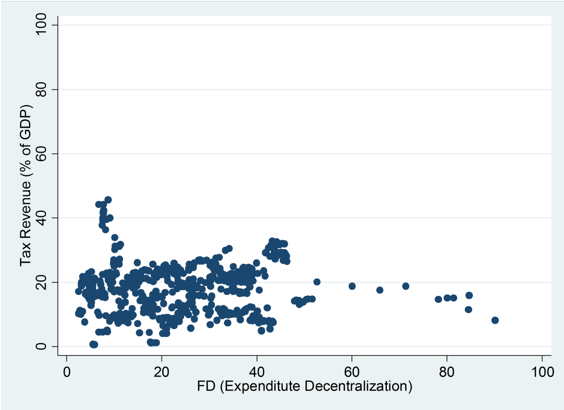


Figure 8: Tax Revenue (% of GDP) and Fiscal Decentralization

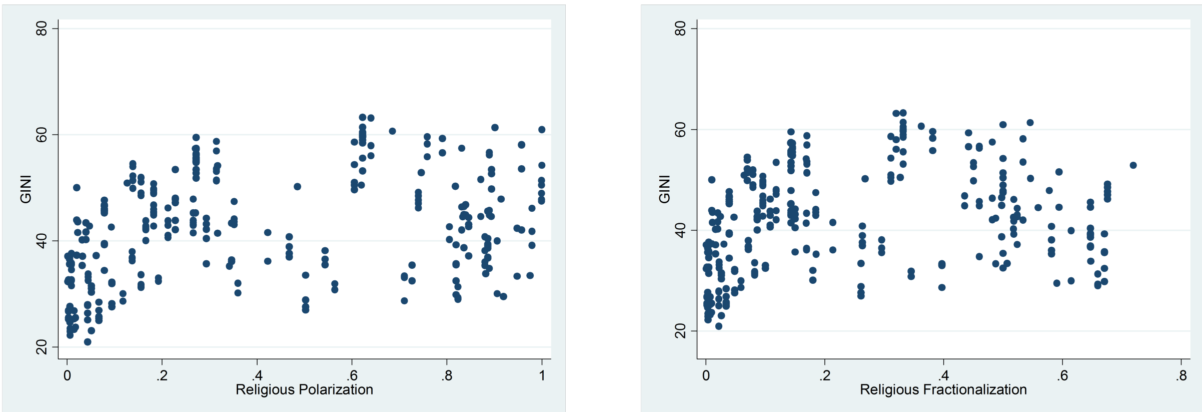


Figure 9: Polarization, Fractionalization and Income Distribution