Do the Subnational Governments Choose Expenditure or Revenue? A Political Economy Approach

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Abstract

In this study, we explore the tax-expenditure behavior of sub national governments in a federal economy with interregional grants. Here, local public goods are produced through federally funds and (costly) local revenues, and have inter-jurisdictional spillover effects. Sub national governments can choose either revenue or expenditure to maximise their benefit. The direction and magnitude of federal fund flow (that determine the local provision of public goods as well as the choice of optimizing instrument) are influenced by the re-election probability of the parties in power at the federal and provincial levels. We endogenise the policy choice (trevenue or expenditure) and show that, in presence of politics (modeled through a simple probabilistic voting environment), such a choice may bear a one-to-one relationship with the political identity of the province.

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1 Introduction

In this paper, we attempt the following set of questions in the context of a federal economy. Does a subnational government choose expenditure first and let the taxes adjust accordingly? Or do they act in opposite manner: to let their revenue collection dictate their spending? To what extent, this choice is affected by central grants and transfers? Does electoral politics play a role in this choice?

The conventional wisdom suggests that, since tax and spending decisions are linked through the budget constraint, it does not matter whether the governments choose taxes or spending as the optimizing variable. Given this, the *causal* relationship between revenues and government expenditure remains a classic point of debate in empirical Public Finance. There exist at least four hypotheses to potentially explain observed relationship between government spending and revenue collection. These propositions are briefly discussed here:

(a) The tax-to-spend hypothesis suggests that the government first determines how much revenue to collect and then decides how much to spend: such a policy necessarily reduces budget deficit. The principal proponents of this hypothesis are Friedman (1978) as well as Buchanan and Wagner (1977).

(b) At the other extreme, we have the spend-to-tax hypothesis: government expenditure decisions are taken first, and it leads to subsequent revenue collection. This view has been well summarized by Dalton (1923), "while an individual adjusts income to expenditure; a public authority adjusts expenditure to income". Notice that such an act always creates or widens a pre-existing deficit in the first place.

(c) Spend-and-tax hypothesis suggests that revenue and spending decisions are taken and executed at the same time. Typically, government, as a rational agent, equates the marginal cost of taxation with the marginal benefit of government spending. Revenue and government expenditure are linked through balanced budget.

(d) Last, but not the least, in US, some spending decisions and revenue decisions are institutionally uncoupled. If this is the case, then expenditure and revenue are causally independent.

The empirical literature is not unanimous regarding the conclusion. Among recent attempts, Change, Liu and Caudill (2002) support the tax-to-spend hypothesis, whereas Ross and Payne (1998) argue in favour of spend to tax hypothesis. At a more disaggregated level, Payne (1998) finds that, in US, the tax-to-spend hypothesis is supported by the budgetary decision of 24 states; the spend-to-tax hypothesis is valid for 8 states while the fiscal synchronization pattern is observed for 11 states. In addition, Owoye (1995) found evidence to support the fiscal synchronization hypothesis. Finally, Baghestani and McNown (1994) have provided evidence for the institutional separation hypothesis.

The idea that sub national expenditure and tax policies have different implications for local public finance is well established in theory: some representative studies are Wildasin (1988), Bayindir-Upmann (1999) or Hindriks (1999). Related to the present study, Akai and Sato (2005) contrast expenditure and tax policy setting within a federation. However, these studies do not endogenise the policy choice.

A closely related study is Koethenbuerger (2008). He endogenises the choice of instruments in which the central tax transfer schemes play a decisive role. Of primary importance is the role played by the responsiveness of the central transfer on local taxation. The responsiveness changes the tax price of providing the public good whenever the neighboring region changes the optimizing variable. However, in his model, the transfer rules ad hoc in nature.

The literature on political budget cycle (for a good survey, see Persson and Tabellini, 2000) offers another insight for endogeneity of policy variables. Incumbent governments (that are unsure to win any election) may indulge in spending just before the election. This may serve two purposes. One, such spending may lure some non committed voters to its fold. Here, spending serves as a signal of good governance to potential voters. Second, the government may want to spend a lot in order to leave the next government (ruled by, presumably, another party) in trouble. Governments shall remain fiscally prudent if they are firmly ensconced. But these studies fail to explain what happen in off election years.

In the present paper, we present an analysis of tax-spending behaviour among the subnational governments (SNG's) relying on a political mechanism that is different from electoral cycle literature. In a federal country, provinces rely on federal transfer to provide local public good. The bulk of such transfers are formulaic in nature (e.g. the Finance Commission transfers in India.). The transfer rule dictates the tax-price of local public good and affect the SNG behaviour. However, the federal authority often takes recourse to discretionary ex post transfers,[1] such that, ostensibly, a sense of horizontal equity prevails within the federation. This discretionary nature of such transfers may betray a political element[2] and provinces with otherwise similar performances end up with different levels of transfers and public good. Thus, provinces face different transfer rules and, experience different tax prices for public good, based on their political identities. Eventually, this leads to a divergence in their policies.

[1] Transfers that arrive *after* the provinces raises revenue.

[2] This feature is well documented: a few studies (see, for example, Sollé-Ollé and Sorribas-Navaro 2006) find the evidence of partisan transfers (such that jurisdictions/provinces that share the same political identity with the upper level governments receive more transfers). On the other hand, Arulampalam *et.al.* (2009) found the evidence that central transfer are distributed to maximise re-election probability, not necessarily to reward loyal provinces.

To simplify the analysis, we assume that there are two parties and two provinces within the federation. Each province is governed by a different party (incumbent) while the other party is in opposition (challenger). A representative voter's utility increases with the public good but decreases with local revenues. Voters care for relative utility. Vote shares for the parties become a function of the difference between provincial utilities. Federal welfare is the sum of provincial utilities. Taking the voter behavior into account, federal transfers are designed in such a way that a sum of federal welfare and vote share is maximized. Thus, the federal government is partly benevolent.[3] We make the simplifying assumption that provincial governments choose local revenue levels or local expenditure to maximize provincial welfare, ignoring the spillover effect ("naïve" provincial governments).

Using this framework, our contribution is the following. First, we endogenise the policy choice and demonstrate that it depends upon the marginal responsiveness of federal transfer with respect to provincial revenues. Second, with politically motivated transfers, such marginal responses will alter (see, for example, Sengupta 2010). Specifically, we demonstrate that politically motivated transfers do change the behavior of the provinces: some switch over from expenditure (maximizing) policy to revenue (maximizing) policy and vice versa. if the political element in the grants assume high importance. The choice of optimizing instrument of the provinces thus bears an one-to-one relationship with their political identity.

The paper is organized as follows. Section 2 presents the basic model. The choice of policy variable under apolitical and political settings are discussed in section 3 and 4. Section 5 concludes the paper.

2 The Model

There exist two provinces, denoted by 1 and 2. A representative consumer in either province derives utility from the public good (P_i) and private

[3] It may be benevolent due to constitutional constraints.

consumption (c_i). The utility function is $u_i(P_i, c_i)$ with standard properties.

The total public good consumed in province i includes 'own' production (p_i) and spillover from the neighboring province. To begin with, we assume that spillover is symmetric. The total public good in province i is thus given by

$$P_i = p_i + \beta p_j \qquad \text{for } i \neq j \quad \text{where } i, j = 1, 2$$

Here, $\beta \in [0, 1)$ is the spillover effect.

A public good produced within the province is financed by locally procured taxes/or local revenues (θ_i) and transfer from the federal government:

$$p_i = B_i + \theta_i + T_i$$

$B_i > 0$ is the status quo public good produced in province i independent of the tax/transfer scheme and T_i is the federal transfer. This might be negative (for equalization purpose). We assume that B_i is large enough such that the stock of public good does not fall below zero.

Consumption is consumer income (y_i) less taxes. We assume that income is given. So we have the following:

$$c_i = y_i - \theta_i$$

We assume that $y_i > 0$ and $\theta_i \in [0, y_i)$. The magnitude of marginal cost of local revenue is thus given by $g_i'(y_i - \theta_i)$. *Ceteris paribus*, higher y_i implies lower marginal cost. Thus a wealthy province can raise the local revenue more easily.

The federal government is constrained by a fixed budget due to intergovernmental transfer. We assume that transfer to one province is financed by taxing the other province. In other words, federal government embarks upon a net equalization scheme. The net transfer to a province can be negative or positive, and the budget must balance. Therefore, we can write,

$$T_1 + T_2 = 0$$

The central government can not commit to a transfer scheme. More specifically, the structure of the game is as follows:

The sequence of moves is as follows.

- Provincial governments set a policy: optimize through either θ or p.
- They choose either θ or p
- Federal government fixes T_i, conditional on provincial θ_i.
- Public good is provided and consumed.

3 Federal Action

In the third stage of the game, given θ_i, the federal government maximizes

$$\sum_i u^i(c_i, P_i)$$

with respect to the transfers. The F.O.C. yields

$$u_P^1 = u_P^2 \tag{1}$$

Solving the first order conditions gives $T_i = T_i(\theta_1, \theta_2)$. From the F.O.C.s, we have:

$$u_{PP}^i \left(1 + (1-\beta)\frac{\partial T_i}{\partial \theta_i}\right) - u_{Pc}^i = u_{PP}^j \left(\beta - (1-\beta)\frac{\partial T_i}{\partial \theta_i}\right) \Rightarrow$$

$$(1-\beta)\frac{\partial T_i}{\partial \theta_i} = \frac{\beta u_{PP}^j - u_{PP}^i + u_{Pc}^i}{\left(u_{PP}^i + u_{PP}^j\right)} \tag{2}$$

This is the marginal incentive for local revenue.

Given the transfer rule $T_i(\theta_1, \theta_2)$, the regions choose either tax or public expenditure as optimizing variables.

Example: Linear Quadratic Utility

Let $u_i = P_i - \frac{\eta_i}{2} P_i^2 + w_i - \frac{\rho_i}{2} w_i^2 + \lambda_i w_i P_i$

Then

$$(1-\beta)\frac{\partial T_i}{\partial \theta_i} = \frac{\beta\eta_j - \eta_i - \lambda_i}{\eta_2 + \eta_1}$$

If regions are symmetric, then

$$(1-\beta)\frac{\partial T_i}{\partial \theta_i} = -\frac{(1-\beta)\,\eta + \lambda}{2\eta} < 0$$

Thus, we can say that if regions are symmetric, then equalization element of the central transfer dominates the Pigouvian element. Notice that, if $(1-\beta)\,\eta + \lambda < 2\eta(1-\beta)$ or $(1-\beta)\eta > \lambda$, then the magnitude of $\frac{\partial T_i}{\partial \theta_i}$ is less than 1, i.e. no region is "overtaxed" for raising more local revenues. We will assume that, indeed, this is the case. Then $\frac{\partial P_i}{\partial \theta_i} = \frac{\eta(1+\beta)-\lambda}{2\eta} > 0$.

4 Regional Choice of Tax Expenditure Policy

Now we turn to stage 2 of the game, and analyze the implications of regional policy. We show that, given the transfer rule, the policy choice of the neighboring state has some bearing on the tax price of the states.

4.1 Neighboring region maximises through θ_2

Let both regions choose local revenue as optimizing variable. Then, region 1's problem is

$$\max_{\theta_1} \; u^1(c_1, P_1)$$

The first order condition is

$$u_P^1\left(1 + (1-\beta)\frac{\partial T_1}{\partial \theta_1}\right) = u_c^1 \tag{3}$$

This defines a reaction function $\theta_1 = R_1(\theta_2)$. Similarly, for other region, we have the reaction function $\theta_2 = R_2\,(\theta_1)$. The pair of Nash equilibrium taxation is obtained as a solution to the above problem.

Now assume that the region 1 maximises its public good expenditure, not tax. In other words, it maximises with respect to p_1 and θ_1 is adjusted accordingly. Thus, it perceives the transfer rule to be implicitly defined by $\bar{T}_1 = T_1(p_1 - \bar{T}_1, \theta_2)$. By differentiating, we get $\dfrac{\partial \bar{T}_1}{\partial p_1} = \dfrac{\frac{\partial T_1}{\partial \theta_1}}{1 + \frac{\partial T_1}{\partial \theta_1}}$

Similarly, $\bar{T}_2 = T_2(\theta_1, p_2 - \bar{T}_2)$

Notice that the maximand for region 1 now is

$u_1 p_1 - \bar{T}_1 + \beta\theta_2 + (1-\beta)\bar{T}_1, y_1 - p_1 + \bar{T}_1)$

Maximizing with respect to p_1,

$$u_P^1 \left(1 - \frac{\partial \bar{T}_1}{\partial p_1} + (1-\beta)\frac{\partial \bar{T}_1}{\partial p_1}\right) = u_c^1 \left(1 - \frac{\partial \bar{T}_1}{\partial p_1}\right)$$

or

$$u_P^1 \left(1 - \beta\frac{\partial \bar{T}_1}{\partial p_1}\right) = u_c^1 \left(1 - \frac{\partial \bar{T}_1}{\partial p_1}\right)$$

Use the expression for $\frac{\partial \bar{T}_1}{\partial p_1}$, one gets

$$u_P^1 \left(1 + (1-\beta)\frac{\partial T_1}{\partial \theta_1}\right) = u_c^1 \tag{4}$$

which is same as (3).

4.2 Neighboring region maximises through p_2

Now assume that the second province maximises with respect to p_2. In that case, the first province perceives the transfer formula to be implicitly defined by $\hat{T}_1 = T_1(\theta_1, p_2 - \hat{T}_2)$. Note that $\frac{\partial \hat{T}_1}{\partial \theta_1} = \frac{\partial T_1}{\partial \theta_1} + \frac{\partial T_1}{\partial \theta_2}\left(-\frac{\partial \hat{T}_2}{\partial \theta_1}\right) = \frac{\partial T_1}{\partial \theta_1} - \frac{\partial T_2}{\partial \theta_2}\left(\frac{\partial \hat{T}_1}{\partial \theta_1}\right) \rightarrow \frac{\partial \hat{T}_1}{\partial \theta_1} = \dfrac{\frac{\partial T_1}{\partial \theta_1}}{1 + \frac{\partial T_2}{\partial \theta_2}}$. Using the linear quadratic case, if $(1-\beta)\eta > \lambda$, then $1 + \frac{\partial T_2}{\partial \theta_2} > 0$, and hence $\frac{\partial \hat{T}_1}{\partial \theta_1} > \frac{\partial T_1}{\partial \theta_1}$. Since provinces are symmetric, this result is true for region 2 as well.

Note that, the tax price of public good is $\frac{d\theta_i}{dp_i} = \dfrac{1}{1 + \frac{\partial \hat{T}_1}{\partial \theta_1}}$. If the neighboring region (say region 2) maximises through public good than through revenue, the tax price of public good in region 1 will be higher and the incentive to tax and provide public good will be lower

. The reason is the following. Suppose that both regions are maximizing through taxes. Then, if region 1 wants to raise higher revenues, it will receive less transfer. To balance the budget, region 2 will receive more transfer. If region 2 is maximizing through taxes, then this extra revenue will increase public good provision, leaving the taxes unaltered. On the other hand, if region 2 maximises through expenditure, then the extra amount will reduce tax in region 2, generating a second round increase (decrease) of transfer to region 2 (for region 1).[4]

One can show that, as long as region 2 sticks to expenditure maximization, the public good production and consumption in region 1 does not change whatever be region 1's choice of optimizing variable. The proof of this claim is analogous to the previous section, and we leave it.

5 Choice of Optimizing Variables

In the first stage of the game, provinces choose either θ_i or p_i. Assume that both provinces initially maximise through taxes. But now region 1 shifts to expenditure optimization. This would not change public good provision or consumption in region 1 provided region 2 does not change its optimizing variable. But the tax price of public good rises for region 2 and, as a result, it reduces its tax. This should have an effect on the welfare of region 1. If region 1 chooses p_1^* optimally, the welfare of region 1, as a function of θ_2 is given by the following expression

$W_1(\theta_2) = u_1\left(p_1^* + \beta(\theta_2 - T_1\left(p_1^* - \bar{T}_1, \theta_2\right), y_1 - p_1^* + T_1\left(p_1^* - \bar{T}_1, \theta_2\right)\right)$

and similarly,

$W_2(\theta_1) = u_2\left(p_1^* + \beta(\theta_1 - T_2\left(p_2^* - \bar{T}_2, \theta_1\right), y_2 - p_2^* + T_2\left(p_2^* - \bar{T}_2, \theta_1\right)\right)$

Now we are ready to state our first result, the proof of which is given in the appendix.

[4] The reasoning is due to Koethenbuerger (2008).

Lemma 1 *Assume that $\eta(1-\beta) > \lambda$ such that the equalization rate is less than 1. Then, If region j is optimizing through taxes, the best response of region i is to optimize through taxes.*

Proof. See appendix. ■

Moving to expenditure maximization (which reduces θ_2) will reduce welfare in region 1 if $\eta(1-\beta) > \lambda$. Then, there is *no incentive* for region 1 to move to a position of expenditure optimization if the neighbor is maximizing through taxes.

Second, assume that both regions are optimizing with respect to p_i. Suppose that the first region deviates and chooses local revenue as optimizing variable. We know that, in this case, region 2 boosts public expenditure. The effect on region 1's welfare, in terms of p_2 is given by the following lemma.

Lemma 2: *Suppose region j is optimizing through expenditure. Then the best response for region i is tax optimization if $\eta(1-\beta) > \lambda$.*

Proof. See appendix. ■

Combining lemma 1 and lemma 2, one gets the following theorem

Proposition 1: *In the policy-choice game, tax optimization by both regions is the equilibrium choice if $\eta(1-\beta) > \lambda$.*

5.1 *Political framework*

There are two political parties. We assume that party L is in power in centre and province 1, while party R governs province 2. In each province, as well as in the centre, the party that is not in power is called the opposition or the challenger. There is an election at the federal level. Each province chooses one representative to the centre (without disturbing the composition of the provincial governments).[5] The party which is in the centre determines the transfer in such a way that it's own vote share is maximized from both

[5]On another note, we can also think as if there is a local election and the federal government cares for the local election.

provinces.

To abstract away from the interaction between voters and politicians, and to focus more on the action of politicians at different levels of government, we make the following simplifying assumption:

Assumption V: Voters are non strategic in nature and they commit to a voting rule.

Voters in a province care for net relative utility. This can be rationalized through status-seeking (or envy, or jealousy) motive. If in the neighboring province, net utilities are relatively higher, the vote share of the incumbent in a province goes down. On the other hand, if they observe that the utilities are higher in their province, the vote share of the provincial incumbent goes up. To capture such behavior in the simplest possible framework, we propose the following. In province 1, a voter i will vote for the incumbent if and only if $U_1 \geq U_2 + \delta_{1i}$. Here δ_{1i} is a random variable that captures the voter heterogeneity for voter i in province 1. It can be positive or negative.[6]

Here, the voter who is indifferent between choosing the incumbent or challenger is situated at $\delta_{1i}^* = U_1 - U_2$. All voters with $\delta_{1i} \leq \delta_{1i}^*$ will vote for the incumbent. Thus the proportion of votes for L in province 1 is given by $\mathbf{\Phi}_1(U_1 - U_2)$, where $\mathbf{\Phi}_1(.)$ is the cdf of the variable δ_{1i}. We make the following assumption about the distribution function.

Assumption D1: $\mathbf{\Phi}_i\,(.)$ is symmetric around zero.

In province 2, the indifferent voter is situated at $\delta_{2i}^* = U_2 - U_1$. The proportion of votes for the incumbent in province 2 is $\mathbf{\Phi}_2(U_2 - U_1)$. The proportion of votes for party L in province 2 is $1 - \mathbf{\Phi}_2(U_2 - U_1) = \mathbf{\Phi}_2(U_1 - U_2)$.

[6]In a formal model of yardstick competition (e.g. Besley and Case 1995), relative performance evaluation serves as a sorting mechanism between good and bad politician in presence of adverse selection and moral hazard. Our model abstracts away from such informational issues. Politicians can only manipulate the transfer levels to earn more vote. Thus the role of the voters is much like the regulatory authority in Shleifer (1986). That being said, our model do not differ from the voting behaviour discussed in Besley and Case, *op. cit.* pp. 32.

The federal government maximizes a weighted sum of federal utility and vote share: thus it is partly benevolent and partly partisan. Let $\lambda \geq 0$ be the weight. Then the maximand of the federal government is

$$L_C = U_1 + U_2 + \lambda[\mathbf{\Phi}_1(U_1 - U_2) + \mathbf{\Phi}_2(U_1 - U_2)] \tag{5}$$

which is to be maximized with respect to T_1.[7]

Finally, the provincial governments choose the local revenue level to maximise the vote share, which amounts to increase the utility differential. We assume the following.

Assumption PG: The provincial governments neglect the spillover effect.

This is a somewhat standard assumption in federalism literature. In other words, provincial government in region i is interested in maximizing only U_i.[8]

[7] We can also consider the alternate electoral incentive of capturing half of the electorate. If we assume that in both regions, the population is normalised to 1, then the central government's objective would be

$$\begin{aligned} &\max_{T_1} U_1 + U_2 \\ &\text{such that } \mathbf{\Phi}_1(.) \geq .5 \\ &\qquad\qquad \mathbf{\Phi}_2(.) \geq .5 \end{aligned}$$

The Lagrangian is

$$L = U_1 + U_2 + \lambda_1[\mathbf{\Phi}_1(.) - \tfrac{1}{2}] + \lambda_2\ [\mathbf{\Phi}_2(.) - \tfrac{1}{2}]$$

For all practical purpose, this is similar to the central's objective (5).

[8] This assumption can be relaxed, such that the provincial government in region i maximise

$$U_i + \mathbf{\Phi}_i(U_i - U_j)$$

This implies lower revenue generation by region i.

The sequence of moves remains same as in section 3. Under politically motivated transfer, federal government maximizes both federal welfare and vote share. The F.O.C. of (5) is given by:

$$u_P^1 - u_P^2 + \lambda(\mathbf{\Phi}_1')(u_P^1 + u_P^2) + \lambda(\mathbf{\Phi}_2')(u_P^1 + u_P^2) = 0$$

Here we make the second simplifying assumption about the distribution.

Assumption D2: The distribution of $\mathbf{\Phi}_i$ is uniform.

Let $\mathbf{\Phi}_i' = \alpha_i$ (a constant), and $\alpha = \alpha_1 + \alpha_2$. Then, the above equation reduces to

$$(1 + \lambda\alpha)u_P^1 = (1 - \lambda\alpha)u_P^2$$

or,

$$u_P^1 = Au_P^2 \tag{6}$$

Assuming uniform distribution, $\alpha = \mathbf{\Phi}_1'(U_1 - U_2) + \mathbf{\Phi}_2'(U_1 - U_2)$ is a constant. This is the marginal swing in favour of party L given an increase in difference in utilities. The second order condition is satisfied if $\lambda\alpha < 1$. Here, $A = \frac{1-\lambda\alpha}{1+\lambda\alpha}$ is a fraction.

Thus, the federal government appears to maximize the weighted sum of utilities, i.e. $U_1 + AU_2$, with $A \leq 1$. Note that, A goes down if either α or λ goes up. In other words, as voters get more responsive to utility difference or the weight attached to vote share goes up, less weight is attached to region 2's welfare.

The intuition is as follows. In the absence of political concerns the utility effect of higher transfers to the aligned province has to be weighed against the reduction in utility in the other state. With political concerns a higher transfer to the aligned province has additional positive effects (and only positive effects from the perspective of the federal government). The reduction in utility in province 2 increases the vote share in both states and the increase in utility in province 1 further increase the vote shares of the federal party. Put differently, the central government has a political incentive to fiscally exploit province 2, which amounts to putting less weight on province 2's utility in the maximization problem.

5.2 Effect On Choice of Optimizing Variable.

By implicitly differentiating (6), we get

$$\begin{aligned}
\frac{\partial T_1}{\partial \theta_1} &= \frac{\beta A u_{PP}^2 - u_{PP}^1}{(1-\beta)\left(u_{PP}^1 + A u_{PP}^2\right)} \\
\frac{\partial T_2}{\partial \theta_2} &= \frac{\beta u_{PP}^1 - A u_{PP}^2}{(1-\beta)\left(u_{PP}^1 + A u_{PP}^2\right)}
\end{aligned}$$

In general, the tax prices of public goods do alter at the margin. For example, with linear-quadratic specification

$$\frac{\partial T_1}{\partial \theta_1} = -\frac{\lambda + \eta\,(1 - A\beta)}{\eta(1+A)(1-\beta)}$$

and

$$\frac{\partial T_2}{\partial \theta_2} = \frac{\eta\beta - A(\eta+\lambda)}{\eta(1+A)(1-\beta)}$$

If A is too low($\simeq 0$), then $\frac{\partial T_1}{\partial \theta_1} = -\frac{\lambda+\eta}{\eta(1-\beta)} < 0$ and $\frac{\partial T_2}{\partial \theta_2} = \frac{\eta\beta}{\eta(1-\beta)} > 0$.

Notice that, even with symmetric provinces, if political considerations assume higher importance in grant disposal, then region 2 is fiscally exploited.

Consider now

Lemma 3 *Under political dispensation of funds,*

(a) *if region 2 is maximizing through taxes, there is no incentive for region 1 to adopt expenditure policy.*

(b) *if region 1 is maximizing through taxes, the best response of region 2 is to adopt expenditure policy.*

(c) *if region 2 is maximizing through expenditure, the best response of region 1 is to adopt tax optimization.*

(d) *if region 1 is maximizing through expenditure, the best response of region 2 is to adopt expenditure maximization.*

Proof. See appendix. ■

Combining the results stated in the lemma, we get our main proposition.

Proposition 2 *If grant disposal is sufficiently politically motivated, then a politically favorite region will go for tax policy and a non-favorite region will go for expenditure policy.*

6 Conclusion

In this paper, we have attempted the following question: to what extent the tax-spending nexus by the sub-national governments are influenced by politics? To answer it, we have constructed a model of a federation with two provinces and two political parties. Provinces produce public goods with (costly) own revenues and federal grants. Federal grants are discretionary and they arrive *after* the provinces raises their resources. Provinces can either raise the revenue first and provide the public good later (tax optimization) or they may provide the public good first and adjust the taxes residually (expenditure optimization). If a province alters its behavior from tax to expenditure maximization, the tax price of public good in the neighboring region changes, thus the incentive for providing the public good (or raising tax for it) also alters. If the federal grants are politically motivated to maximise votes, the responsiveness of federal grants vis-a-vis local taxation are changed. The politically favorite region chooses tax optimization, while the other region chooses expenditure maximization.

The analysis can be extended to other directions. One immediate response is to take the theory to data and test for the implications, and a robustness check with other types of grants and expenditure pattern as well. Since grants and provincial performances are determined in a temporal fashion, it needs a proper dynamic analysis. Thus there exist avenues for future research.

Appendix 1: Proof of Certain Results

Lemma 1

$W_1'(\theta_2) = u_P^1 \left(\beta \left(1 - \frac{\partial T_1}{\partial \theta_1}\left(-\frac{\partial \bar{T}_1}{\partial \theta_2}\right) - \frac{\partial T_1}{\partial \theta_2}\right)\right) + u_C^1 \left(\frac{\partial T_1}{\partial \theta_1}\left(-\frac{\partial \bar{T}_1}{\partial \theta_2}\right) + \frac{\partial T_1}{\partial \theta_2}\right)$

Since $\bar{T}_1 = -\bar{T}_2$ and $T_1 = -T_2$, we can write

$-\frac{\partial \bar{T}_1}{\partial \theta_2} = \frac{\partial \bar{T}_2}{\partial \theta_2}$ and $\frac{\partial T_1}{\partial \theta_2} = -\frac{\partial T_2}{\partial \theta_2}$

Thus

$W_1'(\theta_2) = u_P^1 \left(\beta \left(1 - \frac{\partial T_1}{\partial \theta_1}\left(\frac{\partial \bar{T}_2}{\partial \theta_2}\right) - \frac{\partial T_2}{\partial \theta_2}\right)\right) + u_C^1 \left(\frac{\partial T_1}{\partial \theta_1}\left(\frac{\partial \bar{T}_2}{\partial \theta_2}\right) - \frac{\partial T_2}{\partial \theta_2}\right)$

$= \beta u_P^1 + \left(\frac{\partial T_1}{\partial \theta_1}\left(\frac{\partial \bar{T}_2}{\partial \theta_2}\right) - \frac{\partial T_2}{\partial \theta_2}\right)\left(u_P^1 - u_C^1\right)$

Since $\frac{\partial \bar{T}_2}{\partial \theta_2} = \frac{\frac{\partial T_2}{\partial \theta_2}}{1+\frac{\partial T_1}{\partial \theta_1}}$, one can write

$\frac{\partial T_1}{\partial \theta_1}\left(\frac{\partial \bar{T}_2}{\partial \theta_2}\right) - \frac{\partial T_2}{\partial \theta_2} = -\frac{\frac{\partial T_2}{\partial \theta_2}}{1+\frac{\partial T_1}{\partial \theta_1}} = -\left(\frac{\partial \bar{T}_2}{\partial \theta_2}\right)$, say

$W_1'(\theta_2) = \beta u_P^1 - \left(\frac{\partial \bar{T}_2}{\partial \theta_2}\right)\left(u_P^1 - u_C^1\right)$

But $u_C^1 = \frac{\partial P_1}{\partial \theta_1} u_P^1$

$W_1'(\theta_2) = \beta u_P^1 - \left(\frac{\partial \bar{T}_2}{\partial \theta_2}\right)\left(u_P^1 - \frac{\partial P_1}{\partial \theta_1} u_P^1\right)$

$W_1'(\theta_2) = u_P^1 \left(\beta - \frac{\partial \bar{T}_2}{\partial \theta_2}\left(1 - \frac{\partial P_1}{\partial \theta_1}\right)\right)$

Notice that, for linear quadratic utility function, $1 - \frac{\partial P_1}{\partial \theta_1} > 0$

And if $\eta(1-\beta) > \lambda$, $\frac{\partial \bar{T}_2}{\partial \theta_2} < 0$.

$W_1'(\theta_2) > 0$

Similarly, for region 2, $W_2'(\theta_1) = u_P^2 \left(\beta - \frac{\partial \bar{T}_1}{\partial \theta_1}\left(1 - \frac{\partial P_2}{\partial \theta_2}\right)\right) > 0$ if $\eta(1-\beta) > \lambda$

Putting these results together, we have our first lemma.

Lemma 2

Here,

$W_1(p_2) = u^1\left(\theta_1^* + \beta\left(p_2 - T_2\left(\theta_1^*, p_2 - \bar{T}_2\right)\right) - (1-\beta)T_2(\theta_1^*, p_2 - \bar{T}_2)\right), y_1 - \theta_1^*)$

$= u^1\left(\theta_1^* + \beta p_2 - T_2\left(\theta_1^*, p_2 - \bar{T}_2\right), y_1 - \theta_1^*\right))$

$W_1'(p_2) = u_P^1 \left(\beta - \frac{\partial T_2}{\partial \theta_2}\left(1 - \frac{\partial \bar{T}_2}{\partial p_2}\right)\right)$

Notice that
$\frac{\partial \bar{T}_2}{\partial p_2} = \dfrac{\frac{\partial T_2}{\partial \theta_2}}{1+\frac{\partial T_2}{\partial \theta_2}}$, so $1 - \frac{\partial \bar{T}_2}{\partial p_2} = 1 - \dfrac{\frac{\partial T_2}{\partial \theta_2}}{1+\frac{\partial T_2}{\partial \theta_2}} = \dfrac{1}{1+\frac{\partial T_2}{\partial \theta_2}}$

$W_1'(p_2) = u_P^1 \left(\beta - \dfrac{\frac{\partial T_2}{\partial \theta_2}}{1+\frac{\partial T_2}{\partial \theta_2}} \right)$

Similarly, $W_2'(p_1) = u_P^2 \left(\beta - \dfrac{\frac{\partial T_1}{\partial \theta_1}}{1+\frac{\partial T_1}{\partial \theta_1}} \right)$

Again, $\frac{\partial T_i}{\partial \theta_i} < 0$ if $\eta(1-\beta) > \lambda$ and $\left| \frac{\partial T_2}{\partial \theta_2} \right| < 1$, so. $W_1'(p_2) > 0$ if $\eta(1-\beta) > \lambda$.

Lemma 3.

Notice that (a) $W_1'(\theta_2) = u_P^1 \left(\beta - \frac{\frac{\partial T_2}{\partial \theta_2}}{1+\frac{\partial T_1}{\partial \theta_1}} \left(1 - \frac{\partial P_1}{\partial \theta_1} \right) \right)$. If A is small, then $\frac{\partial T_2}{\partial \theta_2} > 0, 1 + \frac{\partial T_2}{\partial \theta_2} > 0$, however $1 - \frac{\partial P_1}{\partial \theta_1} = -(1-\beta)\frac{\partial T_1}{\partial \theta_1} > 0$. Thus $W_1'(\theta_2) > 0$.

(b) $W_2'(\theta_1) = u_P^2 \left(\beta - \frac{\frac{\partial T_1}{\partial \theta_1}}{1+\frac{\partial T_2}{\partial \theta_2}} \left(1 - \frac{\partial P_2}{\partial \theta_2} \right) \right)$. If A is almost zero, then $W_2'(\theta_1) = u_P^2 \left(-\eta^{-1}\lambda\beta \right) < 0$.

(c) $W_1'(p_2) = u_P^1 \left(\beta - \dfrac{\frac{\partial T_2}{\partial \theta_2}}{1+\frac{\partial T_2}{\partial \theta_2}} \right)$. Notice that $\frac{\partial T_2}{\partial \theta_2} > 0$ and $1 + \frac{\partial T_2}{\partial \theta_2} > 0$ if A is low, so $W_1'(p_2) > 0$.

(d) $W_2'(p_1) = u_P^2 \left(\beta - \dfrac{\frac{\partial T_1}{\partial \theta_1}}{1+\frac{\partial T_1}{\partial \theta 1}} \right)$. If A is small, then $W_2'(p_1) = -\left(\lambda + \beta\eta\right)^{-1}\left(\lambda + \eta + \beta\eta\right)(1-\beta)u_P^2 < 0$

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