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No 742

WARWICK ECONOMIC RESEARCH PAPERS

DEPARTMENT OF ECONOMICS

Political Budget Cycles and Fiscal Decentralization*

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This version : 6 March 2006

Abstract

In this paper, we study a model à la Rogoff (1990) where politicians distort fiscal policy to signal their competency, but where fiscal policy can be centralized or decentralized. Our main focus is on how the equilibrium probability that fiscal policy is distorted in any region (the political budget cycle, PBC) differs across fiscal regimes. With centralization, there are generally two effects that change the incentive for pooling behavior and thus the probability of a PBC. One is the possibility of *selective distortion*: the incumbent can be re-elected with the support of just a majority of regions. The other is a *cost distribution* effect, which is present unless the random cost of producing the public goods is perfectly correlated across regions. Both these effects work in the same direction, with the general result that overall, the PBC probability is larger under centralization (decentralization) when the rents to office are low (high). Voter welfare under the two regimes is also compared: voters tend to be better off when the PBC probability is lower, so voters may either gain or lose from centralization. Our results are robust to a number of changes in the specification of the model.

*We are grateful to the participants of the HECER Workshop on "Fiscal Federalism" (Helsinki, November 18-19, 2005), the "Political Economy Workshop" (Exeter, January 20, 2006) and seminar participants at Sevilla and Lisbon for their comments. We would also like to thank Gani Aldashev, Robert Gary-Bobo, Christos Kotsogiannis, Pilar Sorribas and Dave Wildasin, for helpful comments on a previous draft.

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1. Introduction

There now exists a well-developed theory of political budget cycles (PBCs from now on): see e.g. Drazen (2000) for an overview. For example, in the classic contribution of Rogoff (1990), which initiated the modern literature on this topic, it is argued that the incumbent politician can also signal his competence by shifting government spending towards immediately observable consumption spending and away from investment spending whose effect is only observed with delay. The main prediction that incumbent governments manipulate fiscal policies during election years is generally supported by empirical tests.[1] In addition, the effects of the PBC on voter welfare are ambiguous, because the distortion cost needs to be compared to the selection gain of re-electing only the more competent politicians.

While most of the empirical work has concentrated on central government, more recently, a growing empirical literature has found evidence of a PBC at the sub-national level. For example Akhmedov and Zhuravskaya (2004) find evidence of a PBC in spending by regional governments in Russia around the time of elections of governors, with cycles in transfers and repayment of wage arrears being particularly pronounced. Pettersson-Lidbom (2001) finds that Sweden local government spending is 1.5 percentage point higher and taxes are 0.4 percentage point lower in election years. Galli and Rossi (2002) find evidence of a PBC in some items of expenditure by regional governments (Lander) in Germany. Veiga and Veiga (2004) and Padovano and Lagona (2002) find evidence of a PBC in spending by municipal governments in Portugal and Italy, respectively.

However, one aspect of PBCs that (as far as we know) has received no attention at all in the literature - either theoretical and empirical - is a *comparative* analysis of how the size (or probability) of the PBC might vary with the level of decentralization of fiscal policy. This is particularly surprising as it is a concern amongst institutions such as the

[1] Alesina et al. (1997) perform fixed-effects estimates on a panel of 13 OECD countries for the period between 1961 and 1993 and find that after controlling for other determinants of fiscal imbalances, government budget deficit is higher by 0.6 percent of GDP during election years. Shi and Svensson (2002) use GMM empirical method on a data set including both developed and developing countries over the period 1975 to 1995, and find that on average fiscal deficit increases by 1 percentage point of GDP in election years with a much larger effect in developing countries. Similar results are found in Drazen (2000) and Brender and Drazen (2004).

World Bank and IMF that, while fiscal decentralization can have many benefits, it carries the risk of increasing macroeconomic instability (Ahmad et al. (2005)).

In this paper, we address this issue. We study a three-region, two-period model of fiscal policy where a regional public good can be provided by either a regional or national policy-maker (three regions is the minimum needed to capture the important fact that a central government only needs the support of the majority of regions to achieve re-election). Public good provision can be differentiated across regions, no matter what the fiscal regime is (that is, the national policy-maker is not constrained to provide the public good uniformly,[2] as in e.g. Oates (1972)).

All policy-makers are benevolent i.e. wish to maximize the sum of utilities of the voters in their jurisdictions (as well as some ego-rent from office), but differ in their competence in producing the public good out of tax revenue. Specifically, the unit cost of the public good in a region can be high or low, and the probability that the cost is low is higher for a competent (or "good") incumbent than it is for an incompetent (or "bad") incumbent. In the first period, the voters in any region do not know the type of the incumbent, but must infer it from observing his fiscal policy choices in that region.[3] An election then occurs, and the candidate with the majority of the votes wins.[4] So, as far as the structure of the asymmetric information between voters and policy-makers in concerned, the model is a variant of Rogoff (1990).[5]

Our main focus is on the equilibrium probability that fiscal policy is distorted in any region,[6] which we call the probability of a PBC (calculated ex ante, before the costs of public good production in the different regions are realized, and before the type of the incumbent is determined). In our equilibrium, a PBC is generated when a bad incumbent with high-cost decides to imitate (pool with) a good incumbent. This is of interest, because while not directly observable itself, it is - in our model - positively linearly related to the ex ante expected level of pre-election debt and differences between the level of government expenditure before and after the election, both of which are observable (up to an error term). Indeed, the expected level of debt and pre-election boost to spending

[2] See Besley and Coate (2003), and Lockwood (2002) for a similar assumption.

[3] Other information structures are considered in Section 6.2.

[4] With decentralization, this refers to the majority in the region, and with centralization, this refers to a majority at a national level.

[5] For more discussion on this point, see Section 7.1

[6] It turns out that in equilibrium, the size of the distortion is fixed, given that a distortion occurs.

will be higher in the fiscal regime that has the higher PBC probability.

What happens to the PBC probability following centralization of fiscal policy? As we move from decentralization to centralization, there are several effects on the costs and benefits of pooling relative to separating for the incumbent. Our focus in this paper is on two effects, which to our knowledge, have not been noted in the literature before.[7]

First, and most important is the *selective distortion* effect.[8] This is that given a set of cost realizations across the regions, it is generally "cheaper" for a national incumbent - in terms of fiscal distortion - to secure re-election than it is for three regional incumbents, because majority rule only requires the incumbent to win in a majority (two out of three) regions.

The main point of this paper is that selective distortion can have both *direct* and *indirect* effects on the probability of a PBC, which work in opposite directions. The direct effect is that given that parameter values are such that the high-cost incumbent decides to pool and be re-elected in both fiscal regimes, the probability of distortion in any region will be lower with centralization because distortion is selective.

The indirect effect is that the option of selective distortion lowers the "price" of pooling for the incumbent, and thus enlarges the set of parameter values for which the incumbent will decide to pool. This "price effect" means that there will be a set of parameter values for which pooling only occurs with centralization. For these parameter values, the probability of a PBC is positive with centralization, but zero with decentralization.

Second, in our model, unless the cost of producing the public good is perfectly correlated across regions, the statistical distribution of costs the incumbent of a given type will face generally differs between fiscal regimes (the *cost distribution* effect). For example, with decentralization, an incumbent has a single region and cost can be either high or low. But with centralization, unless costs are assumed perfectly correlated across regions,

[7] One effect that has been studied is the rent-scale effect i.e the idea that following a move to centralization, the total ego-rent of the incumbent will rise, but by less than in proportion to the number of regions in the jurisdiction (Seabright (1996), Persson and Tabellini (2000)). The impact of the rent-scale effect is discussed in our model in Section 6.3.

[8] An exception is Hindriks and Lockwood (2005), where this effect is identified. This paper differs in that focusses specifically on the implications of selective distortion for the probability of the PBC. Also, an effect similar to selective distortion following centralization can occur in pure moral hazard models of the political business cycle (Seabright (1996), Persson and Tabellini (2002)). See Section 7.1 for more discussion of related literature.

an incumbent of the same type will face either 0, 1, 2 or 3 high-cost regions with varying probabilities. This will change the incentives for pooling and thus the PBC probability.

Our main results are then as follows. When only the selective distortion effect is present, we find that the PBC is more likely under decentralization when ego-rents are high, but when ego-rents are intermediate, the PBC is more likely under centralization. In the first case, the direct effect of selective distortion is at work, and in the second case, it is the indirect effect. When ego-rents are low enough, there will be no PBC in either fiscal regime, as the bad incumbent will always prefer to separate rather than distort fiscal policy to stay in office.

It turns out that the cost distribution effect works in the same direction as the selective distortion effect. That is, when the costs are initially assumed perfectly correlated across regions, but are then made independent (introducing a cost distribution effect), the set of parameter values for which pooling (and thus a PBC) will occur with centralization increases. This is because the event that only two out of three regions have high cost now occurs with positive probability, and given this event, pooling is "cheaper" for the incumbent than when all three regions have high cost. But, when ego-rent is high, so that pooling takes place even when all three regions are high-cost, the overall probability of pooling is then lower with independence.

We also compare the ex ante voter welfare under both fiscal regimes. Following Hindriks and Lockwood (2004), (2005), our approach is to compare the *selection* and *incentive* effects of elections on voter welfare under the two fiscal regimes.[9] However, our specific results differ considerably from theirs, reflecting the fact that in our model, politicians differ in competence, whereas in their model, they differ in benevolence (see Section 5.2 for a comparison).

Our first result is that with perfect correlation of costs, the ranking of regimes based on ex ante voter welfare exactly follows (inversely) the probability of a PBC: that is, if a

[9] Banks and Sundaram (1998) were the first to formally analyse de-selection as a mechanism for controlling politicians, although they did so in a complete contracting framework. Besley and Smart (2003) have taken the analysis further and coined this terminology. Specifically, elections allow voters to weed out bad politicians (selection effects), and provide an incentive for politicians to change their behavior in order to increase their chance of re-election (incentive effects). See also Maskin and Tirole (2004) for an interesting discussion on "vote pandering" (or populism) when politicians refrain from adopting the right policy simply because it is not popular.

probability of a PBC is higher in one regime than the other, voter welfare is lower. When a cost distribution effect is introduced by assuming costs independent across regions, voter welfare differs across regimes even when ego-rent is low, so that there is no PBC. Specifically, under either fiscal regime, the bad incumbent will reveal his type and thus be voted out of office (thus making voters better off) whenever (i) with decentralization, the cost in his region is high, or (ii) with centralization, the cost is high in at least two regions. Either one of these events can have higher probability than the other.

The rest of the paper is organized as follows. Section 2 sets out the model. Sections 3 and 4 characterize the equilibrium outcomes in the two fiscal regimes. In Section 5 we analyze both the probability of a PBC and voter welfare under both fiscal regimes. Section 6 considers the robustness of our results to a number of changes in the assumptions. Section 7 discusses related literature and concludes.

2. The Model

2.1. Preliminaries

There are two time periods $t = 1, 2$ and three regions $l = a, b, c$. In each region in each time period, a politician makes decisions about taxation and public good provision. Moreover, at the end of period 1, there is an election in which voters choose between the incumbent and a challenger, having observed only first-period fiscal policy. With decentralization, there is a different politician in each region deciding about tax and public good provision in that region. With centralization, there is a single politician for all regions deciding about tax and public good supply in each region.

In each region l, there are a continuum of measure 1 of identical households/voters who derive utility $W_t^l = u(g_t^l) + x_t^l$ from a regional public good g_t^l and a private good x_t^l in each of the two periods $t = 1, 2$. All agents have an endowment of the private good, normalized to unity. The public good is financed by a lump-sum tax τ_t^l, so that in period t, the utility of the typical voter in region l - ignoring the constant of 1 - is $u(g_t^l) - \tau_t^l$. Second period utility is discounted by a factor $0 < \delta < 1$.

In each region l and each period, the unit cost of producing the public good from the private good can take on one of two values: $c_t^l \in \{c_L, c_H\}$ with $c_L < c_H$. There is no serial cost correlation. We make one of two assumptions about spatial correlation: either

(i) the c_t^l are independent across regions $l = a, b, c$, or (ii) the c_t^l are perfectly correlated across regions $l = a, b, c$. Depending on the nature of the public good and the technology available at the national level, either assumption might be more appropriate.

2.2. Politicians

Both the initial incumbent and the challenger at the election are "good" with probability π and "bad" with probability $1 - \pi$. A "bad" politician is less competent than the good type in the sense that he has a higher expected cost of public good provision. More specifically, let q_G, q_B be the probability of high unit cost of public good provision for the good and bad types: then we assume that $0 \leq q_G < q_B \leq 1$. For now, we assume $q_G = 0$, so the good incumbent never faces a high cost; the implications of relaxing this are discussed in Section 6.4.

All politicians, good or bad, are benevolent in the sense that they maximizes the sum of the utilities of voters in their jurisdiction. Politicians also derive an "ego-rent" from office of R *per region*. For the moment, this is assumed the same under centralization and decentralization (See Section 6.3 for a relaxation of this assumption).

2.3. Budget Constraints and Debt

With decentralization the policy-maker in each region $l = a, b, c$ faces budget constraints in periods $1, 2$

$$c_1^l g_1^l = \tau_1^l + b^l, \;\; c_2^l g_2^l + b^l(1 + r) = \tau_2^l \tag{2.1}$$

respectively, where b^l is debt issued by the incumbent in region l. With centralization, there is one policy-maker, facing a national budget constraint in periods $1, 2$ of

$$\sum_{l=a,b,c} c_1^l g_1^l = \sum_{l=a,b,c} \tau_1^l + b, \;\; \sum_{l=a,b,c} c_2^l g_2^l + b(1 + r) = \sum_{l=a,b,c} \tau_2^l \tag{2.2}$$

respectively, where b is national debt. We assume also $\delta = (1 + r)^{-1}$. Note that we allow taxes to be differentiated, even with centralization. In Section 6.1, we consider the case of centralization with a uniform tax i.e. $\tau_t^l = \tau_t$, for all l.

2.4. Information, The Order of Events, and Equilibrium Concept

In the first period, events are as follows. First, the incumbent chooses public good provision and taxes in his jurisdiction,[10] with debt being residually determined via the government budget constraint. Voters then observe the public good provision and tax in their own jurisdiction *only.* We call this the partial information assumption and relax it in Section 6.2. Then, they update their belief about the competence of the incumbent. They re-elect the incumbent whenever they believe the probability that he is competent is higher than π, the probability that the challenger is competent. In the second period, the winner of the election then chooses public good provision and taxes in his jurisdiction.

Note that we have assumed that first-period borrowing is unobserved by voters prior to the election. This is a key assumption because it allows a high-cost incumbent the option of imitating the fiscal policy of a competent one in the first period. That is, the incumbent can "delay" the revelation of the true cost of public good provision to after the election by borrowing.

Given this information structure and order of events, we then study the perfect Bayesian equilibria (PBE) of this game. It is well-known that games of this type (signalling games) have many PBE, because voter beliefs off the equilibrium path can be arbitrary. We will impose the standard Cho-Kreps stability criterion to select among these equilibria. It turns out that given the structure of the model, there are two such stable equilibria.

We focus for the most part on just one of these two equilibria.[11] This has the properties: (i) the good type, acts *non-strategically* i.e. he just chooses his most preferred level of public good provision, and is always re-elected; (ii) the bad type (when he is high-cost) may choose to pool with the good type, or separate; (iii) when pooling occurs, there is both public good distortion and positive debt accumulation in equilibrium. The attraction of this equilibrium is that when there is pooling, the empirically observed features of the PBC (debt accumulation, increases in public good provision) occur in equilibrium. We will call the equilibrium the *NSG-equilibrium* because it involves non-strategic behavior

[10] Obviously, this is his own region with decentralization, and nationally with centralization.

[11] The other equilibrium is discussed in Section 6.5. In this equilibrium the bad type never distorts public good supply and only the good type signals his competence by resorting to a PBC. The effect of centralization on the probabilitity of PBC is similar with the other equilibrium. So the qualitative picture is the same with the two equilibria.

by the good type.

2.5. Equilibrium without Elections

As a benchmark, we solve the model without elections. Without elections, a randomly drawn politician remains in office for the two periods. First, since utility is linear in the private good, and the intertemporal terms of trade equal the subjective discount factor i.e. $\delta(1+r)=1$, there is no incentive for government borrowing. So, we suppose w.l.o.g. that there will be no borrowing in equilibrium. Second, note that with centralization or decentralization, because the policy-maker is benevolent and has no re-election incentive, in each region, the policy-maker will set the marginal benefit $u'(g)$ equal to the marginal cost c (i.e. the Samuelson rule). Moreover, as the marginal distribution of cost c and the marginal distribution of types are the same whether the policy-maker is national or regional, expected voter welfare will be the same with centralization and decentralization.

3. Equilibrium with Decentralization

Here, we construct the NSG equilibrium. We begin with the second period. In region l, in period $t=2$, the incumbent maximises $u(g_2^l)-\tau_2^l$ subject to the second-period government budget constraint (2.1). So, it is clear that if $c_2^l=c_j,\ j=H,L$, then the incumbent in region l sets fiscal policy

$$g_2^l=g_j,\ \tau_2^l=\tau_j+b^l(1+r),\ j=H,L$$

where $u'(g_j)=c_j$ and $\tau_j=c_jg_j,\ j=H,L$ so that $g_H,\ g_L$ are the efficient levels of public good provision in the two cost realizations. Note that quasi-linear preferences ensure that second-period public good supply is independent of the amount of debt. So, in any region, second-period expected payoffs to voters from good and bad incumbents, given borrowing b are $EW_G-b(1+r)$ and $EW_B-b(1+r)$, where

$$EW_i=q_iW_H+(1-q_i)W_L \quad i=G,B,\ W_j=u(g_j)-c_jg_j \quad j=H,L. \tag{3.1}$$

So, for voters, the second-period benefit to re-election of the incumbent of type i relative to electing the challenger, is

$$S_i=EW_i-EW,\ EW=\pi EW_G+(1-\pi)EW_B$$

Note that this relative benefit is independent of debt. Also, to simplify the subsequent algebra, note that

$$S_G = (1-\pi)S,\ S_B = - \ ,\ = (q_B - q_G)(W_L - W_H) \tag{3.2}$$

where $S > 0$ is the *selection gain* i.e. the second-period welfare gain from replacing a bad incumbent by a good type, which lowers the probability of high cost by $q_B - q_G$ with utility gain of $W_L - W_H$. Clearly, since $q_G < q_B,\ S_G > 0 > S_B$, so the voters prefer to vote out the bad incumbent and to retain the good incumbent.

Finally, note that the second-period benefit to re-election for the incumbent of type i is $R + S_i,\ i = G, B$. Thus, since $S_G > 0 > S_B$, good type is more eager to win election than the bad type. To make the problem interesting, we assume $R + S_B > 0$ i.e. $R > \pi S$, so that both types have a positive incentive to get re-elected.

Now we move to the first period. We construct the NSG equilibrium as follows. First, suppose that the voters in region l set the following re-election rule: *"re-elect the incumbent if $g \geq g_L$, and $\tau = c_L g$; do not re-elect otherwise"*. Note that this rule requires taxes to balance the budget if cost is low. This is without loss of generality, as Ricardian equivalence clearly holds in this model.[12] So, the rule effectively ties down the (indeterminate) debt of a low-cost incumbent to zero. This is a useful benchmark: the actual debt (if any) issued by a high-cost incumbent in equilibrium is therefore also the additional debt generated by the PBC.

Now, consider the incumbent's optimal response to that rule. If the incumbent is good, or if he is bad but low cost, it is obvious that the solution must be to set $g = g_L$. If the incumbent does this, he supplies the public good optimally (given the cost) and is also re-elected.

The interesting case is where the incumbent is bad and high-cost. His choice is between *pooling* i.e. meeting the performance standard by setting $g = g_L, \tau = c_L g_L$, and *separating* i.e. setting his optimal level of public good provision g_H which fails the performance standard. If he decides to separate, by Ricardian equivalence, we can assume w.l.o.g.

[12] That is, the incumbent is indifferent about the financing of a given level of government expenditure. To see this, suppose that the incumbent increases b by one unit, holding first-period g unchanged. Then, from (2.2), τ falls by one unit in the first period, giving a first-period utility increment to the incumbent of 1. Also, from the analysis of the second period, we know that a one-unit increase in b gives a change of $-(1+r)$ incumbent's second payoff. So, the net change in the incumbent's overall payoff is $1-\delta(1+r) = 0$.

that he balances the budget i.e. sets $\tau = c_H g_H = \tau_H$. Note also that in order for a high-cost incumbent to pool, he must issue debt to cover the difference between the cost of the public good provision and taxes, which is $c_H g_L - c_L g_L$.

As already established, the second-period benefit to pooling for the bad type is $R - \pi S$. The first-period cost is that public good supply is distorted upwards from g_H to g_L. The utility cost of that distortion is

$$\Delta = u(g_H) - c_H g_H - (u(g_L) - c_H g_L) > 0.$$

So, the high-cost bad incumbent will wish to pool if the distortion cost from pooling is less than the discounted second-period benefit i.e. $\delta(R - \pi S) \geq \Delta$. This rearranges to a condition that the ego-rent from second-period in office must be high enough relative to the distortion incurred by pooling i.e.

$$R \geq R_D = \frac{\Delta}{\delta} + \pi S.$$

Finally, for equilibrium, we require the voters' behavior to be rational, given their beliefs. This requires

$$\Pr(G\,|g, \tau) \geq \pi \iff g \geq g_L$$

where $\Pr(G\,|g, \tau)$ is the posterior probability (for the voters) that the incumbent is good, given an observed g, τ. Moreover, $\Pr(G\,|g, \tau)$ must be given by Bayes' rule if g is played with positive probability in equilibrium. This condition is easily verified:[13] intuitively, $\Pr(G\,|g_L, \tau_L) \geq \pi$ because, whatever the parameter values, the good incumbent is at least as likely to choose g_L, τ_L as the bad incumbent.

So, we have proved (except for the proof of C-K stability which is given in the Appendix) the following:

Proposition 1. *With decentralization, the following is a (Cho-Kreps) stable equilibrium in each region. The voter's performance standard is "re-elect the incumbent if* $g \geq g_L$, *and* $\tau = c_L g$; *do not re-elect otherwise". The good type and the bad type with low cost always meet this performance standard, issue zero debt and get re-elected. For the bad type with high cost:*

[13] First, if $R < R_D$, so that there is separating by the high-cost bad type, we have from Bayes' rule that $\Pr(G\,|g_L, \tau_L) = \pi/(\pi + (1-\pi)(1-q_B)) > \pi$, $\Pr(G\,|g_H, \tau_H) = 0$. Second, if $R \geq R^D$, so that there is pooling, $\Pr(G\,|g_L, \tau_L) = \pi$. Finally, off the equilibrium path, we just assume monotone beliefs $\Pr(G\,|g, \tau) > \pi,\ g > g_L,\ \Pr(G\,|g, \tau) < \pi,\ g < g_L$.

- if $R < R_D = \frac{\Delta}{\delta} + \pi S$, then he separates i.e. sets the optimal $g = g_H$, $\tau = \tau_H$, issues zero debt, and is not re-elected;

- if $R \geq R_D$ then he pools, sets g_L, τ_L, issues debt $b = (c_H - c_L)g_L = \hat{b}$ and is re-elected.

Moreover, using Proposition 1, we can calculate the ex ante probability of distortion (i.e. a PBC) in any region. This is clearly a function of R as follows:

$$p_D(R) = \begin{cases} 0, & R < R_D \\ (1-\pi)q & R \geq R_D \end{cases} \tag{3.3}$$

where from now on, we set $q_B = q$. The explanation is that with probability $(1-\pi)q$, the incumbent is a bad high-cost one. Moreover, from Proposition 1, if $R \geq R_D$, he will pool, in which case there is a PBC.

While not observable in itself, ex ante probability of a PBC is of particular interest because it determines the level of debt and government spending prior to elections, which are both in principle observable. For example, the ex ante - i.e. before the type of the incumbent is drawn - expected level of debt (per region) is $p_D(R)\hat{b}$ and the ex ante expected difference between the level of government expenditure before and after elections is $p_D(R)(c_H g_L - c_H g_H)$. To see this, note first that debt is issued if and only if a PBC occurs, in which case, $\hat{b}$ units of debt are issued.

4. Equilibrium with Centralization

In each region, the second-period outcome is the same as that with decentralization i.e. the incumbent just sets a level of public good provision and tax of $(g_j, \tau_j + b(1+r))$ if $c = c_j$, where $u'(g_j) = c_j$, $j = H, L$. Now, b is of course the amount of debt issued by national government. So, conditional on b, second-period expected payoffs to voters from good and bad incumbents in any region are the same as with decentralization. Moreover, the per region total second-period benefit to re-election for the incumbent of type i is the same as with decentralization i.e. $R + S_i$, $i = G, B$.

Now we move to the first period. We construct the NSG equilibrium as follows. First, suppose that the voters in region l set the following re-election rule: *"re-elect the incumbent if $g \geq g_L$, and $\tau = c_L g$; do not re-elect otherwise"*.[14] Note that with centralization, to be

[14] Note that this rule again requires taxes to balance the budget if cost is low. This is without loss of

re-elected, the incumbent must meet the performance standard of the voters in only two out of three regions.

Now, consider the incumbent's optimal response to that rule. If the incumbent is good, it is obvious that the solution must be to set g_L, τ_L. If the good incumbent does this, he supplies the public good optimally (given the cost) and is also re-elected.

What about the bad incumbent? Remember that generally, the bad incumbent knows at this stage that a number $k \in \{0, 1, 2, 3\}$ of the regions in his jurisdiction are high-cost. If a region l is low-cost, the bad incumbent cannot do better than set (g_L, τ_L). If region l is high-cost, the only two strategies that can potentially be optimal are (i) to meet the voters' performance standard by setting (g_L, τ_L), or (ii) setting[15] $g = g_H$, $\tau = c_H g_H = \tau_H$. Call these the strategies of *pooling or separating in region* l respectively.

Because of majority voting, the incumbent must pool in only two regions in order to win the election. So, the cost of winning the election - in terms of Δ, the utility cost of distortion in public good provision - is then easy to calculate. If $k = 0, 1$, either there are no high-cost regions, or pooling in the only high-cost region is not necessary to win the election. So, the cost is zero. If $k = 2$, pooling in one high-cost region is necessary to win the election, so the cost of winning is Δ. If $k = 3$, pooling in two high-cost regions is necessary to win the election, so the cost of winning is 2Δ. So, the cost per region of winning the election is

$$\frac{(k-1)\Delta}{3}, \quad k = 2, 3. \tag{4.1}$$

So, if $k > 0$, to win the election, it is clear that in equilibrium, the incumbent will set fiscal policy (g_L, τ_L) in exactly two regions out of three. Call this the *majority low-cost provision* property of the equilibrium.

The bad incumbent of type i will now pool in the aggregate iff the discounted benefit from doing so $\delta(R - \pi S)$, exceeds the distortion cost (4.1). This rearranges to a condition that the ego-rent from second-period office must be high enough relative to the distortion incurred by pooling i.e.

$$R \geq R_C^k = \frac{(k-1)\Delta}{3\delta} + \pi S, \ \ k = 2, 3.$$

Note a key feature; the decision to pool depends on the number of high-cost regions. Note also that $R_C^2 < R_C^3 < R_D$.

generality, as Ricardian equivalence again clearly holds.

[15] By Ricardian equivalence, we can assume w.l.o.g. that he balances the budget.

Finally, for equilibrium, we require the voters' behavior to be rational, given their beliefs. This condition is easily checked along the lines of the decentralization case. So, we have proved (except for the proof of C-K stability which is given in the Appendix) the following:

Proposition 2. *With centralization, the following is a (Cho-Kreps) stable equilibrium in each region. The voter's performance standard is "re-elect the incumbent if $g \geq g_L$, and $\tau = c_L g$; do not re-elect otherwise". The good type and the bad type with $k = 0, 1$ high cost regions always meet this performance standard, issue zero debt and get re-elected. For the bad type with $k = 2, 3$ high cost regions:*

- if $R < R_C^k = \frac{(k-1)\Delta}{3\delta} + \pi S$, then he separates i.e. sets the optimal g_H, τ_H , issues zero debt, and is not re-elected;

- if $R \geq R_C^k$ then he pools, sets g_L, τ_L, issues debt $b = (k-1)\hat{b}$ and is re-elected.

We can now compute[16] $p_C(R)$, the ex ante probability that for a particular region there is distortion in public good provision in equilibrium with centralization as a function of R. This computation follows the logic of the decentralization case. We begin with the case of spatially independent costs:

$$p_C(R) = \begin{cases} 0, & R < R_C^2 \\ (1-\pi)q^2(1-q), & R_C^2 \leq R < R_C^3 \\ (1-\pi)\left(\frac{2}{3}q^3 + q^2(1-q)\right) & R \geq R_C^3 \end{cases} \tag{4.2}$$

The interpretation of $p_C(R)$ is the following. When ego-rent from office is low i.e. below R_C^2, the bad type will never pool when at least two regions are high-cost and so the probability of a PBC is zero. As the ego rent increases to the range $R_C^2 \leq R < R_C^3$, the bad type will pool when two, but not three, regions are high-cost. This occurs with probability $3q^2(1-q)$, and given this event, each region has an ex ante equal probability of $\frac{1}{3}$ of facing a distortion in public good supply. When the ego-rent rises to above R_C^3, the bad type will also pool when three regions are high-cost. This occurs with probability q^3, and given this event, each region has an ex ante equal probability of $\frac{2}{3}$ of facing a distortion in public good supply.

[16] As with decentralization, ex ante probability of a PBC is of particular interest because it determines the level of debt and government spending prior to elections, which are both in principle observable. The ex ante expected level of debt (per region) is $p^C(R)\hat{b}$ and the ex ante expected difference between the level of government expenditure in a region before and after elections is $P^C(R)(c_H g_L - c_H g_H)$.

Now consider the case of perfect correlation. Here:

$$p_C(R) = \begin{cases} 0, & R < R_C^3 \\ (1-\pi)\frac{2}{3}q & R \geq R_C^3 \end{cases} \tag{4.3}$$

The explanation is now that costs are either all low, with probability $1-q$, or all high, with probability q. Moreover, if costs are all high, and the incumbent is bad (which occurs with probability $(1-\pi)q$), pooling occurs in two out of the three regions iff $R \geq R_C^3$.

5. Comparing Decentralization and Centralization

5.1. The PBC

A key objective of this paper is to compare the ex ante probability of the PBC in the two fiscal regimes. To develop intuition, we focus first on the case of perfect correlation. Then, using (3.3), (4.3), we can construct Figure 1.

[Figure 1 in here]

The explanation of Figure 1 is as follows. When $R < R_C^3$, rents are so low that the bad high-cost incumbent will choose to separate with both centralization and decentralization. When $R > R_D$, ego-rents are high enough so that the bad incumbent will choose to pool both with centralization and decentralization. In that case, the possibility of selective pooling with centralization ensures that the probability of pooling in any particular region is $\frac{2}{3}$, rather than 1. This is the *direct effect* of selective distortion lowering the PBC probability. On the other hand, when $R_C^3 \leq R < R_D$, incumbent *only* decides to pool with centralization. This is due to the *indirect effect* of selective pooling i.e. that the "price" of pooling is lowered with centralization. In this case, the probability of pooling in any particular region is $\frac{2}{3}$, rather than zero with decentralization.

Now consider the case of independent costs across regions with centralization. For this case, Figure 2 graphs p_C, p_D.

[Figure 2 in here]

Note first that the qualitative picture is the same as with perfectly correlated costs. That is, when R is high i.e. above R_D, $p_C < p_D$, when R is intermediate i.e. between R_D and

R_C^2, $p_C > p_D$, and when R is low, i.e. below R_C^2, $p_C = p_D = 0$. Again, the direct and indirect effects of selective pooling are at work.

Figures 1 and 2 indicate that a general statement of the relationship between p_C, p_D is possible. Define $\underline{R}$ to be $\underline{R} = R_C^3$ with perfectly correlated costs, and $\underline{R} = R_C^2$ with independent costs.

Proposition 3. *Whether costs are perfectly correlated or independent across regions, there is an* $\underline{R} < R_D$ *such that : (i) if* $R < \underline{R}$, $p_D(R) = p_C(R) = 0$; *(ii) if* $R \geq R_D$, $p_D(R) > p_C(R)$; *(iii) if* $R_D > R \geq \underline{R}$, $p_D(R) < p_C(R)$. *That is, centralization reduces the PBC probability when ego-rents are high, but increases it when rents are intermediate.*

It is also interesting to see the effect on p_C of moving from perfectly correlated to independent costs. This of course isolates the cost distribution effect, as it is absent with perfect correlation, but present with independent costs. Let $p_{C,I}(R)$ and $p_{C,P}(R)$ denote the PBC probabilities with independent and perfectly correlated costs respectively. These probabilities are drawn in Figure 3. It is clear from the Figure (using the fact that $3q^2 - q^3 < 2q$ for $q < 1$) that for $R > R_C^3$, $p_{C,I} < p_{C,P}$, whereas for $R_C^2 \leq R < R_C^3$, $p_{C,I} > p_{C,P}$.

[Figure 3 in here]

To understand Figure 3, note first that when we move from perfect correlation to independence, the minimum value of R at which a positive PBC arises with centralization falls from R_C^3 to R_C^2. This is because the cost distribution effect is now at work; with positive probability, the incumbent can now face just two high-cost regions, in which case the cost of pooling is lower than with three high-cost regions. So, he will be willing to pool - and thus distort public good supply with positive probability - for a lower value of q. On the other hand, when pooling takes place with both perfect correlation and independence, i.e. when $R \geq R_C^3$, the probability that any particular region experiences public good distortion is lower with independence, because, unlike the case of perfect correlation, there is always a positive probability that only two regions will have a high cost, in which case the per region probability of distortion is lower. We can summarize as follows:

Proposition 4. *When costs change from perfectly correlated to independent across regions, if* $R \geq R_C^3$, *the PBC probability falls, but if* $R_C^3 > R \geq R_C^2$, *the PBC probability rises. That is, the cost distribution effect reduces the PBC probability when ego-rents are* *high, but increases it when rents are intermediate.*

5.2. Voter Welfare

In this section, we compare ex ante voter welfare in a given region in the two fiscal regimes. To do this, we write ex ante voter welfare in the following way;

$$EW_D = K - (1-\pi)(1-s_D)(\Delta_D + \delta\pi S). \tag{5.1}$$

The elements of this formula are as follows. First, $K = EW + \delta(\pi W_L + (1-\pi)EW)$ is the baseline expected payoff[17] per period in the equilibrium where separation of the bad type occurs with probability 1. Second, s_D is the separation probability[18] of a bad incumbent (who is thus not re-elected). This measures the selection effect of the election. From Proposition 1, this is

$$s_D = \begin{cases} q, & R < R_D \\ 0 & R \geq R_D \end{cases}$$

Third, Δ_D is the expected per-region cost of distortion by bad incumbent, *conditional on the event of no separation*[19] (and thus re-election), defined as

$$\Delta_D = \begin{cases} 0 & \text{if } R < R_D \\ q\Delta & \text{if } R \geq R_D \end{cases} \tag{5.2}$$

The explanation is as follows. If $R < R^D$, then conditional on re-election, the bad incumbent must be low-cost, so there is no distortion cost. If $R \geq R^D$, then conditional on re-election, the bad incumbent can be either high or low cost. He is high-cost with probability q, and so the expected cost of distortion is $q\Delta$. Finally, from above, πS is the expected gain or loss from retaining a bad type i incumbent, rather than replacing him with a challenger.

So, (5.1) says that expected voter welfare is equal to some baseline level generated when the bad incumbent loses the election, plus an "adjustment factor", which is equal to the probability that the incumbent is bad and wins the election, i.e. $(1-\pi)(1-s_D)$

[17] This is calculated as follows. If the incumbent is bad and separates, this gives payoff $A = EW_B + \delta EW$. If the incumbent is good, he is always re-elected, so voters get $B = W_L + \delta W_L$. Then $EW_D = \pi B + (1-\pi)A$, which reduces to K.

[18] This is calculated unconditionally i.e. before the cost state in known.

[19] Conditional on separation (and no re-election), there is obviously no distortion cost.

times the net gain from that event, $-(\Delta_D + \delta\pi S)$. The latter is always negative: voters unambiguously prefer the bad incumbent to lose the election, because this delivers a second-period selection gain πS, plus elimination in the first-period distortion of public good supply.

The expected welfare under centralization can be written in a similar way as follows:

$$EW_C = K - (1-\pi)(1-s_C)(\Delta_C + \pi\delta S). \tag{5.3}$$

The two differences are (i) that s_C is now the separation probability with centralization; (ii) Δ_C is the expected per-region cost of distortion by a bad incumbent *conditional on the event of no separation* with centralization. Formulae for s_C, Δ_C can be derived along the lines of the decentralization case, but they will vary depending on whether costs are independent or perfectly correlated. To save space, these formulae are only given in the Appendix, as part of the proof of Proposition 5 below.

We can now decompose the welfare difference neatly into incentive and selection effects:

$$\begin{aligned} EW_C - EW_D = {} & (1-\pi)(1-s_C)(\Delta_D - \Delta_C) \\ & + (1-\pi)(s_C - s_D)(\Delta_D + \delta\pi S). \end{aligned} \tag{5.4}$$

From (5.4), $(1-\pi)(1-s_C)(\Delta_D - \Delta_C)$ is the *incentive* effect on voter welfare of a move to centralization, and $(1-\pi)(s_C - s_D)(\Delta_D + \delta\pi S)$ the corresponding *selection* effect. The selection effect is easily signed: it is positive iff the bad incumbent is more likely to be de-selected under centralization. The incentive effect is generally ambiguous in sign.

However, we can show the following. Set $\underline{R} = R_C^3$ with perfect correlation, and $\underline{R}= R_C^2$ with independence. Then we have:

Proposition 5. *If $R_D > R \geq \underline{R}$, $EW_D > EW_C$; and if $R_D \leq R$, $EW_D < EW_C$. Moreover, if there is perfect correlation, and $R <\underline{R}= R_C^3$, then $EW_D = EW_C$. On the other hand, if there is independence, and $R < \underline{R} = R_C^2$, then voter welfare is higher in whichever regime gives the higher separation probability. In particular, if $q > 0.5$, $s_C > s_D$, so $EW_C > EW_D$, and if $q < 0.5$, $s_C < s_D$, so $EW_C < EW_D$.*

The intuition is as follows. Generally, a PBC in a region is costly to the voters in that region in terms of both incentives and selection, so voters dislike PBCs. When $R_D > R \geq \underline{R}$, we we have seen, a PBC occurs only with centralization. So, then, voter welfare is lower with centralization. On the other hand, if $R_D \leq R$, a PBC will occur in both fiscal regimes. Now, the effect of selective pooling means that each region expects distortion with lower probability than with decentralization, implying voter welfare is higher with centralization.

When $R < \underline{R}$, and costs are perfectly correlated, the probability of a PBC is zero, and in fact there are no differences in either incentive or selection effects across fiscal regimes. So, not surprisingly, there is no difference in voter welfare either.

However, when $R < \underline{R}$, and costs are independent, even though the probability of a PBC is zero, there is still a difference in selection effects across regimes, due to the cost distribution effect: that is, generally, $s_D \neq s_C$ i.e. the equilibrium probability that the bad incumbent is de-selected generally differs between fiscal regimes. The reason is that the bad type is de-selected with decentralization when cost is high which occurs with probability q. However the bad incumbent is de-selected with centralization when there is high cost in a majority of regions which occurs with probability with probability $q^3+3q^2(1-q)$. This probability is higher when $q > 0.5$. We can call this the information consolidation effect of centralization in the sense that re-election is based on the performance in several regions rather than a single region as with decentralization. When the bad type is more likely to draw high cost, it is harder for him to be re-elected with centralization than with decentralization. So centralization can have a screening advantage.

At this point, we can compare our findings to Hindriks and Lockwood (2005) who consider a model where politicians differ in benevolence. They consider a decomposition of the change in voter welfare exactly like (5.4), and show that (i) the incentive effect of centralization is always negative i.e. conditional on a fixed separation probability, voter welfare is unambiguously lower with centralization due to the possibility of selective rent diversion by the bad incumbent; (ii) the selection effect is ambiguous i.e. an increase in the separation probability has an ambiguous effect on voter welfare. Interestingly, this is exactly the opposite to our findings above.

6. Some Extensions

6.1. Uniform Taxes

So far, we have assumed differentiated taxes i.e. the τ_t^l can differ across regions. However, an empirical stylized fact is that with centralization, $\tau_t^l = \tau_t$ i.e. when central governments set taxes, rates across regions are the same. What difference does this make to the equilibrium outcome with centralization, and thus with the PBC? It makes no difference at all to what happens in the second period. In the first period, we can construct an equilibrium with the same outcome, except that the amount of debt issued is generally higher than with differentiated taxes.

First, suppose that the voters in region l set the following re-election rule: *"re-elect the incumbent if in region l, g_L, and the uniform tax is $\tau = \tau_L$; do not re-elect otherwise"*. As before with centralization, to be re-elected, the incumbent must meet the performance standard of the voters in only two out of three regions.

The optimal response for the incumbent to this rule is exactly as described in Section 3, with the exception that he must set a uniform tax τ. So, if he meets the performance standard in two out of the three regions, he must set as tax τ_L in *all* regions, and thus will be obliged to issue debt if he faces $k \geq 1$ high-cost regions. This contrasts with the differentiated tax case, where debt is issued iff $k \geq 2$. However, given that the incumbent and voters are indifferent about government financial policy, this is an inessential difference. In this equilibrium, real resource allocation and expected voter welfare are the same as with differentiated taxes.

6.2. Full Information

So far, we have assumed that in the first period, voters observe only public good provision and the tax in their own region before voting. But now, suppose that voters in any region l observe these variables in *all* regions before voting. In the class of equilibria that we are considering mainly in this paper, i.e. NSG equilibria, where the good type behaves non-strategically, there is only one such equilibrium. This is where the voting rule set by all voters is *"re-elect the incumbent if in all regions $g \geq g_L$, and $\tau = \tau_L g$; do not re-elect otherwise"*. The analysis of this equilibrium then follows Section 4. The key difference, of course, is that due to full voter information, selective pooling is no longer feasible. If the bad incumbent faces k high-cost regions, he must pool in all of them. Majority voting per se does not allow him to target regions selectively.

This implies, of course, that the distortion cost of re-election is higher. So, for any given number of high-cost regions, the critical value of R above which he is wiling to pool and win re-election must be higher. In fact, one can compute that for $k \geq 1$, the bad incumbent will pool iff $R \geq \frac{k\Delta}{3} + \pi S = \tilde{R}_C^k$.

What effect does this have on the PBC probability? This is easy to calculate, in the case of independent cost shocks. Let p_k be the probability that there are k high-cost regions: $p_0 = (1-q)^3$, $p_1 = 3(1-q)^2 q$, etc. Then by the argument above,

$$p_C(R) = (1-\pi) \times \begin{cases} 0, & R < \tilde{R}_C^1 \\ \frac{p_1}{3}, & \tilde{R}_C^1 \leq R < \tilde{R}_C^2 \\ \frac{p_1}{3} + \frac{2p_2}{3}, & \tilde{R}_C^2 \leq R < \tilde{R}_C^3 \\ \frac{p_1}{3} + \frac{2p_2}{3} + \frac{3p_3}{3} = q & \tilde{R}_C^3 < R \end{cases} \tag{6.1}$$

Moreover, from the fact that $\tilde{R}_C^3 = R_D$ by definition, and using (3.3), (6.1), we see that $p_C(R) \geq p_D(R)$, and the difference is strict when $\tilde{R}_C^1 \leq R < R_D$. How do we interpret this? Full information closes down selective pooling, so the only difference between fiscal regimes is the cost distribution effect. So, the interpretation is that the cost distribution effect *unambiguously raises the PBC probability* (if it has any effect at all) by lowering the thresholds at which the incumbent is willing to pool (note $\tilde{R}_C^1$, $\tilde{R}_C^2 < R_D$). This is rather different to the findings of Proposition 4. The difference therefore must be due to the fact that there must be some qualitative interaction between the selective pooling and cost distribution effects.

6.3. Rent-Scale Effects

So far, we have assumed that ego-rent per region is the same in both fiscal regimes. But, it is plausible (and has been assumed in the literature, see e.g. Seabright (1996) and Persson and Tabellini (2000)) that following a move to centralization, the total ego-rent of the incumbent will rise, but by less than in proportion to the number of regions in the jurisdiction. For example, the president of the US does not earn 50 times as much as a State governor, either in office or after office!

This possibility can be modelled by assuming that the per-region future ego-rent from holding office with centralization is λR, where $0 \leq \lambda \leq 1$ is the *rent-scale* parameter. Then, with centralization, the total second-period per-region benefit to re-election for the incumbent of type i is $\lambda R + S_i$. This in turn changes the cutoffs in Proposition 2 to R_C^k/λ. So, the effect of a decrease in λ will generally be to reduce the set of parameter values for which the bad incumbent pools. We call this the *rent-scale effect.* In terms of the PBC, this offsets the indirect effect of selective pooling, which is to make the pooling option more attractive for the incumbent with centralization.

Indeed, it is fairly clear that the rent-scale effect can be so strong that it can eliminate the indirect effect of selective pooling on the PBC. Assume for example, perfect cost correlation, and that λ is small enough so that $R_C^3/\lambda > R_D$. Then, given that $p_C(R) = 0,\ R < R_C^3/\lambda$, we see that $p_C(R) \leq p_D(R)$ everywhere. A similar argument applies if costs are independent. That is, if the rent-scale is strong enough, the PBC probability will be unambiguously (at least weakly) lower with centralization.

This is a strong prediction, but we do not put too much weight on it because ego-rents are almost by definition unobservable (we only observe politicians' pay, which political scientists agree is only a small part of ego-rent).

6.4. Allowing Good Incumbents to Have High Costs

So far, we have assumed that $q_G = 0$, and of course, the case $q_G > 0$ is more general. In this case, a NSG equilibrium can easily be constructed, either with decentralization or centralization. For example, in the decentralization case, a high-cost good incumbent has a distortion cost Δ of imitating a low-cost incumbent, but gets benefit $\delta(R + (1-\pi)S)$ from re-election. So, if $R \geq \frac{\Delta}{\delta} - (1-\pi)S \equiv R_D^G$, he will pool in equilibrium, and otherwise he will separate. So, with decentralization, for $R < R_D^G$, there is no pooling in equilibrium, if $R_D^G \leq R < R_D^B = \frac{\Delta}{\delta} + \pi S$, only the good type with the high cost pools, and if $R > R_D^B$, both types with high cost pool. A similar extension can be made in the case with centralization, and with centralization, the key feature of selective pooling of course remains.

The problem is that these equilibria are not stable. The reason is generally that the good type with high cost (unlike the good type with low cost) is not getting his first-best outcome. In particular, in order to get re-elected, he has to set g_L, and thus pay a rather large distortion cost Δ. By deviating from equilibrium, he can credibly signal his type to the voters at lower cost, and still be re-elected.

An informal sketch of this argument is as follows. Assume for concreteness that $R < R_D^G$, so that in equilibrium, a good type with high cost does not pool i.e. sets g_H. Suppose this type now deviates upward from g_H to some $g' + \varepsilon$ with $g_H < g' + \varepsilon < g_L$, where g' is chosen so as to make the distortion cost of g' to an incumbent with high cost just equal to a bad type's re-election benefit $\delta(R-\pi S)$. The distortion cost of g' is formally measured by $\Delta_H(g')$ in (6.2) below, so g' is formally defined by $\Delta_H(g') = \delta(R-\pi S)$.

Now note two points. First, by construction, the bad high-cost type would not like to deviate from g_H to $g'+\varepsilon$ even if he were then re-elected. Second, for ε small enough, the benefit to the high-cost good type from deviation to $g'+\varepsilon$ is approximately

$$\delta(R+(1-\pi)S) - \Delta_H(g') > \delta(R-\pi S) - \Delta_H(g') = 0$$

and is therefore strictly positive. So, by the argument of Cho and Kreps, if rational voters observe $g'+\varepsilon$, they would infer that this deviation was made by a good type and thus re-elect the deviant. Thus, the original equilibrium is not stable.

6.5. Another Equilibrium

So far, we have concentrated on one of the C-K stable equilibria of our model, the NSG. We now ask if our results are similar if we assume the other kind of equilibrium. We will also assume for simplicity that $q_B = 1$, so that the bad incumbent is always high-cost. In this case, it is possible to show that there is only one other stable equilibrium of our model, with the following structure: (i) the good incumbent distorts public good supply above g_L in order to prevent imitation by the bad incumbent, and (ii) the bad incumbent chooses g non-strategically i.e. sets $g = g_H$. For obvious reason, we call this the NSB (non-strategic behavior by the bad incumbent) equilibrium.

We assume throughout partial information and differentiated taxes. Some preliminary results are useful. Define

$$\Delta_j(g) = u(g_j) - c_j g_j - \{u(g) - c_j g\}, \; j = H, L \tag{6.2}$$

to be the utility loss (distortion) from a suboptimal level of public good provision given that the cost is c_j. Assume $u(.)$ strictly concave and satisfies $\lim_{g\to\infty} u'(g) = 0$. Then (6.2) has the useful properties[20]: $\Delta_j(g_j) = 0$, $\Delta_j(g)$ is strictly increasing if $g \geq g_j$, and $\lim_{g\to\infty} \Delta_j(g) = \infty$. Finally, for $g > g_L$, note that

$$\begin{aligned} \Delta_H(g) - \Delta_L(g) &\geq u(g_L) - c_H g_L - \{u(g) - c_H g\} - \Delta_L(g) \\ &= (g - g_L)(c_H - c_L) > 0. \end{aligned} \tag{6.3}$$

[20] To see this, note that for $g > g_j$, $\Delta_j'(g) = c_j - u'(g) > c_j - u'(g_j) = 0$, and $\lim_{g\to\infty} \Delta_j'(g) = \lim_{g\to\infty} c_j - u'(g) = c_j$.

Note that (6.3) is a single-crossing condition that says that the good type always cares less about a distortion above g_L than the bad type does.

6.5.1. Decentralization

We can now construct a NSB equilibrium. First, the voting rule is *"re-elect the incumbent if $g \geq g_D$, and $\tau = c_L g$; do not re-elect otherwise"*. Moreover, the cutoff is

$$g_D = \begin{cases} g_L, & R \leq R_D \\ \tilde{g}_D & R > R_D \end{cases} \tag{6.4}$$

where $R_D = \frac{\Delta_H(g_L)}{\delta} + \pi S$, and $\tilde{g}_D$ is defined by:

$$\Delta_H(\tilde{g}_D) = \delta(R - \pi S). \tag{6.5}$$

So, as above, we are restricting attention to values of $R \geq \pi S$. Note for $R > R_D$, from the properties of $\Delta_H(g)$, that (6.5) always has a unique solution $\tilde{g}_D > g_L$.

What is the optimal response of the incumbent to this performance standard? First, assume $R_D \geq R$. Recalling (i) that when $R_D \geq R$, the performance standard is simply g_L, and (ii) that R_D is the ego-rent that makes the bad incumbent indifferent between meeting performance standard g_L and not. We see that the good type strictly prefers to meet the performance standard, and the bad type prefers not to (strictly if $R < R_D$).

Now assume $R_D < R$. In this case, $\tilde{g}_D$ is constructed so as to make the bad type just indifferent between meeting the performance standard or not in which case we assume w.l.o.g[21] that he chooses g_H. So, the good incumbent strictly gains from meeting the performance standard, because:

$$\begin{aligned} \delta(R + (1-\pi)S) - \Delta_L(g_D) &> \delta(R - \pi S) - \Delta_L(g_D) \qquad (\text{as } S > 0) \\ &> \delta(R - \pi S) - \Delta_H(g_D) \qquad (\text{from } (6.3)) \\ &= 0. \end{aligned}$$

These choices of course, confirm the voters' belief that only the good incumbent will meet the performance standard. So, the conclusion is that a NSB equilibrium of this type always exists.

[21] This is w.l.o.g. because g_D could always be set slightly tighter at $\tilde{g}_D + \varepsilon$ to break the tie.

6.5.2. Centralization

Again, we construct a NSB equilibrium. First, the voting rule is *"re-elect the incumbent if* $g \geq g_C$*, and* $\tau = c_L g$*; do not re-elect otherwise"*. Moreover,

$$g_C = \begin{cases} g_L, & R \leq R_C \\ \tilde{g}_C & R > R_C \end{cases} \tag{6.6}$$

where $R_C = \frac{2\Delta_H(g_L)}{3\delta} + \pi S$, and $\tilde{g}_C$ solves

$$\frac{2}{3}\Delta_H(g_C) = \delta(R - \pi S). \tag{6.7}$$

In setting g_C, voters rationally anticipate that any incumbent seeking re-election will only meet the standard in a majority of regions, as this is the cheapest way of being re-elected.

Now, consider the optimal response of the incumbent to the voting rule. Again, the incumbent has two choices. First, he can meet the performance standard in two out of three regions and be re-elected at the cost of some upward distortion in public good supply, or he can set his optimal public good supply (g_L or g_H) and not be re-elected. An argument exactly as in the decentralization case then establishes that no matter what R, only the good type will choose to meet the performance standard. So, again, the conclusion is that a NSB equilibrium always exists.

6.5.3. Comparing Centralization and Decentralization: the PBC

In the signalling equilibrium, no debt is issued, and the bad type never distorts public good supply. So, let us define a PBC as distortion of g by the good type. Moreover, the size of the distortion generally varies with R, and with centralization, due to selective pooling, g is random i.e. the incumbent randomly chooses two regions in which to meet the performance standard, and sets g_L in the third. So, we will measure the distortion in public good supply as the expected value of g set by the good type. The following table gives distortions in the two fiscal regimes.

Table 1: Distortion in NSB Equilibrium

	Centralization	Decentralization	Difference
$R < R_C$	g_L	g_L	0
$R_C < R \leq R_D$	$\frac{2}{3}\tilde{g}_C + \frac{1}{3}g_L$	g_L	>0
$R > R_D$	$\frac{2}{3}\tilde{g}_C + \frac{1}{3}g_L$	$\tilde{g}_D$	?

To make a comparison when $R > R_D$, we consider the utility function: $u(g) = \sqrt{g}$. In this case, it can be shown[22] that above R_C, $\tilde{g}_C$ is a strictly increasing and concave function of R, and above R_D, $\tilde{g}_D$ is a strictly increasing and concave function of R, as shown in figure 4 below:

[Figure 4 in here]

Moreover, as shown in Figure 4, it can be shown that $\tilde{g}_C$, $\tilde{g}_D$ cross at a unique point $\hat{R} > R_D$. So, the picture is very consistent with results for the NSG equilibrium. That is, if R is low, there is no PBC in both fiscal regimes, for intermediate values of R, there is more distortion with centralization, and for sufficiciently high values of R there is more distortion with decentralization.

7. Related Literature and Conclusions

7.1. Related Literature

Our model of the PBC[23] clearly builds on the seminal work of Rogoff. However - apart from the obvious difference that he did not consider fiscal decentralization - it differs in some important details. First, in our model, in the first period, the incumbent can borrow on an international capital market, so we can have a first-period budget deficit in equilibrium, whereas in Rogoff (1990), the incompetent incumbent "hides" his high cost of producing the public good by cutting back on production of an investment good that is not observed by voters until after the election. The reason for this is that we wish to be consistent with the stylized fact that the PBC shows up mostly on budget deficits (see footnote 1 above).

Second, we allow a more general mapping of competency types into costs than Rogoff (1990). In Rogoff (1990), the good (bad) type has a low (high) cost with probability 1, whereas we just impose the condition that the good type has a low cost with probability

[22] The details of the calculations are straightforward but lengthy, and are available on request.

[23] There is also a more recent career concern model of the political budget cycle proposed by Persson and Tabellini (2002) and Shi and Svensson (2002) where politicians are ex-ante identical and uncertain about how well they will be able to perform. Competence is only revealed ex-post after fiscal policy choices are made. In equilibrium all types of politicians will incur excessive pre-election borrowing to increase their chance of re-election. In equilibrium, however, the voters cannot be fooled and they correctly infer competence from the realized performance, and only re-elect the competent politicians.

1.

Finally, we have a slightly different tie-breaking rule used by voters when they are indifferent.[24] This has the important implication that the equilibrium we have called the NSG equilibrium is stable. In Rogoff (1990), the NSG equilibrium is shown to be unstable when parameter values are such that the bad incumbent decides to pool, and indeed, his main focus of attention is what we call the NSB equilibrium.

The concept of selective distortion is also somewhat related to Seabright (1996) and Persson and Tabellini (2000). In particular, the Seabright model studies the effect of fiscal decentralization in a moral hazard framework, building on Barro(1973) and Ferejohn (1986). The incumbent can exert (in each region separately) a policy effort at some cost, and this effort stochastically determines performance. In the Seabright model, other things equal i.e. abstracting from rent-scale effects, the incentive to put in effort is lower with centralization, as a small increase in effort in any region has a smaller positive effect on the overall re-election probability of the incumbent than with decentralization, due to majority rule. For a more detailed discussion, see Hindriks and Lockwood (2005).

7.2. Conclusions

Fiscal centralization is often claimed to reduce electoral accountability because to win election, the policymaker needs only the support of a majority of regions. This paper has presented a simple model where both the probability and welfare consequences of the political budget cycle can be compared under fiscal centralization and decentralization. In spite of the simple structure, the impacts of a change in the fiscal regime on the political budget cycle and on voter welfare are quite subtle. Surprisingly enough, we find that the classical argument of centralization reducing accountability is turned on its head. Indeed, the fact that central policymaker needs only the support of a majority of regions can reduce the amount of fiscal distortion needed to win election. The gain of selective pooling to signal competence can be lost when we assume that voters can observe the performance of the incumbent in other regions.

[24] In Rogoff (1990), the tie-breaking rule assumes that the incumbent only wins with probability 0.5 if he is judged by voters as equally competent to the challenger, whereas in our model, this probability is 1. In other words, we assume a lexicographic second preference for the incumbent.

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8. Appendix

Proof of Proposition 5. We begin with formulae for s_C, Δ_C. With independence, the separation probability is

$$s_C = \begin{cases} q^3 + 3(1-q)q^2, & R < R_C^2 \\ q^3, & R_C^2 \leq R < R_C^3 \\ 0 & R \geq R_C^3 \end{cases} \tag{8.1}$$

because if $R < R_C^2$, separation occurs whenever there are two or three high-cost regions, which occurs with probability $q^3 + 3(1-q)q^2$, and if $R_C^2 \leq R < R_C^3$, separation occurs when there are three high-cost regions, which occurs with probability q^3. With perfect correlation, for the bad incumbent, $k = 0$ with probability $1-q$, and $k = 3$ with probability q. So,

$$s_C = \begin{cases} q, & R < R_C^3 \\ 0 & R \geq R_C^3 \end{cases} \tag{8.2}$$

Also, with independence

$$\Delta_C = \begin{cases} 0, & \text{if } R < R_C^2 \\ \frac{q^2(1-q)}{1-q^3}\Delta, & \text{if } R_C^2 \leq R < R_C^3 \\ q^2\left(1 - \frac{1}{3}q\right)\Delta & \text{if } R \geq R_C^3. \end{cases} \tag{8.3}$$

The explanation is as follows. First, take $R \geq R_C^3$. Then, in equilibrium, the no-separation event occurs with probability 1. So, if if $k = 2$ there is distortion in only one region, and if $k = 3$ there is distortion in two out of three regions. So the expected per-region cost of distortion by type i, is $3(1-q)q^2\frac{\Delta}{3} + q^3\frac{2\Delta}{3} = q^2(1 - \frac{q}{3})\Delta$. When $R \in [R_C^2, R_C^3)$ the no-separation event occurs with probability $1 - q_i^3$ (from (8.1)), but conditional on this event, there is only distortion in one region when $k = 2$. So the expected per-region cost of distortion by type i (conditional on no separation) is $\frac{q^2(1-q)}{1-q^3}\Delta$. With perfect correlation,

$$\Delta_C = \begin{cases} 0, & \text{if } R < R_C^3 \\ \frac{2}{3}q\Delta & \text{if } R \geq R_C^3. \end{cases} \tag{8.4}$$

Using (8.1), (8.2), (8.3), (8.4) and the formula for $EW_C - EW_D$, we can construct the following table:

Table A1

Perfect Corr.	$s_C - s_D$	$\Delta_D - \Delta_C$	$EW_C - EW_D$
$R > R_D$	0	$\Delta q - \frac{2}{3}\Delta q$	> 0
$R_D > R \geq R_C^3$	$-q$	$-\frac{2}{3}\Delta q$	< 0
$R < R_C^3$	0	0	$= 0$
Indep.	$s_C - s_D$	$\Delta_D - \Delta_C$	$EW_C - EW_D$
$R > R_D$	0	$\Delta q - \Delta q^2\left(1 - \frac{1}{3}q\right)$	> 0
$R_D > R \geq R_C^3$	$-q$	$-\Delta q^2\left(1 - \frac{1}{3}q\right)$	< 0
$R_C^3 > R \geq R_C^2$	$q^3 - q$	$-\Delta q^2\left(1 - \frac{1}{3}q\right)$	< 0
$R < R_C^2$	$q^3 + 2q - 3q^2$	0	?

Inspection of this table, noting that with independence, if $R < R_C^2$, the sign of $EW_C - EW_D$ is equal to the sign of $q^3 + 2q - 3q^2$, gives us the result.

Stability of Equilibrium. We just give a sketch of the proof, to avoid lengthy formalities. Also, we just look at the case of decentralization. The case of centralization is similar. First, in obvious notation, let G, BL, BH be the possible types of the incumbent. In the equilibrium described in Proposition 1, types G, BL are getting their highest possible payoffs (i.e. optimal public good supply, plus re-election), and so will never want to deviate from equilibrium. So, we only need consider possible deviations by BH.

Now let $D \subset \mathbb{R}_+ \times \mathbb{R}$ be the set of pairs (g, τ) such that (g, τ) gives type BH a strictly higher payoff than he gets in equilibrium, *assuming* that he is then re-elected. So, according to the C-K criterion, if the voters observe a deviation $(g, \tau) \in D$, their belief is that $\Pr(G\,|(g, \tau)) = 0$, and their rational response is not to re-elect the deviant.

It follows that there cannot be any strictly profitable deviation for BH. First, if $(g, \tau) \notin D$, this deviation is unprofitable by assumption. Second, if $(g, \tau) \in D$, deviation to (g, τ) will lead to no re-election. So, deviation can give BH at most what he can get by separating i.e. choosing g_H, τ_H and not being re-elected. The latter payoff is either the equilibrium payoff (if $R < R_D$) or less than the equilibrium payoff (if $R \geq R_D$). So, deviation cannot be profitable for BH either. $\square$

Figure 1: The PBC Probabilities, Perfect Correlation Case

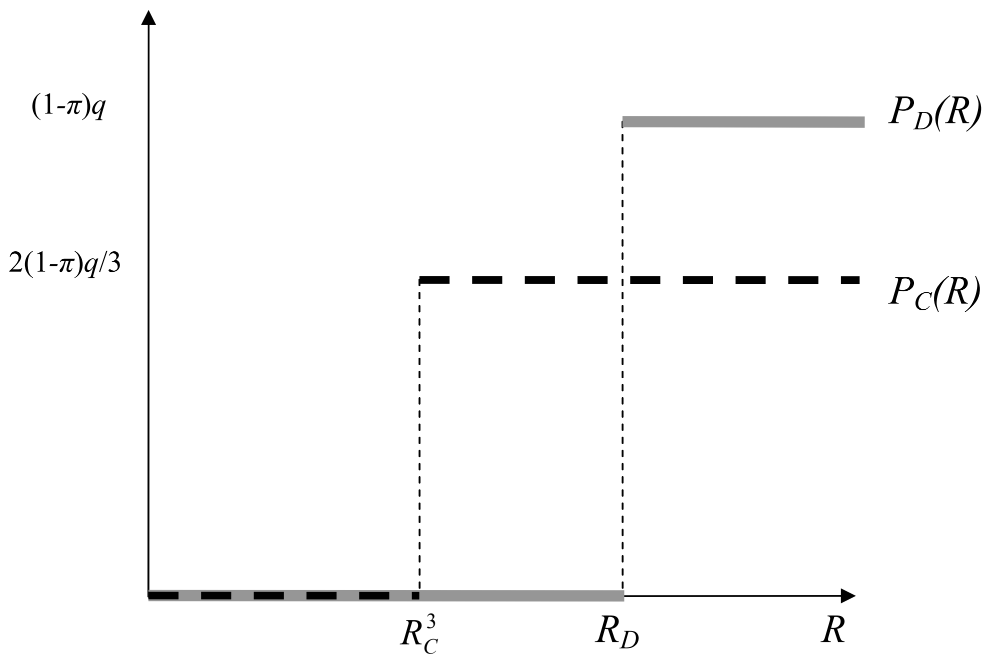

Figure 2: The PBC Probability, Independent Costs

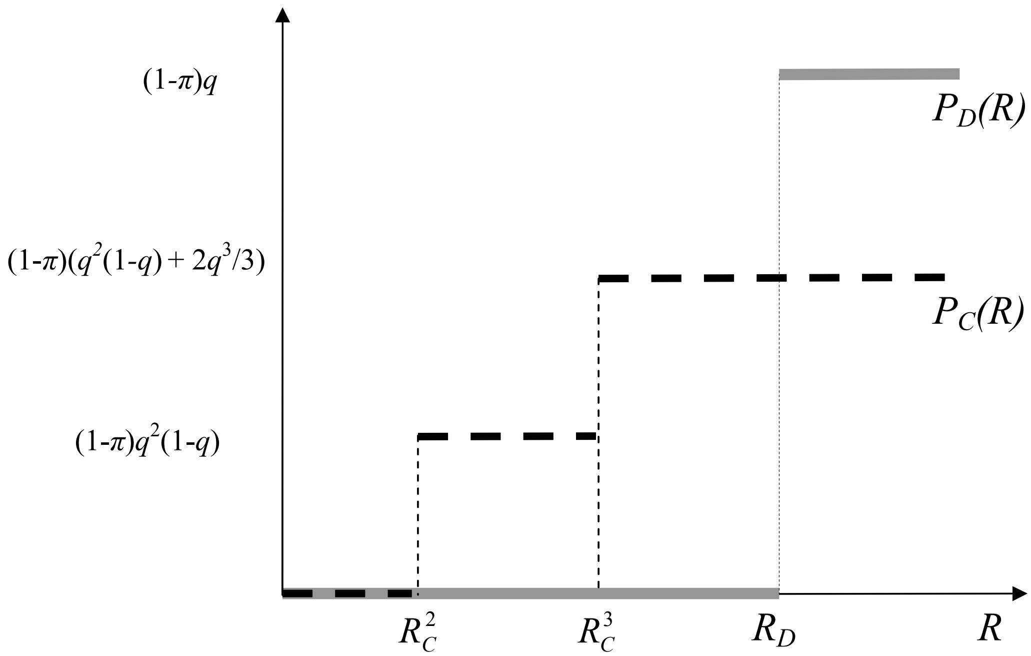

Figure 3: The PBC Probability with Centralization, Independent and Perfectly Correlated Costs

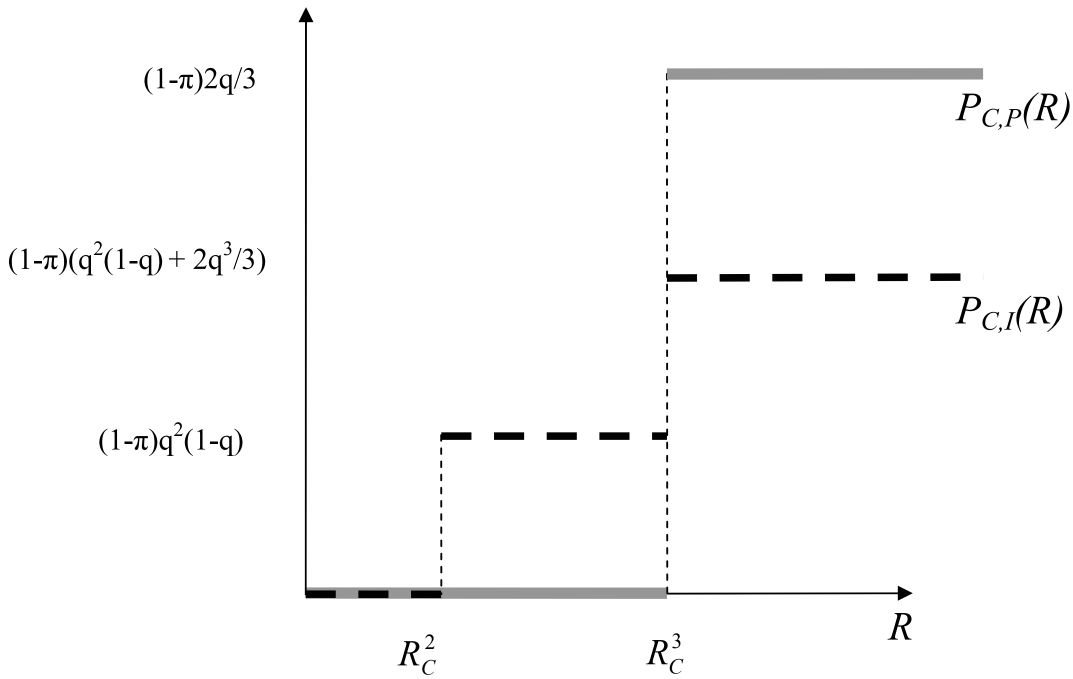

Figure 4: Expected value of g for Centralization and Decentralization in the NBS Equilibrium for $u(g)=\sqrt{g}$.