Pork Barrel Cycles*

Allan Drazen† Marcela Eslava‡

This Draft: October 23, 2005

Abstract

We present a model of political budget cycles in which incumbents influence voters by targeting government spending to specific groups of voters at the expense of other voters or other expenditures. Each voter faces a signal extraction problem: being targeted with expenditure before the election may reflect opportunistic manipulation, but may also reflect a sincere preference of the incumbent for the types of spending that voter prefers. We show the existence of a political equilibrium in which rational voters support an incumbent who targets them with spending before the election even though they know it may be electorally motivated. In equilibrium voters in the more "swing" regions are targeted at the expense of types of spending not favored by these voters. This will be true even if they know they live in swing regions. However, the responsiveness of these voters to electoral manipulation depends on whether they face some degree of uncertainty about the electoral importance of the group they are in. Use of targeted spending also implies voters can be influenced without election-year deficits, consistent with recent finding for established democracies.

JEL classification: D72, E62, D78

Keywords: expenditure composition, political budget cycle, special interest groups, electoral manipulation

*We wish to thank seminar participants at IIES-Stockholm University, Tel Aviv University, the LACEA Political Economy Network, and Yale University for useful comments. We also thank Miguel Rueda for excellent research assistance. Drazen's research was supported by the National Science Foundation, grant SES-0418482, the Israel Science Foundation, and the Yael Chair in Comparative Economics, Tel-Aviv University.

†Jack and Lisa Yael Professor of Comparative Economics, Tel Aviv University, University of Maryland, NBER, and CEPR. Email: drazen@econ.umd.edu

‡Universidad de Los Andes. Email: meslava@uniandes.edu.co

1 Introduction

Conventional wisdom is that incumbents use economic policy – especially fiscal policy – before elections to influence electoral outcomes. A number of studies (Shi and Svensson [2002a, 2002b], Persson and Tabellini [2003]) find evidence of an electoral deficit cycle in a wide cross-section of countries, an empirical finding that Brender and Drazen (2005a) show to reflect electoral cycles in a subset of countries that recently democratized. These "new democracies" experience election-year changes in government deficits in the first few elections after the transition to democracy. In contrast, in "established" democracies, there is no statistically significant political cycle across countries in aggregate central government expenditure or deficits.

The apparent lack of a political deficit cycle in established democracies raises the following question: Is fiscal manipulation absent or, more likely, does it simply appear in different forms? That is, in established democracies, is election-year fiscal policy used to influence voters in such a way that the overall government budget deficit is often not significantly affected? This could occur, for example, if some groups of voters are targeted at the expense of others. Groups whose voting behavior is seen as especially susceptible to targeted fiscal policy may be targeted with higher expenditures and transfers, or by tax cuts, financed by expenditure cuts or tax increases on other groups whose votes are much less sensitive to such policy. Such election-year "pork barrel" spending, by which we mean policies or legislation targeted to specific groups of voters to gain their political support, is widely seen as an especially important component of electoral manipulation. Policies of this type include geographically concentrated investment projects, expenditures and transfers targeted to specific demographic groups, or tax cuts benefitting certain sectors.[1]

Several papers find evidence of electoral composition changes in government spending. Khemani (2004) finds that Indian states spend more on public investment before scheduled elections that in other times, while they contract current spending, leaving the overall balance unchanged. Kneebone and McKenzie (2001) look for evidence of a political budget cycle for Canadian provinces, and find no evidence of a cycle in aggregate spending, but do find electoral increases in what they call "visible expenditures", mostly investment expenses such as construction of roads and structures. Very similar findings are reported for Mexico by Gonzales (2002), who also finds that other categories of spending, such as current transfers, contract prior to elections. Drazen and Eslava (2005) present

[1] An alternative possibility is a change in the composition of expenditures towards those that are highly valued by voters as a *whole* and away from those that are less valued. If politicians are believed to differ in their (not directly observed) preferences over types of expenditures, all voters will prefer a politician whose preferences are more towards expenditures that they prefer. We study such a set-up in Drazen and Eslava (2005).

empirical evidence on compositional effects in regional political budget cycles in Colombia, where investment projects grow before elections, while current spending contracts. Interestingly, electoral composition effects seem to imply expansions in development projects, which are in general easily targeted. Khemani (2004), for instance, argues that his finding of greater public investment before elections suggests that election-year policy takes the form of targeting of special interests, rather than an attempt to sway the mass of voters at large.

The evidence discussed above is also consistent with findings about how voters react to election-year government spending, both in individual country and in cross-section studies. Brender (2003) finds that voters in Israel penalize election year deficits, but also that they reward high expenditure in development projects in the year that precedes an election. Similarly, Peltzman (1992) result that US voters punish government spending holds for current (as opposed to capital) expenditures, but loses power if investment in roads, an important component of public investment, is included in his policy variable. Drazen and Eslava (2005) find that voters in Colombia reward high pre-election public investment, but only to the extent that this extra spending is not obtained at the expense of larger deficits. Perhaps the strongest evidence suggesting that deficits do not help reelection prospects comes from Brender and Drazen (2005b) in a sample of 74 countries over the period 1960-2003. They find no evidence that deficits help reelection in any group of countries, including developed and less developed, new and old democracies, countries with different government or electoral systems, and countries with different levels of democracy. In developed countries, especially old democracies, election-year deficits actually reduce the probability that a leader is reelected. In short, the strategy of providing targeted spending before elections, but financing these transfers through cuts on some other types of spending rather than through deficits seems to be optimal for an incumbent seeking re-election.

In spite of the widespread use of policies targeted at specific groups of voters before elections, there are no formal models integrating targeted expenditures into an intertemporal model of the political cycle with rational voters. Lindbeck and Weibull (1987) and Dixit and Londregan (1996) present formal models where, in order to gain votes, candidates make promises of balanced-budget targeting of voter groups based on their characteristics.[2] However, they assume that campaign promises are binding commitments to a post-electoral fiscal policy, so that there is no voter inference problem about post-electoral utility based on the pre-electoral economic magnitudes announced by candidates. Hence, these models do not really answer a key question: *Why would rational, forward-*

[2] Strömberg (2005) presents an interesting model of the campaign visits by presidential candidates to different U.S. states (a type of targeting), but where voter response to targeting is assumed rather than derived from primitives.

looking voters who are targeted by the incumbent before the election find it optimal to vote for him? The answer is far from obvious: if Floridians know that politicians target them solely because of a forthcoming election, why would they believe that such spending will continue after the incumbent is reelected? This paper addresses this question, incorporating expenditure targeting in a framework of repeated elections with rational voters.[3]

The best known approach in modeling why rational, forward-looking voters might respond to election-year economics was introduced by Rogoff and Sibert (1988) and Rogoff (1990), based on the unobservability of an incumbent's ability or "competence" in providing aggregate expenditures without raising taxes.[4] More "competent" candidates can provide more public goods at a given level of taxes, and hence generate higher welfare, so they are preferred by voters. Since competence is correlated over time, a candidate who is inferred by voters to be more competent than average before the election is expected to be so after the election as well.[5] Voters rationally prefer a candidate from whom they observe higher expenditures before an election, since this is a signal of higher competence.

A key ingredient of various models focussing on competence is voters' inability to observe the overall level of spending or of the deficit (Rogoff [1990], Shi and Svensson [2002a]). Because of this assumption, the competence approach often implies an increase in total government expenditures (or in the government budget deficit) in an election year. The reliance of this result on voters' lack of information is consistent with Brender and Drazen's (2005a) empirical finding of no statistically significant aggregate deficit or expenditure cycle in established democracies (where voters may be well informed about fiscal outcomes). In the absence of aggregate fiscal cycles, rational voters may be trying to infer something other than (or in addition to) competence from election-year fiscal policy. The presence of targeted expenditures as a common form of election-year policy suggests that voters who are targeted before an election want to know whether they will be similarly favored after the election. What makes it credible that a politician will continue to favor the group after the election? Our argument is that politicians have *unobserved* preferences over groups of voters or types of expenditure, preferences that have some persistence over time (so a voter who believes that

[3] Most other papers that consider the allocation of "pork" across different groups of voters (Myerson (1993), Persson, Roland, and Tabellini (2000), Lizzeri and Persico (2001)) similarly assume that candidates make binding promises to voters. Grossman and Helpman (2005) do not assume binding promises. However, as in the other papers, pre-electoral distribution of pork *per se* plays no role in determining election outcomes. Furthermore, in their paper there is no voter uncertainty about policymakers preferences over the allocation of pork, which is central to our approach.

[4] Other rational voter models include Persson and Tabellini (1990), González (2001), Stein and Streb (2003), and Shi and Svensson (2002a). All of these models share with the Rogoff approach a reliance on the effect of pre-electoral fiscal expansion on expected aggregate activity or welfare after the election.

[5] A key innovation of Shi and Svensson (2002a) is that the policymaker chooses fiscal policy before he knows his competence level, so that all "types" choose the same level of expansion. That is, the model focusses on moral hazard rather than signaling, as do the other models. An implication is an aggregate deficit cycle.

the incumbent favors him before the election rationally expects some similarity in the composition of expenditures after the election as well).[6]

Moreover, since a voter may have imperfect information both about the politicians's preferences over different voter groups and about voting patterns over the population, he faces an inference problem. He must try to infer whether receiving high targeted expenditures before the election signals a high weight of his group in the incumbent's objective function (relative to other voters or to non-targeted expenditures) or simply how "swing" his demographic group is, meaning how many votes the incumbent can raise by targeting his group with expenditures. We show the existence of a Perfect Bayesian Equilibrium in which voters rationally respond to election-year expenditures and politicians allocate expenditure across groups on the basis of this behavior. Politicians increase spending targeted to electorally attractive groups before elections, while they contract other types of expenditure to satisfy the no-deficit constraint. As mentioned, a key result is that electoral manipulation arises even with fully rational voters. We further show that even when voters know how "swing" their group is, a political cycle may still arise.

There are two key differences between our approach and those that rely on competence as the crucial unobserved characteristic of politicians. One is that electoral fiscal manipulation arises even if voters can perfectly monitor the fiscal choices of an incumbent. Moreover, our emphasis on cycles in the composition of spending, rather than its overall level, is consistent with the evidence cited above that voters are "fiscal conservatives" who punish (rather than reward) high spending or deficits at the polls. Our model in fact suggests that, if voters are averse to deficits, observability of fiscal policy strengthens the incentive to finance electoral spending through the contraction of other expenditures. The greater ability of voters to monitor fiscal outcomes in established democracies may help explain the absence of significant political deficit cycles.

A second difference with the competence literature is that political budget cycles in our model arise even if all politicians are equally able to provide public goods. Precisely to obtain a clear contrast with that literature, we assume here that all politicians are equally competent in delivering pork. We are aware that in a system with geographically defined districts, legislators often campaign for reelection on the basis of their ability to obtain projects for their district. However, if competence in getting pork is general and not specific to a demographic group (as, for example, Dixit and Londregan [1996]) or type of expenditure (as in Strömberg [2001]), demonstrating competence in delivering pork

[6] Another argument is that politicians who renege on the (implicit) commitment to continue a government program after the election may lose the ability to use fiscal policy as a tool to influence voters in future elections. This may make the pre-election composition of expenditure a credible signal of the composition the incumbent would choose if re-elected.

may be necessary to be reelected, but it is not sufficient. If a politician were very competent to raise pork, but was believed by a specific group of voters not to care about them at times other than elections, they would believe that after the election he will use his pork-raising competence to benefit other groups. Hence, unobserved preferences over groups of voters seems crucial in explaining pork-barrel politics. In reality, both components are no doubt important in explaining the importance of pork in elections, but we focus on the role of persistent preferences, which has not been explored.

The plan of the paper is as follows. In the next section we present an overview of our approach. In section 3 we present a model of politicians with unobserved preferences over groups of voters. In section 4 we show the existence of a Perfect Bayesian Equilibrium for this model with rational, forward-looking voters in which there is a political cycle in the composition of expenditure. In section 5 we add a good valued only by politicians ("office rents") to show that electoral fiscal manipulation might entail some groups being targeted at the expense of others, or all voter groups being targeted at the expense of office rents that politicians value. Because of the difficulty of analytically finding an equilibrium, in section 6 we present an example which illustrates the political equilibrium. Conclusions are presented in section 7.

2 An Overview

To help readers better understand the detailed model in section 3, we first present an outline of our basic argument.

There is an election between an incumbent and a challenger at the end of every other period ("year") t, $t+2$, *etc.* The incumbent has the ability to choose fiscal policy, where, for simplicity, we focus on the targeting of expenditures, and simply assume (in line with voters being fiscal conservatives) that incumbents can neither raise taxes, nor incur deficits. Hence, the sum of all expenditures must always equal the fixed level of taxes.

There are two regions, $h = 1, 2$, where voters in each region value a public good g_t^h supplied to their region. Since taxes are assumed fixed, we abstract here from other types of consumption which could be affected by tax policy. The utility of individual j in region h also depends on the distance between his most desired position π^j over other policies (which is immutable and termed "ideology") and the position π^P of the politician P in power.

Within each region h, there is a non-degenerate distribution of ideological preferences, which may change between elections. We denote the density function of voters in region h in the current election cycle as $f_h(\pi)$, where we suppress the time subscript. We consider both the case where the $f_h(\pi)$

are known to both voters and politicians, as well as the case of asymmetric information where the incumbent knows the densities $f_h(\pi)$, while voters only have imperfect information about them. The nature of the cycle is affected by the information specification, but in both cases a rational political cycle exists. For simplicity, we assume that the preference distribution is uncorrelated over elections, so that past electoral policy gives voters no information about the current distribution.

There are two parties L and R, with known ideological positions $\pi^L < \pi^R$, where we take π^L and π^R as given and assume no competition over ideology. Without loss of generality, we assume that party L is the incumbent.

The single-period utility of a voter in region h with ideological preferences π^j if policymaker $A \in \{L, R\}$ is in office is

$$U_s^{h,j}(A) = \ln g_s^h(A) - \left(\pi^j - \pi^A\right)^2 \tag{1}$$

where $g_s^h(A)$ is public good provided by policymaker A to region h in period s. Voters care about the present discounted value of utility, and hence, about expected future values of g_s^h. (Since $g_s^h(A)$ does not depend on j, we ignore the index j in discussing the central problem of inferring g_{t+1}^h from g_t^h.)

Politicians, as actual or potential leaders of both regions, give weight to the utility of voters of each region from government spending.[7] This may be represented by a weight $\omega_{P,s}^h$ that politician P puts on utility from public goods of residents of that region, that is, on $\ln g_t^h$. A politician P's single-period utility in period s if the policy in place is π^A may be written

$$U_s^P = Z_s^P(\mathbf{g}_s) - \left(\pi^P - \pi^A\right)^2 \tag{2}$$

where $\mathbf{g}_s$ is the vector $\left(g_s^1, g_s^2\right)$ and

$$Z_s^P(\mathbf{g}_s) = \sum_{h=1}^{2} \omega_{P,s}^h \ln g_s^h \ . \tag{3}$$

In contrast to the politician's ideological preferences π^P which are known, the weights $\omega_{P,s}^h$ are

[7] The difference between the objective functions of politicians and voters consistent with the "citizen-candidate" approach of Besley and Coate (1997) or Osborne and Slivinski (1996). A key message of that approach is that because candidates have preferences just like citizens, they can be expected to act on those preferences once elected, rather than be bound by campaign "promises". This view is in fact central to our approach, where a voter's key inference problem is in discerning what those preferences are. We diverge from the basic citizen-candidate model in assuming that a citizen who is elected to make policy for an area wider than his or her own district will no longer act on the same (narrower) preferences he or she did when being a simply a member of (or representing) that district. We would argue that this assumption is quite reasonable. We do not model this "transformation" of preferences.

unknown to voters.[8] The key inference problem giving rise to the possible effectiveness of election-year spending in influencing rational voters may now be stated. The voter's problem is to infer the unobserved weight $\omega^h_{P,t}$ from the politician's observable choice of g^h_t. If $\omega^h_{P,t}$ has some persistence over time, then pre-electoral g^h_t may contain information not only about $\omega^h_{P,t}$, but also about $\omega^h_{P,t+1}$ and hence g^h_{t+1}, inducing forward-looking voters to respond to pre-electoral fiscal policy.[9]

Why would voters not know a politician's preferences? (See footnote 7 on why these preferences are not identical to those of a citizen from the politician's region.) That is, is there really an inference problem? We would argue that since the real world is multidimensional, a voter is necessarily uncertain about how much the politician will favor him relative to other priorities. Moreover, because the politician's environment changes over time, these preferences may change over time, but at the same time will display some persistence.

We now turn to the details. We start by looking at the problem of an incumbent politician, given the fiscal framework, then move to the voters's problem, and finally put the pieces together to find the equilibrium.

3 A Model of Politicians Who Have Preferences over Voters

3.1 The Incumbent's Problem

Politicians differ in the unobserved weight $\omega^h_{P,s}$ they put on voters of the two regions (or groups) in their objective function (2), as summarized by (3). For simplicity, we assume that $\omega^h_{P,s}$ is drawn from an i.i.d. distribution at the beginning of every election year for two years and that $\omega^2_{P,s} = 1 - \omega^1_{P,s}$. (That is, $\omega^h_{P,t+1} = \omega^h_{P,t}$ if t is an election year, but $\omega^h_{P,t}$ and $\omega^h_{P,t+2}$ are uncorrelated.) No correlation in $\omega^h_{P,s}$ *across* electoral cycles greatly simplifies the voters's inference problem, since observed policy in previous elections provides no information about current $\omega^h_{P,s}$.[10] The distribution of $\omega^h_{P,t}$, which is the same for both incumbent and challenger, is defined over (ω^l, ω^u), where $0 \leq \omega^l < \omega^u \leq 1$ and has a mean of $\overline{\omega}$.

[8] Bonomo and Terra (2004) consider politicians who have preferences over sectors, but where these preferences are known.

[9] In the case where voters in the two regions care about both goods, targeting would be of a good rather than of a region (which in this formulation are identical.) See footnote 12.

[10] Assuming $\omega^h_{P,s}$ follows an MA(1) process with innovations that are revealed to voters with a one-period lag has these implications. This alternative type of assumption is, for instance, the one used in Rogoff (1990). A political budget cycle would also arise with an MA(1) process with innovations that are never revealed to voters, as long as imperfect persistence of $\omega^h_{P,s}$ makes g^h_{t-1} a more relevant signal to voters than expenses observed further into the past. However, this assumption makes the analysis of the problem far more complicated.

The off-year decision

A politician L who was elected in t has an objective function Ω_{t+1}^{IN} in the following non-election year $t+1$ (when he is *in* office and not facing an election in $t+1$) for the vector of public goods expenditure $\mathbf{g}_{t+1}^{L}$ of

$$\Omega_{t+1}^{IN}(\mathbf{g}_{t+1}^{L}, L) = \sum_{h=1}^{2} \omega_{P,t+1}^{h} \ln g_{t+1}^{h} + \beta E_{t+1}^{L}\left(\Omega_{t+2}^{ELE}(\cdot, L)\right) \tag{4}$$

where β is the discount factor and $E_{t+1}^{L}\left(\Omega_{t+2}^{ELE}\right)$ is L's expectation as of period $t+1$ of the present discounted value of utility from $t+2$ (an election year) onward. (Since the actual policy $\pi^{A} = \pi^{P}$, (2) and (3) yield current-period utility of $\sum_{h} \omega_{P,s}^{h} \ln g_{s}^{h}$ in an off-election year.) The assumptions that the government's budget is balanced each period and that ω_{L}^{h} as of t has a two-period life imply that actions at $t+1$ have no effect on Ω_{t+2}^{E}. The incumbent's off-year problem is simply to choose the g_{t+1}^{h} to maximize $\sum_{h=1}^{2} \omega_{P,t+1}^{h} \ln g_{t+1}^{h}$ subject to his budget constraint.

Total expenditures equal total tax revenues, which are assumed fixed and set equal to unity. (All politicians are thus identical in terms of total spending.) The choice of fiscal policy is the choice of composition of the government budget, which comprises expenditures that can be targeted to specific groups of voters, and other types of expenditure. For simplicity, in this section, we assume that there are no expenditures other than public goods g^1 and g^2. (In section **??** we consider the implications of politicians also spending on goods that they alone value, that is, "office rents".) Therefore, each period, the government faces the budget constraint:

$$g_{s}^{1} + g_{s}^{2} = 1 \qquad s = t, t+1, \ldots \tag{5}$$

The first-order condition for the politician's off-year problem is:

$$\frac{\omega_{L}^{1}}{g_{t+1}^{1}} = \frac{\omega_{L}^{2}}{g_{t+1}^{2}} \tag{6}$$

where, for ease of exposition, we drop the time subscript on $\omega_{L,s}^{h}$, that is, we write $\omega_{L,t}^{h} = \omega_{L,t+1}^{h} = \omega_{L}^{h}$. Using $\omega_{L}^{2} = 1 - \omega_{L}^{1}$ and $g_{t+1}^{2} = 1 -\ g_{t+1}^{1}$ from (5),

$$g_{t+1}^{h} = \omega_{L}^{h} \qquad h = 1, 2 \tag{7}$$

so that voters's expected utility from reelecting the incumbent is increasing in ω_{L}^{h}.

The value of reelection

The value to L of reelection in t depends on the difference between his expected value of being in office in $t+1$, $E_t^L\left(\Omega_{t+1}^{IN}\right)$, and his expected value of being out of office, $E_t^L\left(\Omega_{t+1}^{OUT}\right)$, where $E_t^L(\cdot)$ is L's expectation as of period t and the values of Ω_{t+1} are the present discounted values from $t+1$ onward. The difference $E_t\left(\Omega_{t+1}^{IN}-\Omega_{t+1}^{OUT}\right)$ may be written

$$E_t^L\left(\Omega_{t+1}^{IN}-\Omega_{t+1}^{OUT}\right)=(1+\beta)\left(\pi^L-\pi^R\right)^2+E_t^L\left(Z_{t+1}^L\left(\mathbf{g}_{t+1}^L\right)-Z_{t+1}^L\left(\mathbf{g}_{t+1}^R\right)\right)+\beta^2E_t^L\Pi_{t+3} \qquad (8)$$

where β is the discount factor and $E_t\Pi_{t+3}$ is the expected gain from the *possibility* of reelection at $t+2$ and later *due* to election at t. The first term in (8) is the gain to the incumbent in periods $t+1$ and $t+2$ of having policy reflect his preferred ideology rather than that of his opponent.

The second term is the value to the incumbent of having his preferred fiscal policy in period $t+1$ rather than that of his opponent. The assumption that ω_L^h has a two-period life implies that as of t there is an expected difference in a politician's preferences over voters only at $t+1$ (where the difference is uncertain since L does not know his opponent's ω_R^h, and hence does not know what $\mathbf{g}_{t+1}^R$ will be if R is elected). As of t the incumbent's expected preferences for dates $t+2$ and later are identical to those of a representative candidate. The assumption that the government's budget is balanced each period further implies that actions at $t+1$ have no effect on the incumbent's expected utility at $t+2$ and later.

The last term reflects the effect of reelection at t on the probability of reelection at the end of $t+2$ and later. For example, if the probability of reelection at $t+2$ is independent of the election outcome at t, then $E_t\Pi_{t+3}=0$. Conversely, if a party's reelection at t increases the probability of its reelection at $t+2$ and later, then $E_t\Pi_{t+3}>0$, where the value of the higher probability of reelection at $t+2$ and later stems (in the absence of "office rents") solely from the ability to enact one's preferred ideological policies.[11] The larger the positive effect of electoral victory at t on the probability of later election (where this effect could be negative), the larger is $E_t\Pi_{t+3}$. Rents would add an important component to the value of reelection at t and all future dates, as in section **??** below.

To summarize, the value of reelection depends on the implied possibility of reelection, the value of policy reflecting one's own rather than the opponent's preferences, and the value of rents. In all

[11] To take a simple example, if L's re-election at t increases its expected probability of re-election at $t+2$ (and hence its probability of being in office at $t+3$ and $t+4$) from ρ_L to $\hat{\rho}_L>\rho_L$, but has no effect on later proababilities, we would have

$$E_t^L\Pi_{t+3}=(1+\beta)\left(\hat{\rho}_L-\rho_L\right)\left(\pi^L-\pi^R\right)$$

cases, however, the expected value $E_t^L\left(\Omega_{t+1}^{IN} - \Omega_{t+1}^{OUT}\right)$ will be strictly positive.

The election year

The incumbent's objective Ω_t^{ELE} in the previous election year t can be written

$$\Omega_t^{ELE}\left(\mathbf{g}_t^L, L\right) = Z_t^L\left(\mathbf{g}_t^L\right) + \beta\left(\rho\left(N^L\right) E_t^L \Omega_{t+1}^{IN}\left(\mathbf{g}_{t+1}^L, L\right) + \left(1 - \rho\left(N^L\right)\right) E_t^L \Omega_{t+1}^{OUT}\right) \tag{9}$$

where ρ, the incumbent's perceived probability of reelection, is a function of the fraction of votes N_t^L the left-wing incumbent receives, and where Ω_{t+1}^{OUT} is the present discounted utility the incumbent at t assigns to being out of office in $t+1$.

Equation (9) may be written

$$\Omega_t^{ELE}\left(\mathbf{g}_t^L, L\right) = Z_t^L\left(\mathbf{g}_t^L\right) + \rho\left(N^L\right)\beta E_t^L\left(\Omega_{t+1}^{IN} - \Omega_{t+1}^{OUT}\right) + \beta E_t^L \Omega_{t+1}^{OUT} \tag{10}$$

Since $E_t^L \Omega_{t+1}^{OUT}$, the expected utility if not reelected, is independent of any choices the incumbent makes, (10) makes clear that the choice of policy in an election year depends on the effect of a choice of $\mathbf{g}_t^L$ on the politician's current utility (as it would in an off-election year) versus the effect on the probability of reelection $\rho\left(N^L\right)$ multiplied by the discounted value of reelection $\beta E_t^L\left(\Omega_{t+1}^{IN} - \Omega_{t+1}^{OUT}\right)$, as discussed above.

For tractability, we assume that the probability $\rho(N^L)$ that the incumbent assigns to winning is a continuous increasing function in N^L (justified, for example, by assuming that the incumbent doesn't know how many votes he needs to win, or how many potential voters will show up to vote). The key point is that the incumbent maximizes this probability by maximizing the number of votes he receives. Assuming that ρ' is nonzero only for some ranges of N^L would complicate the mathematics without changing the basic qualitative results.[12]

The fraction of votes N^L received by the incumbent is given by (where we have assumed both regions have a unit mass of voters):

$$N^L = \phi_1(g_t^1) + \phi_2(g_t^2)$$

where $\phi_h(g_t^h)$ is the fraction of region h's votes that goes to the incumbent, and where the voter's

[12] A related analysis with discrete $\rho(N^L)$ can be found in Drazen and Eslava (2005). We are now working on a multi-region model with "winner-take-all" electoral rules, similar to Strömberg (2005), in which the candidate with a majority of the votes wins the region, and the candidate with the majority of regions wins the election. $\rho(\cdot)$ would then be the probability of winning a majority of regions as a function of the vector of public goods spending targeted to each region.

inference problem yields the dependence of vote shares on current expenditure policy g_t^h. We derive $\phi_h(g_t^h)$ in section 3.2 below.

The expected value of reelection to the L incumbent, $E_t^L\left(\Omega_{t+1}^{IN}-\Omega_{t+1}^{OUT}\right)$, is independent of the choice of g_t^h, so that the incumbent treats it as given in his period t choice of fiscal policy. For the election year, the incumbent's optimal choice is given by maximizing (10) subject to the budget constraint (5), given the $t+1$ decision (7). The first-order condition at t (remember $\phi_h(g_t^h)$ is the share of region h's votes that goes to the incumbent) is:

$$\frac{\omega_L^1}{g_t^1}+\beta\rho'(\cdot)\,\phi_1'\left(g_t^1\right)E_t^L\left(\Omega_{t+1}^{IN}-\Omega_{t+1}^{OUT}\right)=\frac{\omega_L^2}{g_t^2}+\beta\rho'(\cdot)\,\phi_2'\left(g_t^2\right)E_t^L\left(\Omega_{t+1}^{IN}-\Omega_{t+1}^{OUT}\right) \tag{11}$$

The left-hand side of (11) represents the benefit from a marginal increase in g_t^1. As in the post-election year, this benefit includes the utility gain this change induces for voters in region 1, the first term on the left-hand side. However, prior to an election the politician potentially derives an additional benefit from targeting region 1 voters, namely obtaining more votes from them. The right-hand side represents the same benefit from a marginal increase in g_t^2.

We may express the relation between g_t^h and ω_L^h more compactly as follows. Use $1-\omega_L^1=\omega_L^2$ to write (11) for choice of g_t^1 as

$$g_L^1=\omega_t^1+\beta\rho'(\cdot)\,E_t^L\left(\Omega_{t+1}^{IN}-\Omega_{t+1}^{OUT}\right)g_t^1g_t^2\left(\phi_2'\left(g_t^2\right)-\phi_1'\left(g_t^1\right)\right)\ . \tag{12}$$

or

$$g_t^1 = \omega_L^1+A\left(g_t^1,g_t^2\right)\left[\phi_1'\left(g_t^1\right)-\phi_2'\left(g_t^2\right)\right] \tag{13a}$$

$$g_t^2 = \omega_L^2+A\left(g_t^1,g_t^2\right)\left[\phi_2'\left(g_t^2\right)-\phi_1'\left(g_t^1\right)\right] \tag{13b}$$

for goods g_t^1 and g_t^2, where $A\left(g_t^1,g_t^2\right)\equiv\beta\rho'(\cdot)\,E_t^L\left(\Omega_{t+1}^{IN}-\Omega_{t+1}^{OUT}\right)g_t^1g_t^2$ and where $\phi_1'\left(g_t^1\right)-\phi_2'\left(g_t^2\right)$ is the vote gain to the incumbent from transferring a dollar of public goods expenditure from region 2 to region 1. (Using $g_t^1+g_t^2=1$, this could be expressed as a function solely of one of the g_t^h.) This vote gain from a change in expenditure composition is known to the incumbent politician, but needn't be known to the voters.

Since the only difference between an election year and a non-election year is the election itself, a political budget cycle appears if $g_t^h\neq g_{t+1}^h$. The result in (13) thus implies that there will be a political budget cycle as long as $\phi_2'\left(g_t^2\right)\neq\phi_1'\left(g_t^1\right)$. We now turn to the inference and voting problem of voters to find out when is this the case.

3.2 Voter Decisions Based on Fiscal Policy

An individual's only choice variable is how to vote in an election year. Consider a representative election year t, where the voter's choice depends on his expectation of utility in years $t+1$ and later.

Our assumption that $\omega_{P,s}^{h}$ has a two-period life starting in the election year means that in an election year voters need look forward only one period. The voter may then consider each election cycle independently. Consider the election cycle t and $t+1$. A forward-looking voter j in region h prefers the incumbent L over the challenger R if

$$E_t\left[\ln g_{t+1}^{h}(L) \mid g_t^h\right] - (\pi^j - \pi^L)^2 > E_t \ln g_{t+1}^{h}(R) - (\pi^j - \pi^R)^2 \tag{14}$$

Note that, given (5), observing the g_t the other region receives provides no additional information on ω_L^h. (Since we are concentrating on a single election cycle, for simplicity of exposition, we drop the time-subscript on the $\omega_{P,t}^{h}\left(=\omega_{P,t+1}^{h}\right)$). Condition (14) determines the relation between pre-electoral fiscal policy g_t^h and the incumbent's vote share (and hence reelection probability).

The key issue is the information provided by election year fiscal policy about post-electoral utility. The amount of information available to voters about the distribution of ideological preferences determines how responsive voters are to electoral manipulation and, in turn, the politician's incentives to target spending before elections. More specifically, we show below that targeted electoral spending goes to regions with more swing voters. However, voters anticipate this behavior and therefore respond less to pre-electoral manipulation of fiscal policy if they know their region is highly likely to be electorally targeted. On the other hand, the incumbent's ability to engage in this form of electoral manipulation is increased by his access to information about the political environment unavailable to voters. That is, politicians may have more information than voters about the electoral importance of different regions, and this would increase their ability to obtain political benefits from increases in targeted expenses.

We consider three cases: full information; asymmetric information with a fully revealing fiscal policy; asymmetric information where g_t^h doesn't reveal the politician's preferences over regions.

Full information

When ω_L^h (and ω_R^h) is known, then $E[\ln g_{t+1}^{h}(L)] - E_t \ln g_{t+1}^{h}(R)$ depends only on the known ω_P^h and is independent of g_t^h. Logarithmic utility implies $g_{t+1}^{h}(L) = \omega_L^h$, so that a voter who knows the

ω_P^h is indifferent between two candidates if his preferred ideological position is

$$\tilde{\pi}_{FI}^h\left(\omega_L^h\right) = \frac{\pi^L + \pi^R}{2} + \frac{\ln \omega_L^h - \ln \omega_R^h}{2(\pi^R - \pi^L)} \tag{15}$$

Any voter j in region h with $\pi_j > \tilde{\pi}_{FI}^h$ will vote for the challenger, and any voter with $\pi_j < \tilde{\pi}_{FI}^h$ will vote for the incumbent. Note that in this case $\tilde{\pi}_{FI}^h$ is independent of fiscal policy, so that voting decisions *cannot* be affected by pre-election fiscal policy. There will thus be no targeting of voters through fiscal policy.

Asymmetric Information

When ω_L^h is not known, voters must use $g_t^h(L)$ to provide information on ω_L^h. Using (14), where (unlike the previous case) the expectation $E_t\left[\ln g_{t+1}^h(L)\right]$ depends on g_t^h, the ideological position of the indifferent voter, $\widetilde{\pi}^h$, becomes

$$\widetilde{\pi}^h(g_t^h) = \frac{\pi^L + \pi^R}{2} + \frac{E_t\left[\ln g_{t+1}^h(L) \mid g_t^h\right] - \mu}{2(\pi^R - \pi^L)} \tag{16}$$

where $\mu \equiv E_t \ln g_{t+1}^h(R)$, the expected utility under the challenger. (Since the challenger has no way to signal, μ simply depends on the prior). Within region h, all individuals with $\pi^j < \widetilde{\pi}^h(g_t^h)$ vote for the incumbent L party, while those with $\pi^j > \widetilde{\pi}^h(g_t^h)$ vote for the R party. The dependence of the position of the indifferent voter on g_t^h follows from the effect of observing g_t^h on the utility voters expect to receive if the incumbent is reelected.

We can then express the fraction of region h voters who vote for the incumbent as a function of the pre-election expenditure observed by voters. Denoting this fraction as $\phi_h(g_t^h)$ and denoting the lower bound of π^j by $\underline{\pi}$, we obtain:

$$\phi_h(g_t^h) = \int_{\underline{\pi}}^{\widetilde{\pi}^h(g_t^h)} f_h(\pi)d\pi = F_h\left(\widetilde{\pi}^h(g_t^h)\right) \tag{17}$$

where $F_h(\cdot)$ is the cumulative distribution associated with the density $f_h(\cdot)$. Vote shares $\phi_h(\cdot)$ depend on g_t^h because the indifferent voter's expectation of post-electoral utility is conditional on observed g_t^h. That is, since the politician's choice of g_t^h is used to form expectations of ω^h and $\ln g_{t+1}^h$ from (13), the equilibrium expectation of period $t+1$ utility will depend on the politician's choice of g_t^h.

Differentiating (17) with respect to g_t^h, one obtains

$$\frac{\partial \phi_h(g_t^h)}{\partial g_t^h} = f_h\left(\widetilde{\pi}^h(g_t^h)\right)\frac{\partial \widetilde{\pi}^h(g_t^h)}{\partial g_t^h} \tag{18a}$$

$$= f_h\left(\widetilde{\pi}^h(g_t^h)\right)\cdot\left[\frac{\partial E_t\left(\ln g_{t+1}^h(L)\mid g_t^h\right)}{\partial g_t^h}\frac{1}{2\left(\pi^R-\pi^L\right)}\right] \tag{18b}$$

where we have used equations (16) and (19). Note that regions differ in the level of public goods that they receive, and, as a result, in the ideological position of the indifferent voter in region h, $\widetilde{\pi}^h(g_t^h)$. We assume that the $f_h(\cdot)$ have no mass points, so that a marginal increase in $\widetilde{\pi}^h(g_t^h)$ cannot induce a discontinuous jump in the number of voters supporting the incumbent.

Revealing versus non-revealing fiscal policy under asymmetric information

There are two asymmetric information cases to consider – one where voters can perfectly infer ω_L from the $g_t^h(L)$, the other where they cannot. The first case corresponds to voters knowing the densities $f_h(\pi)$ (that is, knowing how swing they are) with the only asymmetric information being about ω. In this case, the monotonic relation between g_t^h and ω_L^h given in (13) allows voters to infer ω_L^h from g_t^h since $f_h(\pi)$ is known. That is, knowing the region's ideological distribution and having observed the incumbent's spending choices, voters can calculate ω_L^1 from (13a). The second case corresponds to voters not knowing the densities $f_h(\pi)$.

If voters can fully infer the value of the ω_L^h from $g_t^h(L)$, then the ideological position of the indifferent voter is identical to the full information case, that is, $\widetilde{\pi}^h(g_t^h)=\widetilde{\pi}_{FI}^h$ for the same ω_L^h (that is, for the g_t^h corresponding to that ω_L^h from (13)). Hence, the incumbent gets the same number of votes from each region as in the full information case. However, vote shares *do* respond to g_t^h since a change in g_t^h reveals a change in ω_L^h (whereas under full information the same change in ω_L^h is known directly) and hence induces a change in $\widetilde{\pi}^h$. In the fully revealing case we thus get a separating equilibrium with political manipulation analogous to that in Rogoff (1990), where it is election year changes in fiscal policy that allow separation. Hence, as we show in section **??**, even if the ω_L can be perfectly inferred, a political cycle may still exist.

Alternatively (and more realistically), voters may have less information than do politicians about how effective spending targeted to a region is in terms of gaining votes. We incorporate this possibility by assuming that voters are uncertain about the exact distribution of ideological positions in each region (that is, the $f_h(\pi)$). That is, they have imperfect information about how "swing" are the voters in each region. In this asymmetric information equilibrium, voters cannot fully infer ω_L^h from g_t^h, which implies that $\widetilde{\pi}^h(g_t^h)\neq\widetilde{\pi}_{FI}^h$. There is then an "extra" mechanism for electoral manipulation, since voters cannot infer to what extent they are targeted for electoral purposes, or because the incumbent has a genuine preference for their region even in in the absence of elections. That is, voters in the two regions who receive the same level of public goods will be unable to infer with certainty that this is not a reflection that they are equally liked.

In both cases $\phi'_h(g_t^h)$ measures the electoral benefit to the politician from targeting an additional dollar of public goods to voters in region h. As can be seen from (18b), the size of this benefit depends first on how much that additional dollar expands the range of ideological positions for which voters prefer the incumbent, characterized by the position of the indifferent voter $\widetilde{\pi}^h(g_t^h)$. If the utility that voters expect under the incumbent in $t+1$ increases, $\widetilde{\pi}^h(g_t^h)$ increases (that is, moves to the right) and the range of supporters for the incumbent expands. For a given change in expected utility, the increase of $\widetilde{\pi}^h(g_t^h)$ is smaller the farther apart π^R and π^L are, as the cost to voters from having their least preferred ideological position in power becomes larger. Second, $\phi'_h(g_t^h)$ depends on the mass of h voters at point $\widetilde{\pi}^h(g_t^h)$, namely $f_h\left(\widetilde{\pi}^h(g_t^h)\right)$,which determines how many additional votes the incumbent obtains from increasing $\widetilde{\pi}^h(g_t^h)$.[13]

4 Political-Economic Equilibrium

To close the model and derive the political-economic equilibrium under rational expectations, we now relate incumbent's optimal behavior in choosing g_t^h as a function of $\phi'_h\left(g_t^h\right)$ as summarized in (13) with optimal voter behavior yielding the $\phi'_h\left(g_t^h\right)$ for the g_t^h received as summarized in (18b). (As shown above, under full information, $\widetilde{\pi}^h$ and therefore ϕ_h are independent of g_t^h, so that $\phi'_h\left(g_t^h\right)=0$. Equations (6) and (13) therefore imply there is no political cycle in this case.)

The first important result is that if vote shares can be affected by targeted spending on public goods (that is, in the asymmetric information case), such spending increases the share of votes that goes to the incumbent, despite the fact that voters recognize the electoral incentives faced by the incumbent.

Proposition 1 *In a political equilibrium under asymmetric information, $\phi'_h\left(g_t^h\right)>0$ for each h.*

Proof: See Appendix

[13] If voters in each region had preferences over both goods, then election-year targeting would be over goods rather than regions, with the good that brings in more voters being the one that would increase in an electoral period relative to a non-electoral period. There will still be a correspondence between targeting regions and targeting goods in that if the region that is most responsive to fiscal policy has a marked preference for, say, good 1, this is the good that will be targeted.

Under asymmetric information there are two cases to consider: the first where fiscal policy fully reveals the politicians preferences, the second where it does not. We consider them in turn.

4.1 Political Cycles in a Fully Revealing Equilibrium

Even if voters know the densities $f_h(\pi)$ for all regions and can therefore perfectly infer the incumbent's ω_L^h, there is a political cycle:

Proposition 2 *In a fully revealing political equilibrium, there is a political cycle in that $g_t^h \neq g_{t+1}^h$ for each h.*

Proof: See Appendix

The region with more "swing voters" will receive $g_t^h > g_{t+1}^h$, while the other region receives $g_t^h < g_{t+1}^h$. For example, if $\phi_1'\left(g_{t+1}^1\right) > \phi_2'\left(g_{t+1}^2\right)$, then (13) together with decreasing marginal utility of g_t^h (and the lack of mass points in the f_h distributions) imply that $g_t^1 > g_{t+1}^1$ and $g_t^2 < g_{t+1}^2$. In other words, even if voters know that pork barrel spending will be given to regions with a high concentration of "swing voters" to attract their votes (that is, they know the $f_h(\cdot)$ and the implications for g_t^h), the region with more swing voters at non-election levels of spending (higher $f_h(\pi(\cdot))$ evaluated at g_{t+1}^h) will still be targeted. Florida will be targeted even if they know they are "Florida".

Though it may seem surprising that voters in the more swing region will respond to pre-electoral targeting even when they know they are targeted for electoral purposes, it is not hard to see why this must be true. In an equilibrium higher g_t^h will lead voters to infer that ω^h and hence that g_{t+1}^h will be higher, implying that votes received from region h will rise. Suppose, nonetheless that g_t^h were independent of $f_h(\cdot)$. For example, suppose that when (unobserved) $\omega^1 = \omega^2$, $g_t^1 = g_t^2 \left(= g_{t+1}^h\right)$ even though $f_1(\pi(g_t^1)) > f_2(\pi(g_t^2))$. The incumbent's decision rule (13) for allocating spending in an election year, which is known by voters, implies he has the incentive to increase g_t^1 and reduce g_t^2 to increase his vote totals. As a result, when the $f_h(\cdot)$ are known, choosing $g_t^1 = g_t^2$ leads voters to infer that $\omega^1 < \omega^2$. That is, voters in a region who the incumbent values the most in terms of the votes that pork barrel spending can buy would be led to believe that the incumbent values them less than he actually does. If Floridians knew they were swing and nonetheless were not targeted by the incumbent, they could only conclude that he places a low value on their utility (lower than he actually does) and would thus vote against him.

4.2 Non-Fully Revealing Political Equilibrium

Alternatively, voters in group h are unable to infer the ω^h from the g_t^h because they lack information about the $f_h(\pi)$, implying that they cannot perfectly infer how many votes the incumbent gets for targeting their group, $\phi_h'\left(g_t^h\right)$. To define an equilibrium, let us define

$$\Psi\left(g_t^h\right) \equiv E_t\left[\ln g_{t+1}^h\left(L\right) \mid g_t^h\right] \tag{19}$$

which is a voter's expected period $t+1$ utility from g as a function of observed g_t^h under asymmetric information if incumbent L is reelected, given his information about $f_h(\pi)$ and ω. Using (13a) and (13b), in equilibrium $\Psi\left(g_t^h\right)$ must satisfy

$$\Psi\left(g_t^h\right) = E_t \ln\left(g_t^1 - A\left(g_t^1, 1-g_t^1\right)\left[\phi_1'\left(g_t^1\right) - \phi_2'\left(1-g_t^1\right)\right]\right) \tag{20}$$

where (18b) implies

$$\phi_h'(g_t^h) = \frac{f_h\left(\widetilde{\pi}^h(g_t^h)\right)}{2\left(\pi^R - \pi^L\right)}\Psi'\left(g_t^h\right) \tag{21}$$

By substituting $\phi_h'(g_t^h)$ into equation (20) and using the definition of $\Psi\left(g_t^h\right)$, we can then write (20) as a first order, non-linear, differential equation in the function $\Psi\left(\cdot\right)$, namely

$$\Psi\left(g_t^1\right) = E_t \ln\left[g_t^1 - \frac{A\left(g_t^1, 1-g_t^1\right)}{2\left(\pi^R-\pi^L\right)}\left(f_1\left(\widetilde{\pi}^1(g_t^1)\right)\Psi'\left(g_t^1\right) - f_1\left(\widetilde{\pi}^1(1-g_t^1)\right)\Psi'\left(1-g_t^1\right)\right)\right] \tag{22}$$

A function $\Psi\left(\cdot\right)$ that solves this equation would characterize a rational political equilibrium in which voters are maximizing their expected utility, incorporating optimal government behavior in response to voter behavior based on correct expectations. This equation captures voters's beliefs affecting electoral outcomes, and therefore the choice of policy, and policy in turn affecting their beliefs. That is,

DEFINITION: *A rational political equilibrium under asymmetric information is a combination of* g_t^h and $\Psi\left(g_t^h\right)$ *(for* $h = 1,2$*) such that: 1) voters are choosing how to vote optimally according to* (14) *given their beliefs; 2) the incumbent chooses* g_t^1 *and* g_t^2 *optimally according to* (13) *given voters's beliefs; and 3) voters's beliefs are rational and based on the politician's behavior and the known distributions of* π *and* ω *(so that the incumbent's policy choice of* g_t^h *ratifies voters's beliefs, that is,* $\Psi\left(g_t^h\right)$*).*

4.3 Characteristics of A Non-Revealing Political Equilibrium

Because (22) is a nonlinear differential equation in the function $\Psi(\cdot)$, we cannot solve it analytically. (We provide a numerical solution in section 6 below for the case including rents to holding office). We can however derive some characteristics of equilibrium.

As shown in Proposition 1, under asymmetric information $\phi'_h\left(g^h_t\right)$ is strictly positive. It follows from (11) that the more electorally valuable region will be targeted in the election year in the general asymmetric information case, as was the case in a fully revealing equilibrium. That is,

Proposition 3 *The region with the higher value of $\phi'_h(\cdot)$ evaluated at the post-electoral g^h_{t+1} receives higher targeted expenditures in an election period t relative to the subsequent non-election period $t+1$, while the other region receives lower targeted expenditures in t relative to $t+1$.*

Proof: See Appendix

Intuitively, if one region is more electorally valuable when its voting behavior is evaluated at the non-electorally motivated level of public goods provided, then in an election period fiscal policy will be targeted to get its votes.

Characterizing who gets targeted under asymmetric information in terms of fundamentals about voter densities, the $f_h(\tilde{\pi}^h\left(g^h_t\right))$, is much harder. To see why, note that two factors determine a region's electoral value as captured by ϕ'_h in (21): the density $f_h(\cdot)$ of ideologically indifferent or "swing" voters; and, given $f_h(\cdot)$, the effect of g^h_t on expected utility in $t+1$. A region can be more electorally valuable even if it has fewer "swing" voters if g^h_t is particularly effective in raising voters's expected utility. That is, if one considers the density of swing voters at the non-electorally-motivated (that is, $t+1$) level of expenditures, it is clear from (21) that $f_1(\tilde{\pi}^1\left(g^1_{t+1}\right)) > f_2(\tilde{\pi}^2\left(g^2_{t+1}\right))$ does not necessarily imply $\phi'_1\left(g^1_{t+1}\right) > \phi'_2\left(g^2_{t+1}\right)$ since $\Psi'\left(g^h_t\right)$ will in general vary with g^h_t. Even if $\Psi\left(g^h_t\right) \equiv E_t\left[\ln g^h_{t+1}(L) \mid g^h_t\right]$ were strictly concave, $\phi'_1\left(g^1_{t+1}\right)$ could be less than $\phi'_2\left(g^2_{t+1}\right)$ even though $f_1(\tilde{\pi}^1\left(g^1_{t+1}\right)) > f_2(\tilde{\pi}^2\left(g^2_{t+1}\right))$ if g^2_{t+1} were sufficiently less than g^1_{t+1}. For instance, a region that in a non-election period receives a particularly low level of public goods is attractive for electoral targeting since, given concavity of utility function, the impact on its expected utility from a small increase in perceived ω is very high. Moreover, since $\Psi\left(g^h_t\right)$ represents an inference problem over unobserved variables, concavity of the utility function does not guarantee concavity of $\Psi\left(g^h_t\right)$ without restricting the distributions of voter ideology π and incumbent preferences ω.

In order to highlight the effect of targeted expenditures on voting, it was assumed in the model that there is no competition over ideology in an election. However, ideology affects the size of targeted expenditure in an election period. Greater ideological differences between the two candidates have a number of effects on the use of targeted expenditure policy, which may be summarized by (21), reproduced here:

$$\phi_h'(g_t^h) = \frac{f_h\left(\widetilde{\pi}^h(g_t^h)\right)}{2\left(\pi^R - \pi^L\right)}\Psi'\left(g_t^h\right)$$

Consider a mean-preserving increase in the difference between π^R and π^L. Given the voter density $f_h(\cdot)$ and expectation function $\Psi\left(g_t^h\right)$, the larger is the ideological spread between the two parties, that is, the greater is $\pi^R - \pi^L$, the smaller will be the effect of targeted expenditures on votes. The reason is that the greater is $\pi^R - \pi^L$, the smaller is the effect of targeted expenditure on $\widetilde{\pi}^h(g_t^h)$, since the larger is the cost of voters of not having actual policy be their preferred option between π^R and π^L. Put another way, the greater is the difference between the two parties' ideological positions, the more voting is influenced by ideology and the less by targeted expenditure. This "first-order" effect is as one would expect intuitively. Conversely, in close ideological elections, targeted expenditures would play a large role.

However, since a change in $\pi^R - \pi^L$ affects the position of the indifferent voter $\widetilde{\pi}^h(g_t^h)$ in (16), there will in general be effects on $\phi_h'(g_t^h)$ via $f_h(\cdot)$ and $\Psi\left(g_t^h\right)$. As above, the net effect will depend on the distribution of ideology.

5 Rents to Holding Office

We now add a value of holding office (over and above the value to the politician of enacting his own preferred ideology), which we call "rents" . Specifically, a part of government expenditure may be spent on a good K that is valued only by the politician ("*desks*"). The key effect of this change is the possibility that targeted public goods expenditures to all regions rise in an election year, at the expense of K. This result does not depend on voters assigning no value to K, only that there are some types of expenditure that voters as a whole value less than others, and these may be cut in an election year. The characterization of K as total waste in the eyes of voters is simply an extreme way to capture those differences in the value assigned by voters to different goods and services provided by the government.

The government's budget constraint now becomes

$$T = g_s^1 + g_s^2 + K_s \qquad s = t, t+1, \ldots \tag{24}$$

The voter's problem is as described in section 3.2, except that here we assume, for simplicity, that voters in each region observe only their own g_t^h, but not that of the other region. The politician's objective function is obviously different than in section 3.1. The incumbent L's objective in a non-election year $t+1$ parallels (4) but with the addition of rents:

$$\Omega_{t+1}^{O}(\mathbf{g}_{t+1}^{L}, L) = Z_{t+1}^{L}\left(\mathbf{g}_{t+1}^{L}\right) + \chi(K_{t+1}) + \beta E_{t+1}^{L}\left(\Omega_{t+2}^{E}\left(\cdot, L\right)\right) \tag{25}$$

where rents χ are an increasing, weakly concave function of K.[14] The incumbent's objective in the election year t can then be written

$$\Omega_t^E\left(\mathbf{g}_t^L, L\right) = Z_t^L\left(\mathbf{g}_t^L\right) + \chi(K_t) + \beta\left(\rho\left(N^L\right) E_t^L \Omega_{t+1}^{IN}\left(\mathbf{g}_{t+1}^L, L\right) + \left(1 - \rho\left(N^L\right)\right) E_t^L \Omega_{t+1}^{OUT}\right) \tag{26}$$

The difference $E_t\left(\Omega_{t+1}^{IN} - \Omega_{t+1}^{OUT}\right)$ is

$$(1+\beta)\left(\pi^L - \pi^R\right)^2 + E_t^L\left(Z_{t+1}^L\left(\mathbf{g}_{t+1}^L\right) - Z_{t+1}^L\left(\mathbf{g}_{t+1}^R\right)\right) + (1+\beta) E_t^L \chi(K_{t+1}) + \beta^2 E_t^L \Pi_{t+3} \tag{27}$$

but where the value in $E_t\Pi_{t+3}$ to being in office after $t+2$ includes the expected present discounted value of future office rents in addition to ideology. Equation (27) represents four components in this model which make reelection valuable, three of which were present in (8): the ability to implement one's preferred ideology; the ability to target expenditures to preferred regions; the rents from office; and the possibility that reelection at t gives to win future reelection and hence gain future advantage of being in office.

With rents from holding office, the first-order condition in a non-election year for each region h (found by maximizing (25) subject to (24)) equates the marginal value of targeted expenditures to the marginal value of rents (where once again we consider g_t^h and K_t over a single election cycle, so we suppress the time subscripts on $\omega_{L,t}^h$):

$$\frac{\omega_L^h}{g_{t+1}^h} = \chi'(K_{t+1}) \qquad h = 1, 2 \tag{28}$$

These first-order conditions for the two regions yield (6). Similarly, for an election year, one derives

[14] Although politicians could differ in the value they place on rents relative to voters, we assume that all politicians assign the same value to such expenditures. Drazen and Eslava (2005) consider politicians who differ in the weight they put on voters relative to "rents", where this weight is unobserved and all voters are homogeneous.

a first-order condition equating the value of targeted expenditures to the value of office rents:

$$\frac{\omega_L^h}{g_t^h} + \beta\rho'(\cdot)\,\phi_h'\left(g_t^h\right)E_t\left(\Omega_{t+1}^{IN} - \Omega_{t+1}^{OUT}\right) = \chi'(K_t) \tag{29}$$

for $h = 1, 2$.

The left hand side of (29) represents the benefit from a marginal increase in g_t^h. As in the post-election period, this benefit includes the utility gain this change induces for region h's voters. However, prior to an election the politician potentially derives an additional benefit from targeting region h, namely obtaining more votes from this region's voters.

Since (29) holds for both regions, optimal choices of $g_t^1$and g_t^2 therefore also satisfy:

$$\frac{\omega_L^1}{g_t^1} - \frac{\omega_L^2}{g_t^2} = \beta\rho'(\cdot)\,E_t\left(\Omega_{t+1}^{IN} - \Omega_{t+1}^{OUT}\right)\cdot\left[\phi_2'\left(g_t^2\right) - \phi_1'\left(g_t^1\right)\right] \tag{30}$$

With respect to the post-electoral allocation of expenditures there is a pre-electoral shift of government resources away from "desks" and into targeted spending. In other words, $K_t < K_{t+1}$. To see that this is the case, combine $\phi_h'\left(g_t^h\right) > 0$ with the fact that K_{t+1} satisfies the post-election first-order condition (28). Given these two elements, if the incumbent were to choose $K_t = K_{t+1}$, the pre-election marginal benefit of targeted public goods spending would exceed that of *desks*. Since $\chi(K)$ is (weakly) concave, satisfying the pre-election first-order condition (29) requires lower non-targeted expenditure before the election. The pre-electoral shift of resources toward targeted spending holds for any realization of ω_L^1 and ω_L^2, so that all types of politicians have incentives to change the composition of expenditures prior to an election.

How do electoral motives change the allocation of resources across regions in the pre-election period, compared to non-election periods? That is, how do g_t^1 and g_t^2 compare to g_{t+1}^1 and g_{t+1}^2? We provide here an intuitive discussion of how these resources are allocated.

In $t+1$ there is no electoral motive for targeted public goods spending, so g_{t+1}^1 and g_{t+1}^2 serve as the reference point in measuring electoral effects. Without loss of generality, suppose that voters in region 1 are more electorally valuable, that is, $\phi_1'\left(g_{t+1}^1\right) > \phi_2'\left(g_{t+1}^2\right)$. Since K_{t+1}, g_{t+1}^1 and g_{t+1}^2 satisfy the first-order condition (28), and $\phi_h'(g) > 0$, the following relations hold:

$$\frac{\omega_L^h}{g_{t+1}^h} + \beta\rho'(\cdot)\,\phi_h'\left(g_{t+1}^h\right)E_t\left(\Omega_{t+1}^{IN} - \Omega_{t+1}^{OUT}\right) > \chi'\left(K_{t+1}\right) \qquad \text{for } h = 1, 2$$

and

$$\frac{\omega_L^1}{g_{t+1}^1} - \frac{\omega_L^2}{g_{t+1}^2} > \beta\rho'(\cdot) E_t\left(\Omega_{t+1}^{IN} - \Omega_{t+1}^{OUT}\right)\left[\phi_2'\left(g_t^2\right) - \phi_1'\left(g_t^1\right)\right]$$

That is, if the $t+1$ composition of spending was imposed in t, the marginal benefit of expenditures targeted to any region would exceed that of K, and the benefit of spending one more dollar on public goods for region 1 exceeds that of spending it on region 2. Given the concavity of $\chi(K)$, the incumbent then has the incentive to transfer resources from non-targeted expenditures K to g^1, the most valuable form of targeted spending. What happens to g_t^2 and the final effect on K_t depend on the relative distance between $\phi_1'\left(g_{t+1}^1\right)$ and $\phi_2'\left(g_{t+1}^2\right)$.

There are two cases to consider. If $\phi_1'\left(g_{t+1}^1\right)$ and $\phi_2'\left(g_{t+1}^2\right)$ are similar in value, then both g_t^1 and g_t^2 will be higher than the corresponding g_{t+1}^1 and g_{t+1}^2, since a small increase in g_t^1 will suffice to make the marginal benefit of transferring resources to region 2 equal to that of transferring resources to region 1. The equilibrium composition of spending before the election would involve lower K_t and higher targeted spending to *both* regions compared to the post-election period. Alternatively, if the values of $\phi_1'\left(g_{t+1}^1\right)$ and $\phi_2'\left(g_{t+1}^2\right)$ are not close to one another, then it may be the case that while $g_t^1 > g_{t+1}^1$ unambiguously, targeted spending on region 2 will fall, that is, $g_t^2 < g_{t+1}^2$. That is, rather than reducing desks to finance all electoral spending on region 1, the politician takes expenditures away from region 2.

6 An Example

Because of the involved nature of an analytical solution for $\Psi\left(g_t^h\right)$, further characterizing equilibrium outcomes in general is difficult. We therefore present a specific illustrative example, which may also help the reader's intuition. .

6.1 Calculating an Equilibrium

We make the following specific assumption about functional forms. Let $\chi(K) = \theta K$, where θ is a constant. Let $E_t\left(\Omega_{t+1}^{IN} - \Omega_{t+1}^{OUT}\right) = \bar{\Omega}$, a constant since a politician's expectation of his future utility depends on his current choice of g_t^h only through its effect on election probabilities. For simplicity in this illustration, we assume that $\pi^R (= -\pi^L) = 0.25$. For tractability. let $\rho(N^L)$ be a linear function of the form $\bar{\rho}N^L$, so that $\bar{\rho}$ is the marginal effect of one more vote on the probability of winning. We assume

$$f^h(\pi) = \alpha^h \exp(-|\pi|)$$

where $\alpha^h = \frac{1}{2(1-\exp(-\bar{\pi}^h))}$. This distribution has the nice feature of being concentrated and symmetric around zero (the midpoint between π^I and π^C), and will prove tractable. Here, $\bar{\pi}^h$ and $-\bar{\pi}^h$ are, respectively, the upper and lower bound for π in region h.

We assume that both voters and incumbent know one of the two regions is characterized by $\alpha^h = \overline{\alpha}$ and the other by $\alpha^h = \underline{\alpha}$ (equivalently, $\bar{\pi}^h$ takes one value for one of the regions and another for the other region). However, only politicians know *which* region has each value of α, while voters simply assign some probability $p_h^{\overline{\alpha}}$ that region h is the one with $\overline{\alpha}$: $\Pr(\alpha^h = \overline{\alpha}) = p_h^{\overline{\alpha}}$.

From the first-order conditions (28) and (29) the incumbent's optimal choices for g_{t+1}^h and g_t^h are given by:

$$g_{t+1}^h = \frac{\omega_L^h}{\theta} \tag{31}$$

and

$$\frac{\omega_L^h}{g_t^h} + \Lambda \phi_h' \left(g_t^h\right) = \theta \tag{32}$$

where $\Lambda = \beta\bar{\rho}\bar{\Omega}$ is the value of one additional vote to the incumbent.

In order to find a solution for $\phi_h' \left(g_t^h (L)\right)$ consistent with voters forming expectations rationally, we first rewrite the incumbent's first-order condition (32) to note explicitly its dependence on individuals's expectations. Using equation (18a) and our assumptions about f^h, π^L, and π^R, note that $\phi_h' \left(g_t^h (L)\right)$ can be written as:

$$\phi_h' \left(g_t^h (L)\right) = a^h \exp\left[-\left|E\left(\ln \omega_L^h \mid g_t^h (L)\right) - E\left(\ln \omega_R^h\right)\right|\right] \frac{\partial E\left(\ln \omega_L^h \mid g_t^h (L)\right)}{\partial g_t^h} \tag{33}$$

or, letting $Y(g_t^h) \equiv \exp\left[-\left|E\left(\ln \omega_L^h \mid g_t^h\right) - E\left(\ln \omega_R^h\right)\right|\right]$,

$$\phi_h' \left(g_t^h (L)\right) = \begin{array}{ll} a^h Y'(g_t^h) & \text{if } E\left(\ln \omega_L^h \mid g_t^h\right) \leq E\left(\ln \omega_R^h\right) \\ -a^h Y'(g_t^h) & \text{if } E\left(\ln \omega_L^h \mid g_t^h\right) > E\left(\ln \omega_R^h\right) \end{array} \tag{34}$$

Since $Y(g_t^h)$ is the component of $\phi_h' \left(g_t^h\right)$ affected by voters's expectations, our analysis of their beliefs will focus on $Y(g_t^h)$. Also, the incumbent and challenger are identical *ex-ante*, so ω_R^h is characterized by the same unconditional distribution that characterizes ω_L^h. $E\left(\ln \omega_R^h\right)$ is formed according to that unconditional distribution.

Voters infer the relationship between ω_L^h and g_t^h from the first-order condition (32), and use it to form expectations about the future. That relationship is given by

$$\omega_L^h = \begin{array}{l} g_t^h\left(\theta - \alpha^h \Lambda Y'(g_t^h)\right) \text{ if } E\left(\ln \omega_L^h \mid g_t^h\right) \leq E\left(\ln \omega_R^h\right) \\ g_t^h\left(\theta + \alpha^h \Lambda Y'(g_t^h)\right) \text{ if } E\left(\ln \omega_L^h \mid g_t^h\right) > E\left(\ln \omega_R^h\right) \end{array} \tag{35}$$

It is clear from this expression that information about α^h (the electoral attractiveness of a region) influences how voters respond to pre-electoral manipulation. If a^h were *known* to voters, they could perfectly infer ω_L^h from their observation of g_t^h. This would correspond to what we call above a "perfectly revealing equilibrium".

Voters form $E\left(\ln \omega_L^h \mid g_t^h\right)$ by taking logs on both sides of (35), and using $\Pr(\alpha^h = \bar{\alpha}) = p_h^{\bar{\alpha}}$. Writing these expectations in terms of $Y(g_t^h)$, we obtain:

$$Y(g_t^h) = \begin{array}{l} e^{-E\left(\ln \omega_R^h\right)} g_t^h \theta \left[1 - \overline{\alpha}\frac{\Lambda}{\theta} Y'(g_t^h)\right]^{p_h^\alpha} \left[1 - \underline{\alpha}\frac{\Lambda}{\theta} Y'(g_t^h)\right]^{(1-p_h^\alpha)} \text{ if } g_t^h \leq \bar{g} \\ e^{E\left(\ln \omega_R^h\right)} \left(g_t^h \theta \left[1 + \overline{\alpha}\frac{\Lambda}{\theta} Y'(g_t^h)\right]^{p_h^\alpha} \left[1 + \underline{\alpha}\frac{\Lambda}{\theta} Y'(g_t^h)\right]^{(1-p_h^\alpha)}\right)^{-1} \text{ if } g_t^h > \bar{g} \end{array} \tag{36}$$

where $\bar{g}$ is such that $E\left(\ln \omega_L^h \mid g_t^h\right) \leq E\left(\ln \omega_R^h\right)$ if and only if $g_t \leq \bar{g}$.[15] This is the first order differential equation that characterizes rational voters's beliefs. Note that expression (35) represents the incumbent's optimal choice of g_t^h given voters's expectations, while expression (36) represents voters's rational expectations, given the incumbent's actions. Equilibrium outcomes are therefore represented by a function $Y(g_t^h)$ that solves expression (36), and the choice of g_t^h that satisfies (35) for that $Y(g_t^h)$. We now proceed to the illustration of those outcomes.

6.2 Illustration

To illustrate the effect of electoral cycles on fiscal choices, we obtain a function $Y(g_t^h)$ that solves the differential equation (36), and then find the incumbent's optimal choice of g_t^h given ω_L and that function $Y(g_t^h)$. For expenditure levels above $\bar{g}$ we use numerical methods to find a solution to (36). The procedure we use to solve (36) is further explained in the appendix.

Suppose that for both L and R, ω^h follows a uniform distribution with values between $\omega^l = 0.2$ and $\omega^u = 0.8$. In terms of other parameters, the specific solution we depict is based on $\theta = 1.3$, $\alpha^1 = 1.93$ (or $\bar{\pi}^1 = 0.3$), $\alpha^2 = 0.79$ (or $\bar{\pi}^2 = 1$), $\Lambda = 0.1$, and $p^{\bar{\pi}^h = 1} = 0.65$.[16]

[15] The fact that $E\left(\ln \omega_L^h \mid g_t^h\right)$ is increasing in g_t^h was proved for the general case in previous sections (it is implied by $\phi_h'(g_t^h)$). This example is, in any case, self-contained: we can consider the positive slope of $E\left(\ln \omega_L^h \mid g_t^h\right)$ as a conjecture, which will then prove consistent with the politicians' choices.

[16] The choice of Λ is consistent, for instance, with $\beta = 0.95$, $\rho = 1$ and $\bar{\Omega} = 0.11$. We solved the problem for different sets of parameters such as $\rho, \bar{\Omega}$, and the other parameters, and the basic insights are similar. We briefly discuss below the implications of varying these parameters.

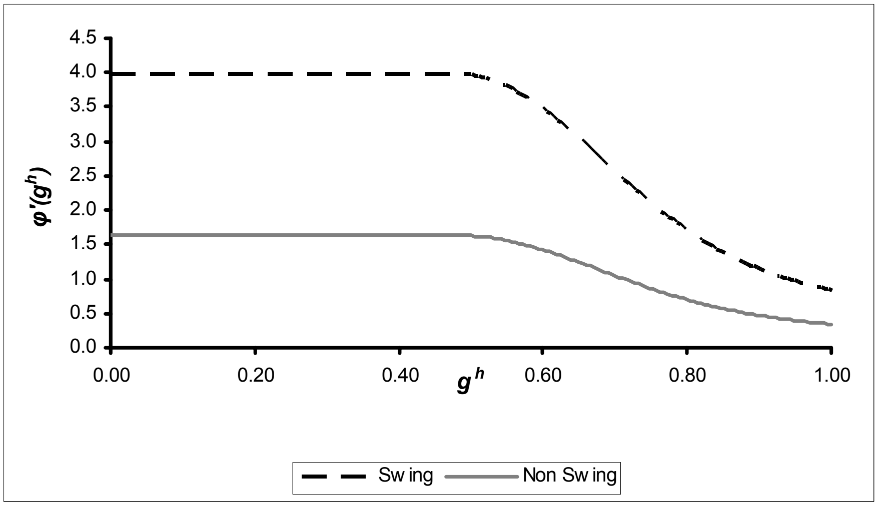

Figure 1: Marginal electoral benefit of g_t^h (voters uncertain about a^h)

The solution to the problem can be summarized by $\phi'(g_t^h)$, and the resulting choice of $g_t^h\,(L)$ as a function of ω_L^h and α^h. We depict them in Figures 1 and 2. Figure 1 shows $\phi'(g_t^h)$ for the two regions, where we denote as "swing" the region with $\bar{\pi}^1 = 0.3$ (larger mass of voters concentrated in the $\pi = 0$ neighborhood), and the other region as "non-swing". Figure 2, meanwhile, depicts the incumbent's optimal choice of election-period public goods spending on each region, $g_t^h(\omega^h)$, given the weight he puts on voters in that region. It also shows the level of spending a region h would receive in the the post-election period, for each possible ω^h (denoted g_{t+1} in the graph).

Examine first Figure 1. For any possible level of g_t^h, a marginal increase in spending leads to a greater gain in votes if it is given to the region with more swing voters. Hence, the incumbent chooses to target that region, as shown in Figure 2. However, both regions receive more spending than in the post election period (since the marginal utility of rents is constant and lower than the marginal utility of increasing spending on voters in either region before the election, relative to post-election levels).[17]

We can compare these results with what would occur if voters in each region knew exactly their

[17] The extent to which pre- and post-electoral policy differ (i.e. the size of the political budget cycle) obviously depends on the specific parameters chosen. For instance, larger values of Λ imply a larger value of re-election, and therefore lead the incumbent to chose larger g_t^h. Small values of θ imply that the post-election level of targeted expenditure is already high (for any candidate) and, given decreasing marginal utility, reduce the potential differences between one and another candidate in terms of provision of targeted goods. This reduces the incentives for electoral increases of g_t^h. For large enough θ, one of the two groups receives less spending before than after the election. Larger ideological gaps between the different candidates reduce the importance voters give to fiscal policy in choosing the candidate, and therefore reduce the incentives for electoral increases of g_t^h. Different choices of α^1 and α^2 will change the electoral benefit the incumbent can obtain from increasing g_t^h, as can be deduced from the figures above. The general patterns of electoral changes for g_t^h, however, are quite robust to the parameters chosen.

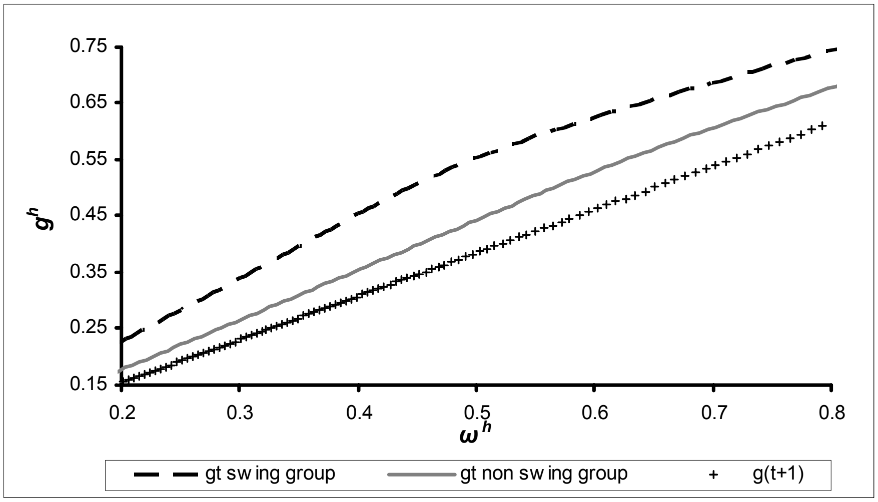

Figure 2: Optimal choice of g_t^h as a function of ω^h (voters uncertain about a^h)

$\bar{\pi}^h$, that is, in a "fully revealing" equilibrium. Suppose, for instance, that region h is the more "swing" region (has the lowest $\bar{\pi}^h$), and its inhabitants know this. Figure 3 compares $\phi'(g_t^h)$ in this case (solid line) with the $\phi'(g_t^h)$ that would result under the baseline case where voters assign $p^{\bar{\pi}^h=1} = 0.65$ (dashed line). Under asymmetric information about the distribution of ideology, voters receiving large spending cannot perfectly infer if this reflects the incumbent's preference for their region, or simply the region's greater electoral value. Hence, they will assign some probability to their being in the non-swing region, leading them to infer a higher ω^h for any given g_t^h than they would infer if they knew they were swing. This implies that, for any level of g_t^h, a larger mass of swing-region voters will prefer the incumbent under asymmetric information than in a perfectly revealing equilibrium.[18]

However, for the same reason, for any given g_t^h, a voter in a region with more swing voters expects greater post-electoral spending if he does not know his region is swing. This combined with decreasing marginal utility means that a marginal increase in g_t^h has a smaller impact on the utility voters expect for the following period relative to the case where they know they are swing. For a swing region, therefore, this effect implies smaller $\phi'(g_t^h)$ under asymmetric information. The opposite directions of these two effects explain the patterns observed in Figure 3: for large levels of g_t^h the latter effect dominates implying smaller $\phi'(g_t^h)$ under asymmetric information about the $f(h)$. The opposite is true for low levels of g_t^h. Given this characteristic of $\phi'(g_t^h)$, for low levels of ω_h, targeted spending to the more swing region is greater if its voters do not know they are swing than if they do. Conversely, g_t^h is greater in a perfectly revealing equilibrium if ω_h is high.

[18] The opposite would happen if group h were the less swing group.

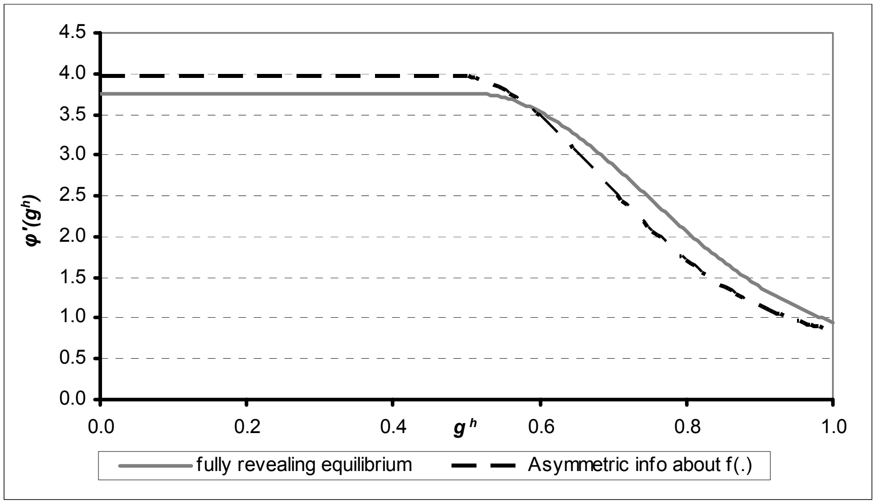

Figure 3: Marginal electoral benefit of g_t^h from swing voters

7 Conclusions

We present a model of a political budget cycle in which politicians use public goods expenditures targeted to more politically "useful" voters at the expense of other voters (or other categories of expenditures). Hence, electoral manipulation is present, but does not show up in aggregate expenditures or deficits in the government budget, consistent with recent empirical findings about established democracies. Election-year provision of pork-barrel spending "works" even though forward-looking rational voters correctly solve the inference problem of trying to discern the motivation for election-year spending under imperfect information. That is, election-year economics succeeds in gaining the votes of rational voters, even though they know there is some probability that they are being targeted solely to get their votes. Even in the extreme case where voters know just how "swing" they are, an electoral cycle in pork barrel spending will in general be present.

Our approach differs from other models of political budget cycles with rational voters in that voters care about the preferences of the incumbent over different voting groups, rather than about his competence. The difference is not merely semantic. In the competence approach a key element is the inability of voters to observe not only the characteristics of the incumbent but also some component of the budget. In contrast, our approach implies that a political budget cycle may emerge even if voters observe all fiscal choices; we shift the attention from the fiscal information voters receive to their fiscal preferences and those of the incumbent.

Our focus on the favoritism of politicians for certain groups is motivated by traditional election-year economics, which gives a key role to special interests in electoral budget manipulation. Although the idea of pork barrel politics is common in political economy, it has not been incorporated in intertemporal models of fiscal policy-making. Furthermore, previous literature does not address the question of why providing such spending would affect the votes of rational, forward-looking, individuals.

References

Besley, T. and S. Coate (1997), "An Economic Model of Representative Democracy," *Quarterly Journal of Economics* 112, 85-114.

Bonomo, M. and C. Terra (2004), "Elections and Exchange Rate Policy Cycles," *Economics and Politics* (forthcoming).

Boyce, W. and R. DiPrima (1997), *Elementary Differential Equations*, (6th edition) New York: John Wiley and Sons.

Brender, A. (2003), "The Effect of Fiscal Performance on Local Government Election Results in Israel: 1989-1998," *Journal of Public Economics* 87, 2187-2205.

Brender, A. and A. Drazen (2005a), "Political Budget Cycles in New versus Established Democracies," *Journal of Monetary Economics* 52, 000-000.

________ (2005b), "How Do Budget Deficits and Economic Growth Affect Reelection Prospects? Evidence from a Large Cross-Section of Countries," working paper.

Dixit, A. and J. Londregan (1996), "The Determinants of Success of Special Interests in Redistributive Politics," *Journal of Politics* 58, 1132-55.

Drazen, A. and M. Eslava (2005), "Electoral Manipulation via Voter-Friendly Spending: Theory and Evidence," working paper.

Gonzàlez, M.(1999), "Political Budget Cycles and Democracy: A Multi-Country Analysis," working paper, Department of Economics, Princeton University.

________ (2002), "Do Changes in Democracy affect the Political Budget Cycle? Evidence from Mexico," *Review of Development Economics* 6, 204-224.

Grossman G. and E. Helpman (2005), "Party Discipline and Pork Barrel Politics," NBER Working Paper 11396.

Khemani, S. (2004) "Political Cycles in a Developing Economy: Effect of Elections in the Indian States. *Journal of Development Economics* 73, 125-154.

Kneebone, R. and McKenzie, K. (2001) "Electoral and Partisan Cycles in Fiscal Policy: an Examination of Canadian Provinces," *International Tax and Public Finance* 8, 753-774.

Lindbeck, A. and J. Weibull (1987), "Balanced Budget Redistribution as the Outcome of Political Competition," *Public Choice* 52, 272-97.

Lizzeri, A. and N. Persico (2001), "The Provision of Public Goods under Alternative Electoral Incentives," *American Economic Review* 91, 225-245.

Myerson, R. (1993), "Incentives to Cultivate Favored Minorities under Alternative Electoral Systems," *American Political Science Review* 87, 856-869.

Osborne, M. and A. Slivinski (1996), "A Model of Political Competition with Citizen Candidates," *Quarterly Journal of Economics* 111, 65-96.

Peltzman, S. (1992), "Voters as Fiscal Conservatives," *Quarterly Journal of Economics* 107, 327-261.

Persson, T. and G. Tabellini (1990), *Macroeconomic Policy, Credibility, and Politics*, London: Harwood.

________ (2003), *The Economic Effects of Constitutions* Cambridge, MA: MIT Press.

Persson, T., G. Roland, and G. Tabellini (2000), "Comparative Politics and Public Finance," *Journal of Political Economy* 108, 1121-1161.

Rogoff, K. (1990), "Equilibrium Political Budget Cycles," *American Economic Review* 80, 21-36.

Rogoff, K. and A. Sibert (1988), "Elections and Macroeconomic Policy Cycles," *Review of Economic Studies* 55, 1-16.

Shi, M. and J. Svensson (2002a), "Conditional Political Budget Cycles," CEPR Discussion Paper #3352.

________ (2002b) "Political Business Cycles in Developed and Developing Countries," working paper.

Stein, E. and J. Streb (2003), "Elections and the Timing of Devaluations," *Journal of International Economics*.

Strömberg, D. (2001), "Mass Media and Public Policy," *European Economic Review* 45, 652-663.

________ (2005), "How the Electoral College Influences Campaigns and Policy: The Probability of Being Florida," working paper.

APPENDICES

A Proofs of Propositions

Proof of Proposition 1: Suppose $\phi_h'\left(g_t^h\right) \leq 0$. The incumbent would then get more votes by *reducing*, or at least not increasing, targeted spending to group h. Larger g_t^h in this case cannot be driven by electoral motives, but by ω_L^h being high. Increases in g_t^h then lead voters in group h to perceive higher ω_L^h and thus to expect higher post-election utility. As a result, more group h voters want to vote for the incumbent, that is, $\phi_h'\left(g_t^h\right) > 0$. This contradicts the initial assumption. $\square$

Proof of Proposition 2: Suppose voters can perfectly infer the ω_L^h from g_t^h, that is, the politician's decision rule $g_t^h(\omega_L^h)$ is invertible, to obtain the equilibrium relation $\omega_L^h = \widetilde{\omega}\left(g_t^h\right)$. This implies that $E_t\left[\ln g_{t+1}^h(L) \mid g_t^h\right] = \ln\left[\widetilde{\omega}\left(g_t^h\right)\right]$. Therefore, letting $\widetilde{\pi}_{PR}^h$ be the indifferent voter's position in this perfectly revealing equilibrium, we obtain:

$$\widetilde{\pi}_{PR}^h(g_t^h) = \frac{\pi^L + \pi^R}{2} + \frac{\ln\left[\widetilde{\omega}\left(g_t^h\right)\right] - \mu}{2(\pi^R - \pi^L)}$$

From the definition of $\phi_h(\cdot)$ in (17) and this $\tilde{\pi}_{PR}^h(g_t^h)$, it follows that ϕ_h in this perfectly revealing equilibrium depends on g_t^h. Hence, from Proposition 1 we know $\phi_h'(g_t^h) > 0$. Moreover,

$$\phi_h'(g_t^h) = \frac{f_h(\tilde{\pi}_{PR}^h)}{2\left(\pi^R - \pi^L\right)\widetilde{\omega}\left(g_t^h\right)} \frac{\partial\widetilde{\omega}\left(g_t^h\right)/\partial g_t^h}{\widetilde{\omega}\left(g_t^h\right)} \tag{A1}$$

Since in general the density of voters is not the same across groups (that is, $f_1(\tilde{\pi}_{PR}^1) \neq f_2(\tilde{\pi}_{PR}^2)$), (A1) implies that, in general, $\phi_1'\left(g_{t+1}^1\right) \neq \phi_2'\left(g_{t+1}^2\right)$. In other words, the additional vote share obtainable from the two groups is not equal in the case $g_t^h = g_{t+1}^h$ for $h = 1, 2$. Then $g_t^h = g_{t+1}^h \left(= \omega_L^h\right)$ cannot solve (13). $\square$

Proof of Proposition 3: Suppose, without loss of generality, $\phi_1'\left(g_{t+1}^1\right) > \phi_2'\left(g_{t+1}^2\right)$. Then $g_t^1 = g_{t+1}^1 \left(= \omega_L^1\right)$ and $g_t^2 = g_{t+1}^2 \left(= \omega_L^2\right)$ cannot solve (13). Proposition 1 and equations (13a) and (13b) then imply that $g_t^1 > g_{t+1}^1$ and $g_t^2 < g_{t+1}^1$. $\square$

B A solution to equation (36)

The $g_t^h \leq \bar{g}$ branch of equation (36) is solved by the following expression:

$$Y(g_t^h) = e^{-E\left(\ln \omega_R^h\right)} g_t^h \theta c_0 \tag{A2}$$

where c_0 is such that

$$c_0 = (1 - \overline{\alpha}\Lambda e^{-E(\ln \omega_R^h)} c_0)^{p^\alpha} (1 - \underline{\alpha}\Lambda e^{-E(\ln \omega_R^h)} c_0)^{(1-p^\alpha)} \tag{A3}$$

We use expression (A2) and the definition of $\bar{g}$ given after (36) (which implies $Y(\bar{g}) = 1$) to find:

$$\bar{g} = \frac{e^{E\left(\ln \omega_R^h\right)}}{\theta c_0}$$

and choose the value of c_0 that solves (A3) and ensures $0 \leq \bar{g} \leq 1$.

For the $g_t^h \geq \bar{g}$ branch of equation (36) we find a numerical solution based on a finite-difference approximation to the equation. The specific solution we choose is the one that ensures $Y(\bar{g}) = 1$ and $Y'(\bar{g}) = -e^{-E\left(\ln \omega_R^h\right)}\theta c_0$ (where, given (A2), the latter amounts to $\phi'(g_t^h)$ being smooth around $\bar{g}$). We first denote $Y_i \equiv Y(g_i)$ (where i indexes the grid of g_t^h we use), and replace $Y'(g_t^h)$ with a finite difference approximation to it, namely, $\frac{Y_{i+1}-Y_i}{g_{i+1}^h - g_{i+1}^h}$. Then, re-write this branch of equation (36) as

$$F(Y, Y', g_t^h) = Y(g_t) g_t^h \theta \left[1 + \overline{\alpha}\frac{\Lambda}{\theta} Y'(g_t^h)\right]^{p_h^\alpha} \left[1 + \underline{\alpha}\frac{\Lambda}{\theta} Y'(g_t^h)\right]^{(1-p_h^\alpha)} - e^{E\left(\ln \omega_R^h\right)} = 0 \ ,$$

where Y' is as explained above. This can be seen as a system of N equations on Y_i and Y_{i+1} for N different values of g_t in the $[\bar{g}, 1]$ interval. Since we know the value of $Y_0 = Y(\bar{g})$ and $\bar{g}$, the system only has N unknowns, and we can solve for them. The solution is found using a quasi-Newton method of Broyden (see, for example, Boyce and DiPrima, 1997), where we use as initial guess $Y(g_t^h) = (0.99, 0.98, ..., 0)$. We also try two other alternatives methods to solve this branch of equation (36) with similar results.[19]

[19] The first alternative method uses a modified Runge-Kutta algorithm. This algorithm approximates a solution to $Y(g_t^h)$ by iteratively generating values of this function and $Y'(g_t^h)$ from initial values. In our case, the initial values are $Y(\bar{g}) = 1$ and $Y'(\bar{g}) = -e^{-E\left(\ln \omega_R^h\right)}\theta c_0$. In each step of this iteration, the algorithm uses the value of $Y'(g_t^h)$ given by the differential equation and the value of $Y(g_t^h)$ calculated in the previous step. Since our differential equation is not linear in $Y'(g_t^h)$, we obtain this value of $Y'(g_t^h)$ using an algorithm of Broyden (for this and the Runge-Kutta algorithms see, for instance, Boyce and DiPrima [1997]). Our second alternative method finds an analytic solution to a first-order Taylor approximation to the $g_t > \bar{g}$ branch of (36).