

Chapter 2 uses the view that politicians favor the interests of specific groups of voters to explain political budget cycles in a model with rational voters. Voters use past fiscal policy to learn information about which types of spending the incumbent is likely to favor if re-elected. The result is a pre-electoral shift of government resources from non-targeted types of expenditures toward goods specific groups of voters care more about. Pre-electoral transfers are mostly directed to undecided groups of voters. Even though voters are rational and predict this behavior, they respond to electoral manipulation, since they cannot observe whether they are being targeted because they are crucial to the incumbent's re-election or because they are genuinely liked.

In chapter 3, I use data on government expenditures and electoral outcomes in Colombia to analyze both voting behavior and the pre-electoral dynamics of government spending. I suggest a correspondence between fiscal data and the conceptual division of expenditures into targeted and non-targeted spending. I find that targeted spending grows and non-targeted spending contracts in the year leading to an election. Consistent with this result, I find that Colombian voters reward pre-election increases in targeted spending, but punish incumbents who run high deficits when the election approaches.

POLITICAL INFLUENCES ON
MONETARY AND FISCAL POLICY

by

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DEDICATION

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A la memoria de Gerardo Eslava y Olga Cobos

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Part I

Central Bank Institutions and the Government's Influence Over Monetary Policy

Chapter 1

Central Banks as Government Appointed Committees

1.1 Motivation

The question of what is the optimal institutional design of an independent Central Bank (CB) has been of great interests to legislators, central bankers, and academics alike. One of the sticky points is *how much* independence should the CB be given. Although the importance of CB independence is widely recognized, there is also ample agreement around the idea that the CB should not be completely isolated from the government. This is in part due to the need for harmony between monetary and fiscal policy, but also because the participation of publicly elected officials in all policy decisions is at the core of democratic systems. The dilemma is how to maintain the desired link with the government, while giving the CB enough independence to alleviate ties between monetary policy and the electoral cycle, and to reduce inflation bias.

In practice, such dilemma is frequently addressed by placing the design of monetary policy in the hands of a committee of central bankers, and giving the government some power over the appointment of its members. The idea is that, while these appointment powers create a tie between the government and

the CB, the larger set of decision-making mechanisms and appointment rules available under a committee arrangement can be exploited to make policy more independent from government's pressures than it would be under a single central banker. In other words, for any given position of each individual member, the mechanisms through which positions are aggregated can be optimally designed to reduce the influence of the government.

Although this argument points to certainly important advantages of committee designs, it fails to recognize that central bankers embedded in this type of setting may in fact not behave as they would in the absence of government appointments, or within monolithic institutions. That is, the positions of individual members are not "given". This paper brings into the picture the potential effects of collective decision-making and government appointments on the choices of each individual central banker. Accounting for this dimension makes clear that not under all circumstances a committee structure indeed helps in isolating monetary policy from the electoral cycle and reducing inflation bias. In particular, the size of the committee and the fraction of members over whose appointment the government has influence are key determinants of the effects of collective decision-making. My results contribute to the debate on the optimal institutional design of the CB, shedding light on the question of how to obtain the benefits of CB independence without fully isolating the CB from the government.

The introduction of collective decision-making and government appointment powers can affect the incentives faced by central bankers in ways that are particularly acute when informational asymmetries give rise to reputation concerns. As previous literature has pointed out, central bankers may want to build a reputation for the CB being tough on inflation. But this is not the only source for

reputation building incentives when appointments to the CB are a privilege of the government. In fact, a central banker may care about the perception the government has about him (how close are his preferences to those of the government, how loyal to the government he is) because such perception affects his chances of being reappointed¹. Hence, a central banker may want to build a reputation of being close to the government.

Moreover, how these reputation building incentives play into a central banker's decisions depends crucially on whether decisions are monolithic or collective. In particular, reappointment probabilities are affected by the government's perceptions about each individual central banker, while inflation expectations are affected by the public's perception about the CB as a whole. In a monolithic environment, the central banker and the CB are the same entity, so there is no difference between the CB reputation and that of the policy-maker. But under a committee there is a dichotomy between the *individual reputation* of each member and the *collective reputation* of the CB. Furthermore, since the vote of a central banker may not be reflected in the actual policy, each member knows that his vote will only have a limited effect on the collective reputation of the CB. Hence, under committee decisions the incentive to show closeness to the government can override the incentive to build a reputation of toughness for the CB, as well as other considerations. If this is the case, the idea that a committee design limits the influence of the government on monetary policy may be wrong.

Motivated by these considerations, I study how the reputation building in-

¹As an example, Ersenkall et al. (1985), find that monetary base in the U.S. expands faster in the months that precede the decision of whether a Federal Reserve Board chairman will be reappointed.

centives faced by central bankers are affected by the government's appointment powers and by collective decision-making. I frame my analysis in a two-period model that falls in the tradition of Barro and Gordon (1983), in which I introduce the possibility of endogenous reappointments of CB members. In this setting I address the tension between the CB collective reputation and each member's individual reputation, as discussed above. While a central banker's concern about the reputation of the CB can reduce his temptation to inflate, his concern to show loyalty to the government in order to be reappointed creates a channel for the government to influence policy.

I show that, compared to a single central banker, a committee design has the potential to both increase the importance of building a reputation for the CB being tough on inflation, and reduce the importance of reappointment considerations. The realization of this potential, however, depends crucially on specific features of the committee design, in particular its size and the fraction of members the government can replace from one period to the next. An increase in the fraction of members to be replaced reduces the relevance of past inflation for future expectations of inflation, diminishing the ability of reputation considerations to reduce inflation bias. It also increases the risk that a central banker will be removed from office if believed to be of a different type than the government, increasing the incentives to follow the government's preferred policy. On the other hand, an increase in the size of the committee reduces the ability any single central banker has to affect actual policy, thus increasing the importance central bankers give to influencing reappointment rather than choosing policy.

The paper is divided in six sections , including this introduction. In section 1.2, I review some relevant literature, and discuss the contributions of this paper.

Section 1.3 discusses the general setting of my model, and solves the problem of a central banker. Section 1.4 compares how that solution differs between the cases of a single central banker and a board. Section 1.5 introduces government appointments. Finally, section 1.6 concludes.

1.2 A little perspective: literature on government appointments and committee central banks

The effects of government appointments on monetary policy, as chosen by a committee, have been previously studied by Lohman (1997) and Waller (1989). These papers extend Alesina's (1987) model of partisan cycles in monetary policy and output, to account for committee decision-making and government appointments to the CB. A central assumption is that each government can change some members of the CB during its term, and it appoints central bankers who belong to its own party. The only source of uncertainty is which party will win the following elections; the types of central bankers are not private information, and as a result each member of the committee always votes for the policy preferred by his political principal. The basic result of this literature is that a well designed committee can reduce inflation cycles because it renders more stable CB preferences than a single central banker arrangement². This implies less uncertainty about future decisions of the central bank, and therefore ends up reducing output cycles as

²This literature does not have much to say about inflation bias: since there is perfect information about the preferences of all policy-makers, inflation always reflects the "median type" in the committee.

well. Waller (1989) shows that lengthening the terms of central bankers (reducing the fraction of members changed at each point) further reduces those cyclical variations, because it implies even less uncertainty about the future preferences of the CB. The decentralization of appointments is shown to have a similar effect by Lohman (1997). The results in these papers support the informal arguments that, in many countries, led to the adoption of boards to direct the CB. Both official statements and other accounts about the reasons that led to this type of institutional design in many countries argue that the preferences of a committee CB will evolve more slowly than those of its single-member counterpart, and will therefore be less subject to the influence of the political cycle³.

The absence of informational asymmetries in this literature implies that a central banker always behaves like his political principal. As a result, the only difference with the case where the government chooses monetary policy is the committee nature of policy-making. In other words, CB independence plays no role in these models, and the only effect of a committee structure is to aggregate the otherwise unchanged votes of central bankers. My approach in this paper is fundamentally different, although not necessarily conflicting: I focus on how a committee affects the decisions of central bankers, rather than on how those

³For instance, the committee design of the Colombian Central Bank is explained in the Bank's Website as follows : "This system guarantees continuity in Bank policy while safeguarding it from the influences of political change, thus ensuring planning more in view of the long-term and garnering greater credibility with the public" (*El Nuevo ordenamiento del Banco y su Junta Directiva*, in www.banrep.gov.co). On other front, Waller (1989) documents how several historians of the U.S. Federal Reserve "argue that the board structure of the Federal Reserve Board of Governors was, in fact, chosen specifically to minimize the influence of partisan politics on the setting of monetary policy" (pp 422-423)

decisions are aggregated. Moreover, there is a rationale for CB independence in my model, since the government is assumed to be immune to the reputation concerns that restrain the inflationary temptations of central bankers.

Another strand of literature (Faust, 1996, Dal Bó, 2002) documents the ability of a committee structure to reduce inflation bias, in the absence of reputation concerns. These papers take advantage of the fact that a committee provides flexibility to aggregate the positions of its members in different ways. The basic starting point is that the inflation rate preferred by the median voter is too high, in the sense of imposing inflation costs without generating benefits from surprise inflation. They show that an optimal decision mechanism can be designed, such that the monetary policy chosen by a board is less subject to inflation bias than the one preferred by the median voter. In Faust’s model, monetary policy is the result of bargaining between members of the CB. Inflation bias is reduced if the representation of anti-inflation groups is disproportionately large, relative to their representation in society. Meanwhile, in Dal Bó’s model central bankers vote over policy choices. He shows that a less inflationary balance of preferences can be achieved if an optimal supermajority rule is used to choose policy⁴. The

⁴Dal Bó’s discussion relies on the assumption that CB committees are large enough to be representative of the distribution of types in society. Given my results this assumption not only is unrealistic, but it also ignores that a large committee creates perverse incentives for central bankers. Moreover, in the supermajority rule he proposes, central bankers vote over status-quo optimal inflation and a “reform inflation” that is chosen by the majority. The majority is supposed to choose a reform inflation level different from the one preferred by the median voter, realizing that only in this way will a supermajority be obtained in the second round. This assumption requires a large amount of coordination among voters, that I find difficult to justify if the committee, as assumed in the paper, is large.

supermajority rule ensures that the pivotal voter is more conservative than the median voter. My results differ from these papers in that, in my model, an appropriately designed board can reduce the inflation bias even when the pro-inflation types are in command of the CB. This arises because, in my model, reputation concerns affect the choices of these “weaker” types, and a committee structure can make reputation more relevant.

Finally, the effects of a committee design on the reputation building incentives of central bankers are addressed by A. Sibert (1999). In her model, as is the case in this paper, the fact that a central banker’s vote may not be reflected in the policy outcome changes the incentives to build a reputation. However, she abstracts from the mechanisms for appointing central bankers which, as this paper shows, are a key determinant of the importance central bankers give to reputation-building considerations. Moreover, Sibert’s model assumes that the public obtains and uses information about individual votes in the CB, while in this paper the idea that individual votes are observed only imperfectly is pivotal to the concept of “collective reputation”. My contention is that people may form expectations based on the actual policy even if individual voting records are available, due to reasons such as the lower cost of observing policy compared to investigating individual votes. Sibert’s paper does analyze the case in which voting records are not published, but my results differ from hers even in this case, given my consideration of the reappointment process. My idea of collective reputation is closer to that proposed by Tirole (1996), for whom the reputation of an organization differs from the reputation of each member because the output of the latter is observed only imperfectly.

1.3 Model: General setting

The model I use follows the tradition of the Barro-Gordon model (1983), which is probably the most standard framework to model the choices of the Central Bank. My analysis relies on previous models of reputation building by the monetary authority (Backus and Driffill, 1985; Barro, 1986). I begin by studying the choice of monetary policy without imposing a specific institutional structure, and derive a general solution to the problem of a central banker. Even without further institutional detail, my general approach differs from the traditional setting in that, as in many CB's around the world, a central banker's term can be extended. That is, a central banker can be reappointed. I will later I specialize the general solution obtained in this section, analyzing the form it takes under different specifications of the institutional setting: board vs single central bankers, and government appointments vs. random appointments.

1.3.1 The preferences of central bankers

Consider a two-period economy with a Central Bank (CB) that rules over monetary policy. The CB is assumed to be independent from the government, in that the latter does not participate in the choice of monetary policy. However, under some of the institutional arrangements I consider, the government is given the role of choosing central bankers.

I assume that the CB has perfect control over the inflation rate, π , which summarizes monetary policy in the model. The preferences of central bankers reflect the costs and potential benefits of inflation. Inflation and inflation variability impose costs on society, for instance because they are associated with distortions of relative prices. At the same time, unanticipated inflation generates

benefits, which can reflect different factors. On one side is the familiar Phillips curve mechanism which, in its simplest form, points that unexpected inflation reduces real wages in the presence of inflexible nominal wage contracts, stimulating the demand for labor. Moreover, unexpected inflation reduces the real value of outstanding nominal liabilities, generating gains to borrowers such as the government. As a result, central bankers derive utility from low and stable inflation, but they also value inflation surprises. Furthermore, central bankers may not be purely altruistic, in which case they also give some value to being in office.

The importance given to reducing inflation, relative to other objectives, differs across central bankers. There are many reasons why such heterogeneity can arise. In Alesina's (1987) model, for instance, it is the reflection of ideological differences and/or party affiliation. It can also capture skepticism on the part of some policy makers about their ability to exploit inflation-output trade-offs (which could in turn give them the ability to commit to a monetary rule, as in Barro's 1986 model); or it could result from central bankers representing interests that are affected by inflation in different ways, such as borrowers and lenders (Faust, 1996). The implication, in any case, is that some central bankers have more incentives than others to reduce inflation, relative to generating inflationary surprises. I assume that central bankers come in two types, which I call hawks and doves. Hawks give more importance than doves to fighting inflation. I assume that the type of a central banker is his private information, which will raise reputation considerations.

The preferences of a dove central banker identified as i are reflected in the following loss function:

$$L_i^d = E \sum_{t=1}^2 \beta_i^{t-1} [\pi_t^2 - c(\pi_t - \pi_t^e) - b * o_{it}] \quad (1.1)$$

where the superindex d refers to a dove, π_t is the inflation rate in period t , π_t^e is the public's expectation of inflation for period t , $\beta_i \in [0, 1]$ is the discount factor, and o_{it} is 1 if i is in office in period t , and 0 otherwise. I allow the discount factor β_i to vary across individual bankers, so that different dove central bankers may care more or less about the future implications of their choices; β_i is characterized by a cumulative density function $F(\beta_i)$. The parameters c and b (where $c > 0$ and $b \geq 0$), capture the value given by a dove policy maker to, respectively, generating inflation surprises and being in office (relative to reducing inflation).

Central bankers face uncertainty that stems from two sources. First, if monetary policy is chosen by a committee, each central banker faces uncertainty about the types of his fellow committee members. The other source of uncertainty for a central banker comes from the possibility that the central banker is not reappointed for period 2. Although I will consider different scenarios for how reappointment is decided, in all of them reappointment is uncertain from the perspective of period 1.

The first term of loss function (1.1) implies that a dove central banker cares about driving inflation to its target value of zero (a different target level could be assumed without changing the basic results). The convex functional form of this term captures inflation stabilization incentives.

The second term reflects a dove's incentives to generate inflation surprises. As in the original formulation of the Barro-Gordon model, I assume a linear functional form. This assumption has the shortcoming of ignoring potential output stabilization incentives, which could be affected by the institutional environment.

However, it makes the problem of the central banker more tractable; this is important in the context of this paper, because the simultaneous introduction of government appointments, committee decision-making, and possible reappointments expands considerably the set of possible states of the world that a central banker must consider⁵.

Notice that, for any individual i serving as central banker in period one, $o_{it=1} = 1$. Moreover, defining r_i such that $r_i = 1$ if i is reappointed for period 2 and $r_i = 0$ otherwise⁶, one can write $E(o_{it=2}) = \Pr(r_i = 1)$. To simplify the notation, I will drop the time subindexes, and indicate period 2 variables with a $'$ mark. A dove's loss function can, therefore, be rewritten as:

$$L_i^d = E \left\{ \pi^2 - c(\pi - \pi^e) + \beta_i [(\pi')^2 - c(\pi' - \pi^{e'})] \right\} - b[1 + \beta_i \Pr(r_i = 1)] \quad (1.2)$$

What is important to note from this loss function is that the choices of a dove central banker in the first period affect not only his current losses, but also his expected losses for period 2. One channel for these intertemporal effects is the well known incentive to build a good reputation for the CB (Backus and Driffill, 1985; Barro, 1986). High inflation in the first period sends the signal to the public that the members of the CB are dove with high probability, and are therefore likely to chose high inflation in period 2. In other words, high π affects the reputation of the CB, increasing future inflation expectations (captured by $\pi^{e'}$). Since $\pi^{e'}$ enters loss function (1.2), consideration of the CB's reputation

⁵Some interesting consequences of CB collective decision-making for the ability of the monetary authority to stabilize output, although in more restricted contexts, are analyzed by Dal Bó (2000) and Waller (1989).

⁶Later I allow the government to choose r .

makes a dove central banker wary of increasing π in the first period.

Consider, for instance, the case of a single central banker. The public uses π to make inferences about the type of the central banker who was in office in period 1. If high π is observed, they assign a higher probability to the central banker being dove than if π was low. In case the central banker is reappointed for period 2, these inferences affect π^{el} .

Importantly, this paper's focus on government appointments to the CB creates an additional link between today's policy and tomorrow's expected losses. In particular, if the decision to reappoint the central banker lies with the government, the central banker's choice of policy in period 1 is likely to affect his chances of reappointment. Reappointment obviously affects the central banker's expected utility from being in office in period 2, captured by b . But further than that, his assessment of the probability of staying in office also affects his expectations about both π' and π^{el} (that is, π' and π^{el} also depend on r_i , as will become clear). As a result, when choosing π , the central banker must take into account the potential effects of his choice on his chances of reappointment. Under the assumption that the government favors partisan appointments, central banker i has incentives to choose the policy preferred by the government to increase his chances of remaining in office.

In short, when choosing policy in period 1, a dove central banker takes into account the potential effect of his choice on three different factors: 1) current inflation, and therefore the central banker's current welfare, 2) next period expected inflation, and 3) his chances of reappointment. Simply put, a dove central banker has a preference for generating an inflation surprise in period 1, but may be discouraged from doing so because high inflation damages the reputation of

the CB, increasing future expectations of inflation. He may also avoid high inflation if this damages his chances of being reappointed, or stick to it if the opposite is true.

As for hawk central bankers, I assume they care solely about driving inflation to zero in the given period, so that a hawk always chooses zero inflation. This assumption is, obviously, extreme, and it is adopted for simplicity. As will become clear later, together with the absence of incentives for output stabilization, it reduces the space of possible policies to a binary one. Although it has the cost of precluding signaling by hawks, it should not affect my conclusions since the focus of this paper is how the institutional environment shapes the incentives of those central bankers who are subject to reputation considerations.

A central banker's choice variable is his vote over π , which is equivalent to the actual policy in the case of a single central banker, but not necessarily so under a committee arrangement. Given the preferences outlined before a hawk central banker votes for $\pi = 0$ in both periods. However, the problem of a dove is more involved. Solving backwards, in period 2 a dove central banker votes for the rate that minimizes his intratemporal loss function, which I will denote as π^d in what follows:

$$\pi^d = \frac{c}{2} \tag{1.3}$$

In period 1, meanwhile, he also considers the implications of his vote on the perceptions of others about his type. These affect both future expected inflation and, potentially, his chances of being reappointed. Notice that, since hawks only vote for $\pi = 0$, voting for *any* rate different from $\pi = 0$ will reveal i as a dove

to those observing his vote⁷. As a result, a dove central banker will consider two possible votes for period 1: $\pi = 0$ and $\pi = \pi^d$, where the latter is his preferred vote among those that reveal his type. Inflation is thus $\pi = 0$ or $\pi = \pi^d$ in both periods.

Before solving for a dove's optimal choice, let us define the structures of time and information.

1.3.2 Timing and information

The timing of events, summarized in Figure 1.1, is as follows. There are two periods, $t = 1$, and $t = 2$. Each period t is divided into three "subperiods", t^-, t, t^+ . At t^- central bankers are appointed (e.g. by the government): they can be newcomers, or, for $t = 2$, central bankers that were in office in $t = 1$ and were reappointed. At t the public forms inflation expectations⁸. At t^+ the CB chooses π , which is observed by all players.

As for the information structure, in any given period there is uncertainty about the type of the central banker in office (central bankers, if the CB is a committee), which is known only to himself. In period 1, only the unconditional probability of a central banker being a dove (which I denote by ϕ) is known to the

⁷Even in the case of a committee, where his individual vote may not be observable to others, voting for $\pi \neq 0$ could result in this alternative rate being chosen, which would reveal that there are at least some dove members in the committee.

⁸Notice that, by assuming that expectations are formed only once within a central banker's term, I am implicitly imposing an equivalence between the length of a central banker's term and the length of nominal contracts. Although relaxing this assumption could have interesting implications for the cycle of monetary policy within a central banker's term, I will keep it throughout the paper for simplicity.

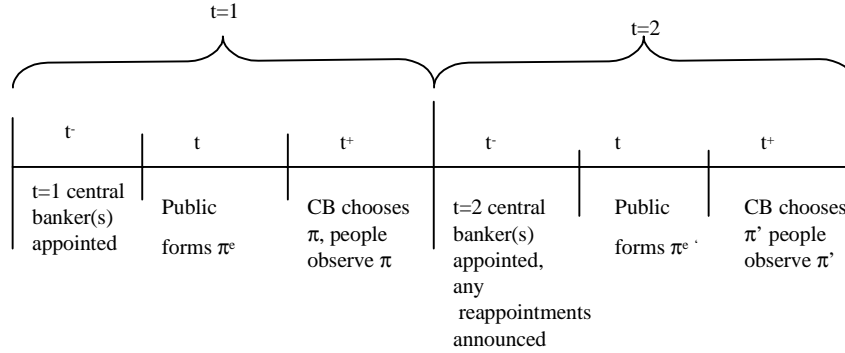


Figure 1.1: Timing of events

public. Given the timing described above, however, in period 2 all players know what policy was chosen in period 1. It is also known if a central banker is an incumbent reappointed at the end of period 1, or a newcomer. This information is used by the public to update beliefs about the types of period 2 central bankers, and ultimately to form $\pi^{e'}$.

1.3.3 Solving the problem of a dove central banker

Remember that in period 2 a dove central banker always chooses the policy that minimizes his current losses, $\pi^d = \frac{c}{2}$. I go now back to discussing a dove's problem in period 1. Without loss of generality, I will address the problem of a specific dove central banker, whom I index by i . I denote i 's vote (which equals actual policy in the single central banker case) as $v_i \in \{0, \pi^d\}$. Since this vote can only take the values of 0 and π^d , the problem of dove central banker i in period 1 can be rewritten as⁹:

⁹Here I use the facts that $c\pi^d = \frac{c^2}{2}$ and $-c\pi^d + (\pi^d)^2 = -\frac{c^2}{4}$

$Min_{\{v_i\}}$

$$\Pr(\pi = \pi^d | v_i) \left[\left(-\frac{c^2}{4} \right) + \beta_i E(L' | v_i, \pi = \pi^d) \right] \\ + \Pr(\pi = 0 | v_i) [\beta_i E(L' | v_i, \pi = 0)]$$

where

$$E(L' | v_i, \pi) = \\ \left(-\frac{c^2}{4} \right) [\Pr(r_i = 1 | v_i) \Pr(\pi' = \pi^d | r_i = 1) + \Pr(r_i = 0 | v_i) \Pr(\pi' = \pi^d | r_i = 0)] \\ + \left(\frac{c^2}{2} \right) E [\Pr^p(\pi' = \pi^d | \pi) | v_i] - b \Pr(r_i = 1 | v_i)$$

and I have abstracted from constant terms. I use $\Pr^p(\pi' = \pi^d | \pi)$ to designate the probability assigned by the public to $\pi' = \pi^d$, given the realization of π . I use this notation to differentiate the probability assigned by the public to a given outcome from the probability assigned by the central banker, who knows his type and can therefore use this additional information. The term in $\Pr^p(\pi' = \pi^d | \pi)$ comes from the fact that $\pi^{e'} = \pi^d * \Pr^p(\pi' = \pi^d | \pi)$.

Note that i is solving this problem before observing the votes of his colleagues (in the committee case), and before knowing whether he will be reappointed. Moreover, he does not know the types of his fellow committee members. These sources of uncertainty explain why a member of a committee does not know with certainty what π will be given his vote. They also explain the expectation operator in front of $\Pr^p(\pi' = \pi^d | \pi)$, since the public assigns $\Pr^p(\pi' = \pi^d | \pi)$ after observing reappointments¹⁰.

¹⁰That is,

Before proceeding with the discussion, I will introduce some notation that facilitates reading the rest of the paper. For any outcome x , I will use $\Delta \Pr(x) \equiv \Pr(x \mid v_i = \pi^d) - \Pr(x \mid v_i = 0)$ to denote the impact of i 's vote on that outcome. More specifically, I define:

$$\begin{aligned} \Delta \Pr(\pi = \pi^d) &\equiv \Pr(\pi = \pi^d \mid v_i = \pi^d) - \Pr(\pi = \pi^d \mid v_i = 0), \\ \Delta \Pr(r_i = 1) &\equiv \Pr(r_i = 1 \mid v_i = \pi^d) - \Pr(r_i = 1 \mid v_i = 0), \text{ and} \\ \Delta \Pr(\pi' = \pi^d) &\equiv \Pr(\pi' = \pi^d \mid v'_i = \pi^d) - \Pr(\pi' = \pi^d \mid v'_i = 0). \end{aligned}$$

Note from the last line that $\Delta \Pr(\pi')$ is defined as a function of v'_i rather than v_i , where v'_i is period 2's vote of i or his replacement if he is not reappointed. Moreover, I also denote $E[\Pr^p(\pi' = \pi^d \mid \pi) \mid v_i] \equiv E_{v_i} \Pr^p(\pi' = \pi^d \mid \pi)$.

Given the above discussion, dove central banker i chooses $v_i = 0$ if and only if $L(v_i = 0) < L(v_i = \pi^d)$ and $v_i = \pi^d$ if the opposite is true¹¹. The following proposition summarizes the choices of dove central banker i , including the condition under which he chooses $v_i = 0$ in the first period (the transformed form of $L(v_i = 0) < L(v_i = \pi^d)$).

Proposition 1 *In period 2 a dove central banker i chooses $v_i = \pi^d$. In period 1 he chooses $v_i = 0$ if the following condition holds:*

$$E[\Pr^p(\pi' = \pi^d \mid \pi) \mid v_i] = \Pr(r_i = 1 \mid v_i) \Pr^p(\pi' = \pi^d \mid \pi, r_i = 1) + \Pr(r_i = 0 \mid v_i) \Pr^p(\pi' = \pi^d \mid \pi, r_i = 1)$$

¹¹I assume that an indifferent dove central banker votes for π^d , but this is not essential for results below.

$$\begin{aligned}
& \Delta \Pr(\pi = \pi^d) \beta_i \frac{E_{v_i}(\Pr^p(\pi' = \pi^d | \pi = \pi^d) - \Pr^p(\pi' = \pi^d | \pi = 0))}{0.5} \\
& - \beta_i \Delta \Pr(r_i = 1) \left[\frac{4b}{c^2} + (1 - \phi) \Delta \Pr(\pi' = \pi^d) \right] \tag{1.4} \\
& > \Delta \Pr(\pi = \pi^d)
\end{aligned}$$

Proof. See appendix A ■

Condition (1.4) is key to understanding the incentives faced by a dove central banker. It indicates that a dove may vote for zero inflation in period 1 if the benefits from this choice exceed the costs. The top row reflects the benefits of voting for $\pi = 0$ in terms of CB reputation, derived from the fact that low current inflation would reduce future expectations of inflation and therefore open the door for future inflation surprises. This term is multiplied by $\Delta \Pr(\pi = \pi^d)$, indicating that $v_i = 0$ will only generate reputation gains if i 's vote is reflected in actual policy. I will call $\Pr^p(\pi' = \pi^d | \pi = \pi^d) - \Pr^p(\pi' = \pi^d | \pi = 0)$ the *reputation factor*, which generates an incentive to vote for low inflation. On the other hand, I will refer to i 's ability to affect policy, captured by $\Delta \Pr(\pi = \pi^d)$, as the *representation factor*. This factor indicates that i will be concerned about the costs his vote may impose in terms of the CB's reputation only if that vote is represented by the policy .

The middle row captures the benefits of $v_i = 0$ in terms of reappointment, since $-\Delta \Pr(r_i = 1)$ is the gain in reappointment probability from choosing $v_i = 0$. Note that $\Delta \Pr(r_i = 1)$ can have any sign, depending on how reappointment is chosen. Although reappointment will be discussed in detail below, it is important to note that, if appointments are in the hands of the government,

this term is likely to imply an incentive to vote for the government's preferred rate (that is, $\Delta \Pr(r_i = 1)$ is negative if the government is hawk and positive if it is dove). The term in parentheses, $[\frac{4b}{c^2} + (1 - \phi)\Delta \Pr(\pi' = \pi^d)]$, gives the value of reappointment, where ϕ is the unconditional probability of a central banker being a dove. As noted before, this value is not only given by the opportunistic reward to being in office, b , but also by i 's desire to shape policy according to his preferences. This is key, as central bankers' incentives to increase their chances of reappointment are frequently dismissed with the argument that central bankers are not opportunistic individuals. This model makes the point that even an altruistic central banker wants to remain in office, so that his beliefs about what is optimal for social welfare are taken into account in the design of future policies.

Finally, the term to the right of the inequality sign captures the fact that $v_i = 0$ is costly from the point of view of period 1, since in the absence of considerations about the future a dove central banker would prefer $\pi = \pi^d$ to $\pi = 0$. As was the case with the reputation incentive, this current loss is only incurred if i 's vote is reflected in the actual policy, so representation also plays a role in this case.

In short, $v_i = 0$ can only result if reputation and reappointment considerations for the future overcome the current costs zero inflation imposes on a dove central banker. This requires high reputation (and/or reappointment) benefits from $v_i = 0$, and also that central banker i assign a high value to the future. The latter requirement is reflected in the fact that condition (1.4) can only be satisfied for large enough values of β_i .

1.3.4 Expectations and equilibrium choices

When forming expectations of inflation for period 2, individuals know that central bankers correctly represent their types in that period. That is, they know that doves will vote for $\pi' = \pi^d$ and hawks will vote for $\pi' = 0$, and therefore $\Pr^P(\pi' = \pi^d | \pi)$ depends on people's beliefs about the types of period 2 central bankers. For a newly appointed central banker, past policy provides no information, so the public assigns a probability ϕ that he is dove (where ϕ was defined above as the unconditional probability that a central banker is dove). For central bankers that were reappointed from period 1, however, the public updates beliefs using Bayesian updating. If i is reappointed for period 2, the public will assign:

$$\Pr^P(i \text{ is dove} | \pi) = \frac{\Pr(\pi | i \text{ is dove}) \Pr(i \text{ is dove})}{\Pr(\pi)} \quad (1.5)$$

Moreover, letting $w = \Pr(v_i = \pi^d | i \text{ is dove})$

$$\Pr(\pi | i \text{ is dove}) = w * \Pr(\pi | v_i = \pi^d) + (1 - w) \Pr(\pi | v_i = 0) \quad (1.6)$$

In equilibrium, w should reflect the optimal strategy of dove central bankers, as presented in proposition 1. Hence, using condition (1.4), w is given by

$$w = \begin{cases} \Pr(\beta_i < \Psi) = F(\Psi) & \text{if } 1 > \Psi > 0 \\ 1 & \text{otherwise} \end{cases} \quad (1.7)$$

where

$$\Psi = \frac{1}{\frac{E_{v_i}(\Pr^P(\pi' = \pi^d | \pi = \pi^d) - \Pr^P(\pi' = \pi^d | \pi = 0))}{0.5} - \frac{\Delta \Pr(r_i = 1) \left[\frac{4b}{c^2} + (1 - \phi) \Delta \Pr(\pi' = \pi^d) \right]}{\Delta \Pr(\pi = \pi^d)}}$$

Equation 1.7 reflects the fact, already discussed, that for small values of β_i i chooses $v_i = \pi^d$. It is important to note that w summarizes the solution to this problem, since it represents the choices of dove central bankers (and the choices of hawks are trivial). Also, the solution to this problem involves the public forming expectations rationally given the optimal strategies of central bankers, and central bankers optimally choosing their votes on policy given the public's beliefs. The former is reflected in (1.5). The latter is satisfied because central bankers know the mechanism of expectations formation just described, and take it into account when evaluating $\Pr^p(\pi' = \pi^d | \pi)$.

It is important to point out that any given central banker does not play a mixed strategy. That is, i either chooses $v_i = 0$ with probability 1 or $v_i = \pi^d$ with probability 1. Although this and the solution to i 's problem are known to the public, the public can only make an evaluation of the probability that a given member chooses $v_i = \pi^d$, because they do not observe the individual β_i . Different discount rates capture sources of heterogeneity across central bankers other than their relative preferences towards fighting inflation¹². Note also that any given central banker faces a problem similar to that of the public, in that he cannot observe the types of his colleagues. Therefore, he also uses w to evaluate the probability that any other dove central banker chooses $v_i = \pi^d$.

The discussion above presents a general characterization of the equilibrium choices of central bankers. I will now analyze what these conditions imply in terms of the optimal institutional design of the CB. I will present alternative

¹²If all dove central bankers were identical, w would be either 1 or 0. In this case, reappointment incentives are the only reason a dove central banker would ever choose low inflation (if $w = 0$ all members are voting for the same rate, so any given member knows his vote does not define policy, i.e. the representation factor is 0).

institutional settings and study the choices of central bankers under each of these environments. The strategy will be to focus on condition (1.4), and study how institutional design affects the different incentives faced by central bankers (summarized by the three key concepts of reputation, reappointment, and representation, discussed above), and ultimately how they affect w . When discussing the convenience of one or another institutional design, I will be implicitly assuming that CB institutions should minimize both inflation bias and the government's influence over monetary policy. These two goals are frequent motivations for placing monetary policy in the hands of an independent CB, and I here simply take them as given¹³.

1.4 The institutional dimension I: collective decision making

Consider first the case for a committee-based CB. As a first approximation, I will isolate the analysis of collective decision-making from the consideration of government appointments. I do so by assuming throughout this section that a central banker's reappointment is exogenously given and independent of his vote in the first period, so that $\Delta \Pr(r_i = 1) = 0$. The condition under which a central

¹³Although I do not provide formal proof that reducing inflation and the government's influence is optimal, my assumptions about the preferences of central bankers are in fact consistent with social losses that are increasing in inflation and inflation variability, under the very plausible assumption that the preferences of central bankers are similar to those of other individuals in society. Note that political pressures constitute a source of undesirable variability of monetary policy, in that the political cycle would impose changes in policy not warranted by shocks to economic fundamentals.

banker votes for $\pi = 0$ (see proposition 1) can thus be written:

$$2\beta_i E_{v_i} (\Pr^p(\pi' = \pi^d \mid \pi = \pi^d) - \Pr^p(\pi' = \pi^d \mid \pi = 0)) > 1 \quad (1.8)$$

Note that not only the terms involving reappointment incentives disappear, but the $\Delta \Pr(\pi = \pi^d)$ term does not enter (1.8) either. The reason for this is that, without government appointments, the votes of central bankers only matter if they affect policy; they do not have any costs or benefits by themselves. As a result, any $\Delta \Pr(\pi = \pi^d) > 0$ suffices for policy considerations to be the only factors in a central banker's choice. This does not mean that representation ceases to play any role, as we will see when discussing the implications of a committee design, but it does imply that representation does not affect the relative importance of reputation-building incentives, compared to other considerations.

Given condition (1.8), reputation building is at the heart of a central banker's choice in the case without government appointments: $v_i = 0$ is chosen if and only if the reputation gain from low inflation is high enough to overcome the current loss $\pi = 0$ imposes on a dove central banker. It is thus the case that inflation bias is minimized when the impact of inflation on the CB reputation is maximized. With this in mind, I will analyze how reputation considerations are affected by specific characteristics of a committee-based CB, such as its size and the fraction of members being replaced in each period. As a benchmark, I start by studying the case of a single central banker, and then move to the committee case.

1.4.1 Single central banker

Suppose there is a single central banker who, after his first term in office, is reappointed with exogenous probability p ($\Pr(r = 1) = p$). One may see 0

and 1 as the only plausible values for p , but I will allow intermediate values for the purpose of comparing with the committee case, and later with government appointments.

With monolithic decisions, a central banker's vote is perfectly reflected in the policy choice and $\Pr^p(\pi' = \pi^d \mid \pi, r_i = 1) = \Pr(i \text{ is dove} \mid \pi)$. Public beliefs about period 1's central banker, who I will still call i , are given by

$$\Pr(i \text{ is dove} \mid \pi) = \begin{cases} 1 & \text{if } \pi = \pi^d \\ \frac{(1-w)\phi}{1-w\phi} & \text{if } \pi = 0 \end{cases} \quad (1.9)$$

where I have used the Bayesian updating mechanism captured by equation (1.5). Hence, the reputation cost of choosing π^d is reflected in the fact that $\Pr(i \text{ is dove} \mid \pi)$ is larger when period 1 inflation is high. Moreover, this cost is only perceived if the central banker is reappointed. If he is replaced by a newcomer, people do not give any importance to past policy in setting inflation expectations, and $(\Pr^p(\pi' = \pi^d \mid \pi = \pi^d) - \Pr^p(\pi' = \pi^d \mid \pi = 0)) = 0$.

Given these elements, during period 1 this dove single central banker can produce zero inflation in equilibrium if:

$$p2\beta_i \left(1 - \frac{(1-w)\phi}{1-\phi w} \right) > 1 \quad (1.10)$$

where, again, the left hand side reflects the incentive to build a reputation for the CB being tough on inflation. Zero inflation can only be supported by the dove central banker if β_i is large enough, ϕ is low enough and the probability people assign to doves voting for high inflation, w , is high. β_i increases the value

given to reducing future expected inflation. Meanwhile, with large ϕ 's, people assign a high probability that the central banker is dove to begin with, so it is hard to lead them to believe the opposite through the choices of π . Finally, a high value of w implies large reputation gains from choosing low inflation, since people know doves are very unlikely to choose $\pi = 0$, and therefore assign a low probability that someone who chose low inflation is dove.

The key element to keep in mind, however, is the fact that i 's reputation is only relevant for next period's expected inflation if i is reappointed. This is the reason why the reputation incentive, given by the LHS of condition (1.10), is increasing in p . A single central banker thus only cares about building reputation if there is some positive probability that he will be reappointed for next period. Interestingly, a characteristic of single central banker arrangements is precisely that the term of the CB expires at some point, different from committee designs where the terms of central bankers can be staggered to ensure that at every point in time there is some continuity. If we considered period 1 to be the last (only) period in office of our dove single central banker (such that $p = 0$), he would not choose $\pi = 0$ no matter what values other parameters took.

1.4.2 A committee Central Bank

Suppose now that monetary policy is decided by a committee, whose members vote over the possible policy choices. What makes collective and monolithic decision-making different from the point of view of a central banker? Without government appointments, there are three major dimensions along which differences exist: the power of each central banker to affect policy, the potential for reputation building and the importance central bankers assign to it, and the

available sets of rules for appointments to the CB.

First, when policy is decided by the votes of several individuals, the vote of any given member may not be reflected in the actual policy choice. This is the *representation* concept discussed above: a given member may not be represented by policy. Although, as captured by condition 1.8, representation does not affect the relative importance of reputation when reappointments are random, it does have an effect on how past inflation affects expectations of future inflation. Put simply, past policy does not reveal individual votes, and therefore contains less information about the types of each member than it does in the single central banker case. One can think of this in terms of policy revealing only the votes of the majority. As a result, the amount of information relevant to learn the types of central bankers that is contained in past policy is decreasing in the level of representation.

Second, the incentives faced by central bankers in terms of building a reputation for the CB can be fundamentally different when policy is chosen by a committee. The key assumption in this paper is that the public forms expectations of future inflation based on past policy, rather than on individual votes of central bankers. This is captured by the assumption that the public observes π , but not the individual v_i . In some of the literature (e.g. Sibert, 1999), a similar feature appears in the assumption that individual votes are not disclosed, or are disclosed only with a lag. However, the public may base expectations only on past policies even if individual votes are disclosed in the CB's public statements, and it is my view that this is a better representation of reality. On one side, while information about monetary policy choices makes it to the headlines of the mass media outlets, the positions of individual central bankers receive less atten-

tion, often restricted to specialized media. This creates costs that may prevent the public from getting information about individual votes at the CB. Moreover, tracking the behavior of each individual member adds one more layer to the, as we will see, already sophisticated calculations involved in forming inflation expectations. It seems relevant to question whether the general public, or even the players involved in wage setting, analyze every policy decision with such high level of sophistication.

In terms of reputation building incentives, the idea that the public forms expectations based on policy outcomes rather than individual votes implies that inflation expectations depend on the *collective reputation* of the CB. As a result, central banker i 's vote can damage the CB's reputation and affect future expected inflation even if he is not reappointed. A committee design has therefore the potential, through this channel, to increase the importance central bankers give to protecting the CB's reputation.

Finally, in terms of reappointment mechanisms, a committee arrangement provides a flexibility that cannot be matched by single central banker designs. The point is simply that for any maximum period a single central banker can stay in office, a committee can be designed to outlive that maximum length¹⁴. In particular, the rules of the committee can be such that at any given point in

¹⁴More generally, the key issue is that committee appointment rules can always imitate their single central banker counterparts, but the opposite is not true. At any given point in time a single central banker either stays or goes, so that p is either 0 or 1. A single central banker that faces retirement ($p = 0$) can be imitated by a committee where the terms of all members expire simultaneously. If the single central banker faces $p = 1$, an analogous committee would have all members staying. However, a committee can also be designed to have some members outlasting others, and this is a feature monolithic institutions cannot imitate.

time at least some of the members remain in office. As discussed in the introduction, this possibility is considered an important tool to guarantee continuity in monetary policy-making, and it has been a key motivation for the adoption of committee CB designs in many countries. I will therefore consider a committee design that exploits it.

Let us now solve the problem of a dove central banker under a committee arrangement. I assume there are $n = 2z + 1$ members in the committee, and policies are decided by a simple majority rule, so that the inflation rate that obtains $z + 1$ or more votes is adopted¹⁵. In particular, I assume that at the end of period 1 exactly m members are removed from office, while the remaining $n - m$ are reappointed¹⁶. As a result, $\Pr(r_i = 1) = 1 - \frac{m}{n}$.

The public knows that in period 2 all doves in the committee vote for $\pi = \pi^d$ while all hawks vote for $\pi = 0$. The probability that $\pi' = \pi^d$ is therefore given by the probability that $z + 1$ or more members of the $t = 2$ committee are doves. The public's estimation of this probability is influenced by period 1 inflation because $(1 - \frac{m}{n})$ of period 2 central bankers helped choose π . In other words, π contains information about a fraction $(1 - \frac{m}{n})$ of the committee that serves in $t = 2$. Letting i be a member in period 1, and public posterior beliefs be denoted by $\Pr(i \text{ is dove} | \pi = \pi^d) \equiv \phi^+$ and $\Pr(i \text{ is dove} | \pi = 0) \equiv \phi^-$, we obtain

¹⁵Notice the assumptions imply an odd-numbered committee, where we can abstract from tie-breaking rules. I do not address here the question of optimal voting rules, which the literature has now also started to look at (see, for instance, Dal Bó's 2000 paper).

¹⁶This assumption closely matches the arrangement that characterizes the Colombian CB. It is also close to other designs with staggered terms (like the cases of Mexico and Venezuela). In many cases, these arrangements are mixed with caps on the number of times a given member can be reappointed.

$$\begin{aligned} & \Pr^p(\pi' = \pi^d \mid \pi = \pi^d) - \Pr^p(\pi' = \pi^d \mid \pi = 0) \\ &= \left(1 - \frac{m}{n}\right) (\phi^+ - \phi^-) \sum_{x=z+1}^n \left[\binom{n}{x} \phi^x (1 - \phi)^{n-x} \left(\frac{x}{\phi} - \frac{n-x}{1-\phi} \right) \right] \end{aligned} \quad (1.11)$$

where I have used an approximate form of $\Pr^p(\pi' = \pi^d \mid \pi = \pi^d)$ to simplify the analysis (a formal derivation of equation (1.11) can be found in appendix A). People's beliefs about the "representative" central banker (i.e. ϕ^+ and ϕ^-) are ruled by:

$$\Pr(i \text{ is dove} \mid \pi) = \frac{\phi w * \Pr(\pi \mid v_i = \pi^d) + \phi(1 - w) \Pr(\pi \mid v_i = 0)}{\Pr(\pi)} \quad (1.12)$$

Expression (1.11) captures the cost of high period 1 inflation in terms of the collective reputation of the CB. This cost is increasing in the fraction of period 2 central bankers who also served in period 1, because π contains information only about those $n - m$ members. It also depends on a modified version of the unconditional probability that the majority of members of the committee are doves (the term preceded by the summation sign). Finally, it is proportional to the effect that choosing high inflation has on the public's beliefs about the probability that any given member is dove, captured by $(\phi^+ - \phi^-)$. Those beliefs are generated with the Bayesian updating mechanism captured by equation (1.12) (derived from (1.5) and (1.6)).

Note that the reputation loss captured by (1.11) depends crucially on the size of the committee and the number of members who are replaced from one period to the next, represented by the parameters n and m . An increase in the fraction of members replaced, $\frac{m}{n}$, reduces the amount of information relevant for period 2 that is contained in period 1 policy. As a result, the reputation gain

from avoiding high inflation in the first period is decreasing in $\frac{m}{n}$, as the first factor in equation (1.11) shows. On the other hand, *representation* is lower in larger committees, as the impact of any individual member’s vote on the policy choice decays when the size of the committee grows. The public therefore learns less from policy about the types of individual members when the committee is large, and this reduces the potential reputation gain to be obtained from choosing low inflation in the first period. This point may be easier to understand if one thinks of policy as revealing the votes of the majority, where the fraction of votes that constitutes a majority is decreasing in the size of the committee. In this sense, policy reveals less about the “average member” if the committee is larger. In terms of expression 1.11, this effect of representation is reflected in the fact that $(\phi^+ - \phi^-)$ is decreasing in the size of the committee¹⁷. Finally, n also has a positive effect on the last term of (1.11). Notice an overall conflicting effect of the committee size: while increases in n increase this last term and $(1 - \frac{m}{n})$, increasing the reputation cost of high π , they also generate an opposite effect by reducing the amount of information contained in policy about the “average member”.

Consider, for instance, the illustration of

$$(\Pr^p(\pi' = \pi^d \mid \pi = \pi^d) - \Pr^p(\pi' = \pi^d \mid \pi = 0))$$

for different values of m and n in Figure 1.2. The reputation loss is depicted as a function of w , the probability that a dove votes for low inflation in the first

¹⁷One can write $(\phi^+ - \phi^-) = \frac{\phi w(1-\phi)\Delta \Pr(\pi=\pi^d)}{\Pr(\pi=\pi^d)(1-\Pr(\pi=\pi^d))}$, which makes the importance of the representation factor (appearing explicitly in the numerator) evident. Note also that this term does not depend on m , because it refers to the probability that a member *who is known to have been reappointed* is dove.

period, under the assumption that $\phi = 0.5$ (i.e. an ex-ante equal proportion of doves and hawks). For this and all other examples, using the notation $(n, \frac{m}{n})$, I will compare the case of $(3, \frac{1}{3})$ to the cases of $(9, \frac{1}{9})$ and $(9, \frac{3}{9})$. These cases are interesting because in any pair of them n , m or $\frac{m}{n}$ are kept constant. In this and all other figures I will use crosses to depict $(3, \frac{1}{3})$, a solid line for $(9, \frac{1}{9})$, and boxes for $(9, \frac{3}{9})$.

Going back to figure 1.2, note that if n grows keeping m constant, so that the fraction of members replaced from one period to the next is reduced, and π becomes more important as a signal about π' (which is the reason why the solid line is always above the crosses). This dominates other potential effects of increases in the committee size, and as a result larger committees increase the reputation loss from high inflation. However, if $\frac{m}{n}$ is kept constant a potential negative effect of size on reputation shows up, as can be seen by comparing the $(3, \frac{1}{3})$ and $(9, \frac{3}{9})$ cases when w is large. The negative effect may dominate only if representation is sufficiently important. This is the case when w is large, because then the separation between hawks and doves is maximized, and the public gives greater importance to the choices of central bankers as reflection of their types.

Comparing this reputation loss to the case of a single central banker discussed above shows both advantages and disadvantages of the committee design. On the darker side, because *representation* is lower in the committee case, the impact of policy on beliefs about individual central bankers is reduced, so that $(\phi^+ - \phi^-)$ in the committee case is smaller than the corresponding effect on beliefs in the single case¹⁸. On the other hand, as mentioned above, the variety of appointment arrangements available for a committee structure implies that it can always be

¹⁸This cost of committee design has also been pointed out by Sibert (1999).

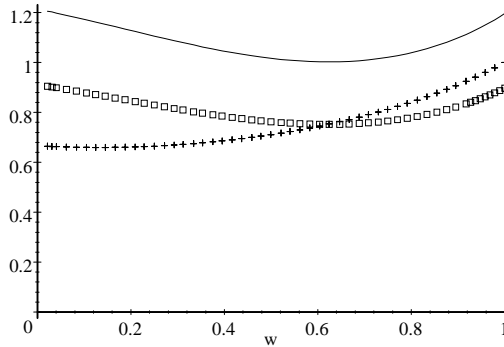


Figure 1.2: Reputation-building incentive, no government

designed to outperform the single central banker in terms of the continuity of policy from one period to the next (i.e. $\frac{m}{n}$ can be chosen as small as desired, and turnover is smooth over time, while for a single central banker r must be 0 in some periods). In particular, if we compare the decision of a dove who knows he will not be reappointed under the two arrangements, only in the committee case is it possible that he will vote for low inflation. This stems from the fact that even if he is not reappointed, his vote will impact the CB's reputation. The benefit of committee designs in terms of continuity, or “inertia”, of monetary policy has been stressed before (e.g. Blinder 1998). This model points out that the benefits of this greater persistence do not come only from welfare gains of reducing the variability of inflation over time, but also from greater incentives for policy makers to keep low inflation to protect the reputation of the CB. In net, a committee can imply more reputation building than the single central banker case, and increase the chances that low inflation is achieved. However, this is only possible if the committee is appropriately designed in terms of the choice of m and n ; a design that maximizes reputation-building incentives implies choosing

n	m	Probability that dove central banker votes for high inflation
3	1	1
5	1	0.94
	2	1
7	1	0.92
	2	1
	3	1
11	1	0.90
	2	0.96
	3	1
	4	1
	5	1

Table 1.1: Case with no government

small $\frac{m}{n}$ to maximize the persistence of policy, but may also require a small enough committee that past policy is considered informative about the types of individual members.

Using equation (1.11) for the reputation loss, the condition under which central banker i votes for low inflation is in this case:

$$2\beta_i \left(1 - \frac{m}{n}\right) (\phi^+ - \phi^-) \sum_{x=z+1}^n \left[\binom{n}{x} \phi^x (1 - \phi)^{n-x} \left(\frac{x}{\phi} - \frac{n-x}{1-\phi} \right) \right] > 1 \quad (1.13)$$

It is clear from this expression that a necessary condition for a dove central banker to choose low inflation is that the reputation loss in equation (1.11) exceeds $\frac{1}{2}$. From Figure 1.2, when $\phi = 0.5$ this is only possible for some committee arrangements that exhibit low proportions of members replaced from period to period. As further illustration, Table 1.1 shows the probability that a dove chooses $v_i = \pi^d$ for an example with $\phi = 0.5$ and $\beta_i \sim U(0, 1)$ (this probability is equal to w , and it is calculated as in equation (1.7)). Only for low $\frac{m}{n}$ cases will high β_i doves vote for low inflation.

It is important to point that these results imply some benefits from the fact

that the public does not observe individual votes. In particular, because inflation expectations are based on past policy, the actions of a central banker can affect the CB's reputation even if he is not reappointed. This makes a central banker wary of increasing inflation, even if he knew he would not be reappointed¹⁹. This conclusion runs against A. Sibert's (1999) result that publishing the votes of central bankers reduces inflation bias. The reason for this difference is that in her model the terms of central bankers are of fixed length, and dove central bankers optimize solely over their horizon in office. Hence, either the central banker knows he will be in office in period 2 for sure, in which case considerations of reputation "even if he is not reappointed" are irrelevant, or he does not care about the following period and hurting the CB's reputation does not concern him.

1.5 The institutional dimension II: government appointments

Consider now the possibility that appointments (and reappointments) of central bankers are not an exogenously determined event, but rather a choice of the government. The government appoints central bankers for period 1, decides whether a central banker is reappointed at the end of that period, and chooses who will replace a central banker who is not reappointed. The president has a seat (but not a vote) on the Central Bank committee, so that he can observe the votes of

¹⁹I believe this is a fair representation of the actual decisions of central bankers, who are usually highly concerned above eroding the credibility of the CB, even in their last terms in office.

the central bankers²⁰. As a result, the reappointment of an incumbent central banker is based on his vote for period 1 policy. As for the appointment of newcomers (for period 1, or to replace a retired incumbent in period 2), there is no relevant information available to distinguish one potential central banker from another, so the government randomizes among all newcomers.

In practice, obviously, previous choices by incumbent central bankers are not the only information governments use to choose central bankers. Governments are likely to appoint newcomers on the basis of their party affiliation and their previous performance in other areas of public service, or in the private sector. Although this makes my assumption that new appointments are uninformed decisions, it reflects the fact that this paper focuses on the effects of appointments on the decisions of incumbent central bankers, which translates into a focus on reappointments (as opposed to appointments of newcomers)²¹.

My modeling of the government is extremely simple. I abstract from the political process that determines who the president is, and assume that the government's type is known to everybody. I also focus on partisan appointments by assuming that governments want to appoint members of their own type. Since members who voted for high inflation reveal themselves as doves, a dove government tries, subject to the institutional constraints in place, to reappoint these members. For the same reason, a hawk government tries to *replace* central

²⁰It is indeed frequent that the government participates in the meetings of the CB committees. In many countries, this takes the form of the Finance Minister or a member of his staff being also a member of the CB committee.

²¹For an analysis of the effects of partisan appointments of newcomers –in the absence of reputation concerns–, see A. Alesina's (1987) model, and subsequent extensions to the case of committees (e.g. Waller, 1989; Lohman, 1997).

bankers who voted for high inflation. This strategy on the part of the government is consistent with previous models of government appointments to the CB. For instance, given the abstraction from presidential elections and congressional approvals of appointments to the CB, partisan appointments will arise in both Waller's (1992) and Havrilesky's (1995, chapter 9) models.

How do government appointments affect the vote of a dove central banker? Consider again the condition under which i chooses $v_i = 0$, stated in proposition 1 (and written in a slightly different form):

$$\beta_i \left(\frac{E_{v_i}(\Pr^P(\pi'=\pi^d|\pi=\pi^d)-\Pr^P(\pi'=\pi^d|\pi=0))}{0.5} - \frac{\Delta \Pr(r_i=1) \left[\frac{4b}{\sigma^2} + (1-\phi) \Delta \Pr(\pi'=\pi^d) \right]}{\Delta \Pr(\pi=\pi^d)} \right) > 1 \quad (1.14)$$

As discussed, the first term on the LHS reflects the benefits in terms of the CB reputation of choosing $v_i = 0$, while the second term captures potential benefits or losses stemming from the effect of v_i on i 's chances of being reappointed. Given the government's reappointment strategy, voting for low inflation increases one's chances of being reappointed if the government is hawk, and decreases them if the government is dove. This is reflected in the fact that $\Delta \Pr(r_i = 1)$ is negative (positive) when the government is hawk (dove). The *reappointment* factor thus creates incentives to vote for the rate preferred by the government.

Furthermore, notice from the second term that the value given to reappointment relative to other objectives is decreasing in $\Delta \Pr(\pi = \pi^d)$. This reflects the fact that the probability of being reappointed depends on the central banker's vote while his other objectives are only affected by the actual choice of policy. Thus, representation now plays the role of determining how much each central banker values reappointment: if each vote has very low impact on the actual

choice of policy, the decisions of central bankers will be mainly driven by reappointment incentives. As a result, the influence of the government on monetary policy is greatest when representation is lowest.

I now return now to the analysis of specific institutional designs, with emphasis on how they affect the balance between reappointment and reputation considerations.

1.5.1 Government appointments and the case of a single central banker

Let us start again with the case of a single central banker. Remember first that the single central banker has perfect power over the choice of policy, so that $\Delta \Pr(\pi = \pi^d) = 1$. Also, if $g = \{h, d\}$ represents the type of the government, then the general reappointment strategy discussed above implies:

$$\Delta \Pr(r = 1 \mid g = d) = 1$$

$$\Delta \Pr(r = 1 \mid g = h) = -1$$

The structure of reappointments affects the incentives faced by central bankers, not only because they value reappointment, but also because current inflation affects the reputation of the CB in the future only if the central banker is reappointed. The condition under which a dove central banker chooses low inflation is now:

$$\beta_i \left(\frac{2(1-\phi)\phi w}{(1-\phi w)} + \frac{4b}{c^2} + (1-\phi) \right) > 1 \quad \text{if } g = h$$

$$\beta_i \left(2(1-\phi) - \frac{4b}{c^2} - (1-\phi) \right) > 1 \quad \text{if } g = d$$
(1.15)

where I have used the fact that, if the central banker is not reappointed, $\Pr^p(\pi' = \pi^d \mid \pi) = \phi$ for any π . Also, to keep matters as simple as possible, I have assumed that the public's beliefs about the type of the central banker are not affected by the type of the government, so that the formula for $\Pr(i \text{ is dove} \mid \pi)$ is as in the case without government²² (equation (1.9)). In each case the first term in the LHS of condition (1.15) represents the reputation loss from choosing high inflation, while the rest of the LHS represents reappointment considerations. As already discussed, the latter increase the incentives to choose $v_i = 0$ if the government is hawk and decreases them in the opposite case, since central bankers value being reappointed.

It is clear from this expression that government appointments tie the choices of dove central bankers to the preferences of the government, implying greater probability of low inflation under hawk governments than under dove ones²³. In

²²If the public takes the decisions of the government into account, it will assign a higher probability that members reappointed to a second period are of the same type of the government who kept them in office. This diminishes the incentives to central bankers to follow the government's preferred policy (because the cost of high inflation in terms of future expectations is higher under a dove government), but does not completely offset them.

²³To see this clearly, rewrite the LHS of the condition as $\frac{(1+\phi w)(1-\phi)}{1-\phi w} + \frac{4b}{c^2}$ when $g = h$ and $(1-\phi) - \frac{4b}{c^2}$ when $g = d$. Note that the expected reputation loss from choosing high inflation may be larger under a dove government because the central banker will be reappointed

fact, under the specific assumptions made here, a dove central banker will never choose low inflation if the government is dove. From a broader perspective, when appointments to the CB are a choice of the government, the political cycle can be a source of variability for monetary policy. I turn now to the question of how collective decision-making affects this link between monetary policy and the preferences of the government.

1.5.2 Collective policy-making and government appointments

Consider now government appointments under in the committee case. As is by now familiar, we need to worry about the effect of v_i on the reputation-building and reappointment incentives, represented respectively by the first and second terms in the LHS of

$$\frac{E v_i (\Pr^P(\pi'=\pi^d|\pi=\pi^d) - \Pr^P(\pi'=\pi^d|\pi=0))}{0.5} - \frac{\Delta \Pr(r_i=1) \left[\frac{4\phi}{\sigma^2} + (1-\phi) \Delta \Pr(\pi'=\pi^d) \right]}{\Delta \Pr(\pi=\pi^d)} > \frac{1}{\beta_i} \quad (1.16)$$

Since we are assuming that people's beliefs about the types of period 1 central bankers are not affected by the type of the government, reputation building incentives are exactly as in the case without government. Future expected inflation does not depend on what members were reappointed, as the public has no information on individual votes to distinguish between the types of those reappointed and those replaced. Since reappointment does not affect expected inflation, reputation-building incentives do not change with the type of the government; they did change in the single CB case because then whether the central

 precisely after choosing high inflation . This diminishes the power of the government to dictate monetary policy but does not completely overcome the reappointment incentive, as reflected in the condition required for low inflation.

banker was reappointed had an effect on expectations, and reappointment probabilities for a given vote changed with the government's type. Since the reputation building incentives are not modified by the inclusion of the government, I will start by studying the reappointment incentive, and ask how should the committee be designed to minimize the power of the government to dictate monetary policy. The overall effect on the incentive to choose $v_i = 0$ will be addressed later.

As before, the committee has n members and m of them are to be changed from period 1 to period 2. The president chooses which members will be replaced and, given his preference to keep central bankers of his same type, he starts by replacing members who voted for the policy he likes less. For instance, suppose the government is hawk, and let V_{-g} be the number of members who voted for π^d . If $V_{-g} \geq m$, the president randomly chooses m members among those who voted π^d . If on the contrary $V_{-g} < m$, he replaces all members who voted π^d and randomly chooses the remaining $m - V_{-g}$ bankers to be replaced from the pool of members that voted for low inflation. As a result, the central banker i faces the following probabilities of being reappointed if the government is hawk:

$$\begin{aligned} \Pr(r_i = 1 \mid v_i = \pi^d, g = h) &= \max \left\{ 1 - \frac{m}{V_{-g}}, 0 \right\} \\ \Pr(r_i = 1 \mid v_i = 0, g = h) &= \min \left\{ 1, 1 - \frac{m - V_{-g}}{n - V_{-g}} \right\} \end{aligned}$$

The government's strategy and implied probabilities when the government is dove are equivalent to the ones just described, but with $v_i = 0$ replaced by $v_i = \pi^d$, and V_{-g} being the number of members who voter for $\pi = 0$. These

reappointment strategies imply²⁴:

$$\begin{aligned} \Delta P(r_1 = 1) = & \hspace{15em} (1.17) \\ \pm & \left[\sum_{x=0}^{m-1} \binom{n-1}{x} \rho^x (1-\rho)^{n-1-x} \frac{n-m}{n-x} + \sum_{x=m}^{n-1} \binom{n-1}{x} \rho^x \rho^{n-1-x} \frac{m}{x+1} \right] \end{aligned}$$

where ρ is the probability that any other member votes against the government's preferred rate (ϕw if the government is hawk and $(1-\phi w)$ otherwise), the negative sign is for the hawk government case, and x is the number of votes against the government's preferred rate from *members other than i*.

With these tools on hand, we can now study how the desire to be reappointed affects a dove central banker's strategy. Focus first on the reappointment value of voting for the government's preferred rate, given by the absolute value of

$$\Delta \Pr(r_i = 1) \left[\frac{4b}{c^2} + (1-\phi) \Delta \Pr(\pi' = \pi^d) \right]$$

This can also be seen as the reappointment incentive if one's vote were known to affect policy (i.e. if $\Delta \Pr(\pi = \pi^d) = 1$). The relationship between this expression and parameters such as $\frac{m}{n}$ and n is difficult to see directly, but I will illustrate it below. In general, this expression is increasing in the fraction of members to be replaced, $\frac{m}{n}$, which ultimately represents the fraction of members over whose appointment the government has power. Moreover, this reappointment incentive is much smaller than in the single central banker case, where the government has perfect power over the permanence of the central banker (and where reappointment is more valuable because it gives the central banker perfect power over period 2 policy).

²⁴To derive this expression, I let x be the number of votes against the government's preferred rate from *members other than i*.

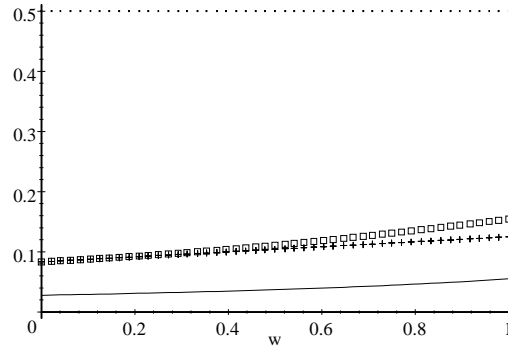


Figure 1.3: Reappointment incentive if vote affects policy

As an illustration, consider Figure 1.3 representing the reappointment value of voting for the government's preferred policy, assuming the government is dove, $\phi = 0.5$ and $b = 0$; the latter is assumed to show that there are reappointment incentives even if the central banker is not opportunistic. Larger values of b lead to greater incentives to affect reappointment, more so for the single central banker case, but do not change the general patterns I will describe below. As above, the cases of $(n, \frac{m}{n}) = (3, \frac{1}{3})$, $(9, \frac{1}{9})$ and $(9, \frac{3}{9})$ are represented, respectively, by crosses, a solid line, and boxes. I add a dotted line for the single central banker case. As a result of $\frac{m}{n}$ falling, increases in n reduce the reappointment value of voting for the government's preferred rate, as can be seen by comparing the crosses and solid line. Moreover, this value is much smaller under any configuration of a committee than under a single central banker. It is important to highlight that the effect of n is dominated by its impact on $\frac{m}{n}$, rather than any other effect it may have, as reflected by the fact that the $(3, \frac{1}{3})$, and $(9, \frac{3}{9})$ combinations yield virtually identical values of voting for the inflation rate favored by the government.

In short, the effect of reappointment is in itself quite small in the committee

case (both compared to the single central banker case, and with respect to the range of values for the effect of reputation building seen, for instance, in Figure 1.2). Furthermore, sets of rules that limit the number of members over whose appointment the government has power reduce the government's power to affect policy.

As suggested by previous literature, the ability of the government to dictate monetary policy can be effectively limited by reducing the number of members that can be appointed at any given point in time. However, in this model the benefit of small values of $\frac{m}{n}$ comes from effects on a central banker's incentives to convince the government that his type and the government's type are the same. In previous papers (e.g. Waller 1989), each central banker votes for the policy preferred by the government that appointed him, so that smaller turnover rates reduce the influence of each government by reducing the fraction of CB members who were appointed by each government and share that government's type. I consider these two channels to be complementary.

The benefit of collective decision making to minimize the effect of reappointment considerations, however, is considerably reduced when representation is brought into the picture. Since a central banker's vote affects his chances of reappointment with probability 1 but affects policy only with probability $\Delta \Pr(\pi = \pi^d)$, reappointment can be much more valuable in the committee case than under a single central banker. Put simply: in terms of future expected inflation a central banker within a committee cares only about the collective reputation of the committee, while in terms of his reappointment it is his individual reputation that matters. A single central banker is not affected by this distortion in the relative importance of different incentives, and can ultimately be less

susceptible to the government's interests. Once again, the specific design of the committee is critical in determining the potential benefits or costs of a committee structure. In particular, the influence of the government over the choices of a central banker is minimized if the risk of being removed from office for not favoring the government is small ($\frac{m}{n}$ is small), but one's vote has a large potential impact on the choice of policy (n small so that representation is maximized).

Figure 1.4 illustrates the reappointment incentive after taking representation into account (that is, the absolute value of the second term in the LHS of (1.16)). As before, the figure assumes the government is dove, $\phi = 0.5$ and $b = 0$. Crosses represent $(n, \frac{m}{n}) = (3, \frac{1}{3})$, a solid line is for $(9, \frac{1}{9})$ boxes are for $(9, \frac{3}{9})$, and the dotted line is the single central banker case. For small values of w the reappointment incentive is always higher in the committee case, because representation is very low (low w implies that most members are expected to vote for zero inflation, so the vote of any individual member is expected to have low impact²⁵). For sufficiently high values of w , the committee can be more successful than the single banker in isolating policy from government pressures, but only if n is small enough to guarantee high representation, and $\frac{m}{n}$ is small enough to imply a low risk of being removed from office by the government.

We can now consider simultaneously reappointment and reputation incentives. A graphical representation of the LHS of condition (1.16) is offered in Figure 1.5 (a more explicit form of this condition is presented in appendix A), using the same assumptions and conventions of figures 1.3 and 1.4. The top set of lines represents the case of a hawk government, where the incentive to choose low

²⁵In fact, the range of w represented in the Figure starts only at 0.4 because as w goes to zero the value of reappointment tends to infinity.

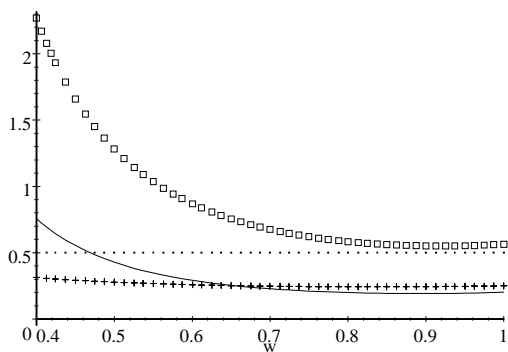


Figure 1.4: Overall reappointment incentive

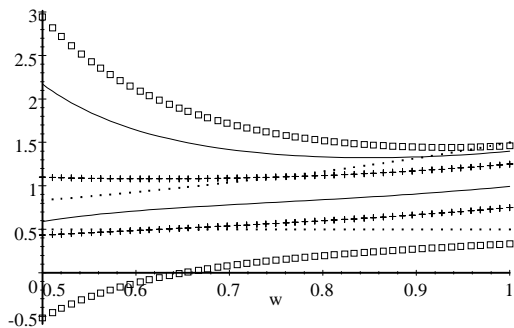


Figure 1.5: Benefit of choosing $v_i = 0$

inflation is maximized, and the bottom set is the case of a dove government.

Note first that, for any given combination $(n, \frac{m}{n})$, there is a clear difference between periods when the government is hawk and periods when it is dove, even though $b = 0$ for this figure. This is key because it is frequently argued that central bankers do not act opportunistically and this isolates their decisions from incentives to impress the government. From this analysis, it is clear that even purely “partisan” (or ideologically driven) central bankers want to keep their jobs and are therefore not immune to government pressures. There is of course a

difference with opportunistic central bankers in that partisan policy makers are driven by the interest to be able to choose the policy they believe is best. In terms of policy, however, the result is the same: they face an incentive to cater to government preferences in order to stay in office.

Compared to a single central banker, a committee design has the potential to both increase the importance of building a reputation for the CB being tough on inflation, and reduce the importance of reappointment considerations²⁶. The realization of this potential, however, depends crucially on specific features of the committee design, in particular its size and the number of members who remain in office from one period to the next. An increase in the fraction of members to be replaced, $\frac{m}{n}$, reduces the relevance of past inflation for future expectations of inflation, diminishing the ability of reputation considerations to contain inflation bias. It also increases the risk that a central banker will be removed from office if believed to be of a different type than the government, giving more importance to incentives to follow the government's preferred policy. On the other hand, an increase in the size of the committee, n , reduces the ability any single central banker has to affect actual policy, making central bankers more concerned about influencing reappointment as opposed to choosing policy.

²⁶In terms of the Figure, note that increasing reputation-building incentives and reducing reappointment considerations act in opposite directions when the government is hawk. It is therefore easier to see the potential gains from committee designs in the bottom portion, where the dove government case is represented.

1.6 Concluding remarks

Central Bank independence is a popular recipe to free monetary policy from both inflation bias and the influence of the political cycle. In practice, however, political, philosophical, and economic considerations have moved societies to maintain institutional links between the government and the CB. This gives rise to the question of whether the institutional design of the CB can be adapted to bring out the desired benefits of independence, in an environment in which such independence is, *de facto*, only partial.

In this quest, many countries have turned to committee designs of the monetary authority, with the idea that these can be more easily shaped to generate optimal outcomes. Two reasons are usually presented to argue that a committee is more flexible than a monolithic institution: the decision making mechanism can be designed to favor the optimal policy, and the terms of its members can be staggered to make CB preferences more stable over time. These arguments, however, overlook the fact that collective decision making also changes the fundamental incentives faced by central bankers when choosing policy.

This paper studies how government appointments and a committee design affect the structure of incentives faced by central bankers. I show that the flexibility provided by a committee setting can be exploited both to reduce inflation bias and to reduce the influence of the government on the choices of a central banker, but the opposite can result if the size of the committee and the rate at which its members rotate are not chosen appropriately. The basic assumption behind these results is that the terms of central bankers' can be extended by decision of the government. That is, central bankers can be reappointed. In this context, policy outcomes affect the reputation of the CB only if at least one central banker

remains in office for the following period.

The persistence in policy that can result from staggering the terms of committee members can be beneficial not only because reducing the time variance of policy has a direct positive effect on welfare, but also because it gives more importance to the inter-temporal considerations that can ultimately deter central bankers from inflating in excess. In this sense, an appropriately designed committee, in which a large fraction of members remains in office for at least one more period, can reduce the inflation bias of monetary policy. By favoring incentives to choose conservative monetary policy, rather than the policy preferred by the government, an appropriate committee design may also reduce the link between monetary policy and the political cycle.

I also explore the idea that collective decision making creates a dichotomy between the collective and individual reputations of board members, in a context where the former depends on past policy outcomes, while the latter depend on the individual decisions of those members. Since the individual vote of a member may not be reflected in the policy outcome, the desire to protect CB reputation may be dominated by individual reputation considerations. This implies that a central banker may give more importance to maximizing his chances of reappointment than to choosing the optimal monetary policy, if the government makes reappointment decisions based on a central banker's individual reputation. As a result, a committee design may actually end up increasing the influence of the government on monetary policy, if each central banker feels that he has little power to affect the policy outcome. This implies that only a committee of small size, where each member's actions are more likely to be effective, will have the ability to isolate monetary policy from the political cycle.

Part II

Political Budget Cycles

Chapter 2

Political Budget Cycles When Politicians Have Favorites

This chapter is joint work with Allan Drazen

2.1 Introduction and literature review

In recent years, a growing body of literature has been devoted to the idea that, as an election approaches, elected officials tailor fiscal policy to improve the chances that they or their parties will be reelected. Although common wisdom has long given credit to this idea, economic theory has struggled with the question of why would politicians expect electoral benefits from adopting popular policies before the elections. The answer is not obvious, since rational individuals should vote on the basis of the policies they expect for after the election, rather than on past outcomes. The line of thought introduced by K. Rogoff and A. Sibert (1988) argues that fiscal choices reflect unobservable and persistent characteristics of officials and, as a result, also exhibit some inertia. Voters therefore try to infer from the incumbent's past policy choices the policies he would adopt if re-elected. This explains why those past choices affect the voters' decision on whether to support the incumbent in the election.

The idea that the votes of forward-looking individuals are only affected by past policy if it is correlated with the future choices of candidates is hardly controversial. An open question, however, is what are the persistent characteristics of officials that voters value and try to infer from past fiscal policies. Existing models focus on the competence of officials to provide public goods, defined as the ability to produce more goods with a given size of the budget. Voters prefer more competent officials, but have only imperfect information about the candidates' levels of competence. The two leading models are those by Rogoff (1990) and Shi and Svenson (2002).

In Rogoff's (1990) signaling model, voters prefer incumbents who provide more public goods, but only part of the goods actually provided are observed by those voters. A highly competent incumbent has an incentive to increase the provision of those visible goods before an election (possibly also contracting spending in their "invisible" counterparts), in order to signal his competence to voters. Shi and Svenson (2002), meanwhile, assume that the incumbent himself has imperfect information about his competence at the time of choosing the size of the budget (equal to taxes plus the deficit). He realizes his competence and provides public goods after choosing the total budget¹, but before the election. The authors also adopt a variant of Rogoff's assumptions about information available to voters: a part of the electorate does not observe the deficit, but only the provision of public goods, and tax revenues. As a result, the incumbent has incentives to choose larger deficits before the election, to be able to provide

¹Note that the "provision of public goods" and the level of spending, or "the budget" differ precisely due to the official's competence. A more competent official provides more goods with the same level of spending. Predictions about the level of public goods provided may therefore not translate into predictions about the level of spending.

more goods for any given level of competence he realizes.

The competence argument provides a plausible and enlightening explanation for pre-electoral manipulation of the budget. Theory should, however, make room for other widely held views about electoral practices. Some of these may explain why electoral manipulation of the budget is seen as pervasive even in countries where information about fiscal policy is widely available. The assumption that competence is unobservable, which is equivalent to some components of the budget being unobservable, may not be realistic for these countries. Alternative views may also explain why pre-electoral increases in deficits and total government spending, which at least under some scenarios arise in models of competence-based PBC, are not widely observed (as some empirical evidence reviewed below shows).

One of those alternative views is that an official provides more public goods to specific groups he either favors or finds attractive from an electoral point of view, and that those targeted expenditures increase when elections are on sight. Theoretical work on this idea has been limited, and has not addressed two key questions: why would pre-electoral targeting affect the votes of individuals choosing who will govern in the future, and why would targeting be concentrated before the election. Dixit and Londregan (1996) present perhaps the leading formal model of spending targeted to specific groups. In their model, politicians target “swing voters”, who are more willing than others to change their votes in light of the politicians’ promises of post-election spending. A politician also tends to target groups of voters to whom he can transfer resources more easily. In the model, however, the choices of candidates take the form of campaign promises, and voters decide their votes based on those promises. There is no link to actual

policy choices and their timing (including electoral cycles), or explicit reasons for why voters should trust promises.

This paper offers a model of political budget cycles with rational agents, in which targeted spending plays a key role. We focus on the idea that each voter has a taste for a limited set of public goods, rather than favoring high spending in general. For instance, elderly voters probably value only marginally the construction of playgrounds, and voters in Alaska have no interest in the construction of roads in Hawaii. The model also distinguishes targeted from non-targeted expenditures, where the crucial distinction lies in the electoral benefits to the incumbent from increases in each category. In particular, non-targeted expenses are those valued only marginally by voters from any important group. There are no deficits, and therefore policy choices relate to the composition, rather than the size, of the government's budget.. Politicians favor specific groups in society, and those preferences evolve only slowly over time. What a specific voter wants to find out is which of the candidates has preferences closest to his own at the time of the election. In other words, along the dimension of public goods provision, a voter wants to support the candidate that will target him with expenditures after the election.

In this framework, we show that before elections incumbents can be expected to increase targeted spending, while they contract other types of expenditure, avoiding increases in the deficit. This follows from efforts to convince specific groups of voters that they are favored by the incumbent, so that they would benefit from having him re-elected. This result is consistent with much of the empirical evidence, which shows that pre-electoral expansions in some categories of spending, particularly those covering the development of infrastructure, are ac-

accompanied by contractions in other categories. Kneebone and McKenzie (2001) document this for Canadian provinces, where some capital expenses grow before elections, while spending in social services, industrial development, and health actually show pre-electoral contractions, leaving overall spending unchanged. For Mexico, M. González (2001) shows election-year increases of government investment and contractions of current transfers. A similar finding will be shown for the Colombian case in the following chapter.

Our emphasis on pre-electoral changes in the composition of spending, as opposed to increases in the overall budget and/or the deficit, is motivated by the empirical literature on fiscal preferences of voters. This literature indicates that voters actually punish incumbents who run high-spending policies. For instance, Brender (2003) finds that the chances of re-election of incumbent local officials in Israel are a decreasing function of the government deficit in the year leading to the election. Peltzman (1992) shows that, in the US, the share of votes received by the incumbent's party is also decreasing in recent government expenditures. Similarly, for OECD countries, Alesina, Perotti, and Tavares (1998) find that governments that adopt tight fiscal policies do not suffer falls in popularity. In short, voters seem to penalize rather than reward high levels of spending, and this should be reflected in the theory of political budget cycles.

A key point of the model is that electoral manipulation arises even with fully rational voters, given that voters must try to infer the incumbent's preferences from his past fiscal behavior. Higher pre-election spending in a given good signals high appreciation of that good by the politician (i.e. appreciation for the group that values that good), and is therefore positively correlated with its provision after the election. Voters are therefore rationally led to respond to pre-electoral

increases in their most preferred types of spending. Although they are aware of the incumbent's attempts to influence the election, they cannot determine if their group is being targeted because it is seen as key to the incumbent's re-election, or because the incumbent genuinely favors it.

The strength of the political cycle in our model depends on the distribution of ideological preferences, and on the amount of information voters have about the political environment . As is probably not surprising, targeted spending increases more prior to elections if there is a larger fraction of swing voters. In a multi-group framework, more undecided groups of voters receive more electoral transfers than their committed counterparts. However, in our model voters anticipate this behavior. As a result, high levels of spending targeted to undecided voters are recognized as being politically motivated, rather than being interpreted as a genuine signal that the politician favors the goods preferred by those voters. This creates a natural limit to electorally motivated increases in spending. On the other hand, the incumbent's ability to engage in this form of electoral manipulation is increased by its access to privileged information about the political environment. In particular, politicians in our model have more information than voters about the potential electoral benefits of targeting expenditures to a specific group of voters (i.e. how "swing" or undecided the group is). This increases their ability to obtain political support from increases in targeted expenses, as voters cannot determine if this targeting is politically motivated.

The paper proceeds as follows. Section 2.2 presents a basic model with homogeneous voters and only two types of incumbents, in which the incumbent chooses how to split the budget between targeted and non-targeted spending. We use this model to introduce the basic inference problem faced by voters, and to derive the

pre-electoral shift from non-targeted towards targeted types of spending. The model also makes clear that PBCs based on targeted spending can arise even if voters can perfectly observe all components of the budget, which is not the case in models where PBC's arise from competence signaling. In section 2.3 we incorporate the division of voters in different interest groups, and consider infinite types of incumbents. We show how pre-electoral transfers are allocated across groups of voters. Finally, section 2.4 presents some concluding remarks.

2.2 A three-period model

We begin with a basic model of elections between an incumbent official and a challenger. The incumbent has the ability to choose fiscal policy, and a central assumption is that individuals value targeted transfers or expenditures, but dislike deficits. They vote on the basis of these indicators, which politicians take into account in designing policy meant to increase their electoral prospects. We focus on the targeting of expenditures, and simply assume that the aversion of voters to deficits imposes a tight fiscal constraint: incumbents can neither raise taxes, nor incur deficits. In short, the sum of all expenditures must always equal the fixed level of taxes. Of course, a voter could be targeted with both low taxes and high expenditures to gain his votes but, to simplify this exposition, it is assumed that only expenditures are used to target individual voters before elections.

There are three periods, $t - 1, t, t + 1$, with an election at the end of t . The choice of fiscal policy concerns the composition of the budget between targeted and non-targeted expenses. The incumbent politician chooses fiscal policy according to his preferences over the composition of the budget, but also to attract voters. For simplicity, we assume that each voter has a taste for only one type of

government expenditure, and voters are grouped according to their preferences over types of expenditure. Thus, a group h is made up of people who prefer the same type of expenditure g^h , and everyone in group h receives the same per-capita level of the expenditure. Voters within a group will differ in their preferences over policies other than targeted expenditures (termed “ideology”). Although there can in principle be many groups of voters, in this section we assume targeted expenses are homogeneous, and therefore all voters are lumped into the same group. We therefore focus on the tension between targeted and non-targeted expenses, rather than the allocation of goods across groups of voters. We address the second issue in section 2.3.

2.2.1 Voters

An individual trades off ideology over non-fiscal policy π , and utility from targeted expenditures, g_t , in deciding whether to support a candidate. The idea of targeted expenses is close to that in Dixit and Londregan’s model of targeted transfers (1996), but in a setting where expectations of future policy play a key role as determinants of how an individual votes.

Utility of an individual depends on two factors, each of which may be influenced by government policy. First, there is the consumption of the government supplied good $g_t \geq 0$, which provides utility directly. We abstract here from other types of consumption, which are affected by tax policy, since we are imposing fixed taxes. Second, an individual j also cares about the distance between his most desired position over non-fiscal policies π^j (which is immutable) and the position π^I of the politician in power (where I refers to the incumbent). We take both π^I and π^C , the challenger’s position, as given. In the post-election period,

$t + 1$, either the initial incumbent I or a challenger C may be in power.

Single period utility of individual j in period t if politician P is in power may be written

$$U_t^j(P) = V(g_t) - (\pi^j - \pi^P)^2 \quad (2.1)$$

where $V'(\cdot) > 0$, $V''(\cdot) < 0$, and g_t also depends on P , given that it is chosen by the government. A voter j is thus characterized by π^j . (To help in following the exposition, note that $V(g_t)$ does not depend on j , since all voters receive the same level of targeted expenses. Hence in discussing the problem of inferring g_{t+1} from g_t , we may ignore the index j .)

An individual's only choice is whether to vote for the incumbent or the challenger, and only in an election period. We therefore focus on utility as of period t , when the election takes place. The present expected discounted utility of individual j as of period t is

$$W_t^j = U_t^j(I) + \beta E_t U_{t+1}^j(P) \quad (2.2)$$

where β is the discount factor, and $P = I, C$. $E_t U_{t+1}^j(P)$ is the utility expected for period $t + 1$ from the perspective of t . Uncertainty about $t + 1$ stems from two sources: uncertainty about who will be in office after the elections, and uncertainty about the preferences of the candidates. The latter will be made clear in the next section.

2.2.2 Politicians

We assume fixed tax revenue and zero budget deficit, so that government fiscal policy consists only of expenditure decisions. There are two government provided goods: g_t to voters and K_t , a good which the politician values but which voters

do not. One may think, for example, of politicians who value managing a large bureaucracy. (For simplicity of exposition we call K_t “desks”.) However, the idea we have in mind is more general: voters may value some government services less than others for many reasons, such as the low visibility of some types of expenditure or voters’ failure to recognize the positive externalities these services produce. The characterization of K_t 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. Each period, the government thus faces a budget constraint:

$$T = K_t + g_t \tag{2.3}$$

where T is a fixed an exogenous level of tax revenue.

The politician’s objective is to maximize a weighted sum of transformed voters’ utilities, the fixed value χ of being in office, and the value of non-targeted expenses. We let $\omega_{P,t}$ denote the weight a politician P puts on voters, as opposed to non-targeted expenses, in period t . A politician P ’s objective in the post-election period can then be written

$$\Omega_{t+1}^P = \omega_{P,t+1} \left[V(g_t) + \sum_{j=1}^N \frac{(\pi^j - \pi^P)^2}{N} \right] + a(K_{t+1}) + \chi \tag{2.4}$$

where N is the size of the voting population, which we assume to be constant, K is non-targeted expenditure and $a(K)$ is an increasing and (weakly) concave function. We have written this objective in per-capita terms for simplicity.

The crucial assumption in our argument about the effectiveness of election year expenditures to produce votes is that $\omega_{P,t}$ is not observed by the voters,

but is correlated over time. Voters can only try to infer the value of $\omega_{I,t+1}$ from observations on g_t , that is, on expenditures before an election. Hence, in this model the reason why voters prefer some types of politicians over others has to do with the politicians' preferences, rather than their ability to provide public goods. Information asymmetries do not refer to a lack of ability, on the part of voters, to observe parts of the budget, but to the politician's preferences being his private information.

We make assumptions such that $\omega_{I,t}$ provides all relevant information about $\omega_{I,t+1}$, which is the reason why voters focus solely on g_t rather than incorporating policies further into the past (i.e. g_{t-1}). More generally, the idea is that $\omega_{I,t+1}$ is closest to $\omega_{I,t}$, so that voters would take into account all past policy realizations, but give more importance to more recent observations. We abstract from this possibility for simplicity, and therefore will make no further reference to period $t-1$, which is introduced only to show why manipulation occurs right before the election, rather than over the whole horizon of the incumbent in power.

We assume the process governing the evolution of ω_{P_t} for $P \in \{I, C\}$ takes the simplest possible form that satisfies the conditions discussed above. In particular, for any politician P , ω_{P_t} can take on two values: $\omega_{P_t} = \{\bar{\omega}, \underline{\omega}\}$ with prior probabilities $\Pr(\omega = \bar{\omega}) = \bar{p}$ and $\Pr(\omega = \underline{\omega}) = (1 - \bar{p})$. We suppose $\bar{\omega} > \underline{\omega}$, so that a politician endowed with $\bar{\omega}$ cares more about targeting expenses to people (a *people* politician), while $\omega_{P_t} = \underline{\omega}$ makes the politician more interested in bureaucracy than targeting (a *desks* politician). Moreover, also for simplicity, ω_{P_t} only changes from $t-1$ to t , but not from t to $t+1$. That is, $\omega_{P_t} = \omega_{P,t+1} \equiv \omega_P$ for $P \in \{I, C\}$.

Abstracting from constant terms, we write the incumbent's objective in an

election year as

$$\Omega_t^I = \omega_I V_t(g_t) + a(K_t) + \beta \rho(g_t) \Omega_{t+1}^I + \beta (1 - \rho(g_t)) \Omega_{t+1}^{I(P=C)} \quad (2.5)$$

where β is a discount factor and ρ is the probability of re-election, which is a function of g_t given that voters use g_t to make inferences about the incumbent's preferences. $\Omega_{t+1}^{I(P=C)}$ represents the utility the incumbent would obtain if the challenger won the election, given by his post-election objective function evaluated (in expected terms) at $\pi^P = \pi^C$, $\chi = 0$, and the levels of g_{t+1} and K_{t+1} that the challenger provides. Note that in (2.5) we dropped the term concerning ideology because, since ideological positions of both voters and candidates are given, this argument is a constant in period t .

One solves the problem backwards, starting with the post-election period. A government P maximizes (2.4) by choice of g_{t+1} subject to the budget constraint (2.3). The solution is given by the following first-order condition:

$$\omega_P V'(g_{t+1}) = a'(T - g_{t+1}) \quad (2.6)$$

The assumption of concavity of $V(g)$ and $a(K)$ implies that the post-election transfers to people are increasing in the weight the politician gives to such transfers, so that $g_{t+1}(\bar{\omega}) > g_{t+1}(\underline{\omega})$. We will denote $g_{t+1}(\underline{\omega}) = \underline{g}$, and suppose that $\bar{\omega}$, the value of ω for the people-type politician, tends to ∞ , so that he always chooses the maximum level of transfers possible, $g_{t+1}(\bar{\omega}) = T$. This assumption simplifies the solution but, as we discuss later, we could dispense of it and still prove that politicians are expected to engage in pre-electoral increases in targeted expenses.

In the election period, the incumbent chooses g_t to maximize his objective (2.5), subject to the budget constraint (2.3). The fact that g_t affects his chances of reelection, implies that a politician may then choose a value of g_t different from what he chooses in a non-election period. Given our assumption that $\bar{\omega} \rightarrow \infty$, a “people-type” politician would provide the maximum possible g_t even in the non-election period, so he would not change his policy in the election period. A *desks* policy-maker (one characterized by $\underline{\omega}$), however, could choose $g_t(\underline{\omega}) > \underline{g}$ if that would get him more votes. In particular, from the solution to the post-election fiscal problem and voters’ preferences, notice that voters prefer a *people* policy-maker over a *desks* one, so the latter may find worth pretending he is of the *people* type. There are, therefore, two possible choices of policy for an incumbent with $\omega = \underline{\omega}$: his own preferred non-election spending (that is, $g_t(\underline{\omega}) = g_{t+1}(\underline{\omega}) = \underline{g}$), or $g_t(\underline{\omega}) = T$, the transfer provided by the high type in any period². He will choose high transfers if the current utility benefit from choosing his preferred policy (low g_t) is smaller than the benefit derived from increasing his reelection chances through high targeted expenses. More formally, the *desk*-type incumbent will choose high targeted spending in the election period if

$$\Delta\Omega < \beta (\rho(T) - \rho(\underline{g})) (\Delta\Omega\bar{p} + \chi) \quad (2.7)$$

where $\Delta\Omega$ is the current utility gain to a policy maker of $\underline{\omega}$ type of choosing his own preferred policy:

$$\Delta\Omega \equiv \underline{\omega} [V(\underline{g}) - V(T)] + [a(T - \underline{g}) - a(0)] > 0$$

²In fact, we chose $\bar{\omega} \rightarrow \infty$ precisely to constrain the choice space to this binomial configuration. Notice that by choosing any policy different from $g_t = T$ the politician reveals himself as the low type, which is the reason why no other policy generates electoral benefits.

(where the last inequality follows from \underline{g} being policy that maximizes $\underline{\omega}(V(\underline{g})) + a(T - \underline{g})$).

Note that the benefit from choosing high transfers in t , given by the right hand side of condition (2.7), depends on both the gain in reelection probability, $(\rho(T) - \rho(\underline{g}))$, and the value of being reelected. The latter includes not only the exogenous value given to office, χ , but also the value of having in $t + 1$ one's preferred policy rather than the challenger's, which is non-zero only in the event the challenger is of a different type. This explains the presence of $\bar{p} = \Pr(\omega_P = \bar{\omega})$ in condition (2.7).

The following proposition summarizes the behavior of the incumbent:

Proposition 2 *In the election period, the incumbent's optimal choice of targeted expenses $g_t(\omega_I)$ is characterized by the following policy rule:*

$$g_t(\omega_I = \bar{\omega}) = T$$

and

$$g_t(\omega_I = \underline{\omega}) = \begin{cases} T & \text{if } \Delta\Omega < \beta(\rho(T) - \rho(\underline{g}))(\Delta\Omega\bar{p} + \chi) \\ \underline{g} & \text{otherwise} \end{cases}$$

To find the equilibrium choice of policy, we still need to characterize the re-election probabilities $\rho(T)$ and $\rho(\underline{g})$, which depend on voters' choices. We therefore turn now to characterizing those choices.

2.2.3 Voting behavior and election outcomes

We consider now the problem of voters. Let $E[V(g_{t+1}) | P, g_t]$ be voters' expectation of his utility from government transfers if politician P is elected for $t + 1$,

conditional on g_t . An individual j votes for the incumbent if he expects to receive higher utility in $t + 1$ under the incumbent, relative to the challenger. This is,

$$E[V(g_{t+1}) | I, g_t] - (\pi^j - \pi^I)^2 > E[V(g_{t+1}) | C] - (\pi^j - \pi^C)^2 \quad (2.8)$$

The voter knows the ideological positions of both challenger and incumbent, π^I and π^C , as well as the politicians' first order condition for the post-election period, (2.6), which determines g_{t+1} . However, he has imperfect information about both ω_I and ω_C . To infer the challenger's position, he has no other information than the knowledge of the ex-ante distribution of ω , summarized by $\Pr(\omega_C = \bar{\omega}) = \bar{p}$. However, voters can use the realization of g_t to extract additional information about the incumbent's type. Using Bayes' rule and the prior \bar{p} , voters adjust their beliefs about the incumbent according to following expression:

$$\bar{p}_1(g_t) \equiv \Pr(\omega = \bar{\omega} | g_t) = \frac{\Pr(g_t | \omega = \bar{\omega}) * \Pr(\omega = \bar{\omega})}{\Pr(g_t)} \quad (2.9)$$

where we have denoted the posterior probability voters assign to $\omega = \bar{\omega}$ as $\bar{p}_1(g_t)$.

Equation (2.9) captures the rational essence of voters in this model. Specifically, it implies:

$$\bar{p}_1(g_t = \underline{g}) = 0$$

That is, since voters know a *people* type politician never chooses low transfers ($\Pr(g_t = \underline{g} | \omega = \bar{\omega}) = 0$), upon observing $g_t = \underline{g}$ they assign a zero probability to the incumbent having $\omega_I = \bar{\omega}$. On the other hand,

$$\bar{p}_1(g_t = T) = \frac{\bar{p}}{\bar{p} + (1 - \bar{p})q} \quad (2.10)$$

where $q = \Pr(g_t = T \mid \omega = \underline{\omega}) \leq 1$ is the probability that a low-type politician will choose $g_t = T$ in the electoral period.

The nature of voters' posterior beliefs reflects an essential characteristic of this political game: while high pre-election transfers indicate the incumbent would also choose high targeting after the election, voters only take this signal seriously if the political incentive is not so large that in the election period any politician would provide high electoral transfers, no matter what his preferences are. This explains why observing high pre-election transfers does not give the incumbent any advantage over the challenger if $q = 1$ (i.e. $\bar{p}_1(g_t = T) = \bar{p}$ if $q = 1$).

We can now rewrite the condition under which voter j prefers the incumbent over the challenger, condition (2.8), as:

$$(\bar{p}_1(g_t) - \bar{p}) [V(T) - V(\underline{g})] > (\pi^j - \pi^I)^2 - (\pi^j - \pi^C)^2 \quad (2.11)$$

where the left hand side represents the expected gain in utility from consumption if the incumbent is reelected, and the right hand side represents the expected loss in utility from ideological issues if reelection occurs.

Since the vote of any individual depends on his position in the ideological space, we need to give more structure to the distribution of voter preferences to determine the share of votes an incumbent obtains (and hence his re-election probability ρ) for a given choice of election period fiscal policy.

Suppose, without loss of generality, that smaller π^j represent positions more “to the left”, and $\pi^I < \pi^C$. Assume also that there are three ideological positions voters hold: $\tilde{\pi}^j = \{\hat{\pi}^I, \pi^M = \frac{\pi^I + \pi^C}{2}, \hat{\pi}^C\}$. Voters with $\pi = \hat{\pi}^I$ are the incumbent's core voters, and they are so far left of center that they vote for the incumbent even if he is known to be of the *desks* type, that is, even if $\bar{p}_1 = 0$. Analogously,

voters with $\pi = \hat{\pi}^C$ are the challenger's core voters, and they are so far right of center that they vote for the challenger even if the incumbent is known to be of the *people* type³. In the middle are voters with $\pi = \pi^M$, swing voters in that they are ideologically as close to one candidate as they are to the other. They therefore vote on the basis of the fiscal policy they expect to see from the candidates. They vote for the incumbent if and only if they believe he is more likely than the challenger to have high ω , that is, iff $\bar{p}_1(g_1^I) > \bar{p}$. (If $\bar{p}_1(g_1^I) = \bar{p}$, swing voters are indifferent between the two candidates, and vote to reelect the incumbent with some probability r . We postpone further analysis of this case for section 2.2.4, where we study the equilibrium.) The crucial point is that swing voters may be led to vote for the incumbent by high pre-election targeted expenditure, even though they know that he may be a *desks* politician who provides such expenditure solely to increase his chances of being reelected.

We summarize the behavior of voters in

Proposition 3 *In an election between the incumbent and a challenger, the optimal voting strategy of an individual j is given by:*

- 1) If $\pi^j = \hat{\pi}^I$ individual j votes for the incumbent with probability 1
- 2) If $\pi^j = \hat{\pi}^C$ individual j votes for the challenger with probability 1
- 3) If $\pi^j = \frac{\pi^C + \pi^I}{2}$ individual j votes for the incumbent with probability $r(g_t)$,

³Formally, using (2.11), one may derive $\hat{\pi}^I < \pi^M - \frac{\bar{p}[V(T)-V(g)]}{2(\pi^C - \pi^I)}$ and $\hat{\pi}^C > \pi^M + \frac{(1-\bar{p})[V(T)-V(g)]}{2(\pi^C - \pi^I)}$

where

$$r(g_t) = 1 \quad \text{if } \bar{p}_1(g_t) > \bar{p}$$

$$r(g_t) \in [0, 1] \quad \text{if } \bar{p}_1(g_t) = \bar{p}$$

$$r(g_t) = 0 \quad \text{if } \bar{p}_1(g_t) < \bar{p}$$

where $\bar{p}_1(\underline{g}) = 0$, and $\bar{p}_1(T) = \frac{\bar{p}}{\bar{p} + (1-\bar{p})q}$

Given the voting strategies in proposition 3, election outcomes are easy to characterize. Let ϕ_I , ϕ_C and ϕ_M , be the fraction of voters with π^j equal to $\hat{\pi}^I$, $\hat{\pi}^C$, and π^M , respectively, where we assume that $\phi_I < \frac{1}{2}$ and $\phi_C < \frac{1}{2}$. The election is decided following a simple majority rule⁴. Hence, no candidate can win the election without getting the votes of at least some swing voters⁵, and a candidate supported by all swing voters wins the election. The incumbent obtains ϕ_I of the votes if $\bar{p}_1 < \bar{p}$, $\phi_I + r\phi_M$ if $\bar{p}_1 = \bar{p}$, and $\phi_I + \phi_M$ of the votes otherwise. In other words, the incumbent is re-elected if $\bar{p}_1 > \bar{p}$ or if $\bar{p}_1 = \bar{p}$ and $\phi_I + r\phi_M \geq 0.5$. For the time being, we assume that both voters and politicians have perfect information about ϕ_I , ϕ_M , and ϕ_C .

Translating this into election outcomes as a function of g_t , the assumption that no group of core voters is a majority implies that an incumbent who chooses

⁴For completeness, we will suppose that a tie is resolved in favor of the incumbent, but this is not crucial to our results.

⁵This follows from our assumption that $\phi_I < \frac{1}{2}$ and $\phi_C < \frac{1}{2}$. The solution is trivial if any group of core voters is a majority: the election is decided beforehand, and therefore there is no incentive for the incumbent to increase transfers in the pre-electoral period. Fiscal policy is given by $g_t(\omega) = g_{t+1}(\omega)$, and swing voters vote for the incumbent if and only if they observe high pre-election transfers, but their vote does not affect the outcome of the election.

low pre-electoral targeted spending will not be reelected, since voters recognize him as being of the *desks* type. Hence, $\rho(g_t = \underline{g}) = 0$. Moreover, $\rho(T) = 1$ if swing voters prefer the incumbent ($\bar{p}_1(g_t) > \bar{p}$), since $\phi_I + \phi_M = 1 - \phi_C \geq \frac{1}{2}$. Finally, if swing voters are indifferent between the two candidates ($\bar{p}_1(g_t) = \bar{p}$) then $\rho(T) = 1$ if and only if indifferent voters choose the incumbent with high enough probability, and there are enough swing voters. That is, if and only if $\phi_I + r(g_t)\phi_M \geq 0.5$.

2.2.4 Equilibrium

Armed with this knowledge of optimal strategies, we can now study the possible political-economic equilibria. We use the concept of Perfect Bayesian Equilibria. A pair of strategies (for the incumbent and voters) is an equilibrium if the voter's strategy satisfies proposition 3 and the incumbent's choice of g_t satisfies proposition 2 given the voters' behavior. Note that these conditions are sufficient and necessary for an equilibrium since: 1) posterior beliefs in proposition 3, represented by $\bar{p}_1(g_t)$, obey Bayes' rule, 2) proposition 3 summarizes the strategy that maximizes a voter's utility given his beliefs and the incumbent's strategy, $g_t(\omega_I)$, and 3) proposition 2 summarizes the strategy that maximizes the incumbent's utility.

For simplicity of notation we describe the incumbent's strategy in terms of the probability of choosing $g_t = T$ given his type, $\Pr(g_t = T \mid \omega_I)$, and swing voter j 's strategy in terms of $r(g_t)$, the probability that he will vote for the incumbent given g_t . We have already discussed the voting strategies of core voters.

Given the strategies in propositions 2 and 3, there are three possible types of equilibria:

Pooling equilibria: incumbents choose $\Pr(g_t = T \mid \omega_I) = 1$ independently of their type, and voters choose $r(g_t) = \begin{cases} \bar{r} \geq \frac{0.5 - \phi_I}{\phi_M} & \text{if } g_t = T \\ 0 & \text{otherwise} \end{cases}$.

A separating equilibrium: each type of politician chooses the same policy they will choose in the post election period, and swing voters vote for the incumbent if and only if $g_t = T$.

Equilibria in *mixed strategies:* a *desks* incumbent chooses $\Pr(g_t = T \mid \omega_I) = q \in (0, 1)$ and swing voters vote for the incumbent if and only if $g_t = T$.

These three sets of strategies indeed constitute equilibria, since no player wants to deviate from his strategy, given the other's. Note also that there are no pooling equilibria with $r(g_t = T) < \frac{0.5 - \phi_I}{\phi_M}$, since then incumbent would be better off deviating to $\Pr(g_t = T \mid \omega_I = \underline{\omega}) = 0$.

Proposition 4 describes the equilibrium outcomes for the case where swing voters shift the outcome of the election, depending on whether a *desks* politician gives more value to reelection or to providing low transfers (that is, whether $\beta(\bar{p}\Delta\Omega + \chi) > \Delta\Omega$).

Proposition 4 *Given $\phi_I + \phi_M \geq 0.5$, there are three cases in equilibrium:*

Case 1) $\beta(\bar{p}\Delta\Omega + \chi) > \Delta\Omega$

The optimal strategy for the incumbent is

$$\Pr(g_t = T \mid \underline{\omega}) = \Pr(g_t = T \mid \bar{\omega}) = 1$$

The optimal strategy for swing voters is

$$r(g_t) = \begin{cases} \bar{r} \geq \frac{0.5 - \phi_I}{\phi_M} & \text{if } g_t = T \\ 0 & \text{otherwise} \end{cases}$$

Case 2) $\beta(\bar{p}\Delta\Omega + \chi) = \Delta\Omega$

The optimal strategy for the incumbent is

$$\Pr(g_t = T \mid \omega_I) = \begin{cases} 1 & \text{if } \omega = \bar{\omega} \\ q \in [0, 1) & \text{if } \omega = \underline{\omega} \end{cases}$$

The optimal strategy for swing voters is

$$r(g_t) = \begin{cases} 1 & \text{if } g_t = T \\ 0 & \text{otherwise} \end{cases}$$

Case 3) $\beta(\bar{p}\Delta\Omega + \chi) < \Delta\Omega$

The optimal strategy for the incumbent is

$$\Pr(g_t = T \mid \omega_I) = \begin{cases} 1 & \text{if } \omega = \bar{\omega} \\ 0 & \text{if } \omega = \underline{\omega} \end{cases}$$

The optimal strategy for swing voters is

$$r(g_t) = \begin{cases} 1 & \text{if } g_t = T \\ 0 & \text{otherwise} \end{cases}$$

Proof. Note first that all of these sets of strategies constitute equilibria, since given the voters' strategy the incumbent's satisfies proposition 2, and given the incumbent's strategy the voters' satisfies proposition 3. Second, to prove that in each case only the type of equilibrium described exists, note that a separating (resp. pooling) equilibrium cannot be supported if $\beta(p\Delta\Omega + \chi) > \Delta\Omega$ (resp. $< \Delta\Omega$) because the incumbent would deviate to $g_t(\underline{\omega}) = T$ (resp. $g_t(\underline{\omega}) = \underline{g}$). Moreover, an equilibrium where the incumbent plays mixed strategies can only exist if he is indifferent between the two policies, which happens iff $\beta(p\Delta\Omega + \chi) = \Delta\Omega$. ■

Proposition 4 implies that, provided reelection is valuable enough to incumbents, *desk* type politicians will choose $g_t = T$ with some positive probability. Meanwhile, in the post election period *desk* politicians choose $g_t = \underline{g}$ with certainty. As a result, the unconditional expectation of government's targeted expenses is higher in the pre-election period, compared to their expected value for

other periods⁶. Conversely, non-targeted expenses are expected to be lower prior to an election than in other periods. In other words, fiscal policy exhibits cycles with the timing of elections. These cycles take the form of a change in the composition of expenditures, which shift towards targeted expenses in election times.

Of course, a political budget cycle of this form will only appear if the incentives to influence the election are large enough. There are two parts to this requirement. The first refers to the preferences of politicians: electoral manipulation of the budget will only arise if $\beta(p\Delta\Omega + \chi) \geq \Delta\Omega$, so that the incumbent assigns a large value to being reelected. There is, however, an additional necessary condition, namely that swing voters (those whose voters depend on fiscal policy) can change the outcome of the election ($\phi_I + \phi_M \geq 0.5$). The existence of a political budget cycle therefore depends on the political environment, in particular in the potential electoral benefit from increasing transfers.

What is interesting about the apparently obvious need for a large fraction of impressionable voters is that, given the rational character of voters in our model, fiscal manipulation is less effective to “buy” the vote of any single individual precisely in the cases where there are most swing voters. In this simplified setting, where our assumptions imply $\rho(g_t)$ is either 0 or 1, this is reflected in the fact that $\bar{p}_1(T \mid \phi_I + \phi_M < 0.5) = 1 \geq \bar{p}_1(T \mid \phi_I + \phi_M \geq 0.5)$.

Note further that the assumption that $\bar{\omega} = \infty$ (and the implication that a fiscal expansion in an election year reflects *mimicking* by the $\underline{\omega}$ politician, whom

⁶The unconditional expectation of targeted expenditure is given by $E(g_t) = T[\bar{p} + (1 - \bar{p})\Pr(g_t = T \mid \underline{\omega})] + \underline{g}(1 - \bar{p})\Pr(g_t = \underline{g} \mid \underline{\omega})$ in the preelection period, and $E(g_{t+1}) = E(g_{t-1}) = T\bar{p} + \underline{g}(1 - \bar{p})$ in non-election times.

voters would not prefer if his type were known) is a convenient modeling device, rather than essential to the existence of the political cycle. If $\bar{\omega} < \infty$, a cycle might take the form of *signaling*, in that the $\underline{\omega}$ type would choose \underline{g} in both election and non-election periods, while the $\bar{\omega}$ type would choose g_t just high enough to separate himself in an election period. Under the now familiar conditions that re-election is valuable enough, this g_t is higher than this type's g_{t+1} , and we have (qualitatively, at least) the same type of cycle. For instance, in Rogoff's (1990) model, pre-electoral manipulation arises from signaling by the good type (competence signaling, since competence is the focus of his model rather than targeted spending). His approach has been criticized (unfairly, we think) in that it is the more competent candidate who engages in fiscal manipulation, rather than the less competent one. In a mimicking model it is the less desirable candidate who engages in fiscal manipulation. What is essential to our model (and to Rogoff's as well, from our perspective) is that at least some types of officials engage in this manipulation. Which types are susceptible to these incentives changes with the specific assumptions of the model, and is therefore not substantive or robust. In fact, in section 2.3 we extend the model to continuous types, and show that under certain conditions all types may engage in election-year manipulations of the budget.

2.2.5 Asymmetric information about the electoral environment

So far we have assumed that all players have symmetric and perfect information about ϕ_I , ϕ_M , and ϕ_C . This assumption is clearly not realistic, as the electoral effectiveness of providing targeted spending to voters is not known with certainty,

and candidates frequently hold more information about it than the public does. We will now relax this assumption, and show that the existence of asymmetric information about the political environment reinforces the incentives faced by incumbent officials to affect election outcomes through changes in fiscal policy. This will also eliminate the unsatisfactory feature that in some of the equilibria with electoral transfers (in particular the pooling equilibrium) voters are indifferent between the challenger and an incumbent that targets them with spending. This is of course a result of the technical approach and the simplifying assumptions we have made, so we do not take the model as predicting that voters will strictly be indifferent. However, it does open the question of how do individuals actually vote when they are “indifferent”, since one would not expect them to simply toss a coin to define which way to vote. In other words, one may question whether $r(g) \in (0, 1)$ is meaningful in terms of the actual behavior of voters.

To account for the possibility that candidates running for election know more than voters about how effective are targeted expenses to generate votes, we assume that the shares of core and swing voters are only known to the politician. In particular, we assume that voters assign a probability z that $\phi_I + \phi_M \geq 0.5$. In other words, voters assign a probability $1 - z$ that the challenger’s core voters are a majority, in which case a *desks* incumbent would have no incentive to choose $g_t = T$.

Voters now characterize the behavior of the incumbent by

$$\Pr(g_t = T) = \bar{p} + z(1 - \bar{p}) \Pr(g_t = T \mid \omega = \underline{\omega}, \phi_I + \phi_M \geq 0.5)$$

where, as before, \bar{p} is the unconditional probability that the incumbent is not a *desks* politician.

After observing fiscal policy, voters update their beliefs about the incumbent's type following Bayes' rule, as captured by equation (2.9). Their beliefs on the probability that a policy maker who chose high transfers is of the high type are now:

$$\begin{aligned} \bar{p}_1(g_t = T) &\equiv \Pr(\omega = \bar{\omega} \mid g_t = T) \\ &= \frac{\bar{p}}{\bar{p} + z(1 - \bar{p}) \Pr(g_t = T \mid \omega = \underline{\omega}, \phi_I + \phi_M \geq 0.5)} \end{aligned} \quad (2.12)$$

Given $z < 1$, it is now the case that $\bar{p}_1(g_t = T) > \bar{p}$ even if $\Pr(g_t = T \mid \omega = \underline{\omega}, \phi_I + \phi_M \geq 0.5) = 1$. That is, it is now true the incumbent can lead swing voters to prefer him over the challenger by choosing high transfers, even if *desks* politicians are as likely to choose high election transfers as high-type politicians whenever $\phi_I + \phi_M \geq 0.5$. The reason is simply that voters do not know whether the latter holds.

The equilibria for this case are described in proposition 5

Proposition 5 *In equilibrium, the optimal strategy for swing voters is*

$$r(g_t) = \begin{cases} 1 & \text{if } g_t = T \\ 0 & \text{otherwise} \end{cases}$$

The optimal strategy for the incumbent is

$$\Pr(g_t = T \mid \omega_I) = \begin{cases} 1 & \text{if } \omega = \bar{\omega} \\ q & \text{if } \omega = \underline{\omega} \end{cases}$$

where $q = 0$ if $\phi_I + \phi_M < 0.5$. If $\phi_I + \phi_M \geq 0.5$ then

$$q = 1 \text{ if } \beta(p\Delta\Omega + \chi) > \Delta\Omega$$

$$q = 0 \text{ if } \beta(p\Delta\Omega + \chi) < \Delta\Omega$$

$$q \in [0, 1) \text{ if } \beta(p\Delta\Omega + \chi) = \Delta\Omega$$

This type of imperfect information makes the problem more interesting, by capturing an additional inference problem for voters. Voters now need to make inferences about whether they are being targeted with transfers because the politician likes providing such transfers, or because transfers are very effective to raise votes. The fact that they assign some probability that the latter is not true gives more room for the politician to influence the outcome of elections by providing more targeted expenses prior to elections.

2.3 A generalization: letting politicians have favorites

The simple model discussed above illustrates the ideas of voters rationally responding to pre-electoral manipulation and of the electoral shift of government resources toward targeted spending. This simplified setting, however, also raises questions that need to be addressed in a more general model. First, an unattractive feature of that simple model is that the categorization of politicians into two types renders an equilibrium in which only one of the types engages in pre-electoral manipulation. Second, if electoral manipulation arises from targeting

spending toward projects most favored by voters, it would be more natural to represent voters as having heterogeneous fiscal preferences. In fact, our focus on targeted spending comes from the belief that voters have narrowly defined preferences over government expenditure, and that they want fiscal policy in the hands of an official who shares those preferences with them. It is our view that voters use pre-election fiscal policy not only to learn about the incumbent's preferences in terms of targeted and non-targeted spending, but also to identify which candidate should be expected to devote larger resources to the projects a given group of individuals is most interested in. Put in a different way, an individual's vote also depends on his beliefs about which groups of voters are most favored by the incumbent. A relevant question is, therefore, how does the incumbent allocate targeted spending across different groups of voters. We present in this section a more general version of the model discussed above, in which we address the allocation of spending across groups of voters and consider a continuum of types of politicians.

We assume that each voter has a taste for only one type of government expenditure. Groups of voters are defined according to preferences over types of expenditure: a group h is made up of people who prefer the same type of expenditure g^h , and everyone in group h receives the same per-capita level of the expenditure. For simplicity, we consider only two different types of targeted spending. This defines two groups of voters, h_1 and h_2 .

Within each group, voters differ in their preferences toward non-fiscal policies. That is, for each group there is a non-degenerate distribution of preferences over ideology; we denote this distribution as $f_h(\pi)$ for group h . As we did at the end of section 2.2, we assume there is asymmetric information about the effectiveness

of different types of government expenditure in raising votes (i.e. how “swing” specific groups of voters are). In particular, we assume that the incumbent knows $f_{h_1}(\pi)$ and $f_{h_2}(\pi)$, while voters only have imperfect information about them. We will first focus on the most general form of the problem, and will only later make specific assumptions about the amount of information about the f 's that is available to voters.

2.3.1 Voters

In terms of a voter's problem, the only difference with respect to the simpler model of previous sections is that now his consumption is indexed by h . Therefore, as in equation (2.8), a voter j in group h prefers the incumbent over the challenger if

$$E [V (g_{t+1}^h) | I, g_t^h] - (\pi^j - \pi^I)^2 > E [V (g_{t+1}^h) | C] - (\pi^j - \pi^C)^2 \quad (2.13)$$

The indifferent voter in group h may therefore be represented by the position $\tilde{\pi}(g_t^h)$, defined by

$$\tilde{\pi}(g_t^h) = \frac{E [V (g_{t+1}^h) | I, g_t^h] - E [V (g_{t+1}^h) | C] + (\pi^C)^2 - (\pi^I)^2}{2(\pi^C - \pi^I)} \quad (2.14)$$

Since g_t^h affects the utility voters expect to receive if the incumbent is re-elected, the indifferent position is a function of g_t^h . Suppose, without loss of generality, that $\pi^I < \pi^C$. Then, within group h , all individuals characterized by $\pi^j < \tilde{\pi}(g_t^h)$ vote for the incumbent, while those with $\pi^j > \tilde{\pi}(g_t^h)$ vote for the challenger.

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

$$\phi_h(g_t^h) = \int_{\underline{\pi}}^{\tilde{\pi}(g_t^h)} f_h(\pi) d\pi = F_h(\tilde{\pi}(g_t^h)) \quad (2.15)$$

so that

$$\phi_h'(g_t^h) = f_h(\tilde{\pi}(g_t^h)) \frac{\partial \tilde{\pi}(g_t^h)}{\partial g_t^h} \quad (2.16a)$$

$$= f_h(\tilde{\pi}(g_t^h)) * \left[\frac{\partial E(V(g_{t+1}^h) | I, g_t^h)}{\partial g_t^h} * \frac{1}{2(\pi^C - \pi^I)} \right] \quad (2.16b)$$

where the last equality uses equation (2.14). Note that groups differ in the level of spending they receive, and as a result in the ideological position of the indifferent voter $\tilde{\pi}(g_t^h)$, as well as in the distribution f_h . We choose the f_h s to be smooth functions, so that at no point a marginal increase in $\tilde{\pi}(g_t^h)$ can bring large masses of additional voters to the incumbent's side. As a result of this and the concavity of $V()$, ϕ_h is also concave.

$\phi_h'(g_t^h)$ measures the electoral benefit to the politician from directing an additional dollar to voters in group h . The size of this benefit depends on how much that additional dollar expands the range of ideological positions where voters prefer the incumbent, characterized by the position of the indifferent voter $\tilde{\pi}(g_t^h)$. If the utility voters expect to obtain under the incumbent in $t + 1$ increases, $\tilde{\pi}(g_t^h)$ increases (that is, moves closer to π^C) and the range of supporters for the incumbent expands. For a given change in expected utility, the increase of $\tilde{\pi}(g_t^h)$ is smaller the further apart π^C and π^I are, as the cost to voters from having their least preferred ideological position in power becomes larger.

Besides the effect of an additional dollar on $\tilde{\pi}(g_t^h)$, $\phi'_h(g_t^h)$ also depends on the mass of h voters at point $\tilde{\pi}(g_t^h)$, which determines how many additional votes the incumbent obtains from increasing $\tilde{\pi}(g_t^h)$. This mass of voters is measured by $f_h(\tilde{\pi}(g_t^h))$.

An important assumption here is that voters observe only the expenditures targeted to their own group. This is close to the visibility argument: voters care about certain types of government expenditure because these are the ones visible to them. Probably the most familiar expression of this is regional targeting of expenditures, where voters in one region do not directly observe the goods provided to another.

2.3.2 The incumbent's problem

We now write the incumbent's objective in an election year as

$$\Omega_t^I = \sum_{h=1}^2 \omega_I^h V(g_t^h) + a(K_t) + \beta \rho \left(\overline{N}^I \right) \Omega_{t+1}^I + \beta \left(1 - \rho \left(\overline{N}^I \right) \right) \Omega_{t+1}^{I(P=C)} \quad (2.17)$$

where ρ , the probability of re-election, is now expressed as function of the fraction of votes the incumbent receives, denoted as \overline{N}^I .

The incumbent assigns potentially different weights to voters in different groups, which is the reason why those weights are now indexed by h . For any group h , we assume that the weight ω_I^h is drawn from a distribution $m(\omega^h)$, and ω^h can take any value in a continuous interval $[\omega^l, \omega^u]$ (where all values are positive). We assume that $m(\omega^h)$ is the same for both incumbent and challenger (that is, ω_C^h is also distributed according to $m(\omega^h)$). We also assume that the values of ω^l and ω^u , as well as the forms of $V()$ and $a()$, are such that in the post-election period politicians always choose interior solutions for K , g^{h1} and g^{h2} . Without this assumption we would need to address limit cases, but the intuition

of electoral manipulation and resource allocation across groups would still be the same.

For tractability, we consider $\rho(N^I)$ as a continuous increasing function. The continuity of $\rho(N^I)$ is clearly inexact in a setting where elections are decided by some majority voting rule, but it simply implies that candidates try to maximize the number of supporters they have⁷. Moreover, we actually assume that $\rho(N^I)$ is a linear function of the form $\bar{\rho}N^I$. Both of these assumptions imply that all votes are equally important, and ignore the fact that candidates mainly want to obtain a majority. This is certainly extreme, but it is not a crucial force behind our results about how electoral transfers are allocated across groups of voters.

Assuming equal sized groups, the fraction of votes received by the incumbent, N^I , is given by:

$$N^I = \sum_{h=1}^2 \phi_h(g_t^h)$$

Each period, the government faces the budget constraint:

$$T = K_t + \sum_{h=1}^2 g_t^h \tag{2.18}$$

⁷One of many reasons why this behavior can be optimal is a candidate's uncertainty about turnout: some voters that prefer him over his opponent may not turn out to vote, so that it is optimal to have ample advantage. Another potential reason to justify the interest to maximize votes is that larger political support increases the outside value of the candidate. We do not formally model any of these reasons, but they provide a motivation for the assumptions regarding ρ .

As before, we solve the politician's problem backwards. Without loss of generality, we focus on his targeting of a generic group h . If the incumbent is re-elected for the post-election period, he chooses g_{t+1}^h according to the first order condition (FOC):

$$\omega_I^h V'(g_{t+1}^h) = a'(K_{t+1}) \quad (2.19)$$

A re-elected incumbent therefore chooses spending good h as an increasing function of the weight ω_I^h . As a result, the post-election utility an h voter in receives if the incumbent is re-elected is also increasing in ω_I^h .

Let $\Lambda = \beta \bar{\rho} \left(\Omega_{t+1}^I - \Omega_{t+1}^{I(P=C)} \right)$ be the discounted value the incumbent expects to obtain from an additional vote from group h , which we take as given, and remember $\phi^h(g_t^h)$ is the share of group h 's votes that goes to the incumbent. For the election period, the incumbent's optimal choices are summarized by the following proposition:

Proposition 6 *The incumbent's choice of policy in the pre-election period satisfies the budget constraint (2.18) and*

$$\omega_I^h V'(g_t^h) + \phi_h'(g_t^h) \Lambda = a'(K_t) \quad (2.20)$$

for $h = h_1, h_2$.

The left hand side of FOC (2.20) 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 group h voters. However, prior to an election the politician potentially derives an additional benefit from targeting group h , namely obtaining more votes from this group's voters.

Note that a similar FOC applies for spending targeted to the other group. Optimal choices of $g_t^{h_1}$ and $g_t^{h_2}$ therefore also satisfy:

$$\omega^{h_1} V'(g_t^{h_1}) + \phi'_{h_1}(g_t^{h_1}) \Lambda = \omega^{h_2} V'(g_t^{h_2}) + \phi'_{h_2}(g_t^{h_2}) \Lambda \quad (2.21)$$

The first important result is that targeted spending increases the share of votes that goes to the incumbent, despite the fact that voters recognize the electoral incentives faced by the incumbent. The following proposition states and proves this result.

Proposition 7 *For any group h , $\phi'_h(g_t^h) > 0$.*

Proof. Suppose $\phi'_h(g_t^h) \leq 0$. 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_t^h being high. Increases in g_t^h then lead voters in h to perceive higher ω_t^h and expect higher post-election utility. As a result, more group h voters want to vote for the incumbent, that is, $\phi'_h(g_t^h) > 0$. This contradicts the initial assumption. ■

The intuition behind this result is as in the simple model of previous sections. High spending to a group could reflect electoral motives or a genuine preference of the incumbent for that group. Voters cannot distinguish the true force behind high observed transfers, and therefore assign some probability to being targeted due to actual fiscal preferences rather than electoral reasons.

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 $\phi^{h'}(g_t^h) > 0$ with the fact that K_{t+1} satisfies the post-election FOC (2.19). Given these two

elements, if the incumbent chose $K_t = K_{t+1}$ the pre-election marginal benefit of targeted spending would exceed that of *desks*. Since $\phi_h()$, $V()$, and $a()$ are all concave (with $a()$ possibly weakly concave), satisfying the pre-election FOC (2.20) therefore requires lower non-targeted expenditure before the election.

The pre-electoral shift of resources toward targeted spending holds for any realization of ω_I^{h1} and ω_I^{h2} , so that all types of politicians have incentives to change the composition of expenditures prior to an election⁸. The main reason for the difference with respect to the results above is that $m(\omega)$ is continuous, so that all politicians want to increase targeting to separate from marginally lower types. In this sense, the result of electoral manipulation by all types of politicians reflects a more general representation of fiscal behavior. Note that another difference with the results from above is that here Λ , the value of re-election, plays no role in determining whether an incumbent follows electoral incentives in designing the budget (although it determines the extent of the manipulation). This results from ignoring the discontinuous character of the $\rho(g_t^h)$ function, and should therefore not be taken literally.

The more interesting question to address with this generalized framework is how electoral motives change the allocation of resources across groups in the pre-election period, compared to non-election periods. We will provide here an intuitive discussion of how these resources are allocated. For this purpose, it is useful to establish the post-election choice of fiscal policy as a benchmark against which pre-election outcomes can be compared. This is the relevant benchmark

⁸This is true as long as incumbents always choose interior solutions for K , $g^{h=1}$ and $g^{h=2}$ in the post-election period. As mentioned above, we have assumed that this is the case to avoid dealing with the limit cases.

because we are interested in comparing the composition of spending chosen before the election to what would be chosen in the absence of electoral incentives. Since we have designed the $t + 1$ period to differ from t only in the electoral incentive, the political budget cycle is given precisely by the difference between the t and $t + 1$ fiscal choices. We will therefore start from the possibility that the $t + 1$ composition of spending is imposed in the t period.

The key determinant of how pre-electoral transfers are split between the two groups is their relative potential to generate additional votes to the incumbent. That is, the ratio of $\phi'_{h_1}(g_{t+1}^{h_1})$ to $\phi'_{h_2}(g_{t+1}^{h_2})$ is crucial. Suppose also that, at the $t + 1$ levels of targeted spending, the incumbent would derive more electoral benefits from targeting h_1 voters than from targeting h_2 voters. That is, $\phi'_{h_1}(g_{t+1}^{h_1}) > \phi'_{h_2}(g_{t+1}^{h_2})$.

Since K_{t+1} , $g_{t+1}^{h_1}$ and $g_{t+1}^{h_2}$ satisfy the FOC (2.19), and $\phi'_h(g) > 0$, the following relations hold:

$$\omega^h V'(g_{t+1}^h) + \phi'_h(g_{t+1}^h) \Lambda > a'(K_{t+1}) \quad \text{for } h = h_1, h_2$$

and

$$\omega^{h_1} V'(g_{t+1}^{h_1}) + \phi'_{h_1}(g_{t+1}^{h_1}) \Lambda > \omega^{h_2} V'(g_{t+1}^{h_2}) + \phi'_{h_2}(g_{t+1}^{h_2}) \Lambda$$

That is, if the $t + 1$ composition of spending is imposed in t , the marginal benefit of expenditures targeted to any group exceeds that of K , and the benefit of directing one more dollar to $g_t^{h_1}$ exceeds that of directing it to $g_t^{h_2}$. The incumbent then has incentives to take one dollar out from non-targeted expenditures K , and put it into g^{h_1} , the most valuable form of targeted spending, while keeping g^{h_2} unchanged. This will increase the marginal benefit of desks (non-targeted

spending), given the concavity of $a(K)$. What happens to $g_t^{h_2}$ and the final effect on K_t depend on the relative distance between $\phi'_{h_1}(g_{t+1}^{h_1})$ and $\phi'_{h_2}(g_{t+1}^{h_2})$.

Case 1: $\phi'_{h_1}(g_{t+1}^{h_1})$ and $\phi'_{h_2}(g_{t+1}^{h_2})$ are “close”. Then resources will only be shifted from K into g^{h_1} until $g^{h_1} = g_0$, where g_0 satisfies

$$\omega^{h_1} V'(g_0) + \phi'_{h_1}(g_0) \Lambda = \omega^{h_2} V'(g_{t+1}^{h_2}) + \phi'_{h_2}(g_{t+1}^{h_2}) \Lambda$$

From this point, resources from K would be redirected toward both types of targeted expenditure, now equally valuable, until the FOC's (2.20) and (2.21) are simultaneously satisfied. Compared to the post-election period, the equilibrium composition of spending before the election would involve lower K_t and higher targeted transfers to both groups.

Case 2: $\phi'_{h_1}(g_{t+1}^{h_1})$ and $\phi'_{h_2}(g_{t+1}^{h_2})$ are “far ” from each other. In this case resources are shifted from K_t towards $g_t^{h_1}$ until $K = K_1$, where K_1 satisfies

$$\omega^{h_2} V'(g_{t+1}^{h_2}) + \phi'_{h_2}(g_{t+1}^{h_2}) \Lambda = a'(K_1)$$

Then, $g_t^{h_2}$ and K_t will both contract until the marginal benefits of all types of spending are equated. In this case, relative to the post-election, only the group that produces high electoral benefits will obtain larger targeted expenditure before the election. The other group will actually receive $g_t^{h_2} < g_{t+1}^{h_2}$.

Note that, in the process of moving resources from K to the most productive type of targeted spending, $\phi'_{h_1}(g_{t+1}^{h_1})$ and $\phi'_{h_2}(g_{t+1}^{h_2})$ being “far” or “close” are defined by whether equality is first achieved between the marginal benefit of g^{h_1} and g^{h_2} , or the marginal benefit of g^{h_1} and K . For instance, in the former case $\phi'_{h_1}(g_{t+1}^{h_1})$ and $\phi'_{h_2}(g_{t+1}^{h_2})$ are close enough that in equilibrium electoral transfers are directed to both groups.

A graphic representation may be useful. In figures 2.1 and 2.2, we present distributions $\tilde{f}_h(g^h) \equiv f_h(\tilde{\pi}(g^h))$ for the two groups. These distributions represent the density at the type that would be indifferent between the incumbent and the challenger if $g_t^h = g^h$. The thicker line is \tilde{f}_{h_1} and the thin line represents \tilde{f}_{h_2} . For this figures, we have assumed that $\omega_I^{h_1} = \omega_I^{h_2}$, so that $g_{t+1}^{h_1} = g_{t+1}^{h_2} \equiv g_{t+1}$. As a result, the only difference between $\phi'_{h_1}(g_{t+1})$ and $\phi'_{h_2}(g_{t+1})$ comes from the different shapes of the f function at the position of the $\tilde{\pi}(g_{t+1}^h)$ voter. To match the assumption that $\phi'_{h_1}(g_{t+1}) > \phi'_{h_2}(g_{t+1})$ in the graph, $\tilde{f}_{h_1}(g_{t+1}) > \tilde{f}_{h_2}(g_{t+1})$.

In case 1 above, represented by Figure 2.1, while keeping g^{h_2} at g_{t+1} , resources are shifted from K into g^{h_1} until a point such as g_0 . At this point, the distance between $f_{h_2}(g_{t+1})$ and $f_{h_1}(g_0)$ has become quite modest, and it just compensates the utility gap that has been created between the two groups. As a result, it is valuable to start pumping resources into group h_2 as well. In case 2, however, the distance between the two distributions is much larger (Figure 2.2). The point g_1 , at which the marginal benefits of $g^{h_1} = g_1$ and $g^{h_2} = g_{t+1}$ are equal, is much larger than g_0 . As a consequence, the incumbent is unwilling to reduce desks as much as necessary to provide g_1 to group h_1 and g_{t+1} to group h_2 . Rather than reducing desks until $g^{h_1}=g_1$, at some $g < g_1$ the incumbent starts to also take resources away from group h_2 .

In short, if targeting a given group of voters is much more beneficial for electoral purposes than targeting the other, resources will be shifted to the more favorable group not only from desks but also from the other group. However, both groups could receive higher expenditure before the election if they are relatively similar in terms of providing electoral benefits. Notice that we evaluate how beneficial a group is in electoral terms at the post-election level of spending.

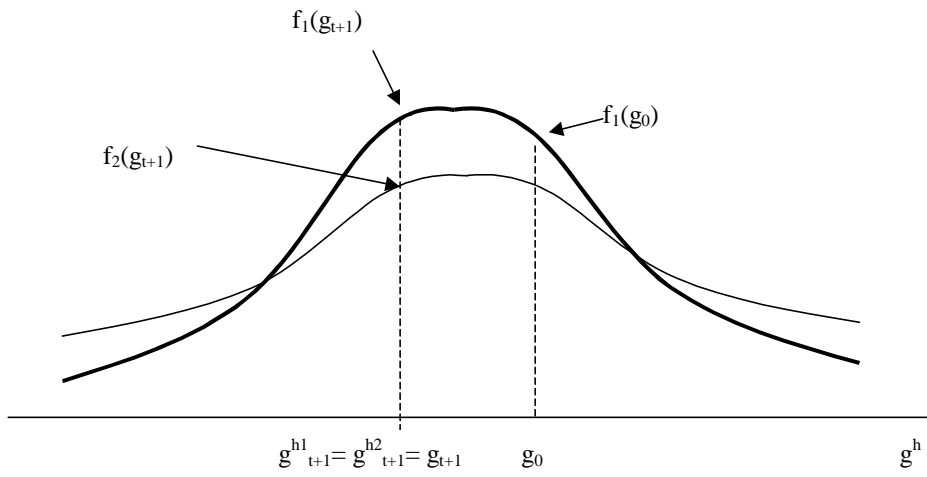


Figure 2.1: Case 1: $\phi_{h_1}(g_{t+1})$ close to $\phi_{h_2}(g_{t+1})$

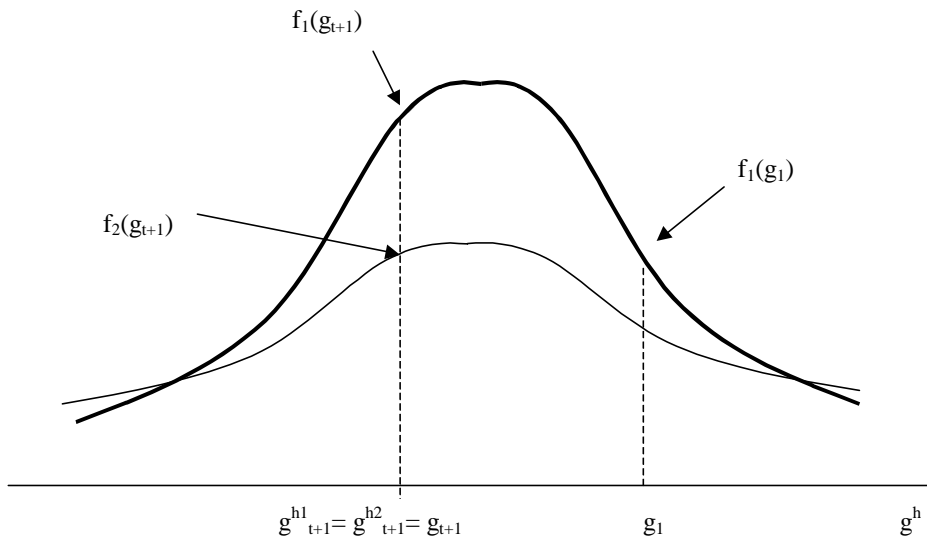


Figure 2.2: Case 2: $\phi_{h_1}(g_{t+1})$ far from $\phi_{h_2}(g_{t+1})$

In other words, what is relevant is comparing $\phi'_{h_2}(g_{t+1}^{h_2})$ to $\phi'_{h_1}(g_{t+1}^{h_1})$, since our interest is to find how fiscal policy differs between t and $t+1$. Given the definition of $\phi'_h(g^h)$ (see equation 2.16a), the number of votes the incumbent can raise from targeting a specific group above the post-election level depends on both the distribution of the group along the “ideology” dimension, and the expenditure the group would receive if no elections were imminent. The first element is captured by the shape of the $f_h(\pi)$ function. The second determines the position of the indifferent voter. If, for instance, $\omega_I^{h_1}$ is large, so that h_1 receives high spending even in the absence of electoral incentives, transferring more resources to that group would only raise a few votes, because even without those additional resources h_1 voters would expect high future utility under the incumbent. In this case, $\phi'_{h_1}(g_{t+1}^{h_1})$ is relatively low, because an increase in $g_t^{h_1}$ above $g_{t+1}^{h_1}$ would only have a small effect in the position of the indifferent voter.

It is important to realize that whether $\phi'_{h_2}(g_{t+1}^{h_2})$ and $\phi'_{h_1}(g_{t+1}^{h_1})$ are “sufficiently close” that both groups receive pre-electoral transfers, or “sufficiently far apart” that one of the groups actually does worse before the election than after it, depends on the specific functional forms of $V()$ and $a()$. For instance, we will see in an example that if $a(K)$ is linear, $\phi'_{h_2}(g_{t+1}^{h_2})$ and $\phi'_{h_1}(g_{t+1}^{h_1})$ are “sufficiently close” no matter what the other parameters and functional forms are. The reason is that reducing K below its post-election level does not increase the marginal benefit of desks, so that satisfying the pre-election FOC (2.20) for h_2 requires giving electoral transfers to this group as well.

We should note that the results obtained in the simpler model still hold here. The extent of electoral manipulation of policy is increasing in the share of votes the incumbent can raise by engaging in it; political business cycles are likely to

be more intense in more “swing” societies, and core groups of voters receive less targeting than other groups. The main difference in this setting is that it is now clear that we focus on the fraction of voters that are swing “at the post-election levels of spending”. Only voters close to the indifferent ideological position are willing to shift their votes facing a marginal change in policy, but that indifferent position is in turn a function of policy. The relevant question is thus whether the mass of voters close to the indifferent position at a given composition of spending is large.

2.3.3 Voters’ expectations and the impact of fiscal policy on vote shares

The discussion above characterizes how are electoral transfers (the additional resources dedicated to targeted spending before elections) allocated across groups. This allocation is a function of the additional share of votes an incumbent can raise by directing an extra dollar to a given group h , represented by $\phi'_h(g_t^h)$. It is useful to remember that

$$\phi'_h(g_t^h) = \frac{\tilde{f}_h(g_t^h)}{2(\pi^C - \pi^I)} \frac{\partial E[V(g_{t+1}^h)]}{\partial g_t^h} \quad (2.22)$$

so that the effect of fiscal policy on voters’ expectations is a key determinant of $\phi'_h(g_t^h)$. The intuition is simple: voters are led by fiscal policy to support the incumbent only if the policy increases their expected well-being under the incumbent. Until now, we have abstracted from a careful analysis of voters’ expectations and the form of $\phi'_h(g_t^h)$. We address these issues now. This analysis also sheds light on the role played by voters receiving imperfect information about

f_h .

The basic logic behind voters' beliefs is that they formulate expectations about their future well-being under each candidate optimally using all information available to them. In particular, voters in any group h can solve the politician's problem for each possible value of ω_I^h , and know precisely how their future utility under the incumbent relates to ω_I^h . At the same time, they have imperfect information about ω_I^h and $f_h(\pi)$, which in turn implies they cannot perfectly observe $\phi'_h(g_t^h)$. From the politician's FOCs (2.20) and (2.21), known to voters, $E[V(g_{t+1}^h)]$ is a function of g_t^h and the beliefs voters hold about $\phi'_h(g_t^h)$. This is summarized in proposition 8, where we write $E[V(g_{t+1}^h)] \equiv E(v(\omega_I^h))$ to highlight that ω_I^h is the determinant of their future utility voters are trying to infer from their current observation of government expenditure.

Proposition 8 *Let $E[V(g_{t+1}^h)] \equiv E[v(\omega_I^h)]$. Voters' beliefs about their future well-being under the incumbent are formed according to*

$$E(v(\omega_I^h)) = E \left[v \left(\frac{a'(K_t) - \phi'_h(g_t^h) \Lambda}{V'(g_t^h)} \right) \right]$$

where

$$\phi'_h(g_t^h) = \frac{\tilde{f}_h(g_t^h)}{2(\pi^C - \pi^I)} \frac{\partial E[v(\omega_I^h)]}{\partial g_t^h}$$

Proof. This follows from FOC (2.20) and (2.22) ■

Note that, by plugging $\phi'_h(g_t^h)$ into the equation for $E(v(\omega_I^h))$, we can write $E(v(\omega_I^h))$ as a first order, non-linear, differential equation. This equation captures how voters' beliefs affect electoral outcomes, and therefore the choice of policy, and how policy in turn affects their beliefs. Note also the important role of imperfect information about $f_h(\pi)$. Voters in group h know that the extent to

which g_t^h reflects electoral motivations, rather than fiscal preferences, depends on how productive for electoral purposes is h . If voters knew h is highly attractive from an electoral perspective, they would see g_t^h as a very noisy signal about ω_I^h , and this would in turn reduce the incentives to the incumbent to deliver high g_t^h . The extent of the political budget cycle is thus magnified by the fact that politicians are better informed than the public about which types of publicly provided goods generate the largest electoral benefits.

Because of the involved nature of a solution for $E(v(\omega_I^h))$, further characterizing equilibrium outcomes for this general case is difficult. At the same time, observing solutions for some specific cases helps to clarify the intuition. We therefore resort to a specific example where we illustrate the equilibrium.

2.3.4 An example

Take the following specific assumptions about functional forms: $a(K) = \theta K$, where θ is a constant, and $V(g^h) = \ln g^h$. Suppose also that, for any politician P ($P = I, C$), ω_P^h follows a uniform distribution with values between $\omega^l = 0.2$ and $\omega^u = 1$. Without loss of generality, we assume that $\pi^I = -\pi^C$. We pick a value $\pi^C = 0.25$, which will save some notation. 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 group h . Figure 2.3 depicts $f^h(\pi)$ for different values of $\bar{\pi}^h$: the crosses

correspond to $\bar{\pi}^h = 0.3$ ($\alpha^h = 1.93$), the solid line to $\bar{\pi}^h = 0.75$ ($\alpha^h = 0.95$) and the diamonds to $\bar{\pi}^h = 1$ ($\alpha^h = 0.79$).

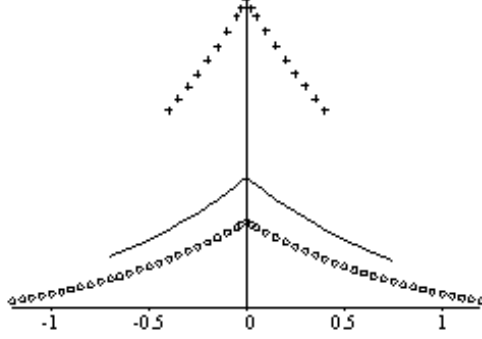


Figure 2.3: $f_h(\pi)$ for different values of $\bar{\pi}^h$

We assume that both voters and the incumbent know one of the two groups is characterized by $\alpha^h = \bar{\alpha}$ and the other by $\alpha^h = \underline{\alpha}$. To capture asymmetric information about the political environment, however, only politicians know which group corresponds to each value of α , while voters simply assign some probability $p_h^{\bar{\alpha}}$ that group h is the one with $\bar{\alpha}$: $\Pr(\alpha^h = \bar{\alpha}) = p_h^{\bar{\alpha}}$.

From the FOC's (2.19) and (2.20) the incumbent's optimal choices for g_{t+1}^h and g_t^h are given by:

$$g_{t+1}^h = \frac{\omega_I^h}{\theta} \tag{2.23}$$

and

$$\frac{\omega_I^h}{g_t^h} + \Lambda \phi^{h'}(g_t^h) = \theta \tag{2.24}$$

The key issue is how to solve for $\phi^{h'}(g_I^h)$, where this solution is consistent with voters rationally forming expectations. The first step is to re-write the incumbent's FOC (2.24) to explicitly note that it depends on individuals's expectations. Using $V(g_{t+1}^h) = \ln\left(\frac{\omega_t^h}{\theta}\right)$, our assumptions about f^h , and equation (2.16a), note that $\phi^{h'}(g_I^h)$ can be written as:

$$\phi^{h'}(g_I^h) = \alpha^h \exp\left[-|E(\ln \omega_I^h | g_t^h) - E(\ln \omega_C^h)|\right] \frac{\partial E(\ln \omega_I^h | g_t^h)}{\partial g_t^h}$$

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

$$\phi^{h'}(g_I^h) = \left\{ \begin{array}{ll} \alpha^h Y'(g_t^h) & \text{if } E(\ln \omega_I^h | g_t^h) \leq E(\ln \omega_C^h) \\ -\alpha^h Y'(g_t^h) & \text{if } E(\ln \omega_I^h | g_t^h) > E(\ln \omega_C^h) \end{array} \right\} \quad (2.25)$$

Note that $Y(g_t^h)$ is the component of $\phi^{h'}(g_I^h)$ affected by voters's expectations, so our analysis of their beliefs will focus on $Y(g_t^h)$. Also, ex-ante incumbent and challenger are identical, so ω_C^h follows the same unconditional distribution that characterizes ω_I^h . $E(\ln \omega_C^h)$ is formed according to that unconditional distribution.

Voters unveil the relationship between ω_I^h and g_I^h from the FOC (2.24), and use it to form expectations about the future. That relationship is given by:

$$\omega_I^h = \left\{ \begin{array}{ll} g_t^h (\theta - \alpha^h \Lambda Y'(g_t^h)) & \text{if } E(\ln \omega_I^h | g_t^h) \leq E(\ln \omega_C^h) \\ g_t^h (\theta + \alpha^h \Lambda Y'(g_t^h)) & \text{if } E(\ln \omega_I^h | g_t^h) > E(\ln \omega_C^h) \end{array} \right\} \quad (2.26)$$

It is clear from this expression that one key reason why voters respond to pre-electoral manipulation is their lack of information about α^h , which determines how attractive from the electoral point of view is a given group. In this example, if the α^h were known to voters, they could perfectly infer ω_I^h from their observation of g_t^h , and increases in g_t^h would generate no electoral benefits to the incumbent.

Voters form $E(\ln \omega_I^h | g_t^h)$ by taking logs of both sides of (2.26), and using $\Pr(\alpha^h = \bar{\alpha}) = p_h^{\bar{\alpha}}$. Writing these expectations in terms of $Y(g_t^h)$, we obtain:

$$Y(g_t^h) = \left\{ \begin{array}{l} e^{-E(\ln \omega_C^h)} g_t^h \theta [1 - \bar{\alpha} \frac{\Delta}{\theta} Y'(g_t^h)]^{p_h^{\bar{\alpha}}} [1 - \underline{\alpha} \frac{\Delta}{\theta} Y'(g_t^h)]^{(1-p_h^{\bar{\alpha}})} \text{ if } g_t^h \leq \bar{g} \\ e^{E(\ln \omega_C^h)} \left(g_t^h \theta [1 + \bar{\alpha} \frac{\Delta}{\theta} Y'(g_t^h)]^{p_h^{\bar{\alpha}}} [1 + \underline{\alpha} \frac{\Delta}{\theta} Y'(g_t^h)]^{(1-p_h^{\bar{\alpha}})} \right)^{-1} \text{ if } g_t^h > \bar{g} \end{array} \right\} \quad (2.27)$$

where \bar{g} is such that $E(\ln \omega_I^h | g_t^h) \leq E(\ln \omega_C^h)$ if and only if $g_t \leq \bar{g}$.⁹ This is the first order differential equation that characterizes voters' beliefs. Note that expression (2.26) represents the incumbent's optimal choice of g_t^h given voters' expectations, while expression (2.27) represents voters' rational expectations, given the incumbent's actions. Equilibrium outcomes are therefore represented by a function $Y(g_t^h)$ that solves expression (2.27), and the choice of g_t^h that satisfies (2.26) for that $Y(g_t^h)$. Those equilibrium outcomes, which we illustrate below, are summarized in proposition 9.

⁹The fact that $E(\ln \omega_I^h | g_t^h)$ is increasing in g_t^h was proved for the general case in previous sections. This example is, in any case, self-contained: we can consider the positive slope of $E(\ln \omega_I^h | g_t^h)$ as a conjecture, which will then prove consistent with the politicians' choices.

Proposition 9 *In this example, voters' equilibrium expectations about the future are characterized by*

$$E(\ln \omega_I^h | g_t^h) \left\{ \begin{array}{ll} = \ln(g_t^h \theta c_0) & \text{if } g_t^h < \bar{g} \\ \approx \left(-\theta (g_t^h)^2 c_3 \right) \ln \left[c_1 + c_2 \int \exp \left(\theta (g_t^h)^2 c_3 \right) dg \right] & \text{if } g_t^h > \bar{g} \end{array} \right\} \quad (2.28)$$

where c_0, c_1, c_2 and c_3 are constants which depend on $\bar{\alpha}$, $\underline{\alpha}$ and $p_h^{\bar{\alpha}}$, and

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

Meanwhile, the incumbent's optimal choice for g_t^h is given by

$$\frac{\omega^h}{g_t^h} = \left\{ \begin{array}{ll} \theta - \alpha^h \Lambda \theta e^{-E(\ln \omega_C^h)} c_0 & \text{if } E(\ln \omega_I^h | g_t^h) \leq E(\ln \omega_C^h) \\ \theta + \alpha^h \Lambda (c_1 - 2\theta g_t^h Y(g_t^h) c_3) & \text{if } E(\ln \omega_I^h | g_t^h) > E(\ln \omega_C^h) \end{array} \right\} \quad (2.29)$$

Proof. See appendix B. ■

We can now illustrate this solution¹⁰. Take the following set of parameters: $\omega \sim U[0.2, 1]$, $T = 1$, $\theta = 1.3$, $\alpha^{h_1} = 1.93$ (or $\bar{\pi}^{h_1} = 0.3$), $\alpha^{h_2} = 0.79$ (or $\bar{\pi}^{h_1} = 1$), $p^{\alpha^{h_1} = \bar{\alpha}} = 0.5$, and $\Lambda = 0.1$. The choice of Λ is consistent, for instance, with¹¹ $\beta = 0.99$, $\rho = 1$ and $\Omega_{t+1}^I - \Omega_{t+1}^{I(P=C)} = 0.11$, where the latter would be

¹⁰Note that the solution for the upper branch of $E(\ln \omega_I^h | g_t^h)$ is an approximation, since it involves linearizing the differential equation around the $E(\ln \omega_I^h | g_t^h) = E(\ln \omega_C^h)$ point (see appendix).

¹¹ $\beta = 0.99$ corresponds to a discount rate of 0.01, which is consistent with historical records of quarterly interest rates.

satisfied by combinations of $\omega_I^{h_1}$ and $\omega_I^{h_2}$ such as 0.3 and 0.9 or 0.5 and 0.45. These parameters imply $\bar{g} = 0.53$.

The solution to the problem can be summarized by $\phi'(g_t^h)$, the first order condition (2.24), and the resulting choice of g_t^h as a function of ω_I^h and α^h . We depict them in the following three figures.

Figure 2.4 shows $\phi'(g_t^h)$ for the two groups. Keep in mind that $\phi'(g_t^h)$ represents the additional h votes the incumbent can obtain from raising g_t^h one dollar. The top line in that figure corresponds to the group with more swing voters, which in this case is h_1 since it has the larger α^h . The larger effect on votes for the more swing group is consistent with our previous result that electoral incentives to target swing groups are large, compared to more core groups. Note also that $\phi'(g_t^h)$ is positive and (weakly) decreasing everywhere, reflecting the fact that the incumbent can always obtain more h votes by increasing g_t^h , but the electoral gain tends to decrease as g_t^h grows. In other words, the share of group h votes the incumbent obtains, given by $\phi(g_t^h)$, is increasing and (weakly) concave. The positive slope shows the incentive for electoral increases in targeted spending. The concavity is a consequence of decreasing marginal utility, and less concentration of voters in the tails of the π^h distribution. In fact, note that the decreasing pattern of $\phi'(g_t^h)$ is less pronounced for group h_2 (bottom line), which exhibits a π^h distribution with fatter tails.

The incumbent's choice of g_t^h is characterized by the FOC (2.24), which can be written as:

$$\frac{\omega_I^h}{g_t^h} = \theta - \Lambda\phi^{h'}(g_t^h) \quad (2.30)$$

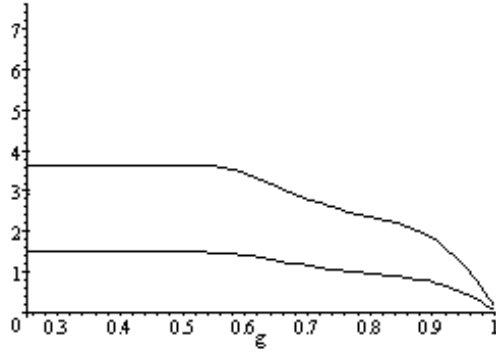


Figure 2.4: $\phi'(g_t^{h_1})$ and $\phi'(g_t^{h_2})$

This representation is useful because the FOC then looks very similar to the FOC for the post-election period. The only difference is the last term of the right hand side. We depict both the pre-election and the post-election FOC's in Figure 2.5. The left hand side, $\frac{\omega_I^h}{g^h}$, is given by the decreasing dotted curves for different values of ω_I^h . From bottom to top, these curves correspond to $\omega_I^h = 0.2$, $\omega_I^h = 0.4$, $\omega_I^h = 0.6$ and $\omega_I^h = 0.8$. Meanwhile, the dashed horizontal line corresponds to the right hand side of the $t + 1$ FOC (which is given simply by θ). The two solid curves represent the right hand side of the period t FOC for the two groups: the bottom one represents the case of the more swing group (h_1), which we already noted exhibits the larger $\phi^{h'}$ for any g_t^h .

Take, for instance, group h_1 . The incumbent's optimal choice of $g_t^{h_1}$ is given by the intersection between the $\theta - \Lambda\phi^{h_1'}$ (g) line (bottom solid line) and the $\frac{\omega_I^h}{g^h}$ curve. Meanwhile, his optimal choice of $g_{t+1}^{h_1}$ is at the intersection of the dashed horizontal line and the same $\frac{\omega_I^h}{g^h}$ curve (since ω_I^h does not change between t and $t + 1$). Note that, for any given ω_I^h , both groups receive larger targeted expenditures before the election than after it ($g_t^h > g_{t+1}^h$ for both h). In this case,

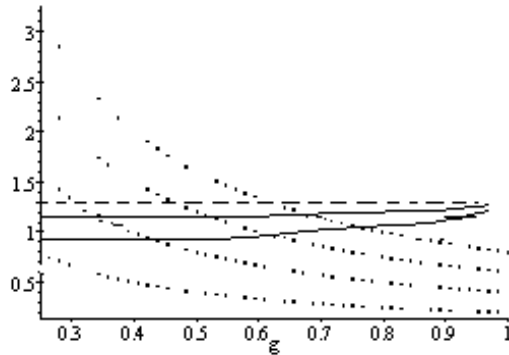


Figure 2.5: Incumbent's first order conditions

as discussed above, the constant marginal utility of *desks* precludes the possibility that one of the groups receives less targeted spending before the election than in $t + 1$.

The size of pre-electoral transfers (the difference between g_t^h and g_{t+1}^h) is larger for group h_1 , characterized by a larger mass of swing voters. The differences between the two groups, however, become smaller for larger values of g_t^h , since at these levels voters already perceive high benefits of choosing the incumbent (note that the two curves grow closer as g increases). In other words, given decreasing marginal utility, providing voters with additional expenditures in the high g region has only small effects in the well-being they expect to enjoy if the incumbent is re-elected. These results are reflected in Figure 2.6, which shows the optimal choice of g_t^h as a function of ω_I^h .

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

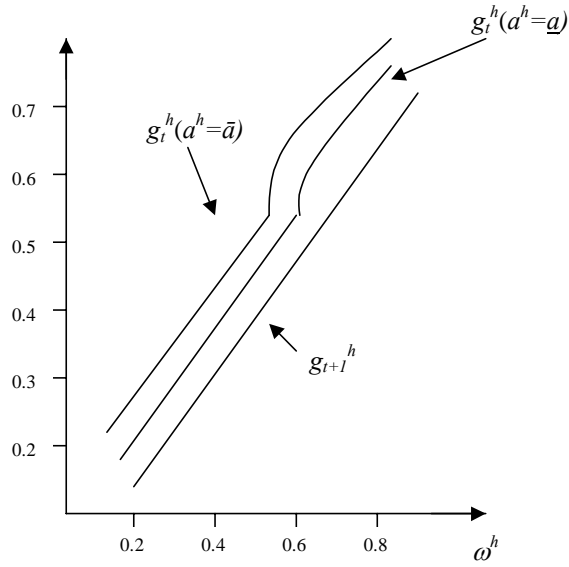


Figure 2.6: $g_t^h(\omega_I^h)$ and $g_{t+1}^h(\omega_I^h)$

lead the incumbent to choose 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 . 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^{h1} and α^{h2} 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 changes in the parameters.

2.4 Concluding remarks

This paper has used the widely held view that politicians favor the interests of certain specific groups of voters to explain the emergence of political budget cycles in a model with rational voters. In the model, voters use past fiscal policy to learn information about which groups and types of spending the incumbent is likely to favor after the election, if he is re-elected. The result is a pattern of pre-electoral shifts of government resources from non-targeted types of expenditures toward goods specific groups of voters care more about. Pre-electoral transfers are mostly directed to undecided groups of voters, while groups that are committed to one or other candidate may even face negative transfers. A key feature of the model is that, even though voters are rational and predict this behavior, they respond to electoral manipulation, since they cannot observe whether they are being targeted because they are crucial to the incumbent's re-election or because they are genuinely liked.

Our view differs from other models of political budget cycles in that voters' care about the preferences of incumbents over different interest groups, rather than his competence. This focus is motivated by traditional political practices in the management of the government's budget, which suggest an important role for special interests in electoral budget manipulation. Although the idea of pork barrel politics is no strange to the political economy arena, it has not been previously incorporated in intertemporal models of fiscal policy-making. Furthermore, previous literature does not address the question of why providing *pork* spending would affect the votes of rational, forward-looking, individuals.

Chapter 3

On Political Budget Cycles and Voters as Fiscal

Conservatives: Evidence From the Colombian Experience

3.1 Introduction

Common wisdom is that, as elections approach, elected officials increase government spending to improve the chances that they or their parties will be reelected. It is not unusual to hear reports of pork spending growing in election years, and the public seems to expect popular spending projects when elections are imminent. For economists, however, the debate about the existence, extent and characteristics of this manipulation is hardly settled. Among the many sticky points, there are inconsistencies between the idea of pre-electoral increases in the government's budget and both the actual dynamics of government spending and the behavior of voters. First, evidence of election-year increases in government spending and the deficit is at best mixed. Second, increases of the size of the budget seem to hurt, rather than improve, an incumbent's chances of being re-elected.

Partly motivated by this empirical evidence, the model introduced in previous pages presents a view where political budget cycles (PBC) take the form

of a change in the composition, rather than the size, of government spending. Before elections, specific groups of voters are targeted with spending, while non-targeted types of expenditure contract. Behind the model is the idea that voters dislike deficits, but like receiving goods specifically targeted to them. Voters react to fiscal policy because it provides information about the amount of targeted expenditure the incumbent will provide in the future if re-elected.

This view of electoral cycles suggests that empirical analyses of the PBC that focus solely on the dynamics of the overall budget –as is the case in most of the literature– are at risk of misinterpreting the evidence, besides missing an important part of the action. For one, electoral manipulation of government expenditures may occur without impacting the overall budget or the deficit. Moreover, the effect of elections on the dynamics of government spending is inextricably linked to the preferences of voters. These may vary from country to country, and learning about them is crucial for an adequate interpretation of the evolution of the budget around election times. Put simply, even contractions of government expenditure may be consistent with electoral incentives, if they are what the preferences of voters dictate.

In this chapter, I use data on government expenditures and electoral outcomes in Colombia to examine the characteristics of PBCs, in terms of both voting behavior and government spending¹. I ask whether election outcomes are consistent with voters having different preferences toward different types of government expenditure. I also examine if it is rational for voters to believe that fiscal choices reflect persistent characteristics of officials, an assumption behind most models

¹This paper focuses solely on the electoral manipulation of government expenditures, without dealing with potential electoral cycles in the revenue side.

of PBCs with rational voters. From the point of view of policy, meanwhile, I look at evidence on pre-electoral changes of government expenditures. Special emphasis is put on the separate analysis of different types of government expenditure, since both the popular Rogoff (1990) model and the model introduced in chapter 2 suggest the potential importance of composition effects. I finally tackle the question of whether the extent of electoral effects on fiscal policy depends on the degree of party polarization among voters.

This chapter is organized as follows. I begin by discussing some relevant empirical literature in section 3.2. Section 3.3 comments on some interesting features of the Colombian case. The pre-electoral dynamics of government spending are analyzed in section 3.4, while section 3.5 studies the effect of fiscal behavior on election outcomes. These two sections introduce the data and tools necessary to examine the effect of party polarization on the electoral budget cycle, which is done in section 3.6. In section 3.7 I analyze whether the dynamics of expenditure are consistent with the idea that the fiscal preferences of officials exhibit some inertia. While all other empirical sections focus on Colombian municipalities, some evidence at the central government level is introduced in section 3.8. Finally, section 3.9 provides some concluding remarks.

3.2 A discussion of previous literature

Two bodies of past empirical work are relevant for the questions I address in this chapter: literature on fiscal preferences of voters, and literature on the dynamics of fiscal policy around election times.

The first of these branches of work examines how fiscal policy affects the incumbent's chances of being reelected. Brender (2003) uses data on the elections

of local mayors in Israel, and estimates a model where the probability of reelection of the mayor is a function of his budget choices. He finds that voters penalize election year increases in deficits, but also that they reward high expenditure in development projects. Peltzman (1992) shows that, in the US, the share of votes received by the incumbent's party is decreasing in government current (as opposed to capital) expenditures. This result, however, loses power if investment in roads, an important component of public investment, is included in the policy variable². For OECD countries, Alesina, Perotti, and Tavares (1998) find that governments that adopt tight fiscal policies do not suffer falls in popularity and are not penalized by voters in the polls. In short, this literature suggests that elected officials do not receive electoral benefits from boosting spending before elections. If anything, the opposite seems to be true. However, not all types of government spending generate the same opposition: some development projects actually appear to increase political support for the incumbent.

A second group of relevant empirical papers examines the dynamics of fiscal policy, looking for systematic changes that coincide with election times. The most comprehensive studies are those by Schuknecht (1994), Shi and Svensson (2000), Persson and Tabellini (2002), and Brender and Drazen (2003). Except for Schuknecht's paper, this work focuses solely on aggregate measures of fiscal policy: total spending³, tax revenue, and deficits. Using data for 35 developing

²The author interprets the "odd findings" obtained when including expenditure in roads as a result of the high lumpiness of this component. An alternative interpretation, consistent with the model introduced above, is that roads are clearly targeted public goods and voters react favorably to being targeted by the incumbent.

³The measure of spending used in Shi and Svensson's paper is actually government consumption spending from national accounts. I find results with this measure difficult to interpret as

countries over the years 1970-1992, Schuknecht (1994) finds that overall fiscal balances worsen during an election year, due to an increase in total government spending. Shi and Svensson (2000) study a sample of 123 developed and underdeveloped countries over a horizon of 20 years. They find that deficits grow before elections in both developed and developing countries, but the electoral effects are particularly strong in developing economies. Moreover, spending shows pre-electoral increases in their sample of developing countries, but not in developed economies.

Later results, however, are not so favorable to the existence of electoral cycles in total government spending. Brender and Drazen (2003) show that the finding of PBCs in total spending is driven solely by new democracies: there is no evidence of electoral manipulation in countries with a long history of democratic institutions. They argue that fiscal cycles in new democracies reflect underdeveloped media and poor accounting practices. Persson and Tabellini (2002), with data for 60 countries for 1960-1998, study if PBC's vary across political systems. They find no effect of elections on government expenditure or surplus for the overall sample, and a pre-electoral *contraction* of government spending in countries with majoritarian electoral rules. In sum, the evidence in favor of pre-electoral increases in total government spending and government deficits is, at best, mixed. Furthermore, it seems that politicians only engage in spending hikes when voters cannot effectively monitor government balances, a behavior that is consistent with voters being opposed to raising overall spending.

In terms of the composition of expenditures, Schuknecht finds that, prior to

 it includes different levels of government (local, national, publicly owned enterprises), which should respond to different types of elections and in different ways.

elections, capital expenditures rise as a share of both GDP and overall expenditure. Kneebone and McKenzie (2001) find no pre-electoral increases in aggregate spending for Canadian provinces, but do find that what they call “visible expenditures”, mostly capital expenses such as construction of roads and structures, grow in election periods. They also find that spending in social services, industrial development, and health actually contract before elections. Very similar findings are reported for Mexico by M. González (2001), who also finds that other categories of spending, such as current transfers, contract prior to elections. In short, pre-electoral manipulation of the budget is concentrated in some specific categories of government spending. For the countries covered in these studies, it would appear that capital expenditures are seen by politicians as an effective way to impress voters, and that officials attempt to take advantage of this fact⁴. Moreover, officials seem to find ways to increase these expenditures prior to elections without increasing overall spending, thus avoiding being penalized by voters who are fiscal conservatives.

The picture that emerges from this findings is a confusing one, at least in light of the widespread idea that officials expand government expenditure prior to elections. On one hand, voters seem to penalize such increases, and there is no robust evidence that overall spending is manipulated in this way. On the other, expenditure increases are actually observed for some types of spending. The main contribution of this paper is to put these apparently contradictory pieces together and show how they can be reconciled. In contrast to previous work, I analyze

⁴Alesina et al. (1998) assert that “cuts in public investment are less visible and [politically] costly [than cuts in other spending]”, but provide no evidence that this is the case. The evidence just discussed, as well as the results I present in this paper, point in the opposite direction, at least for the countries covered by these studies.

both voting behavior and the dynamics of government budgets as two parts of the same problem, and focus on the idea that not all types of government spending should be treated equally in this analysis. My results suggest that the model put forward in the previous chapter can serve as a unifying framework with which to understand the diverse findings from these branches of the empirical literature. This paper also proposes that some specific components of the government accounts are more likely than others to reflect what the previous chapter calls targeted expenditure, that is, expenditure that generates large effects in electoral support. In that spirit, another contribution of this paper is a systematic analysis of differential effects of elections on the various components of overall public spending.

3.3 The Colombian case

Colombia offers an interesting case for the study of these issues, as an example of a developing economy with a relatively well established democracy⁵. Electoral cycles in the overall budget have long been considered a phenomenon of developing countries. This is partly because of the idea that incumbents increase spending to boost economic activity, a tool that is considered specially powerful in less developed economies. However, if the engine behind PBC is the use of fiscal policy

⁵The statement that Colombia is a “well established democracy” may be puzzling for the reader, in view of the intense armed conflict that has bled the country for years. However, from the point of the institutional regime, Colombia has enjoyed the rule of democracy practically without interruption since the 19th century. This is not a minor achievement in the Latin American context, where most countries went through long and painful periods under the rule of dictators, even in the last decades of the 20th century.

as a signal about characteristics of the incumbent (as theoretical models suggest) the crucial distinction is not between richer and poorer countries, but between older, well established, democracies and their younger counterparts. This is so because voters in an established democracy have greater ability to monitor the fiscal choices of officials. In such democracy, therefore, the fiscal preferences of voters should impose constraints on the specific form the PBC takes. If voters are fiscal conservatives, we should not observe pre-election deficit increases in an old democracy, even if the country lags in economic development (this is consistent with the evidence in Brender and Drazen, 2003). The contrast with the traditional view of “unconditional” manipulation of the budget in developing economies, makes countries like Colombia a particularly interesting ground to examine the link between the preferences of voters and electoral manipulation of government spending.

Although I do present some evidence on the central government’s budget, the main focus in this paper is on spending behavior by local governments. I choose this “cross-district” approach, rather than the more usual cross-country strategy for two reasons. First, the PBC model of chapter 2 suggests the importance of distinguishing between targeted and non-targeted types of expenditure. This distinction is most relevant at the local level, where expenses can be targeted most efficiently. Second, the extent of cross sectional differences in institutional settings is much larger in a multi-country setting than it is for cross sectional units within the same country. This is specially clear with respect to constitutional rules, national laws, electoral and judicial systems, and monetary policy, all of which are important determinants of the existence and strength of political budgetary cycles. Most important of all, the view in this paper is that the fiscal preferences

of voters play a key role in determining the PBC. This creates the potential for widely different forms of electoral budget manipulations from country to country, and suggests the convenience of limiting the analysis to a single country, where general features of the political system that are difficult to control for do not vary. Note that the within-country strategy does not wipe out the sources of variation in the institutional environment that are necessary to identify key characteristics of the PBC; in particular, the degree of ideological commitment to one or other party does exhibit wide variation across districts of the same country.

I should point that, although in Colombia the direct reelection of incumbent executive officials is banned, pre-electoral manipulation of fiscal finances is regarded as a usual political practice. PBCs are thought to arise in Colombia largely due to the actions of the legislative bodies, whose members are in fact subject to direct re-election (in the case of city councils), or at least have found ways to circumvent formal restrictions to run for direct re-election (as in the national Congress). There are also reasons why even an incumbent mayor, who cannot run for re-election immediately, would want to manipulate fiscal policy at the end of his period in office. Most importantly, voters identify the preferences of the official with those of his party, and therefore the policy decisions of an official are interpreted as signals of party preferences and competence. Hence, the incumbent knows that his decisions affect his party's re-election chances.

3.4 The electoral dynamics of government spending

In this section, I analyze evidence of pre-electoral manipulation of public spending in Colombian municipalities, with special emphasis on contrasting different types of expenditure. In particular, the model introduced in previous pages suggests important differences between targeted expenditures and other components of the budget. I try to unveil such differences using the disaggregate components of government accounts.

A classification of government expenditure into targeted and non-targeted expenses is not readily available, or straightforward. In fact, all government expenses (probably with the exception of interest payments on external debt) generate benefits for at least some groups in society, even if it is only to those individuals who provide the services and goods to the government. However, my view is that some of the components of expenditure that governments report separately, in particular most categories of investment expenditures, are more likely to reflect what I call targeted expenses than others.

Opportunistic targeted expenditures, close to the familiar concept of *pork* spending, are most often associated with projects of infrastructure development: construction of roads, schools, water plants. These are highly visible expenditures that benefit specific (yet potentially large) groups of voters. In Kneebone and McKenzie's (2001) words, infrastructure spending fits the "caricature of the opportunistic politician building roads, hockey rinks and schools just prior to elections". On the other hand, some current expenditures, such as purchases of supplies and services and payments to other governmental entities, can be pre-

sumably cut without visibly hurting large groups of voters. Data that separates current government spending from expenditures linked to development projects could therefore fit the need for distinguishing targeted from non-targeted expenditures, and would also distinguish visible from non-visible spending, which is relevant in some models of PBC (e.g. Rogoff’s 1990 model).

I use a panel of yearly data on government accounts for all municipalities in Colombia over the 1984-2000 period. Expenditures are reported at a relatively high level of detail, allowing me to discern the behavior of different types of spending. Following much of the literature, I estimate equations in which the policy variables are represented as functions of the timing of elections, as well as other controls. The basic relationship can be written as:

$$y_{it} = a_i + b * y_{it-1} + \sum_k c_k * x_{k,it} + d * elec dum_{it} + \varepsilon_{it} \quad (3.1)$$

where i is an index for districts, y_{it} is some specific type of spending by the local government of city i in period t , a_i is a district effect, and the x are control variables (indexed by k to allow the use of more than one control). The variable *elec dum* is a political dummy that captures the timing of elections, and it is the central variable in the analysis. This variable takes a value of 1 in periods preceding local elections, and 0 in all other periods. The error term is white noise. The autoregressive form is used in the literature on political cycles as a parsimonious representation of the policy choices, given the lack of elements to incorporate a fully structural model of fiscal policy. However, I also include additional controls to account for as much variability in the data as I can. I estimate a separate regression for each type of government expenditure (that is, each type of government expenditure is a different y). In all regressions, the main

interest is d , the coefficient that captures the effect of elections.

The traditional view of political budget cycles is that we should observe pre-electoral increases in overall spending and at least some of its disaggregate categories ($d > 0$ for at least some y 's, $d < 0$ for no category). This is the kind of evidence previous empirical studies have attempted to find. Theoretical models, however, suggest the possibility that the PBC takes the form of a change in the composition, rather than the size, of the budget. In Rogoff's (1990) model of competence signaling, as an election approaches incumbents expand the provision of visible goods and contract that of less visible goods. For a given level of competence of the incumbent, this implies more spending in visible projects and less spending in other government tasks. Meanwhile, the model introduced in the previous chapter postulates a pre-electoral shift in government resources away from non-targeted spending and into targeted projects. Given the discussion above, both models would be consistent with some components of current spending contracting prior to elections, with a simultaneous expansion of categories related to development projects⁶.

⁶In Rogoff's paper visible spending is called government "consumption", while the less visible good, which the author identifies as spending in national defense and financial activities, is referred to as "government investment". When taking the model to the data, this choice of words may be misleading, at least for some countries. In the Colombian case, less visible expenditures such as defense, payments to pensioned employees, and office supplies are all recorded under the consumption or "current spending" categories. Highly visible types of projects, like the construction of bridges, schools, and water plants, are all under the "investment" heading. The multi-period character of these projects raises a question about whether politicians are able to time them so that voters observe them before the election. Common wisdom, the existing empirical evidence, and the evidence I present here all seem to suggest that they are.

3.4.1 Data

The data consist of annual observations for each Colombian municipality (close to 1100 cross-sectional units) for the period 1984-2000. Of the 18 years in the sample, 6 are local election years, when mayors and city councils are elected⁷. Elections occur at predetermined dates, and all cities hold elections the same day. Mayors have been elected by popular vote only since 1988. In previous years, the Colombian administrative system was highly centralized, with the president appointing governors and governors appointing mayors. From the late eighties, however, a gradual decentralization process has taken place both in the fiscal and the administrative fronts. Since 1988 mayors and governors have been elected by the people, and local officials now have many fiscal responsibilities that in previous decades were in the hands of the central government. The timing of the election dummy is such that the pre-election period is the year previous to the election if the election takes place in the first semester, and the year of the election if the election is held in the second semester.

In terms of government spending, I use data from the Colombian *Contraloría General*, a public entity with the task of monitoring public finances. Since the use of these data is a novel feature of this paper, I will discuss features of the database in some detail. The financial reports local governments file with the *Contraloría* contain a detailed description of the revenues and expenditures of the regional government, so disaggregate measures are available. The general structure of the expenditure accounts available is summarized in the first column of Table 3.1 (the label I use for each account below is listed in the second column). Note

⁷Mayors and councils are elected simultaneously. A list of the local elections held in the 1988-2000 period is presented in the appendix.

Type of Expenditure	Name
Total Expenditure	TOTAL
1. Current Expenditure	CURRENT
1.1. General Payments	GENERAL
1.2. Personnel Expenditure	PERSONNEL
1.3. Current Transfers	TRANSFERS
2. Investment	INVESTMENT
2.1. Infrastructure	INFRASTRUCTURE
2.2. Water, Energy, and Communications	POWER
2.3. Housing	HOUSING
2.4. Education	EDUCATION
2.5. Health	HEALTH
2.6. Others	OTH_INV
3. Interest payments	INTEREST

Table 3.1: Composition of spending

that the Colombian government accounts designate as “Investment” items that in many other countries are known as capital expenditure⁸. Besides the categories listed in Table 3.1, I also examine investment in roads, which is a subcomponent of infrastructure investment. The reason for highlighting this specific subcomponent is that construction of roads is regarded as a particularly popular way to raise votes prior to an election⁹.

Infrastructure development projects show up mostly in the investment categories. Given the discussion above, I associate these categories with targeted expenditures.

Not all districts report all levels of disaggregation, or in all years. I use all

⁸In the category “Infrastructure” I include expenditures listed under roads, urban infrastructure, and construction of market places.

⁹For instance, there are several anecdotes in Colombia about mayors who insisted in inaugurating bridges not fully finished because their terms were nearing an end. The result were poor quality bridges that ended up causing waves of accidents, or even collapsing.

the available information, with numbers of observations as reported in Table 3.2. Current expenditure and its broader subcategories, as well as total investment, are available for more than 90% of the districts in years prior to 1997, and for close to 80% of the districts after that. The disaggregation of investment is only available since 1990¹⁰.

Table 3.2 presents summary statistics for the different categories of spending I analyze. For each type of expenditure, statistics in the first row refer to all periods, statistics in the second row are for pre-electoral periods, and statistics in the third row are for other periods. All measures are in 1998 prices. Notice that most current expenditure categories display lower averages in pre-electoral periods than in other periods, while the opposite is true for most investment categories, in particular those associated with the development of infrastructure (infrastructure, water and energy, housing). These observations suggest pre-electoral changes in the composition of spending, in directions consistent with the predictions of both the Rogoff (1990) model and the budget composition model of chapter 2. A more formal analysis is undertaken in the following section.

The dynamics of different categories of government spending can be seen in Figures 3.1 and 3.2. The former contrasts current spending, and its subcomponents, with investment. The latter shows the different categories of investment, for the period in which disaggregated data is available (1990-2000). Vertical dotted lines indicate pre-election years, as defined by the variable *elec dum*. Note, in particular, peaks in pre-election periods for infrastructure, road construction,

¹⁰When disaggregations are reported, I check for consistency between reports of total investment and the sum of its disaggregate categories. I do the same for current spending and its subcategories. In both cases, inconsistencies arise in less than 1% of observations, and I discard those observations with inconsistencies.

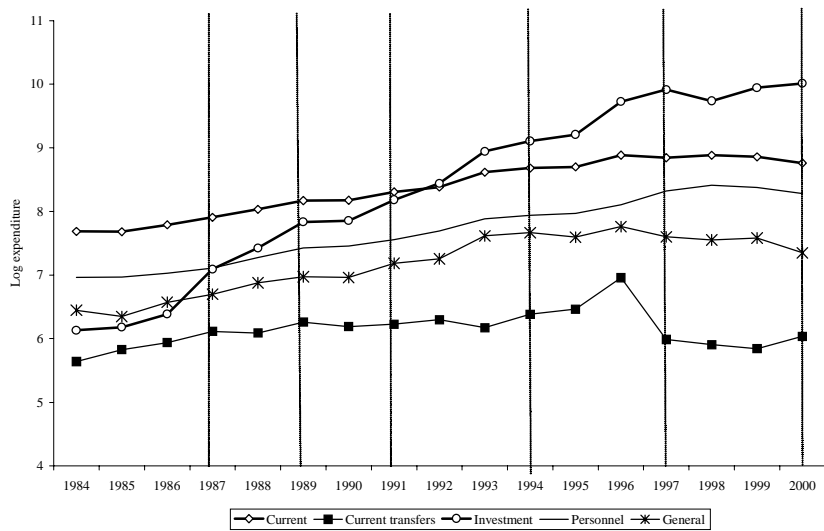


Figure 3.1: Evolution of spending: broad categories

housing, and investment in energy and water plants.

Type of expenditure	Periods	Number of observations	Mean	Standard deviation
TOTAL	All	12,318	56,502	611,645
	Pre-electoral	5,289	53,490	586,284
	No pre-electoral	7,029	58,769	630,088
CURRENT	All	12,317	19,872	185,560
	Pre-electoral	5,288	18,535	177,053
	No pre-electoral	7,029	20,877	191,717
GENERAL	All	12,248	4,071	21,020
	Pre-electoral	5,239	3,853	21,924
	No pre-electoral	7,009	4,234	20,317
PERSONNEL	All	12,249	9,767	82,734
	Pre-electoral	5,240	9,202	80,848
	No pre-electoral	7,009	10,190	84,120
TRANSFERS	All	12,230	5,900	91,405
	Pre-electoral	5,229	5,074	78,942
	No pre-electoral	7,001	6,518	99,703
INVESTMENT	All	12,318	30,151	382,388
	Pre-electoral	5,289	29,187	365,595
	No pre-electoral	7,029	30,876	394,578
INFRASTRUCTURE	All	5,265	3,173	8,257
	Pre-electoral	2,005	3,526	7,375
	No pre-electoral	3,260	2,955	8,750
ROADS	All	7,451	2,617	7,264
	Pre-electoral	2,837	2,943	6,865
	No pre-electoral	4,614	2,417	7,492
POWER	All	5,563	3,707	6,168
	Pre-electoral	2,111	4,273	7,103
	No pre-electoral	3,452	3,360	5,490
HOUSING	All	7,351	762	4,073
	Pre-electoral	2,794	882	4,622
	No pre-electoral	4,557	688	3,695
EDUCATION	All	7,455	3,612	5,523
	Pre-electoral	2,840	3,882	5,827
	No pre-electoral	4,615	3,446	5,322
HEALTH	All	7,455	2,710	5,010
	Pre-electoral	2,840	2,934	5,262
	No pre-electoral	4,615	2,572	4,844

Table 3.2: Summary statistics for different types of expenditure

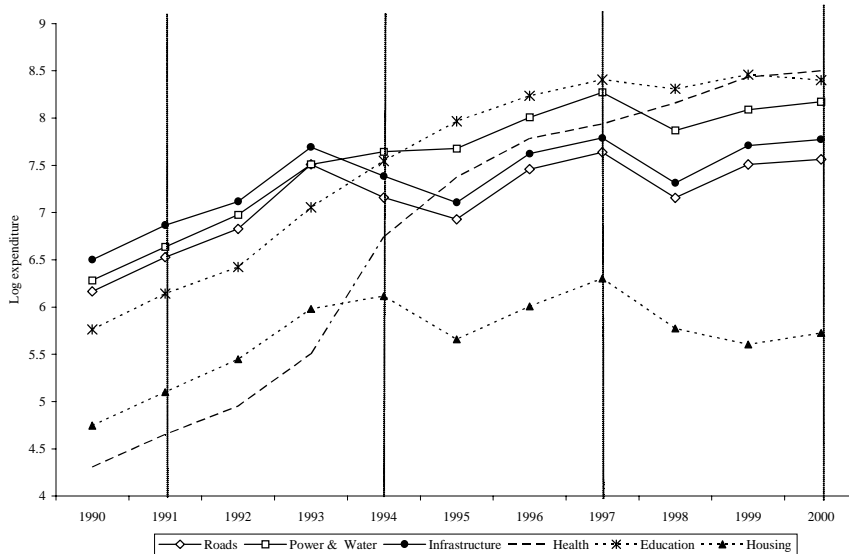


Figure 3.2: Evolution of spending: investment categories

Table 3.3 lists the different control variables I use in alternative specifications. Note that most controls are timed in the previous year, since I expect these past outcomes to influence the incumbent’s fiscal choices in the current period. This timing should also address concerns relating potential endogeneity of these regressors.

I use different specifications, with alternative sets of controls, to analyze the robustness of the results. Specification (1) includes state per capita GDP to control for economic activity (GDP_PC), a quadratic time trend (T)¹¹, and some

¹¹I use trend variables, rather than time-specific dummies, because of the difficulty of conceptually separating PBC effects from other year effects (besides, obviously, the mechanical impossibility of identifying separate coefficients for all years plus the electoral dummy). For instance, there are arguments, beyond the scope of this paper, that would imply PBC-related effects on spending in years *after* elections. The difficulty with this data is that, because of

social indicators that could be used as inputs in fiscal policy decisions. The latter include population and a poverty indicator known as Unsatisfied Basic Needs (UBN). Specifications (2) and (3) use alternative financial indicators, trying to account for the financial constraints faced by local governments. These constraints are particularly important in later years, when the law has required that regional governments in Colombia obtain authorization from the central level to increase expenditure if they have been running deficits in previous years. I use deficit, debt, and fiscal dependence indicators, which were all constructed by me from the Contraloría data. The Fiscal Dependence indicator, included in both specification (2) and (3), accounts for the level of fiscal decentralization in the country, which grew dramatically over this period. It is increasing in the share of revenues represented by transfers from the central government (as opposed to the local government's own fiscal effort). Finally, in specification (4) I include Incumbent Advantage, measured by the percentage share of votes received by the incumbent official in the last election. I try to account in this way for the greater degrees of freedom that a popular incumbent has when choosing fiscal policy. Appendix C provides sources and more details on how these controls were generated.

Figure 3.3 depicts the evolution of per-capita spending, deficits, and debt, while Figure 3.4 shows the fiscal dependence index. The increasing trend in all of these variables reflects the growing level of decentralization in the country.

the timing of elections in Colombia, most years are either a pre-election year or a post-election year.

Control	Specification			
	(1)	(2)	(3)	(4)
T(t)	x	x	x	x
y(i,t-1)	x	x	x	x
GDP_PC(i,t-1)	x	x	x	x
UBN(i,t-1)	x	x	x	x
POPULATION(i,t-1)	x	x	x	x
DEFICIT(i,t-1)		x		x
DEBT_84(i,t-1)			x	
T*FISCAL_DEP(t)		x	x	x
VOTE SHARE(i, prev.elect)				x

Table 3.3: List of control variables

3.4.2 Regression specification

Since I have more than 1,000 cross-sectional units, estimating the city-specific effects (a_i) separately is not efficient. I therefore use the first-differenced version of relationship (3.1).¹² The specification can be written as:

$$\Delta y_{it} = b * \Delta y_{it-1} + \sum_k c_k * \Delta x_{k,it} + d * \Delta elec dum_t + u_{it} \quad (3.2)$$

where

$$u_{it} = \Delta \varepsilon_{it}$$

Note that I have dropped the i subindex for *elec dum*, since elections occur at the same time in all districts. Also, the model in differences does include a

¹²Due to econometric problems related to the autoregressive component, a fixed-effects estimator is not appropriate, as it would yield biased estimates. While lags of the endogenous variables can be used as instruments in the first-differences specification to address this problem, the same is not true in a fixed-effects specification.

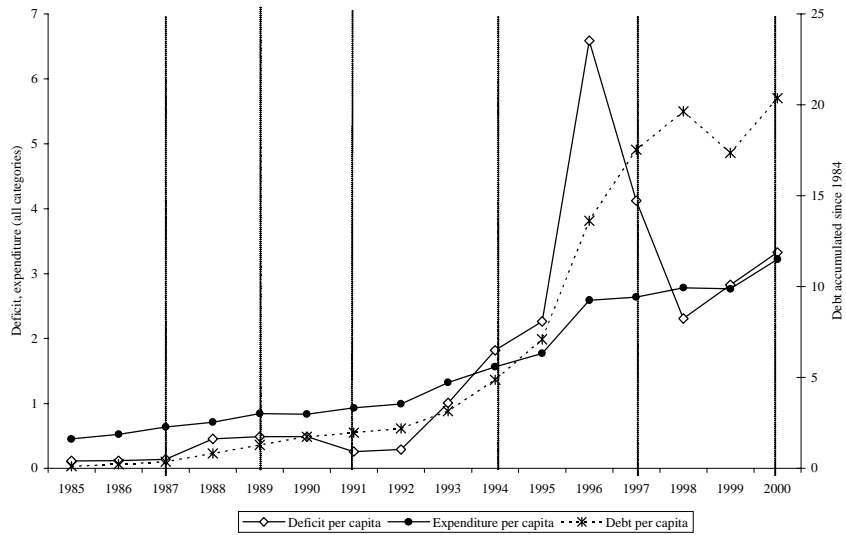


Figure 3.3: Evolution of financial indicators

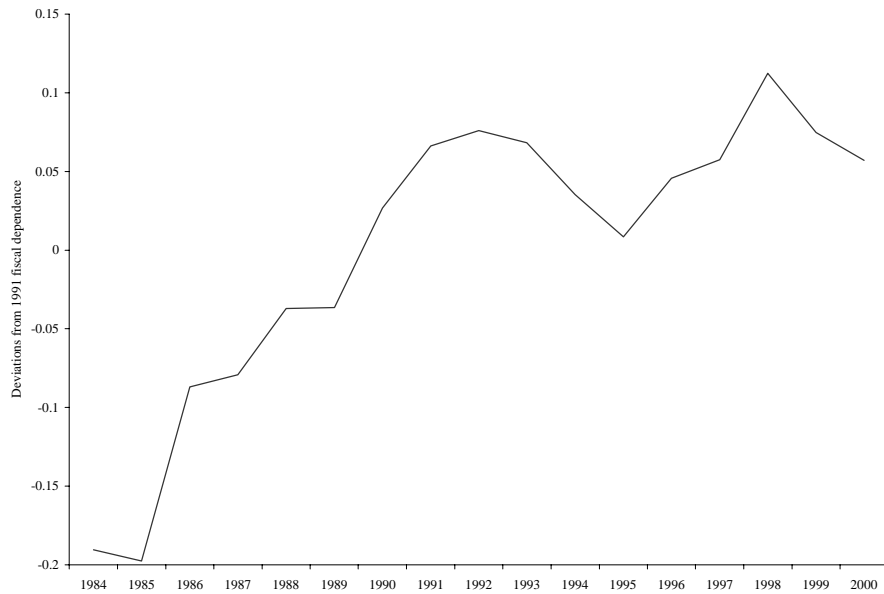


Figure 3.4: Evolution of fiscal dependence

constant and a linear trend, since the controls include a quadratic trend (with both linear and quadratic terms). Given that the first local election is dated in 1988, in the regressions the initial t is 1987 (the first pre-election period). Data for previous years provide instruments in the estimations.

Regression (3.2) is affected by the familiar endogeneity problem: the error term now includes $\varepsilon_{i,t-1}$ which is correlated with Δy_{t-1} , and also includes $\varepsilon_{i,t}$ which is correlated with the x_t if these outcomes are affected by contemporaneous fiscal policy. To address this problem, I follow the approach suggested by Anderson and Hsiao (1982), and estimate (3.2) by 2SLS, using $y_{i,t-2}$ and $y_{i,t-3}$ to instrument the $\Delta y_{i,t-1}$, and $x_{i,t-1}$ and $x_{i,t-2}$ to instrument the $\Delta x_{i,t}$ ¹³. Under my assumption that $\varepsilon_{i,t}$ is white noise makes this instruments valid, in the sense of being orthogonal to the innovations. As a robustness check, I re-do these estimations using a GMM approach with the same matrix of instruments. I also run regression (3.1) in levels by OLS, replacing the city-specific effect with time-invariant variables for each municipality. This last model is specified as follows:

$$y_{it} = a_1 * surf_i + a_2 * dist_i + \sum_{r=3}^6 a_r * regiondum_i \quad (3.3)$$

$$+ b * y_{it-1} + \sum_k c_k * x_{k,it} + d * elec dum_t + \epsilon_{it}$$

¹³A widely used alternative methodology is the one suggested by Arellano and Bond (1991). I do not use this approach because, with the relatively large numbers of periods (15) and endogenous variables (up to 5) in my estimations, the matrix of instruments suggested by these authors would contain a minimum of 60 columns, even if we only use two lags as instruments for each period. Besides being computationally consuming, GMM estimators with such a large number of overidentifying restrictions are known to have poor finite sample properties (see Wooldridge, 2002, for a discussion).

where I include the surface covered by the city or state, its average distance with respect to main markets in the country, and dummies for the four main regions in the country. I report robust standard errors. I refer to the results from OLS and GMM estimations in the text, but do not report these results to avoid overcrowding the paper with tables.

The dependent variables are expressed in logs, as are population, GDP, and UBN. Note from Table 3.2 that I have a total of 12,318 observations, 5,289 of which fall in pre-electoral periods. All reported regressions are weighted by expenditures; results are largely robust to eliminating these weights. I also conducted some robustness tests varying in the sample (both in terms of time periods and of districts included in the regression). These changes did not affect results importantly.

3.4.3 Regression results

Results for the political dummy in which we are interested, d , are presented in Tables 4 and 5. To facilitate reading, estimates for other coefficients are not reported, but are available from the author upon request. In these tables, each of columns (1) through (4) represents a different set of controls, as detailed in Table 3.3. Each row corresponds to a different regression, and the dependent variable for that regression is recorded in the first column. Throughout the paper, results in bold letters are significant at the 5% level, while results in bold and italics are significant at 10%. When interpreting the size of estimated coefficients, keep in mind that expenditure variables are expressed in logs.

I run two versions of equation (3.2). Table 3.4 presents results for the first of those versions, where $y_{i,t}$ corresponds to the share of total expenditure repre-

sented by a specific type of spending. For instance, the row marked CURRENT reports the estimate of d when the dependent variable is current expenditure as a share of total expenditure (including interest payments, i.e. total spending is not simply the sum of current spending and investment, which is why conducting the exercise for both categories is not redundant). This is motivated by theoretical models that, as mentioned, suggest PBCs should take the form of changes in the composition of the budget, rather than its size.

The results point to a change in the composition of expenditure away from current expenditures and into capital spending. The categories of investment associated with most visible infrastructure projects, namely construction of roads, infrastructure, housing, and water, power, and communications (POWER), all show pre-electoral expansions. These are significant, both statistically and economically; for instance, in some of the estimates expenditure in infrastructure grows by around 60% prior to elections. Other categories of investment, more related to the provision of universal (as opposed to targeted) goods, as health and education, do not show similar pre-electoral cycles. At the same time, there is a contraction of current spending, which can be attributed to a decrease in the share of the budget represented by current transfers¹⁴. These findings are consistent with an opportunistic pre-electoral expansion of targeted expenditures.

¹⁴This may seem puzzling, since the theoretical literature frequently refers to targeted expenditures as *transfers* to the targeted groups. However, the reader should not confuse these with “*Current Transfers*”, as defined in the Colombian government accounts. These cover benefits to retired and temporary employees, and transfers to other levels of government. None of these is likely to constitute a group of voters worthy of pre-electoral targeting. As argued above, in the government accounts pre-electoral opportunistic transfers are more likely captured by some investment categories.

Dependent variable: Type of expenditure (as a fraction of total expenditure)	Electoral effect (coefficient d)			
	(1)	(2)	(3)	(4)
CURRENT	-0.143 (0.016)	<i>-0.026</i> (0.010)	-0.059 (0.009)	0.001 (0.010)
GENERAL	-0.059 (0.028)	0.011 (0.018)	-0.003 (0.017)	0.079 (0.018)
PERSONNEL	-0.036 (0.032)	0.005 (0.020)	-0.019 (0.018)	<i>0.039</i> (0.021)
TRANSFERS	-0.413 (0.035)	-0.290 (0.023)	-0.334 (0.023)	-0.266 (0.024)
INVESTMENT	0.206 (0.088)	0.110 (0.031)	0.134 (0.025)	0.101 (0.016)
INFRASTRUCTURE	1.277 (0.237)	0.630 (0.157)	0.818 (0.243)	0.526 (0.109)
ROADS	1.112 (0.160)	0.693 (0.130)	0.639 (0.128)	0.820 (0.153)
POWER	0.782 (0.140)	0.466 (0.114)	0.373 (0.090)	0.517 (0.124)
HOUSING	0.915 (0.919)	0.717 (0.760)	0.772 (0.830)	0.420 (0.302)
EDUCATION	0.346 (0.085)	0.008 (0.073)	-0.008 (0.069)	0.165 (0.068)
HEALTH	0.227 (0.072)	-0.011 (0.075)	-0.005 (0.075)	0.191 (0.076)

Notes: This table presents estimates for coefficient d in regression (3.2). Estimation is done by 2SLS.

Standard errors in parentheses.

Bold characters denote significance at 5%. Bold and italics denote significance at 10%.

Each row corresponds to a different regression, where the dependent variable is the share of total expenditure represented by a different category (current, general, etc).

Each column corresponds to a different set of controls as detailed in Table 3.3.

Table 3.4: Effect of elections on the composition of total expenditures

My choice of instruments is greatly restricted by data availability, since not many other variables are measured at the local level. However, the set of instruments I use, consisting of the lags of potentially endogenous variables, does seem to perform relatively well. The relevance of the instruments should not be of much concern, since most of these variables exhibit persistence: economic activity, poverty, and the size of the population are all variables that change only slowly over time. Below, I show that government spending also shows inertial dynamics. The first stage R-squared for endogenous variables are in most cases around 0.3. To test the exogeneity of the instruments, I run regressions of the residuals from equation (3.2) on the matrix of instruments used for each case. Intuitively, the R-squared from these regressions should be low if the instruments are indeed exogenous. These R-squared are indeed quite small, ranging in size from 0.005 in the regressions from transfers to around 0.04 in the regressions for personnel spending. However, they are not small enough to support the hypothesis that instruments are exogenous in a formal Chi-squared test¹⁵, as is frequently the case when using large panels.

Regressions with other methods, and/or without weights, produce similar results. OLS regressions of the specification (3.3) actually show significant pre-election increases in all the reported components of investment, accompanied by contractions of current transfers and some subcomponents of personnel spending. GMM estimates of (3.2) are mostly similar. The main exception is in the weighted estimations, where GMM estimates of the electoral effect on total investment lose

¹⁵Under the null hypothesis that instruments are exogenous, the product of this R-squared and the number of observations follows a Chi-squared distribution with degrees of freedom equal to the number of overidentifying restrictions. In my case, these statistics are frequently larger than the corresponding critical value.

significance.

I repeat these regressions setting y_{it} equal to the log level of expenditure in a given category. That is, I look for effects on spending amounts, rather than shares of overall spending. Table 3.5 presents the results of this approach. As in Table 3.4, spending on total investment, infrastructure, power, and roads all show pre-electoral increases. The level of current transfers, meanwhile, contracts. These effects are large in size, approaching 20% in absolute value for infrastructure, roads, water and power plants, and transfers. An interesting result from these regressions is that payments to personnel increase by about 8% prior to elections¹⁶. Education expenditure also increases significantly before elections. Overall expenses do not show any economically significant change in the pre-election periods (even when statistically significant, the change is smaller than 2%).

OLS (for equation 3.3) and GMM estimations yield very similar results. The main difference is that the effect on total investment loses significance in those two specifications, although the effects on its main subcomponents remain significant and large. The GMM estimation also fails to identify any significant effect on housing expenditures.

In sum, the results indicate a pre-election shift of government resources from current spending into investment types of expenditures, while the overall budget does not experience significant changes. This is consistent with the view that incumbents try to obtain voters' support by increasing the provision of goods that are most valuable and/or visible to them, while avoiding large deteriorations

¹⁶The finding of a pre-electoral expansion of personnel expenditures would be consistent with the widespread idea that politicians in Colombia trade government jobs in exchange for political support.

of the overall balance. Is this strategy optimal to tilt election outcomes in favor of the incumbent? Trying to answer this question I now examine some empirical evidence on the link between the government's budget and election outcomes.

Dependent variable: Type of expenditure	Electoral effect (coefficient d)			
	(1)	(2)	(3)	(4)
TOTAL	-0.089 (0.072)	<i>0.015</i> (0.008)	0.018 (0.008)	-0.013 (0.009)
CURRENT	-0.030 (0.028)	-0.014 (0.017)	-0.051 (0.012)	-0.035 (0.013)
GENERAL	0.008 (0.048)	0.058 (0.009)	0.050 (0.009)	0.054 (0.009)
PERSONNEL	0.112 (0.012)	0.067 (0.006)	0.077 (0.006)	0.067 (0.006)
TRANSFERS	-1.778 (1.251)	-0.213 (0.025)	-0.278 (0.025)	-0.261 (0.028)
INVESTMENT	0.069 (0.042)	0.051 (0.012)	0.090 (0.010)	0.046 (0.011)
INFRASTRUCTURE	0.249 (0.049)	0.224 (0.043)	0.199 (0.059)	0.197 (0.047)
ROADS	0.331 (0.042)	0.265 (0.041)	0.261 (0.039)	0.252 (0.045)
POWER	0.325 (0.052)	0.287 (0.042)	0.275 (0.039)	0.257 (0.055)
HOUSING	0.632 (0.329)	0.615 (0.316)	0.604 (0.320)	0.237 (0.287)
EDUCATION	0.089 (0.029)	0.067 (0.020)	0.071 (0.019)	0.033 (0.035)
HEALTH	-0.078 (0.057)	-0.014 (0.044)	0.028 (0.041)	-0.136 (0.093)

Notes: This table presents estimates for coefficient d in regression (3.2.).

Estimation is done by 2SLS. Standard errors in parentheses.

Bold characters denote significance at 5%. Bold and italics denote significance at 10%.

Each row corresponds to a different regression, where the dependent variable is a given type of government expenditure.

Each column corresponds to a different set of controls as detailed in Table 3.3.

Table 3.5: Effect of elections on different types of expenditure

3.5 Do voters reward targeted spending?

The evidence presented above is consistent with the view that elected officials face incentives to manipulate the budget before elections, in order to improve the chances that their parties will be re-elected. The implicit foundation for this view is that voters' support for the incumbent is affected by his previous fiscal choices. One argument is that all increases in spending should boost popular support for the government, because of their expected favorable effects on economic activity. According to theoretical models of the PBC, however, the reason why rational voters care about past fiscal policies when deciding whether to re-elect an incumbent is that the fiscal choices of an incumbent reflect persistent personal characteristics. Past policies are therefore an indication of the policies the incumbent would enact if re-elected, and because of this reason they influence voters' perceptions about the incumbent. In Rogoff's (1990) model voters' support depends positively on the provision of goods visible to voters, which they associate with higher competence. Meanwhile, the model presented in chapter 2 suggests that voters react favorably to increases in targeted spending, even if they dislike incumbents who run deficits¹⁷.

Three obvious questions come to mind. Does recent fiscal policy indeed affect the choices of voters? If so, what are the directions of those effects? Finally, is there evidence that an incumbent's fiscal choices are indeed persistent? I devote this section to answering the two first questions, while the last one is addressed

¹⁷Models of competence inference (e.g. Rogoff 1990 and Shi and Svensson 2001) are also consistent with voters punishing high deficits, under the assumption that if at least some voters observe the overall budget. Informed voters associate higher deficits, for any given level of spending, with lower competence of the incumbent.

in the section 3.7.

3.5.1 Data

As argued before, the relevant definition of “incumbent” for the Colombian case is the incumbent *party*, since officials cannot run for direct re-election. I therefore use data on the share of votes obtained by each party in the local mayor elections of 1992-2000 (four elections). Unfortunately, for previous elections only the share of votes obtained by the winner of the election is available, so that full party shares cannot be calculated¹⁸.

Politics in Colombia have been traditionally dominated by two major parties, Liberal and Conservative. While some candidates, particularly in the 1990’s, ran under the banner of a myriad of different parties or *political movements*, many of these movements can be traced back to the traditional parties, and voters in each locality are frequently aware of those ties¹⁹. In that sense, elections are still mainly a contest between these two major parties, although there are also two smaller left-wing parties and some truly independent political groups.

The challenge is to identify in the data which candidates are associated with one of the major parties, in order to calculate the appropriate shares of party

¹⁸It is often the case that several candidates run for the same party, so that the votes received by one candidate cannot be assumed to equal the votes received by his party in that election.

¹⁹There are two reasons why candidates prefer to run for movements linked to the parties, rather than the parties themselves. The first is that by creating a new group they can access funding that is available for each political organization in the race. The second is that voters have grown suspicious of the political practices (not necessarily the ideals) of the traditional parties. Candidates then try to avoid being associated with those practices by running outside the structure of the party.

votes. I use information from external sources, including informal accounts, to match the different movements with the traditional party division between liberals and conservatives. Appendix C contains a list of movements and parties that I have been able to match with the larger parties. All movements not listed in appendix C are considered “independents” in my analysis.

I calculate the share of votes obtained by, for instance, the Liberal party, as the sum of the shares obtained by all the smaller organizations linked to the Liberal party in that list. Since some apparently independent groups may indeed also be Liberal or Conservative, even if I am not able to identify them as such, the share of votes my calculations assign to a given major party is a lower bound. Table 3.6 presents some summary statistics; panel 1 refers to vote shares, and panel 2 to number of elections won. Columns (1) and (2) record statistics for the Liberal and Conservative party, respectively, while column (3) shows statistics for the predominant party in each election (between conservatives and liberals). Figures in column (4) correspond to the winning *candidate*. The high frequency of zero shares is due to the fact that these measures are lower bounds. Note that, despite this fact, in 50% of the elections at least one of the major parties receives 65% of the votes (column (3)). Moreover, the predominance of the two parties is confirmed by the fact that, out of 3880 total elections, 2880 are won by a candidate that I can tie to one of these parties. Votes to the predominant party tend to exceed those obtained by the winning candidate, since often more than one candidate runs for each party.

		Party			
		(1) Liberal	(2) Conservative	(3) Max(lib,cons)	(4) Max (candidates)
Panel 1: vote shares	Mean	39.69	30.79	63.81	58.68
	Median	37.91	32.39	64.93	54.51
	25 percentile	0	0	45.11	47.79
	75 percentile	74.50	57.39	95.63	66.60
	Maximum	100	100	100	100
	Minimum	0	0	0	20.38
Panel 2: elections won	Wins	1650	1230		
	Wins running within the party	1597	1064		
	Wins runing for associated movement	53	166		

Table 3.6: Summary statistics for election outcomes

3.5.2 The effect of fiscal policy on vote shares

I study here the relation between the share of total votes obtained by each of the two major parties and pre-electoral fiscal policy. As in previous studies, the effect of the overall budget is captured by the government's deficits. However, I have already highlighted that theoretical models suggest that voters see targeted, more visible, expenditures with a different eye than they see the rest of spending. I therefore attempt to distinguish the effects of these spending categories. Following the previous discussion, I treat investment spending as targeted expenditure, and current spending as non-targeted expenditure. I run a regression of the following form:

$$\begin{aligned}
votes_{pit} = & \alpha_0 + \alpha_1 votes_{pit-1} \\
& + (\alpha_2 invest_{it} + \alpha_3 current_{it} + \alpha_4 deficit_{it} + \alpha_5 gr_{it-1}) * inc_{pit-1} + \varepsilon_{itp}
\end{aligned} \tag{3.4}$$

The time indices here refer to election periods, so that t is the current election

and $t - 1$ the previous election. $votes_{pit}$ is the share (in percentages) of votes obtained by party p in city i during the t election. For this analysis, I treat zero vote shares as missing values, since I suspect that most of these cases do not reflect that a major party did not present any candidate, but rather that I cannot tie a candidate to the party he belongs to. Vote shares are modeled as a function of the interaction between fiscal variables and the discrete variable inc_{pit-1} , which takes the value of 1 if party p is in office at the time of the election and -1 otherwise. The fiscal variables correspond to the pre-election year; I include the log of investment spending ($invest_{it}$), the log of current spending ($current_{it}$), and the per capita government deficit ($deficit_{it}$). Average GDP growth between $t - 1$ and t (gr_{it-1}) is also considered to control for other observables that may affect voters' perceptions about the incumbent. Under the assumption that ε_{itp} captures the part of voting behavior that the politician cannot predict, fiscal policy decisions cannot be based on those innovations, and the policy variables included in the regression should satisfy the restriction of being orthogonal to the error term.

Results are reported in Table 3.7; column (1) reports estimates of (3.4) with the expenditure variables ($invest$ and $current$) in per-capita terms, while for column (2) the expenditure regressors are expressed as shares of total expenditure (these shares do not add up to one, since interest payments is not included in any of these categories). Note that the dependent variable is expressed as percentages, while the spending measures are in logs.

As previous studies have found for other countries (e.g. Brender, 2003, for Israel, and Peltzman, 1992, for the US), and contrary to traditional interpretations of the PBC, my results indicate that Colombian voters penalize the incumbent

party for running high deficits. Furthermore, high capital expenditures (which I interpret as targeted spending) increase the share of votes obtained by the incumbent party, while current (“non-targeted”) expenditure has no significant effect²⁰. A one percent increase in per capita investment increases the fraction of votes obtained by the incumbent party by about 0.03%, while a two standard deviation increase in the deficit per capita (about \$4,000 pesos of 1998) decreases the share of votes to the incumbent party by close to 0.08%. These results are consistent with the view that voters dislike incumbents who run high deficits, while they value specific types of expenditures. They are also consistent with my results on electoral changes in the composition of spending, that show incumbents increasing targeted spending before the elections, while they try to avoid concomitant increases in the overall budget. According to findings in this section, this fiscal strategy is optimal in terms of maximizing the share of votes that go to the incumbent party in the upcoming election.

²⁰GDP growth does not have any significant effect. This result is not surprising result since my measure of GDP is at the state level. Voters probable do not “blame” the local mayor for the state economy’s performance.

Dependent Variable: Votes to party P		
Regressor	(1)	(2)
Constant	32.801 (1.606)	31.694 (1.761)
Votes to P in past election	0.485 (0.026)	0.507 (0.030)
Deficit * incumbent	-0.023 (0.009)	-0.019 (0.009)
Investment Expenditure *incumbent	2.757 (0.805)	5.282 (1.414)
Current Expenditure *incumbent	1.312 (0.787)	-0.070 (0.660)
GDP growth*incumbent	-6.464 (16.070)	1.465 (16.553)
Observations	2032	2032
R-square	0.222	0.221

Notes: this table presents the results of estimating equation 3.4.

Bold characters denote significance at 5%. Bold and italics denote significance at 10%.

The (log of) expenditure variables are either in per capita terms (column (1)) or fractions of total expenditure (column (2))

Incumbent is 1 if party P is in power at the time of the election, -1 otherwise

Table 3.7: Effect of fiscal performance on vote shares

3.6 The effect of ideological polarization: PBCs in swing cities

The model introduced in chapter 2 also suggests that electoral effects on the budget should vary depending on the level of loyalty of voters to one party or the other. The incumbent's core voters will support him even if they do not expect to receive targeted transfers from him in the future, and the opposite is true for the challenger's core voters. In this sense, pre-electoral manipulation of targeted versus non-targeted spending should be more of an issue in societies with a large fraction of uncommitted, or swing, voters.

This section examines how the extent of the electoral effect depends on the degree of polarization in a given district. I begin by characterizing districts as swing and non-swing, on the basis of five different measures of degree of commitment to one of the two major parties. In all of the cases, the swing variable is a dummy equal to 0 if the district is not swing, 1 if the district is swing. The three first measures are time invariant, while I allow the other two to vary from election to election. The definitions are as follow:

1. *Swing_freqelec*: district is not swing if the same party won at least 5 of the 7 elections in the period²¹.

2. *Swing_actual_vote*: district is not swing if one of the parties obtained at least 70% of the votes in every election in the 1992-2000 period²². The 70% threshold is based on the summary statistics of vote shares (see Table 3.6): in

²¹Even though I only have voting shares for 1992-2000, my data base does contain the winning candidate's party affiliation for all the elections.

²²The period limitation responds to data availability.

half of my sample elections, one major party obtained at least 64% of the votes, and that number rises to 71% if I omit elections in which I could not tie any candidate to a major party (as will be the case in this section).

3. *Swing_fitted_vote*: same as *swing_actual_vote*, but constructed using projected rather than actual vote shares. The fitted vote shares come from a regression identical to (3.4), except that I allow the coefficients to vary for the Liberal party with respect to the Conservative party. Vote shares are projected by fixing investment at 0, since the ideological polarization of a group in the model of chapter 2 (the degree to which it is not “swing”) represents its coincidence with one party on issues *other than targeted spending*. An important conceptual advantage of these projected measures is that they eliminate the potential endogeneity of swing measures with respect to government investment.

4. *Swingtemp_actual_vote*: time-varying measure. District is not swing in election period t if in election $t - 1$ the ruling party obtained at least 70% of the votes.

5. *Swingtemp_fitted_vote*: same as *swingtemp_actual_vote* but using projected vote shares (again, assuming investment is zero) rather than actual.

The fraction of districts identified as swing is 57% for the first measure (*swing_frequelec*), around 75% for the time-invariant measures based on vote fractions, and around 60% for the time-varying measures. Some summary statistics for the projected vote shares are recorded in Table 3.8. The projected vote shares exhibit less dispersion than the actual shares, and have higher means (the actual shares are summarized in Table 3.6); those means exceed 50% for both parties due to the presence of missing values, more prevalent in districts where the party is not dominant. For each party, the projected share is positively correlated

	Mean	Std Dev	Minimum	Maximum
Projected vote share Liberal party	63.912	13.536	36.550	80.704
Projected vote share Conservative party	60.006	19.714	23.252	86.440
Sample Correlations				
	Projected vote share Liberal party	Actual vote share Liberal party	Projected vote share Cons. party	Actual vote share Cons. party
Projected vote share Liberal party	1	0.394	-0.624	-0.349
Actual vote share Liberal party		1	-0.426	-0.175
Projected vote share Conservative party			1	0.546
Actual vote share Conservative party				1

Table 3.8: Summary statistics for fitted vote shares

with the actual share, and negatively correlated with the actual share for the other party. Table 3.9 presents sample correlations between the different swing dummies, which are low in many cases. The only high correlations are between the two time-varying dummies (0.995), and between the time-invariant measures obtained from projected votes and from the frequency of wins. I place most confidence in the swing dummy based on the frequency of wins, and the time-varying measure based on actual votes. This is because the difficulties in correctly identifying which candidates are tied to which parties, and the resulting proliferation of missing values for the vote shares, place doubts on swing measures that depend on being able to follow vote shares within a district over time. The three other dummies for swing districts (`swing_actual_vote`, and the two dummies that depend on projected vote shares) are affected by this problem.

To analyze whether the electoral change in the composition of spending differs

	<i>fregelec</i>	<i>actual_vote</i>	<i>fitted_vote</i>	<i>temp_actual</i>	<i>temp_fitted</i>
<i>swing_fregelec</i>	1	0.058	0.452	0.056	0.053
<i>swing_actual_vote</i>		1	0.083	0.014	0.013
<i>swing_fitted_vote</i>			1	0.011	0.008
<i>swingtemp_actual_vote</i>				1	0.995
<i>swingtemp_fitted_vote</i>					1

Table 3.9: Sample correlations for swing district dummies

between swing and non-swing districts, I add an interaction between the election dummy and the swing district dummy to the basic regression (3.2). The modified empirical model is:

$$\Delta y_{it} = b * \Delta y_{i,t-1} + \sum_k c_k * \Delta x_{k,it} \quad (3.5)$$

$$+ d * \Delta elec dum_t + s * \Delta (elec dum_t * swing_{it}) + u_{it}$$

where $swing_{it}$ is one of the swing district dummies defined above. The d coefficient captures now the electoral effect in non-swing districts, while the corresponding effect in swing districts is given by $d + s$. I express the dependent variables as shares of total spending, since this exercise is motivated by the expenditure composition model of chapter 2.

For non-swing districts, the electoral effect reflects possible electoral motives outside the expenditure composition incentive. Given the above discussion, one would expect those electoral incentives to capture the need for reducing the deficit in order to attract votes²³. The d coefficient should therefore be negative. The

²³As mentioned, loyalty to one party is defined in terms of the coincidence with that party in issues other than targeted spending. Hence, non swing districts cannot be swayed by targeting expenditures to them, but can change their support to one or another candidate as a result of shifts in other issues. These other issues include the overall budget. Given the preference of voters for smaller overall budgets, increases in spending should negatively affect the incumbent party in non-swing districts.

electoral incentives to change the composition of expenditure toward targeted spending are reflected in $d + s$. I would thus expect $d + s > 0$ for components of expenditure related to targeted spending (such as investment), and $d + s < 0$ for at least some of the other components. The results of estimating equation (3.5) by 2SLS, using the same instruments as in previous tables, are presented in Tables 3.10 and 3.11. Table 3.10 reports results using the time-invariant definitions of swing districts (definitions 1, 2 and 3), while Table 3.11 reports results for the time-varying measures (definitions 4 and 5). The set of controls included in the estimation is the one listed under column (4) in Table 3.3. Besides the coefficients' estimates and their standard errors, I include the Wald statistic for the null hypothesis that $d + s = 0$, that is, that the electoral effect is not significant for swing districts²⁴.

The results are consistent with the preceding discussion. In non-swing districts several types of expenditures exhibit a pre-electoral contraction. This result is robust to different measures of swing districts, except for the time-invariant dummy based on actual vote shares, under which I find no electoral effect at all in non-swing districts. Swing districts, however, exhibit changes in the composition of spending consistent with the pattern described above: current spending contracts, mostly due to a reduction in current transfers, and this contraction is larger than the effect observed for non-swing districts. The infrastructure-related category of road construction shows an expansion, and the other investment categories, education and health, do not exhibit the contraction they display for

²⁴Note that less categories of spending are listed in this table due to data problems: since election results for major parties are only available for some districts, and the coverage of the spending data also varies across districts and categories of expenditure, for some categories the set of districts with recorded data contains only swing districts.

Dependent variable: type of expenditure (as fraction of total expenditure)	Swing district dummy					
	<i>swing_frequelec</i>		<i>swing_actual_vote</i>		<i>swing_fitted_vote</i>	
	Pre-election dummy	Pre-election * swing	Pre-election dummy	Pre-election * swing	Pre-election dummy	Pre-election * swing
CURRENT Wald stat: joint effect	-0.295 (0.057)	0.109 (0.035)	1.505 (1.001)	-1.716 (0.998)	-0.283 (0.064)	0.086 (0.041)
GENERAL Wald stat: joint effect	-0.006 (0.118)	0.148 (0.063)	1.478 (1.816)	-1.382 (1.810)	-0.008 (0.131)	0.131 (0.074)
PERSONNEL Wald stat: joint effect	-0.182 (0.083)	0.086 (0.055)	2.192 (1.609)	-2.296 (1.606)	-0.195 (0.095)	0.096 (0.065)
TRANSFERS Wald stat: joint effect	-0.792 (0.183)	-0.159 (0.091)	2.830 (2.446)	-3.747 (2.429)	-0.706 (0.206)	-0.244 (0.113)
ROADS Wald stat: joint effect	0.227 (0.294)	0.970 (0.311)	-2.879 (5.588)	3.655 (5.611)	0.013 (0.349)	1.044 (0.366)
EDUCATION Wald stat: joint effect	-0.485 (0.110)	0.566 (0.107)	0.047 (2.168)	-0.200 (2.171)	-0.493 (0.128)	0.456 (0.124)
HEALTH Wald stat: joint effect	-0.444 (0.107)	0.573 (0.107)	1.576 (2.175)	-1.722 (2.177)	-0.403 (0.128)	0.366 (0.124)

Notes: this table presents the results of estimating equation (3.5) by 2SLS.

Columns correspond to different regressions, changing the swing district dummy.

Standard errors in parentheses.

The Wald statistic corresponds to $H_0: d+s=0$.

Bold characters denote significance at 5% level. Bold and italics denote significance at 10%.

Table 3.10: Effect of elections on government expenditure: swing versus non-swing districts (time-invariant dummies)

non-swing districts.

Dependent variable: type of expenditure (as fraction of total expenditure)	Swing district dummy			
	<i>swingtemp_actual_vote</i>		<i>swingtemp_fitted_vote</i>	
	Pre-election dummy	Pre-election * swing	Pre-election dummy	Pre-election * swing
CURRENT Wald stat: joint effect	-0.138 (0.052)	-0.324 (0.067)	-0.096 (0.050)	-0.383 (0.062)
GENERAL Wald stat: joint effect	0.103 (0.122)	0.358 (0.205)	0.095 (0.114)	0.342 (0.176)
PERSONNEL Wald stat: joint effect	-0.115 (0.075)	-0.224 (0.101)	-0.093 (0.074)	-0.247 (0.099)
TRANSFERS Wald stat: joint effect	-0.888 (0.172)	-0.340 (0.231)	-0.854 (0.163)	-0.409 (0.211)
ROADS Wald stat: joint effect	0.583 (0.259)	1.557 (0.660)	0.683 (0.276)	0.992 (0.616)
EDUCATION Wald stat: joint effect	-0.143 (0.103)	-0.100 (0.189)	-0.167 (0.105)	0.179 (0.206)
HEALTH Wald stat: joint effect	-0.130 (0.101)	-0.036 (0.227)	-0.145 (0.105)	0.073 (0.229)
		0.420		0.085

Notes: this table presents the results of estimating equation (3.5) by 2SLS.

Columns correspond to different regressions, changing the swing district dummy.

Standard errors in parentheses.

The Wald statistic corresponds to $H_0: d+s=0$.

Bold characters denote significance at 5% level. Bold and italics denote significance at 10%.

Table 3.11: Effect of elections on government expenditure: swing versus non-swing districts (time-varying dummies)

3.7 The persistence of expenditure choices

All models in which voters rationally respond to electoral manipulation of the budget rely on some mechanism that relates pre- and post-election fiscal policy. This is so because forward looking individuals vote on the basis of what they expect from the candidates once in office. The empirical implication is that an official's fiscal choices should exhibit some inertia.

I analyze here whether the dynamics of government spending in Colombian municipalities are consistent with this implication. If so, we should observe that government spending exhibits some persistence, but the inertial component should be less pronounced in periods in which a power transition occurs²⁵. In particular, in light of models discussed previously, I examine whether the *composition* of spending is persistent over time, and whether that persistence diminishes at times of power transitions. Since mayors cannot be directly re-elected in Colombia, I look at party transitions. If fiscal policy reflects inertial characteristics of both parties and officials, the pattern of autocorrelation of spending should be less pronounced in periods of transition from one mayor to another, but this difference should be less important when the transition occurs within the same party.

The empirical model is a modification of the one used in previous sections, and takes the following form:

²⁵The persistence of government spending is not driven solely by persistent characteristics of officials. Other factors that contribute to persistence are stable fundamental characteristics of the economy, relatively rigid spending items (e.g. public employment), and multi-period spending commitments.

$$\begin{aligned} \Delta y_{it} = & b * \Delta y_{it-1} + \sum_k c_k * \Delta x_{k,it} + d * \Delta elec dum_t \\ & + b_1 * \Delta (y_{it-1} * elec dum_{t+1}) + b_2 * \Delta (y_{it-1} * elec dum_{t+1} * reel_{it}) + u_{it} \end{aligned} \quad (3.6)$$

where $reel_{it}$ is a dummy equal to 1 if the same party remains in power between $t - 1$ and t , 0 otherwise, and the rest of the notation is as above. Note that the transitions of officials in power occur at periods given by $elec dum_{t+1}$. The terms in the top line of equation 3.6 are the focus of this section. The serial correlation is given by b in “normal” times, $b + b_1$ in periods in which the incumbent party is replaced by a challenger, and $b + b_1 + b_2$ when the same party remains in office, but the mayor changes. As the previous discussion suggests, the assumption of persistent official characteristics should be reflected in $b > 0$, $b_1 < 0$, and $b_2 > 0$ to (partially) offset the negative effect of b_1 .

As before, I carry this estimation by 2SLS, adding the first and second lags of $y_{it-1} * elec dum_{t+1}$ and (in some cases) $y_{it-2} * elec dum_{t+1}$ to the list of instruments introduced in section 3.4. Tables 3.12 and 3.13 summarize the results. The dependent variable for the results reported is the ratio of current to investment spending, since the focus is on the composition of expenditures between targeted and non-targeted categories. However, the estimates are qualitatively similar if I use instead the shares of total spending represented by these categories, or the levels of investment and current spending. Note that, different from previous tables, here the rows represent different regressors, while the dependent variable is the same in all cases. I only report results for the b , b_1 , b_2 and d coefficients, and the Wald statistic for the null hypothesis that $b_1 + b_2 = 0$ (i.e. that all persistence is due to party characteristics). Table 3.12 presents results using

what the table calls the “basic set of instruments”, consisting of the instruments used for previous tables plus the first and second lags of $y_{it-1} * elec dum_{t+1}$, while Table 3.13 reports results adding $y_{it-2} * elec dum_{t+1}$ to the set of instruments (for what the table calls the expanded set of instruments). In both tables, the results in column (1) come from a specification with the basic set of controls (Table 3.3, column 1), while in column (2) the full set of controls (Table 3.3, column 4) is used. The first-stage R-squared is included for each regressor.

Results are consistent with the patterns expected. The ratio of current to investment spending exhibits high serial correlation, but this correlation falls by about 10% when the party in power changes. The reduction in the correlation is only around 2% when the mayor is replaced by someone from the same party. Note that, consistent with results in previous sections, the ratio of current to investment spending falls in pre-electoral periods. Also, note that results are very similar in all columns of Tables 3.12 and 3.13.

Regressors	Dependent variable: current expenditure / investment			
	(1)		(2)	
	Basic controls, basic instruments		All controls, basic instruments	
	Estimates	1st stage R-squared	Estimates	1st stage R-squared
Lag dependent variable	0.920 (0.013)	0.730	0.922 (0.019)	0.683
Lag dependent * power transition dummy	-0.140 (0.028)	0.839	-0.249 (0.034)	0.919
Lag dependent * power transition dummy* party reelection dummy	0.118 (0.027)	0.827	0.288 (0.034)	0.893
Pre-election dummy (electoral effect)	-0.299 (0.030)	1	0.177 (0.053)	1
Wald statistic (H0: $b_1+b_2=0$)	48.330		107.070	
R-square	0.525		0.162	
Observations	6651		6471	

Notes: this table presents the results of estimating equation (3.6) by 2sls.

Columns 1-2 correspond to different sets of controls.

Standard errors in parentheses.

Bold characters denote significance at 5% level. Bold and italics denote significance at 5%.

Table 3.12: Persistence of the composition of government expenditure (basic instruments)

Regressors	Dependent variable: current expenditure / investment			
	(1)		(2)	
	Basic controls, all instruments		All controls, all instruments	
	Estimates	1st stage R-squared	Estimates	1st stage R-squared
Lag dependent variable	0.923 (0.013)	0.741	0.920 (0.013)	0.744
Lag dependent * power transition dummy	-0.130 (0.022)	0.887	-0.134 (0.024)	0.892
Lag dependent * power transition dummy* party reelection dummy	0.109 (0.021)	0.862	0.113 (0.023)	0.864
Pre-election dummy (electoral effect)	-0.295 (0.031)	1	-0.294 (0.040)	1
Wald statistic (H0: $b_1+b_2=0$)	48.790		49.630	
R-square	0.468		0.515	
Observations	6651		6471	

Notes: this table presents the results of estimating equation (3.6) by 2sls.

Columns 1-2 correspond to different sets of controls.

Standard errors in parentheses.

Bold characters denote significance at 5% level. Bold and italics denote significance at 5%.

Table 3.13: Persistence of the composition of government expenditure (all instruments)

3.8 Electoral cycles in the central government's budget

Although I have argued that electoral cycles derived from the targeting of expenditures are most relevant at the local level, where targeting is most efficient, this phenomenon is no stranger to national level politics. In fact, the idea of pork projects is most often associated by the public with Congress politics. One question is, therefore, whether we also observe this type of effect at the national level. In this section, I take an exploratory look at that question, focusing on the dynamics of some components of the Colombian central government's budget.

One problem for this exploration is the short length of the official quarterly time series on fiscal policy, which begins in 1988. I gathered information to extend those series, from the official printed reports of the *Contraloría General* on the finances of the government²⁶. The resulting data are quarterly frequency, and cover the 1974.1-2000.1 period. The level of disaggregation is not as detailed as for the local data, but I can distinguish current from investment spending, and two subcomponents of current spending: transfers and personnel. The denomination transfers, again, introduces confusions; one must note that these are *current* transfers, not including the transfers from the central level to the local governments, which are actually recorded as a part of investment. I therefore still regard transfers as a non-targeted type of spending.

Elections occur at predetermined dates, every four years. Presidential and

²⁶The Contraloría General is the same source I use for my local fiscal data. It is the entity in charge of monitoring the government's financial statements. More details on the construction of national level fiscal variables are provided in the appendix.

Congressional elections are almost simultaneous (a two-month period separates them), so it is impossible to separate the effect of Congressional elections from that of a Presidential election. As controls, I use information on unemployment, GDP and per capita GDP. Sources, definitions, and the dates of presidential elections are listed in appendix C.

I run a regression of the form:

$$y_t = \sum_{l=1}^L b_l * y_{t-l} + c * x_{t-1} + d * elec dum_t + \varepsilon_t \quad (3.7)$$

where y_t is the growth rate of some type of government spending between $t - 1$ and t , and x_{t-1} is a control equal to the growth of either unemployment, GDP, or per capita GDP, which I date in the previous period for the same reasons explained before for the local case. $elec dum_t$ is the pre-election dummy, which in this case takes the value of 1 in the two quarters prior to the elections, 0 in all others. Note that I use L lags of the dependent variable, where L is optimally chosen following the Akaike criterion.

The results of this estimation are presented in Table 3.14. The table only shows the estimates for the electoral effect (d), and follows the same conventions used in all other tables. Each column corresponds to a different control (unemployment, GDP, and per capita GDP for columns 1, 2, and 3 respectively).

I obtain results that are broadly consistent with those observed for the local level. First, there is no significant change of total spending before elections. The sign of the effect is always negative for transfers and current spending, and positive for investment. However, while the effect on investment is always significant, the negative effect on current types of spending is significant only when controlling for unemployment.

Dependent variable: Type of expenditure	Electoral effect (coefficient d)		
	(1)	(2)	(3)
TOTAL	0.068 (0.105)	0.149 (0.102)	0.148 (0.102)
CURRENT	-0.846 (0.103)	-1.543 (1.018)	-1.561 (1.020)
PERSONNEL	0.048 (0.059)	0.058 (0.061)	0.053 (0.061)
TRANSFERS	-0.647 (0.105)	-0.052 (0.134)	-0.049 (0.133)
INVESTMENT	0.563 (0.262)	0.849 (0.275)	0.843 (0.275)

Notes: This table presents estimates for coefficient d in regression (3.7).

Estimation is done by OLS. Standard errors in parentheses.

Bold characters denote significance at 5%. Bold and italics denote significance at 10%.

Each row corresponds to a different regression, where the dependent variable is a given type of government expenditure.

A different control in each: unemployment rate (1), GDP (2), per capita GDP (3)

Table 3.14: Effect of elections on different types of expenditure. Central Government.

I consider these results as indicative that the suggested pre-electoral changes in the composition of government spending occur also at the national level. One interesting extension of these results would be to examine the allocation of pre-electoral payments to the local governments (registered under the investment heading), and relate these to the level of electoral polarization that characterizes different districts. At this point, however, the data on regional allocations of central government expenditures are not readily available.

3.9 Concluding remarks

The goal of this paper is to offer a more comprehensive view of electoral cycles in government spending, integrating the pre-electoral fiscal choices of incumbents with the impact of those choices on election outcomes. The picture that emerges is one where voters punish the pre-electoral deterioration of fiscal balances but reward incumbents who, before the election, increase the provision of goods most visible and valuable to voters. In terms of maximizing his probability of being re-elected, therefore, an incumbent's optimal strategy implies simultaneously increasing spending on those goods favored by voters and contracting other types of spending. In the Colombian case, this is reflected in pre-electoral shifts of resources away from current spending and into the development of infrastructure-related projects.

The evidence presented here shows that there is a logic to apparently contradictory pieces of previous evidence, which showed certain types of government spending growing before elections despite voters' inclination to replace incumbents that chose high spending. It also suggests that the traditional view that incumbents have electoral incentives to run high deficits does not apply gener-

ally, even within the group of developing economies, which are frequently seen as the mecca of political budget cycles. On the contrary, this evidence is consistent with models that picture the political budget cycle as an electoral manipulation of the composition, rather than the size of the budget. In the same vein, it is also consistent with the argument that voters favor specific types of goods, and incumbents attempt to influence electoral results by spending on those goods.

An interesting question that is left open is to what extent the greater susceptibility of specific types of spending to electoral manipulation reflects heterogeneous preferences of voters and politicians, as opposed to different degrees of visibility of public goods. In simpler, although inexact, words, is the PBC more a reflection of *pork* politics, or competence signaling? Is it perhaps even a reflection of incumbents pre-paying important campaign contributors? The answer to this question requires a different kind of data and empirical strategy, possibly differentiating electoral transfers to specific groups of voters or contributors, and is part of a future research agenda.

Appendix A

Technical Appendix to Chapter 1

A.1 Proof of proposition 1

Here I use the specifics of each case (single central banker, and committee CB) to get to a unique expression. For the committee case, as discussed in section 1.4.2, $E_{v_i} \Pr^p(\pi' = \pi^d | \pi) = \Pr^p(\pi' = \pi^d | \pi)$, so terms involving solely $\Pr^p(\pi' = \pi^d | \pi)$ are constants in the dove's problem. Abstracting from these and other constants, and taking into account that $\Pr(\pi = 0 | v_i) = 1 - \Pr(\pi = \pi^d | v_i)$ and $\Pr(r_i = 0 | v_i) = 1 - \Pr(r_i = 1 | v_i)$, we can re-write the dove's problem in the committee case as:

$$\begin{aligned} & \underset{\{v_i\}}{Min} \\ & \Pr(\pi = \pi^d | v_i) \left(-\frac{c^2}{4} \right) \\ & + \Pr(\pi = \pi^d | v_i) \beta_i \left(\frac{c^2}{2} \right) \left[E_{v_i} \Pr^p(\pi' = \pi^d | \pi = \pi^d) - E_{v_i} \Pr^p(\pi' = \pi^d | \pi = 0) \right] \\ & - \beta_i b \Pr(r_1 = 1 | v_i) + \beta_i \left(-\frac{c^2}{4} \right) (1 - \phi) \Pr(r_i = 1 | v_i) \Delta \Pr(\pi' = \pi^d) \end{aligned}$$

The last term uses the fact that, if $r_i = 0$, i 's replacement votes for π^d in the second period with probability ϕ . Since a dove chooses $v_i = 0$ if $L(v_i = 0) < L(v_i = \pi^d)$, proposition 1 follows.

For the single central banker case, the problem can be written:

$Min_{\{v_i\}}$

$$\Pr(\pi = \pi^d | v_i) \left(-\frac{c^2}{4} \right) + \beta_i \left(\frac{c^2}{2} \right) E_{v_i} \Pr^p(\pi' = \pi^d | \pi = v^i) \\ - \beta_i b \Pr(r_1 = 1 | v_i) + \beta_i \left(-\frac{c^2}{4} \right) (1 - \phi) \Pr(r_i = 1 | v_i) \Delta \Pr(\pi' = \pi^d)$$

The expression in proposition 1 follows, taking into account that $\Delta \Pr(\pi = \pi^d) = 1$ for single central banker case.

A.2 Derivation of equation (1.11)

Letting k be a given member of period 2 committee, the public assigns

$$\Pr(k \text{ is dove} | \pi = \pi^d) = \frac{m}{n} \phi + \left(1 - \frac{m}{n}\right) \phi^+ \\ \Pr(k \text{ is dove} | \pi = 0) = \frac{m}{n} \phi + \left(1 - \frac{m}{n}\right) \phi^-$$

so that

$$\Pr^p(\pi' = \pi^d | \pi = \pi^d) = \\ \sum_{x=\frac{n+1}{2}}^n \binom{n}{x} \left[\left(\frac{m\phi + (n-m)\phi^+}{n} \right)^x \left(1 - \frac{m\phi + (n-m)\phi^+}{n} \right)^{n-x} \right]$$

and a similar expression applies if $\pi = 0$, with ϕ^- in lieu of ϕ^+ . Taking a first order approximation of this expression around $\phi^+ = \phi$ leads to equation (1.11).

A.3 Explicit form of condition (1.16)

Note that

$$\begin{aligned}\Delta \Pr(\pi = \pi^d) &= \Pr\left(\frac{n-1}{2} \text{ of others vote for } \pi^d\right) \\ &= \binom{n-1}{\frac{n-1}{2}} (\phi w)^{\frac{n-1}{2}} (1 - \phi w)^{\frac{n-1}{2}}\end{aligned}$$

and similarly

$$\Delta \Pr(\pi' = \pi^d) = \binom{n-1}{\frac{n-1}{2}} (\phi)^{\frac{n-1}{2}} (1 - \phi)^{\frac{n-1}{2}}$$

To obtain an explicit form of the condition to choose $v_i = 0$ in the committee case with government appointments, plug these expressions and equations (1.11) and (1.17) into condition (1.16).

Appendix B

Appendix to Chapter 2

B.1 Proof of proposition 9.

We first need to prove that (2.28) solves the differential equation (2.27). Note that

$$Y(g_t^h) = e^{-E(\ln \omega_C^h)} g_t^h \theta c_0$$

satisfies equation (2.27) for the $E(\ln \omega_I^h | g_t^h) < E(\ln \omega_C^h)$ case, if $c_0 = (1 - \bar{\alpha} \Lambda e^{-E(\ln \omega_C^h)} c_0)^{p^\alpha} (1 - \underline{\alpha} \Lambda e^{-E(\ln \omega_C^h)} c_0)^{(1-p^\alpha)}$. Also, \bar{g} is the value of g_t^h that solves $Y(g_t^h) = 1$.

The nonlinear differential equation in the $E(\ln \omega_I^h | g_t^h) > E(\ln \omega_C^h)$ branch of (2.27) is obviously hard to solve, but we will take the view that voters rather solve an approximate, linear, form of it. We take a first order Taylor approximation around $Y' = x = -\theta c_0 e^{-E(\ln \omega_C^h)}$. This ensures that $\lim_{g \rightarrow \bar{g}} \frac{\partial E(\ln \omega_I^h | g_t^h)}{\partial g_t^h}$ is equal whether we approach from the left or the right. This yields (letting $\hat{\alpha} = E(\alpha)$)

$$Y(g_t^h) = \frac{e^{E(\ln \omega_C^h)}}{g_t^h \theta} [K_1 - K_2 (Y' - x)]$$

$$\text{where } K_1 = \frac{\left(1 + \bar{\alpha}\Lambda C e^{-E(\ln \omega_C^h)}\right) \left(1 + \underline{\alpha}\Lambda C e^{-E(\ln \omega_C^h)}\right) - \Lambda C e^{-E(\ln \omega_C^h)} \left(\hat{\alpha} - \Lambda C \bar{\alpha} \underline{\alpha} e^{-E(\ln \omega_C^h)}\right)}{C \left(1 + \bar{\alpha}\Lambda C e^{-E(\ln \omega_C^h)}\right) \left(1 + \underline{\alpha}\Lambda C e^{-E(\ln \omega_C^h)}\right)} =$$

and $K_2 = \frac{\Lambda \left(\hat{\alpha} - \Lambda C \bar{\alpha} \underline{\alpha} e^{-E(\ln \omega_C^h)}\right)}{\theta C \left(1 + \bar{\alpha}\Lambda C e^{-E(\ln \omega_C^h)}\right) \left(1 + \underline{\alpha}\Lambda C e^{-E(\ln \omega_C^h)}\right)}$. The solution to this differential equation takes the form:

$$Y(g_t^h) = \exp\left(\frac{-\theta (g_t^h)^2}{2K_2 e^{E(\ln \omega_C^h)}}\right) \left[c_1 + \frac{K_1}{K_2} \int \exp\left(\frac{\theta (g_t^h)^2}{2K_2 e^{E(\ln \omega_C^h)}}\right) dg_t^h \right] \quad (\text{B.1})$$

where c_1 is a constant such that $Y(\bar{g}) = 1$. Letting $\frac{K_1}{K_2} = c_2$ and $\frac{1}{2K_2 e^{E(\ln \omega_C^h)}} = c_3$, this is identical to (2.28) for $E(\ln \omega_I^h | g_t^h) > E(\ln \omega_C^h)$.

Plugging (2.28) into (2.26) we obtain (2.29).

Appendix C

Appendix to Chapter 3

C.1 Sources and details on data

C.1.1 Data for local level estimations

Population, surface, distance to main markets, and the UBN indicator were provided by the University of Los Andes' CEDE. State per capita GDP data are from DANE (the Colombian Bureau of Statistics). Also, GDP for “new” states¹ is only reported since 1995. Previously, only the sum for all new states was reported. I impute pre-1995 GDP for these new states by keeping the contribution of each state to total new-states-GDP constant in its 1994-1996 level. The Unsatisfied Basic Needs indicator (UBN) summarizes the fraction of households without proper housing (in terms of number of rooms and construction materials), without sanitary services, with school-less children, or with a single low income for more than three people. This poverty indicator is commonly used with local-level data, because at this level income measures needed to construct

¹There is a subset of nine states that were only elevated to the state category in 1991. They were previously in a different, now disappeared, category of the regional classification. These are what I call “new” states.

other poverty indicators are not available.

Debt in specification (3) (Table 3.3) corresponds to the sum of all deficits incurred by the city since 1984 until December of $t - 1$. Deficit (specification (2)) is the deficit at the end of the previous year. To construct the fiscal dependence indicator, I first calculate the average share of total revenue that is represented by transfers of revenue from other levels of government. I use the average over all regional units, because the decentralization effect I try to account for is a process dictated by national law. Let this average fiscal dependence for year t be denoted as f_t . The Fiscal Dependence index used in the regressions is calculated as:

$$FD_t = \ln(f_t) - \ln\left(\sum_{t=1984}^{2001} \frac{f_t}{T}\right)$$

where T is the total number of years. The FD_t index is therefore close to 0 in years of intermediate decentralization, positive in years of higher decentralization, and negative in years of lower decentralization. In the regressions, I interact FD_t with the trend variable, to differentiate the trend effects related to the process of fiscal decentralization from any other trend effects.

For the pre-1997 elections, I use electoral results recorded in the National Planning Department Databases, while for 1997 and 2000 I use official results directly provided by the *Registraduría Nacional*.

C.1.2 Data for national level estimations

National level fiscal data were taken from several issues of the *Revista Informe Financiero* of the *Contraloría General*. I use the figures for “Agreements”, which correspond to payments the government is committed to make in the period. To

make the investment series consistent over time, the contributions of the central level to the local governments were always included in the definition of investment. Similarly, the definition of current transfers always includes “operation contributions”.

The unemployment rate series is from DANE (the National Bureau of Statistics). The original series has missing values for 78.2, 78.4, and 80.2, which filled using the average of adjacent quarters. GDP is only available for 1977.1-1999.4, and no unique quarterly series covers the whole period; for 1977-1995 there is a series from the National Planning Department, while DANE has been in charge of reporting quarterly GDP since 1994. Following a practice that has become standard when working with Colombian data I construct a unique series from the two by seasonally adjusting the pre-94 series to make it compatible with the DANE series, and using growth rates from one to extend the other.

C.2 Matching political movements and the main parties

I use information in Pachón (2002), as well as informal consultations, to link some movements to the traditional parties. I also consider as liberal (conservative) a movement with the word “Liberal” (“Conservative”) in its name. Table C.1 lists the matches obtained (the left column lists the name of the party as it appears in the official records of election results):

Party or movement	Mapping to larger parties
Partido Liberal Colombiano	Liberal
Alternativa Liberal	Liberal
Apertura Liberal	Liberal
Convergencia Popular	Liberal
Liberalismo Ind. De Restauracion	Liberal
Mov. Convergencia Popular Civica	Liberal
Mov. Inpedinte Liberal Mil	Liberal
Mov.Renovador De Accion Liberal-Mor	Liberal
Nuevo Liberalismo	Liberal
Partido Conservador Colombiano	Conservative
Mov. Conservatismo Independiente	Conservative
Mov. De Integracion Regional	Conservative
Mov. De Participacion Popular	Conservative
Mov. Humbertista	Conservative
Mov. Nal. Conservador	Conservative
Mov. Unico De Ren. Conservadora	Conservative
Movimiento De Salvacion Nacional	Conservative
Movimiento Nueva Fuerza Democratic	Conservative
Movimiento Progresismo Democratico	Conservative
Movimiento Unionista	Conservative
Ad M-19	M-19
Union Patriotica Up	Up

Table C.1: Party correspondences

C.3 Election dates

C.3.1 Local elections

The first mayor elections are in March 1988. Before 1994, local elections occurred every two years, but the frequency has been extended to three years since then. Table C.2 lists years of elections.

C.3.2 National elections

Elections every four years at predetermined dates. Table C.3 lists the elections that occur within the period covered by the aggregate fiscal data.

Election	delec=1 in:
March 1988	1987
March 1990	1989
March 1992	1991
October 1994	1994
October 1997	1997
October 2000	2000

Table C.2: Dates of elections for Mayors

Election	delec=1 in:
May 1976	1975.4 and 1976.1
May 1978	1977.4 and 1978.1
May 1982	1981.4 and 1982.1
May 1986	1985.4 and 1986.1
May 1990	1989.4 and 1990.1
May 1994	1993.4 and 1994.1
May 1998	1997.4 and 1998.1
May 2002	2001.4 and 2002.1

Table C.3: Dates of elections for President

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