Committees as Substitutes for Commitment[*]

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Abstract

In this paper, policies are negotiated in a committee by playing a dynamic voting game with an endogenous default (or status quo) policy. We show that joining a committee by maintaining a strong agenda setting power is a way for a decision maker to commit to a policy that in absence of committees is not time consistent. The disciplinary role of the endogenous status quo and the heterogeneity of preferences within the committee are two crucial ingredients to obtain this result. As a motivating example, this paper focuses on the time consistency of monetary policy.

JEL Classifications: D72, E61, E58

1 Introduction

Since the seminal contribution by Kydland and Prescott (1977), it has been understood that, absent commitment, the time inconsistency problem is pervasive in models of fiscal and monetary policy.

So far the standard framework to study dynamic consistency problems assumes that economic policies are decided by a single, omnipotent policy maker. In practice, however, policy makers do not have complete freedom of action, and most policies are made by collective decision-making bodies (such as, monetary boards and legislatures). For example, Fry *et al.* (1999) report that 79 central banks out of a sample of 88 use some form of committee structure when deciding monetary policy. Motivated by this evidence, we model policy making as follows. During every period a committee votes on the current policy. We assume that committee members have different ex ante preferred policies. In other words, if they could decide for the entire committee and they had commitment, they would choose different policies. Policy changes are proposed by an agenda setter (or chairman). We suppose that the agenda setter is fixed over time and places a take-it-or-leave-it offer before the committee. If the proposal does not obtain a majority of votes, the current default option (which coincides with the status quo policy) is maintained until the next voting game. In case of approval, the policy accepted today becomes the new status quo for the next period. The current status quo is then a state variable.

The implications in terms of time consistency of the optimal policy are noticeable: under some conditions, dynamic consistency problems are reduced. That is, making decisions as a committee works as a substitute for a commitment technology, as a device for restraining the behavior of policy makers.[1] As we will see, the disciplinary role of the endogenous status quo will be key for our result. Consequently, this paper provides a possible justification for why in many policy decisions the default outcome is often the status quo.[2]

The intuition explaining why committee decision making is time consistent is as follows. Suppose that the initial status quo coincides with the ex ante optimal policy outcome for

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[1]Incidentally, notice that the words committee and commitment share the same etymology: from Latin, *committere*, to entrust (from *com-* + *mittere*, to send).

[2]On this point, see Tsebelis (2002, p. 8). Rasch (2000) identifies the countries where this provision is part of the formal rules. Voting models featuring an endogenous status quo are rare. Exceptions include Baron (1996), Azariadis and Galasso (2002), Bullard and Waller (2004), Bernheim *et al.* (2006), and Fong (2006).

the entire economy (sometimes called the Ramsey outcome). For the sake of the argument, assume that the status quo coincides with the policy that the agenda setter would choose if he had commitment. Suppose that consumers expect the committee to implement the Ramsey outcome. Do policy makers betray consumers? Our answer is, under some conditions, no. We obtain this result because a deviation changes the default option in the next voting game and, consequently, might decrease the future negotiating power of the agenda setter. The cost of betraying consumers is large when the deviation moves to an absorbing state: this happens when the new status quo is a policy that a majority of policy makers prefer. Therefore, in spite of the one-shot benefit from deviating, the agenda setter, when he looks forward *via* the status quo, may have an incentive to make the "right" decision.

We emphasize that our result can be applied to many settings where credibility problems arise. As a motivating example, the focus of this paper is on the time consistency of monetary policy. In our opinion, the dynamic voting game that we have described resembles the actual policy making process in a monetary policy committee.[3] In particular, the assumption that one committee member controls the agenda seems quite plausible: monetary boards are often dominated by strong chairmen (e.g., Arthur Burns, Paul Volcker, and Alan Greenspan), who are nonetheless checked by the requirement that they must induce a majority of committee members to assent to their point of view.

The idea that institutional constraints induce policy stickiness and reduce credibility problems is not new.[4] A simple way to solve time-consistency problems through committees would be to assume that central bankers who do not have any incentive to betray consumers belong to the committee and have veto power. In this case, deviations from the Ramsey policy would

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[3]Consider, for example, the voting procedure in Europe since January 1999. The decision making body of the European Central Bank (ECB) includes 19 members. Each of the members has one vote. According to the statute of the ECB, monetary policy is decided by simple majority rule; if the vote is tied, the ECB's President has a deciding vote. More details can be found at: *http://www.ecb.int/ecb/legal/pdf/en_statute_2.pdf.* Note that the procedure that we have just described is common to other monetary policy committees, including the FOMC.

[4]Kydland and Prescott (1980) themselves first hinted at a similar outcome when they conjectured that "institutional constraints may result in the time consistent solution being nearly optimal." Along the same lines, North and Weingast (1989) argue that the establishment of institutions of limited monarchy in England after 1688 improved the ability of the Crown to credibly commit to repay the debt.

not be approved. We emphasize that this is not the intuition behind our paper. In fact, our result holds even when all committee members have a one-shot incentive to deviate from the ex ante optimal policy. In spite of this incentive, the optimal outcome is sustained by the threat of disagreement in the continuation game that follows a deviation; the threat is credible since we posit a committee where policy makers have different ex ante preferred policies. [5] The fact that we are able to sustain the optimal outcome in the shadow of disagreement is, to the best of our knowledge, a novel and general result that goes beyond the actual application of this paper.

A further remark is in order. In our model, a simple majority is required to pass a policy change. Consequently, the committee is not necessarily stuck after any deviation.[6] For instance, when the status quo is a high inflation rate, a majority of committee members will be willing to lower the current inflation rate. In order to argue that separation of power leads to commitment, we will have to show that the agenda setter does not deviate to a high inflation rate where the threat of disagreement is not credible.[7]

We stress that our solution to the time consistency problem does not rely on history-dependent strategies. In fact, we adopt Markov perfection as a solution concept. For the past years a growing literature has analyzed credibility problems without using trigger strategies and, instead, supposed that the government and consumers use Markov strategies (for example, Klein, *et al.* 2008). Usually, Markov perfect equilibria are characterized by solving the functional Euler equation of the policy maker; in order to do so, policy rules are restricted to being differentiable. In our model, policy rules are not differentiable. Consequently, we fol-

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[5]Notice that in our model, the agenda setter chooses not to propose deviations from his optimal inflation rate as opposed to being forced to do so. This distinction would have practical consequences if we were to introduce shocks that change the optimal policy of each committee member. Intuitively, our committee would be more responsive to shocks than a committee that does not deviate because conservative central bankers have veto power. Introducing uncertainty in a model with an endogenous default and credibility problems is, however, a daunting task.

[6]If we required unanimity (or a large super-majority) to pass a policy change, we would further diminish credibility problems by reducing the chance that deviations are passed and by making more credible the threat of disagreement after a deviation. For realism, in our voting game decisions are made under simple majority rule.

[7]The characterization of the proposal strategy when the default policy is a high inflation rate is somewhat involved. In some cases, before lowering the inflation rate, the committee increases the inflation rate.

low a different route: we construct a strategy profile and we verify that there are no profitable deviations from it. Constructing such a policy rule is particularly challenging because we must look for a fixed point that solves the voting game among the committee members as well as the policy game between the committee and the private sector.

We conclude this section by mentioning a possible objection to our result. When the optimal policy for the entire economy does not coincide with the ex ante preferred policy by the agenda setter, making decisions through committees is welfare improving for the agenda setter (since he can sustain his preferred policy), but not necessarily from the economy's perspective. In Section 4.4 we analyze this objection, and show how to sustain the optimal inflation π^U for the entire economy, even when it does not coincide with the chairman's ex ante preferred policy. In order to do so, a Grand Planner has to appropriately select the agenda setter of the committee and choose the initial status quo. We show that, in some circumstances, there is a case for selecting a liberal agenda setter, whose preferred inflation rate is higher than π^U. The fact that our argument still works with a liberal agenda setter highlights the differences between our paper and the conservative banker's solution proposed by Rogoff (1985).

The remainder of the paper is organized as follows. Section 2 reviews the literature. Section 3 describes the model. In Section 4, we characterize the politico-economic equilibrium without commitment. Section 4.1 provides an explanatory example to build intuition. Sections 4.2-4 analyze the general model. Section 5 concludes.

2 Related Literature

The seminal work by Kydland and Prescott (1977) pointed out that governments face a time consistency problem. Since then, the literature has explored mechanisms that substitute for commitment and make credibility problems less severe.

A very large literature has modeled the interaction between the government and the private sector as an infinitely repeated game and used folk theorem-type results to show that the commitment solution can be supported in equilibrium even when the government cannot bind its future choices.[8] In those studies, agents' strategies specify each period's action as a function

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[8]For instance, see Barro and Gordon (1983b), Stokey (1989), Chari and Kehoe (1990), Chang (1998), and Phelan and Stacchetti (2001).

of the entire history of play. In this paper, instead, we rule out the possibility to extend memory beyond what is included in the "payoff-relevant" state of the game.[9]

Another body of literature assumes that the type of policy maker is unobserved by the private sector (see Celentani and Pesendorfer, 1996, and Phelan, 2003). Households form beliefs about the government's type: policy makers are either opportunistic (if they like to break promises) or trustworthy. In such a framework, deviations from promises destroy the belief that the policy maker is not opportunistic. The long-run cost of betraying public trust may be sufficient to induce all policy makers to keep promises. In our model, all policy makers are opportunistic, and consumers know it.

Persson and Tabellini (1994) introduce politics into the picture. They deal with time inconsistency in a model of capital taxation with heterogenous agents. Their paper shows that the median voter is able to implement his preferred policy by electing a "more conservative" candidate (that is, a person who is more endowed with capital), who, once in office, sets a capital tax that matches the median voter's ex ante optimal policy. This result is related to Rogoff (1985), who studies strategic delegation in a model of monetary policy. In contrast to this literature, in Section 4.4 we show that, in some circumstances, it is optimal to choose an agenda setter that is more liberal than the median. Compared to strategic delegation, our solution to the time-consistency problem is more convenient when preferences are not observed or when it is not possible to find an agent that is immune from credibility problems (recall, in fact, that our solution works even when all policy makers in the committee have a one-shot incentive to betray consumers). Moreover, in a model with uncertainty, delegation may be problematic when the agent and the principal are not subject to the same shocks.

Our paper is also related to the literature on legislative bargaining. In a seminal paper, Baron and Ferejohn (1989) consider a legislature with n members who want to divide a dollar among themselves by playing a non-cooperative bargaining game. Their framework has recently been used by Battaglini and Coate (2008) to study the dynamic evolution of public debt, taxation and public spending. In Bassetto (2008), two overlapping generations Nash-bargain over tax rates, transfers, and government spending. In his model, the current policy decision, by affecting capital accumulation, changes the strategic position of each generation in the next

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[9]For this reason, simplicity is often cited among the advantages of Markov strategies relative to history-dependent strategies. See Maskin and Tirole (2001) for further discussion on Markov perfect equilibria.

negotiation. The endogeneity of the negotiation power will be a distinctive feature of our model as well.

To conclude, we discuss the literature on monetary policy committees. Our focus here is on those papers that mainly deal with dynamic consistency problems.[10] Sibert (2003) studies whether individual central bankers have more or less incentives to build a reputation than a committee as a whole and suggests several institutional features that enhance reputation building of committees. Dal Bó (2006) shows that committee decision making under a super-majority voting rule is able to deliver the ideal balance between commitment and flexibility. Bullard and Waller (2004) analyze alternative institutional arrangements in the context of a general equilibrium model with overlapping generations. They show that constitutional rules that give the older generation veto power over changes in monetary policy implement the social optimum in a politico-economic equilibrium. In contrast to their model, in our setup all policy makers at each point in time are tempted to betray consumers. In spite of that, in our model the committee is disciplined by the threat of disagreement off the equilibrium path.

3 Voting over Monetary Policy in a Committee

We consider a currency area with $n + 1$ regions. Let n be odd. Each region i, with $i \in N = \{1, ..., n\}$, has a voting representative in a monetary policy committee. Besides the n voting representatives, the committee includes an agenda setter (or proposer), indexed by p, whose task is to place a proposal before the committee. The set of all committee members is denoted by $\overline{N} = N \cup \{p\}$.

Time is discrete and the horizon is infinite. The inflation rate from $t - 1$ to t is denoted as $\pi_t \in X$, where $X = [\pi_{\min}, \pi_{\max}] \subset R$. In each period t the committee votes directly on the time-t inflation rate for the entire currency area. We assume that the committee is able to

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[10]Most of the literature on monetary policy boards abstracts from credibility problems. In Waller (1992, 2000), committees improve welfare since they reduce the policy uncertainty associated with the electoral outcome. Another strand of literature sees information sharing as the main rationale for committee decision making. In an experimental study, Blinder and Morgan (2005) show that group decision making is better than individual decision making when the members in the committee have different signals about the (uncertain) potential output.
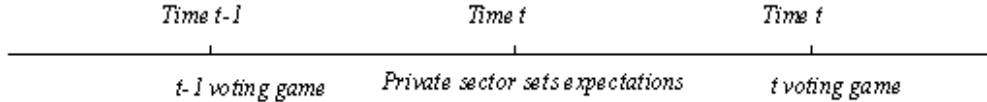
Figure 1: Timing of Events

perfectly control π_t.

We posit a simple Barro-Gordon economy for the currency area. Employment x_t is determined by

$$x_t = \theta + (\pi_t - \pi_t^e), \tag{1}$$

where θ is a positive constant, which we interpret as the natural rate of employment. The term π_t^e is the expected inflation rate in the currency area.

Each policy maker $i \in \overline{N}$ maximizes the following intertemporal payoff:

$$\sum_{t=0}^{\infty} \delta^t w_i(\pi_t, \pi_t^e) = -0.5 \sum_{t=0}^{\infty} \delta^t \left[(\pi_t - \bar{\pi}_i)^2 + \lambda(x_t - \bar{x})^2 \right]. \tag{2}$$

The discount factor is denoted by $\delta \in (0, 1)$. The parameter $\lambda \in [0, 1)$ is the relative weight on employment deviations from the target $\bar{x}$. The ex ante optimal inflation rate for member i is denoted by $\bar{\pi}_i$. We could justify the different target inflation rates as a consequence of (unmodeled) heterogeneity across the regions of the currency area or as a result of different distributional concerns among committee members. With respect to the latter justification, the argument may go as follows. Since the poor hold more cash as a function of their total purchases (see, on this point, Erosa and Ventura, 2002), low income individuals are more vulnerable to anticipated inflation relative to high income individuals.[11] Conversely, agents with high earning ability bear a larger share of the labor income tax burden. As shown by Albanesi (2005, 2007), distributional considerations may then determine significant departures from the Friedman rule. This argument may then explain why some policy makers, depending on the weights in their social welfare function, may rely more heavily on the inflation tax than others.

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[11]On the basis of household polling data, Easterly and Fisher (2001) find that the poor are more likely than the rich to mention inflation as a top concern.

The median in the committee is defined as per usual. Order the n voting representatives so that central banker 1 is the one with the smallest target inflation, and individual n is the one with the largest target inflation, and $\pi_1 \leq \pi_2 \leq ... \leq \pi_n$. The median representative is the one with the index $m = (n+1)/2$.

In most of the paper, we suppose that $\lambda \in (0,1)$. In this case, assuming that $\bar{x} > \theta$, the committee has an incentive to generate unexpected inflation to bring the actual employment closer to the employment target. As a benchmark, in Section 4.2 we consider the case $\lambda = 0$.

This paper analyzes two interrelated decision problems: the policy makers' decision problem in the voting game and the consumers' problem. We formulate the private agent's problem as in Sargent (1999). At the beginning of time t consumers set price expectations; afterwards, the committee meets (see Figure 1 for the timing of events). We suppose that each region of the currency area includes a continuum of consumers distributed on the interval $[0,1]$. Consumers are denoted by the index j. The choice variable of consumer j in region i is the anticipated inflation rate, denoted by $\pi_{i,t}^{e\,j}$. The average setting of $\pi_{i,t}^{e\,j}$ is the expected inflation rate in the currency area, π_t^e. We define the one-period payoff to a private agent as

$$u(\pi_{i,t}^{e\,j}, \pi_t) = -(\pi_{i,t}^{e\,j} - \pi_t)^2. \tag{3}$$

The private sectors behave competitively. Each infinitesimal consumer takes π_t as given, since he correctly perceives that his own actions have no influence on the policy that will be decided by the committee. From (3) each private agent maximizes his payoff by setting $\pi_{i,t}^{e\,j} = \pi_t$. That is, the private sector's objective is to correctly forecast the inflation rate that the committee will select.

The policy makers are the only strategic players in our model. In each period a non-cooperative voting game takes place among the policy makers. We will assume a voting protocol that gives the agenda setter the power of making take-it-or-leave-it proposals to the committee. This is not meant to be a literal description of actual policy making. Instead, it is a modeling device to capture the idea that chairmen usually have more power and influence than the other committee members. In some monetary policy committees, however, chairmen do seem to control the agenda. Referring to the US Fed, Alan Blinder, who served on the FOMC, argues:

> "In practice, each member other than Alan Greenspan has only one real choice
> when the roll is called: whether to go on record as supporting or opposing the

chairman's recommendation. ... It is therefore quite possible for the Fed to adopt one policy even though the (unweighted) majority favors another."[12]

At the same time, Blinder (2004) also emphasizes that it would be incorrect to claim that Alan Greenspan was the *de facto* single decision maker in the FOMC. First of all, because the FOMC chairman lacks the formal authority to dictate monetary policy. Second, because there exists anecdotal evidence that at least to some extent, the final proposal by Alan Greenspan has been influenced by the internal debate.[13]

The policy choice that is negotiated in period t is π_t. In period $t+1$ a new bargaining game takes place to decide π_{t+1}; and so on, for all t. The negotiation game unfolds with players making proposals and with the other players accepting or rejecting the offer. In most bargaining models, the agenda setter is chosen either randomly or is determined by the "protocol" (a fixed order over the players). Throughout the paper, we assume that the agenda setter p is fixed over time.[14] Voting unfolds as follows: at time t the agenda setter (or chairman) makes a take-it-or-leave-it proposal $\pi_t \in X$. After the proposal is placed before the committee, all $i \in N$ simultaneously vote on π_t. (The assumption that the agenda setter does not cast a vote is not essential for our results.) A simple majority is required to pass a proposal: that is, if $|\{i \in N : i \text{ accepts } \pi_t\}| \geq (n+1)/2$, π_t is accepted; if not, the status quo q_t is implemented. The status quo is endogenous: if π_t is rejected, the status quo q_t is maintained in the next bargaining game; if π_t is approved, π_t becomes the status quo for the next period.

3.1   The Agenda Setter's Dynamic Programming Problem

We focus attention on stationary Markov strategies, where the past affects current behavior only through its effect on a state variable. In stating the problem recursively, we get rid of the time indexes. The current status quo q is given by the previous inflation rate, $q = \pi_{-1}$, while the inflation rate chosen in the current period is denoted by π. Given that the status quo matters in

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[12]See Blinder (2004, p.47). The tradition of dominance by the chairman did not originate with Greenspan: "Paul Volker's dominance was also legendary." (Blinder, 2004, p. 47).

[13]Along the same lines, Laurence Meyer (Meyer, 2004) remarks on "[Greenspan]'s disproportionate influence on FOMC decisions" and on "his efforts to build consensus around his policy recommendations" (p. 50). However, Mayer also notes that the chairman "does not necessarily always get his way" (p. 52).

[14]The standard reference for voting games with a fixed agenda setter is Romer and Rosenthal (1978).

our voting game, consumers use π_{-1} to predict the policy decision that the committee will make. Since all agents are identical and they all face the same problem, in a symmetric equilibrium $\pi_i^{e\,j} = \pi^e$ for all j and i. The stationary strategy of the private sectors is then described by an aggregate expectation rule $\Pi \colon X \to X$. Expected inflation is $\pi^e = \Pi(\pi_{-1})$. The state of the economy at the time the negotiations take place is denoted by $\varphi = (\pi_{-1}, \pi^e) \in X^2$. In each period a *stationary* strategy for the agenda setter p is a proposal rule $G_p \colon X^2 \to X$. The proposal rule indicates what the agenda setter proposes to the committee for any given state φ. For all $i \in N$ a strategy is simply a voting rule: $G_i \colon X^3 \to \{accept,\ reject\}$. In other words, for a given state φ and for a given proposal π, policy maker i must either accept or reject the offer. We require players to use *stage-undominated* voting rules (see Baron and Kalai, 1993). This amounts to saying that

$$G_i(\varphi, \pi) = \left\{ \begin{array}{c} accept\ \pi,\ \text{if} \\ w_i(\pi, \pi^e) + \delta V_i(\pi, \Pi(\pi)) \geq w_i(\pi_{-1}, \pi^e) + \delta V_i(\pi_{-1}, \Pi(\pi_{-1})) \\ reject,\ \text{otherwise} \end{array} \right\},$$

where V_i is the value function of representative i.[15] The condition above implies that player i votes for proposal π if and only if the utility of accepting π and continuing to the next period with a new status quo is at least that of rejecting the proposal and continuing to the next period with the current status quo. The voting decision of each representative is made taking as given Π and G_p. In equilibrium, the rules that the voting representatives expect consumers and the agenda setter to follow in the continuation game are the correct ones. We define the *acceptance set* $A(\varphi)$ as the set of proposals that obtains a majority of votes when the state is φ. More formally,

$$A(\varphi) = \{\pi \in X : |\{i \in N : i \text{ accepts } \pi\}| \geq (n+1)/2\}. \tag{4}$$

As shown by Proposition A1 in the Appendix, a proposal will be accepted by the committee if and only if it is accepted by the median.[16] This result greatly simplifies the analysis since it

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[15] This requirement is standard. It rules out equilibria where all players accept a proposal they do not like because a single rejection would not change the voting outcome.

[16] We obtain this result by showing that preferences satisfy an order restriction, as discussed in Rothstein (1990). This allows us to conclude that for any possible proposal, the policy makers that prefer the status quo all lie to one side of those preferring the proposal. One advantage of assuming quadratic utilities, besides their

makes the characterization of the equilibrium depend only on the utilities of the median and of the agenda setter.

Before moving on, we give a definition. A policy π is said to be *static* if, whenever the status quo coincides with that policy, the status quo is proposed and passed in every period.

The Bellman equation of the agenda setter is the following:

$$V_p(\pi_{-1}, \pi^e; \Pi, G_{-p}) = \max_{\pi \in A(\varphi)} \left\{ w_p(\pi, \pi^e) + \delta V_p(\pi, \Pi(\pi); \Pi, G_{-p}) \right\}. \tag{5}$$

The maximization in each period is done for a given state variable $\varphi = (\pi_{-1}, \pi^e)$, taking as given Π and the strategies of the other players, which are denoted by G_{-p}. Without any loss of generality we consider only equilibria where p proposes policies that are accepted by the committee.[17] In fact, proposing a policy outside $A(\varphi)$ is equivalent to proposing the status quo, which is always accepted.

Next, we make two assumptions. First, we assume that $\bar{\pi}_m$ is greater than $\bar{\pi}_p$ and that the extent of disagreement between the median and the agenda setter is sufficiently large.

ASSUMPTION 1: *The agenda setter has a lower target inflation than the median. We assume that* $\bar{\pi}_m > \bar{\pi}_p + [1 + \delta + \lambda(1 - \delta)] \lambda(\bar{x} - \theta) / (1 + \lambda)$.

It is important to note that the assumption that the agenda setter is more conservative than the median is not essential to our results. In fact, in Section 4.4 we will suppose that the agenda setter is more liberal than the median. What is important is the existence of disagreement within the committee, which is measured by the distance between the ideal points of the median and of the agenda setter. In many committees, this is a quite plausible assumption. For example, a large empirical literature has pointed out that district bank presidents in the FOMC tend to prefer tighter monetary policy than members of the Board of Governors.[18]

tractability and the fact of being overwhelmingly adopted by the related literature, is to satisfy this condition. If preferences were only single-peaked but not order-restricted, note that proposals may be accepted by a coalition that does not include the median. For a discussion, see Austen-Smith and Banks (1999, ch. 4).

[17]On the basis of FOMC transcripts for the period 1987 to 1996, Chappell *et al.* (2005, p. 186) conclude that "there are at least suggestions that Greenspan's proposals were crafted with knowledge of what other members might find acceptable."

[18]See, for example, Belden (1989), Havrilesky and Schweitzer (1990), and Gildea (1992). In the Bank of England, there seems to be a division between external members and internal ones (see Gerlach-Kristen, 2003).

To simplify the characterization of the equilibrium, we make a second assumption, which is nonetheless defendable on grounds of realism. We suppose that all committee members are dismissed if employment falls much below the natural level θ. Let χ denote a positive and sufficiently large constant.

ASSUMPTION 2: *When the current employment x falls below $\theta - \chi$, all policy makers are replaced by other representatives with the same preferences. For all $i \in \overline{N}$, the cost in utility terms of being replaced is equal to B.*

Looking at equation (1), one can see that employment falls below θ only when the committee generates a *deflationary* surprise. We assume that B is sufficiently large so that the committee never generates a deflation surprise that brings employment below $\theta - \chi$.

Solving the model amounts to finding a fixed point of the policy rules followed by the committee, so that, given that in future the committee will follow those rules, the committee is going to follow the same rules in the current period. Moreover, in any pure-strategy equilibrium the private sector correctly anticipates the decision rules of the committee members. This implies that along the equilibrium path employment is at its natural level.[19]

DEFINITION OF EQUILIBRIUM: *A politico-economic equilibrium without commitment (**PEC**) is a proposal rule $G_p : X^2 \rightarrow X$, a voting rule $G_i : X^3 \rightarrow \{accept, reject\}$ for all voting representatives $i \in N$, an aggregate expectation rule $\Pi : X \rightarrow X$, and an individual expectation rule $\Pi_i^j : X \rightarrow X$ for all $i \in \overline{N}$ and $j \in [0, 1]$, such that:*

1. *for all $i \in \overline{N}$ and $j \in [0, 1]$, the expectation rule Π_i^j of consumer j in region i maximizes (3), for given strategies of the committee and for given Π;*

2. *for all $\varphi \in X^2$, the proposal rule G_p solves the right hand side of (5), given G_{-p} and given Π;*

3. *for all $\varphi \in X^2$ and for all proposals, all $i \in N$ use stage-undominated voting rules G_i, given the strategies of the other policy makers and given Π,*

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[19]Our equilibrium concept, which combines features of classical competitive analysis and game theory, bears some resemblance to Chang (1995) and Bassetto (2008).

$$\pi^e$$

	a	b
a	**3**	1.5
b	4	**2**

π

Figure 2: One-period Payoff

4. for all $i \in \overline{N}$ and $j \in [0,1]$, the individual expectation rule is consistent with the aggregate expectation rule: that is, $\Pi_i^j(\pi_{-1}) = \Pi(\pi_{-1})$, for all $\pi_{-1} \in X$.

4 Policy Making without Commitment

4.1 A Sketch of the Argument: Examples

This subsection considers simple policy games with a discrete policy space in order to provide the intuition behind our result. We will compare the traditional setup, where a single central banker has complete freedom to choose the inflation rate, to ours, where decisions are made by voting.

4.1.1 Traditional Setup

Consider an economy with a continuum of identical consumers. Inflation can only take two values: $\pi \in \{a, b\}$, where $a < b$. Consider the one-shot policy game between the central banker and the private sector. The timing of choices is as before. Consumers form expectations forecasting the inflation rate that the central banker will select. The payoffs to the central banker are shown in Figure 2. For example, 4 is the payoff of choosing b when the private sector expected a. Notice that the outcome $(b, \pi^e = a)$ is not a rational expectations equilibrium because consumers are not optimizing: given that b is expected and given that a is chosen by all other consumers, each infinitesimal agent would choose b to maximize his payoff. Since all consumers are alike, aggregate and individual expectations would be inconsistent. The only rational expectations equilibria (shown in bold) are $(b, \pi^e = b)$ and $(a, \pi^e = a)$. The Ramsey outcome is defined as the best equilibrium within this set. Note that in the absence

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$\pi^e=a$			$\pi^e=b$		
	P	M		P	M
a	3	2	a	1.5	0
b	4	5	b	2	3

Figure 3: One-period Payoffs to P and M

of commitment, the Ramsey outcome $(a, \pi^e = a)$ is not a subgame perfect equilibrium because the central banker would have an incentive to deviate and choose b when $\pi^e = a$. The only subgame perfect equilibrium is $(b, \pi^e = b)$. The difference $b - a > 0$ is the well-known inflation bias.

4.1.2 Our Setup

Suppose that decisions are made according to the protocol described in Section 3. For simplicity, in this example we assume that the committee includes only two members, P and M, bargaining over π, where $\pi \in \{a, b\}$. Policy maker P, the agenda setter, places a take-it-or-leave-it offer and M chooses whether to accept it or reject it. If the proposal is rejected, the status quo is maintained. Once a proposal is passed, the current policy becomes the status quo for the next voting game. Time is discrete and infinite. The payoffs are shown in Figure 3. Each matrix indicates the policy makers' payoffs for a given expected inflation. The two members have different ex ante preferred policies: a is the target inflation of P, while b is the target inflation of M. The matrices show that both P and M gain from generating unexpected inflation when $\pi^e = a$; they also show that generating unexpected deflation when $\pi^e = b$ is costly for both representatives.

Herein, we show that when the agenda setter is sufficiently patient, policy a is sustained by a politico-economic equilibrium. Consider the following stationary Markov strategy profile. First, we suppose that the private sector expects the current policy to be static:

$$\Pi(a) = a, \; \Pi(b) = b.$$

Second, we posit the following proposal strategy and acceptance sets for all pairs φ of status

quo policy and expected inflation:[20]

$$
G_P(\varphi) = \begin{cases} a \text{ if } \varphi = (a, a), \\ b \text{ if } \varphi = (b, b), \end{cases}
$$

$$
A(\varphi) = \begin{cases} \{a, b\} \text{ if } \varphi = (a, a), \\ \{b\} \text{ if } \varphi = (b, b). \end{cases}
$$

For instance, when π_{-1} and π^e are both equal to a, our strategy profile prescribes that P proposes a and M accepts policies a and b.

To see whether the above strategy profile is sustained by a PEC, we check that the proposal rule is perfect, the acceptance sets are optimal (that is, the voting rules are stage-undominated) and expectations are correct.

To prove that proposing a when $\varphi = (a, a)$ is perfect, we show that there are no profitable one-period deviations.[21] Note that a one-period deviation to b would be feasible since $b \in A(a, a)$. To decide whether or not to propose b, the agenda setter evaluates the cost and the benefit of betraying consumers. From our expectation rule, in the period that follows the deviation consumers correctly expect b.[22] Moreover, since $A(b, b)$ does not include policy a, member M is expected to veto any proposal that brings the inflation rate back to a. Therefore, this deviation introduces a long-run cost for the agenda setter. If $\delta \geq 1/2$ the long-run cost compensates the current benefit and, consequently, a is a static policy. The proposal $G_P(b, b) = b$ is perfect because a deviation to a is rejected. Next, we check that the acceptance sets are optimal given that the above profile describes what happens if the proposal is rejected. First, notice that when players use stage-undominated voting rules, the status quo is always accepted. This is why both acceptance sets contain the status quo. Moreover, accepting policy b when $\varphi = (a, a)$ is stage-undominated because it would cause an inflation surprise and move the

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[20]For brevity, we do not write down the strategies that are never played by the committee given the expectation rule that we have postulated. This is why we consider only two states: (a, a) and (b, b). We remind the reader that the first (second) component of φ denotes the current status quo (expected inflation).

[21]According to the One-Stage Deviation Principle, this is a sufficient requirement for Markov perfection since our game is continuous at infinity. See, for instance, Fudenberg and Tirole (1991, p. 108). Notice that after a one-period deviation the agenda setter conforms to the strategy profile described in the text.

[22]In our model, expectations correctly anticipate the outcome of the equilibrium strategy after any history, not just along the equilibrium path.

inflation rate permanently to b. On the other hand, accepting policy a when $\varphi = (b, b)$ is not stage-undominated because it would cause a (costly) deflation surprise and move the inflation rate permanently to a. Finally, notice that the private sector optimizes (i.e., expectations are correct).

We therefore conclude that when $\delta \geq 1/2$ policy a is sustained by a PEC. If the current status quo is equal to a, in all subsequent periods the committee will implement policy a despite the temptation of both policy makers to deviate to b. This result is obtained because P and M have opposite preferences on the equilibrium path: the fact that b is the ex ante preferred policy by M makes the threat of disagreement after the deviation credible. If b were not static, which amounts to saying that in equilibrium we would have $\Pi(b) = a$ and $G_P(b, a) = a$, one-period deviations from a would not be costly anymore and policy a could not be sustained by a PEC.

In the remainder of this section, we argue that policy a cannot be static when the committee is homogenous (that is, when the preferences of P and M are aligned) or when the default policy is not endogenous.

REMARK 1: Suppose that M has the same preferences as P. Policy a, which is now the optimal policy for the entire committee, cannot be sustained by a PEC even when $\delta \geq 1/2$.

Recall from the previous discussion that policy a is static only if b is static. To prove that policy a cannot be supported in a homogenous committee, we first show that for a sufficiently large δ policy b cannot be static when a is static. Indeed, suppose by way of contradiction that policies a and b are both static. We claim that there exists a profitable deviation. When b is the status quo and expectations are equal to b, the committee is tempted to generate a deflation surprise. This deviation, which is costly in the current period since both members obtain a payoff of 1.5 instead of 2, would change the state variable in the next period and permanently move the economy to a. When $\delta > 1/3$, the long-run benefit from deviating is greater than the short-run cost. Therefore, policy b cannot be static when δ is greater than $1/3$. Second, recall that even if b is static, policy a cannot be implemented when $\delta \leq 1/2$. Therefore, we conclude that the only rational expectations equilibrium is $(b, \pi^e = b)$ starting from any status quo. Intuitively, a committee where policy makers do not disagree on the optimal policy is equivalent to having a single legislator. Then we obtain the standard result in the literature: credibility problems arise.

REMARK 2: If the default policy is fixed, policy a cannot be sustained by a PEC.

To prove the above claim, consider a committee with heterogenous preferences, as in Figure 3, but assume that the default policy in case of disagreement is fixed and equal to a.[23] We show that b and a cannot be both static for sufficiently large δ. Indeed, suppose that a and b are both static and that b is the current status quo. Consider the following deviation. Instead of staying in b, a sufficiently patient agenda setter would propose policy a even if consumers expected b. Policy maker M dislikes moving to a, but cannot avoid the deflation surprise even if he rejects the proposal because a rejection implements the default policy a. As a result, in equilibrium b is not static and, consequently, policy a cannot be sustained by a PEC.

Before concluding this example, notice that committee decision making is not time consistent anymore if the voting game has a finite horizon. This happens since the proposal is pinned down in the last period T. At time T, a deviation to b is implemented, since changing the status quo is not costly anymore. At time $T-1$, the agenda setter knows that he will move the status quo at time T: consequently, a deviation to b becomes profitable; and so on, for all t.[24]

4.2 A Benchmark Case: The General Model with $\lambda = 0$

We now come back to the general model where the policy space is equal to the interval $[\pi_{\min}, \pi_{\max}]$ and proposals are passed by majority rule. As a benchmark, we start by considering the case when there are no incentives to surprise the private sector. Proposition 1 characterizes a politico-economic equilibrium for the dynamic game with $\lambda = 0$. To simplify the notation, for all status quo we write the proposal strategy $G_p(q, \Pi(q))$ as $G_p(q)$, knowing that in equilibrium expectations are correct: that is, $\Pi(q) = G_p(q, \Pi(q))$ for all q.

PROPOSITION 1: *Let $\lambda = 0$. The following proposal strategy $\mathcal{G}_p$ is sustained by a politico-economic equilibrium:*

$$\mathcal{G}_p(q) = \bar{\pi}_p, \; if \; q \in \left[\pi_{\min}, \bar{\pi}_p\right] \cup \left[2\bar{\pi}_m - \bar{\pi}_p, \pi_{\max}\right],$$

---

[23]If the default is fixed at b, policy a cannot be sustained either since the proposal $G_P(a,a) = a$ would be clearly rejected by M.

[24]Since in practice committee members have finite (and often staggered) terms of office, we are implicitly assuming that each committee member is replaced by another policy maker with the same preferences and that members care about policy outcomes that occur after the end of their mandates.
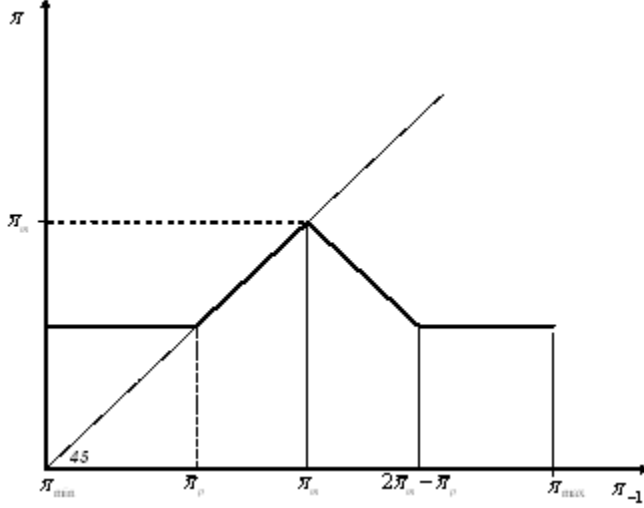
Figure 4: Proposal Rule when $\lambda = 0$

$$\mathcal{G}_p(q) = \bar{\pi}_m - \left| q - \bar{\pi}_m \right|, \; \mathit{if} \; q \in \left(\bar{\pi}_p, 2\bar{\pi}_m - \bar{\pi}_p \right).$$

In equilibrium, proposals are approved and expectations are rational.

Proof: See the Appendix.

The stationary proposal policy is shown in Figure 4. When the status quo belongs to the interval $\left[\bar{\pi}_p, \bar{\pi}_m \right]$, in any period the proposal coincides with the status quo policy. In other words, $\left[\bar{\pi}_p, \bar{\pi}_m \right]$ is an absorbing set. In this interval there is a deadlock: a majority of committee members would like to move the policy toward $\bar{\pi}_m$, but inflation rates above the status quo are not put on the agenda by p. A policy change can only occur when the status quo is sufficiently extreme. In particular, when q falls in the interval $\left(\bar{\pi}_m, 2\bar{\pi}_m - \bar{\pi}_p \right)$, the agenda setter chooses the policy closest to his ideal point subject to the constraint that the median will accept it. The constraint is binding in equilibrium. That is, the median will be indifferent between the status quo and the policy that p proposes. Since the utility of the median is symmetric, this proposal is equal to $2\bar{\pi}_m - q$, the reflection point of q with respect to $\bar{\pi}_m$. For the most extreme status quo policies, convergence to the agenda setter's ideal point is complete.

Note that the proposal policy that we have just discussed is identical to the one obtained by Romer and Rosenthal (1978), who analyzed the static version of our agenda-setting game.

This is not surprising since the profile described in Proposition 1 is independent from δ. In the dynamic voting game with $\lambda \in (0,1)$, this is not going to be true anymore.

4.3 The General Model with $\lambda \in (0,1)$

This section looks at the interesting case when policy makers have an incentive to deviate from their announcements. The next proposition characterizes the Markov perfect equilibrium of our dynamic voting game when $\lambda \in (0,1)$.

PROPOSITION 2: *Let $\lambda \in (0,1)$. Under Assumptions 1-2, there exists a $\bar{\delta} < 1$ such that the following proposal strategy $\mathcal{G}_p$ is sustained by a politico-economic equilibrium for all $\delta \geq \bar{\delta}$:*

$$\mathcal{G}_p(q) = \bar{\pi}_p + (1-\delta)\,\lambda(\bar{x}-\theta), \, if \, q \in \left[\pi_{\min}, \bar{\pi}_p + (1-\delta)\,\lambda(\bar{x}-\theta)\right) \cup \left(\tfrac{\bar{\pi}_p(\lambda-1)+2\bar{\pi}_m+\lambda((\lambda-1)(1-\delta)+2)(\bar{x}-\theta)}{\lambda+1}, \pi_{\max}\right],$$

$$\mathcal{G}_p(q) = q, \, if \, q \in \left[\bar{\pi}_p + (1-\delta)\,\lambda(\bar{x}-\theta), \bar{\pi}_m\right],$$

$$\mathcal{G}_p(q) = z, \, if \, q \in \left(\bar{\pi}_m, \bar{\pi}_m + \tfrac{2\lambda(\bar{x}-\theta)}{\lambda+1}\right),$$

where z is implicitly defined by the following condition

$$-\left(z-\bar{\pi}_p\right) - \lambda\left(\theta-\bar{x}\right) - \frac{\delta}{(1-\delta)}\frac{\lambda+1}{\lambda-1}\left(\frac{z(\lambda+1)-2\lambda(\bar{x}-\theta)-2\bar{\pi}_m}{\lambda-1} - \bar{\pi}_p\right) = 0,$$

$$\mathcal{G}_p(q) = \tfrac{q(\lambda+1)-2\lambda(\bar{x}-\theta)-2\bar{\pi}_m}{\lambda-1}, \, if \, q \in \left[\bar{\pi}_m + \tfrac{2\lambda(\bar{x}-\theta)}{\lambda+1}, \tfrac{\bar{\pi}_p(\lambda-1)+2\bar{\pi}_m+\lambda((\lambda-1)(1-\delta)+2)(\bar{x}-\theta)}{\lambda+1}\right].$$

In equilibrium, proposals are approved and expectations are rational.

Proof: See the Appendix.

Figure 5 depicts the proposal strategy. The set of stationary policies is given by the interval $\left[\bar{\pi}_p + (1-\delta)\,\lambda(\bar{x}-\theta), \bar{\pi}_m\right]$. This interval contains inflation rates that in absence of committees, are not time consistent. In particular, the institutional constraint allows p to sustain $\pi = \bar{\pi}_p + \lambda(1-\delta)(\bar{x}-\theta)$, an inflation rate lower than $\pi = \bar{\pi}_p + \lambda(\bar{x}-\theta)$, the equilibrium inflation in the standard Barro-Gordon model.[25] As $\delta \to 1$ the target inflation for p becomes time consistent, even when a commitment technology is not available.

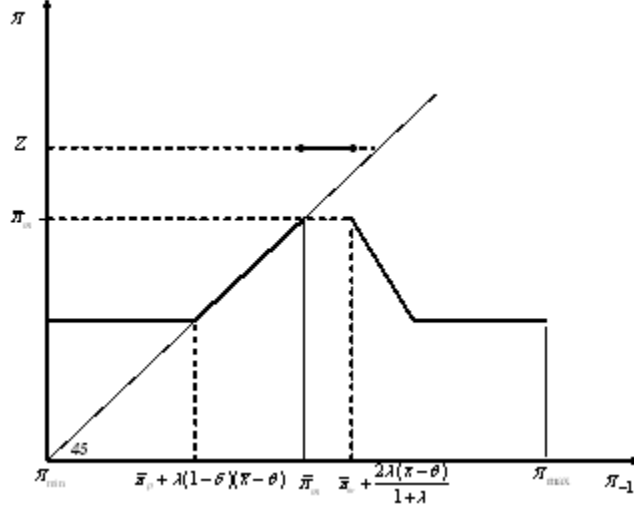[25] See, for instance, Persson and Tabellini (2000, p. 402).

Figure 5: Proposal Rule when $\lambda \in (0, 1)$

In our equilibrium, a steady state inflation rate is reached, at the latest, in two periods. Notice that when $q \in \left(\bar{\pi}_m, \bar{\pi}_m + 2\lambda(\bar{x} - \theta)/(\lambda + 1)\right)$ the convergence to the steady state is not monotonic. The committee first increases the inflation rate to policy z. Only when the status quo is sufficiently inefficient from the vantage point of the median and of the agenda setter, the committee can credibly lower the inflation rate to a policy smaller than $\bar{\pi}_m$. (Later in this section, we will discuss these dynamics in more details.) When q belongs to the intervals $\left[\pi_{\min}, \bar{\pi}_p + (1 - \delta)\lambda(\bar{x} - \theta)\right)$ and $\left[\bar{\pi}_m + 2\lambda(\bar{x} - \theta)/(\lambda + 1), \pi_{\max}\right]$, the convergence to the steady state is immediate. In the former case, the committee increases the inflation rate to $\bar{\pi}_p + (1 - \delta)\lambda(\bar{x} - \theta)$, the best stationary policy from the vantage point of the agenda setter. When the status quo is greater than $\bar{\pi}_m + 2\lambda(\bar{x} - \theta)/(\lambda + 1)$, the committee lowers the inflation rate. Note that the higher the initial status quo, the larger the inflation decrease that the agenda setter is able to impose to the rest of the committee. Eventually, when the status quo is sufficiently undesirable for most committee members, the agenda setter can propose $\bar{\pi}_p + (1 - \delta)\lambda(\bar{x} - \theta)$.

We now compare the proposal rules from Propositions 1 and 2. First, the interval of stationary inflation rates is now $\left[\bar{\pi}_p + (1 - \delta)\lambda(\bar{x} - \theta), \bar{\pi}_m\right]$ instead of $\left[\bar{\pi}_p, \bar{\pi}_m\right]$. Policies in the interval $\left[\bar{\pi}_p, \bar{\pi}_p + (1 - \delta)\lambda(\bar{x} - \theta)\right)$ are not static anymore because the long-run cost of an inflation surprise for p would be lower than the one-shot benefit in employment terms. Only after $\bar{\pi}_p + (1 - \delta)\lambda(\bar{x} - \theta)$ does the long-run cost of a deviation outweigh the short-term benefit. The

21

intuition for this result is similar to the one behind the example in Section 4.1.2.

The most notable differences with respect to the game with $\lambda = 0$ concern the proposal strategy for states above $\bar{\pi}_m$. When $q \geq \bar{\pi}_m + 2\lambda(\bar{x} - \theta)/(\lambda + 1)$, the agenda setter does not propose the reflection point of q with respect to $\bar{\pi}_m$. Proposals that are symmetric on opposite sides of $\bar{\pi}_m$ are not offered because the median would reject these proposals ex post, thus generating unexpected inflation. To make the median indifferent between accepting and rejecting, the agenda setter must offer a policy that is closer to $\bar{\pi}_m$ than q, thereby increasing the inflation cost of rejecting the proposal and decreasing the gain from the deviation.

Moreover, note that the proposal rule of Proposition 2 is discontinuous at $\bar{\pi}_m + 2\lambda(\bar{x} - \theta)/(\lambda + 1)$. When $q = \bar{\pi}_m + 2\lambda(\bar{x} - \theta)/(\lambda + 1)$, the proposal is $\bar{\pi}_m$. However, for status quo policies slightly lower than $\bar{\pi}_m + 2\lambda(\bar{x} - \theta)/(\lambda + 1)$, there are no proposals below the status quo that are acceptable to m: this implies that the agenda setter cannot propose an inflation decrease.[26] At the same time, it would not be an equilibrium strategy for the committee to stay at $\bar{\pi}_m + 2\lambda(\bar{x} - \theta)/(\lambda + 1)$. The argument is by contradiction. Suppose that policies $\bar{\pi}_m + 2\lambda(\bar{x} - \theta)/(\lambda + 1)$ and $\bar{\pi}_m$ are both static. Consider the following one-period deviation: when $\bar{\pi}_m + 2\lambda(\bar{x} - \theta)/(\lambda + 1)$ is the default, the agenda setter proposes policy $\bar{\pi}_m$ despite the fact that the private sector expects no change. This deviation generates a surprise *deflation* which is costly for both policy makers in the short run. However, when δ is sufficiently high this cost would be compensated for by staying at $\bar{\pi}_m$ forever. To summarize, we have argued that when $q \in (\bar{\pi}_m, \bar{\pi}_m + 2\lambda(\bar{x} - \theta)/(\lambda + 1))$, the committee cannot credibly pass an inflation decrease and, on the other hand, cannot keep the status quo unchanged. To resolve this impasse, the only remaining option would be for the committee to move to a higher inflation rate, from where an inflation decrease is credible. This is exactly what happens in our equilibrium strategy. When $q \in (\bar{\pi}_m, \bar{\pi}_m + 2\lambda(\bar{x} - \theta)/(\lambda + 1))$, the committee increases the inflation rate to policy z, even if this is costly in the current period for both the median and the agenda setter. It does so

---

[26]Indeed, assume by way of contradiction that when $q \in \left(\bar{\pi}_m, \bar{\pi}_m + \frac{2\lambda(\bar{x} - \theta)}{\lambda + 1}\right)$ there exists a Markov equilibrium where the agenda setter proposes, for example, $\bar{\pi}_m$. One can easily show that rejecting this proposal ex post is a profitable deviation for m. Notice in fact that this rejection, which generates an inflation surprise, has no long-run cost for the median. In the next period the state variable will be the same as of today because the status quo will not change. Then, since the proposal rule and the expectation rule are stationary, the agenda setter will still propose an inflation decrease.

because in the next period, when the status quo is equal to z, the committee will decrease the inflation rate. The reason for these dynamics is that only when the status quo is sufficiently undesirable, the committee can credibly lower the inflation rate.

The condition in Proposition 2 which defines z insures that the agenda setter does not want to generate an inflation surprise above z, which is costly by Assumption 1, in order to lower the steady state the committee will move to. At policy z the agenda setter achieves the optimal trade-off between the short-term cost of this deviation and the long-run benefit.[27]

The proof in the Appendix verifies that: (1) proposals are accepted by the committee; (2) expectations are correct; and (3) the agenda setter does not deviate from $\mathcal{G}_p$. To prove the latter point, one needs to check all possible one-period deviations from $\mathcal{G}_p$. Consider, for example, a policy in the interval $\left[\bar{\pi}_p + (1 - \delta)\lambda(\bar{x} - \theta), \bar{\pi}_m\right]$. To show that this policy is static, we verify that one-period deviations from this policy are either unprofitable for p or not accepted by the committee. First, we consider inflation surprises within the interval $\left[\bar{\pi}_p + (1 - \delta)\lambda(\bar{x} - \theta), \bar{\pi}_m\right]$. These deviations would be accepted by a majority of committee members, but they are not proposed in equilibrium because they are not profitable for the agenda setter: the long-run cost of moving permanently to a new absorbing state outweighs the one-shot benefit in employment terms. Second, the agenda setter may consider an inflation surprise above $\bar{\pi}_m$. Note that when the status quo is greater than $\bar{\pi}_m$ the threat of disagreement is not credible since the median and the agenda setter (the two key players in the committee) are willing to lower the inflation rate. A deviation above $\bar{\pi}_m$ results in a short-run cost for p (by Assumption 1), but it may allow the agenda setter to move the steady state to a policy closer to his ideal point. Is this proposal accepted by the median? In spite of a short-term benefit for the median (note that for m the inflation cost is not as large), this deviating proposal is necessarily costly for the median in the long run (a better steady state for the agenda setter is a worse steady state for the median). The proof verifies that the short-run benefit that m obtains by accepting this proposal is smaller than the long-run cost. After showing that all profitable deviations are rejected by the committee, we thus conclude that the strategy profile described in Proposition 2 is indeed a stationary Markov equilibrium.

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[27]The three terms in the condition that defines z are the marginal inflation cost of an inflation surprise, the current marginal benefit in terms of output, and the long-run inflation benefit, respectively. To compute the third term we use the posited proposal rule for states $q \geq \bar{\pi}_m + 2\lambda(\bar{x} - \theta)/(\lambda + 1)$.

4.4 A Case for Selecting a Liberal Agenda Setter

In this section, we will argue that committee decision making may help implement the utilitarian optimum for the currency area, which we denote by π^U. In Section 4.3, we characterized the interval of static policies. If the utilitarian optimum belongs to that interval, a Grand Planner would be able to implement π^U by choosing π^U as the initial status quo and by selecting an agenda setter who is more conservative than the median. However, π^U may not be a static policy according to Proposition 2; typically, this occurs when $\pi^U > \bar{\pi}_m$. In this case, we will argue below that in order to implement π^U, the Grand Planner has to choose an agenda setter that is more liberal than the median and select π^U as the initial status quo. To simplify the characterization of the equilibrium, we assume that the ex ante optimal policy of the agenda setter is $\pi_{\max}$, the maximal inflation rate. The following assumption replaces Assumption 1.

ASSUMPTION 3: *Suppose that there exists an individual $\widehat{p}$ whose target inflation is $\bar{\bar{\pi}}_{\widehat{p}} = \pi_{\max}$, with $\bar{\bar{\pi}}_{\widehat{p}} > \bar{\pi}_m + [1 + \delta + \lambda(1-\delta)] \lambda(\bar{x} - \theta)/(\lambda+1)$. Policy maker $\widehat{p}$ is chosen to be the agenda setter.*

Proposition 3 posits a PEC for the game with $\widehat{p}$ as agenda setter.

PROPOSITION 3: *Let $\lambda \in (0,1)$. Under Assumptions 2-3, the following proposal strategy $\mathcal{G}_{\widehat{p}}$ is sustained by a PEC:*

$$\mathcal{G}_{\widehat{p}}(q) = \bar{\bar{\pi}}_{\widehat{p}}, \; if \; q \in \left[\pi_{\min}, \bar{\pi}_m + (1-\delta)\lambda(\bar{x}-\theta)\right),$$

$$\mathcal{G}_{\widehat{p}}(q) = q, \; if \; q \in \left[\bar{\pi}_m + (1-\delta)\lambda(\bar{x}-\theta), \pi_{\max}\right].$$

In equilibrium, proposals are approved and expectations are rational.

Proof: See the Appendix.

The proposal rule $\mathcal{G}_{\widehat{p}}$ is depicted in Figure 6. Note that all policies greater than $\bar{\pi}_m + (1-\delta)\lambda(\bar{x}-\theta)$ are static (i.e., they are on the 45-degree line). In Section 4.3, we showed that any policy in the interval $\left[\bar{\pi}_p + (1-\delta)\lambda(\bar{x}-\theta), \bar{\pi}_m\right]$ is sustained by a PEC because the agenda setter is not willing to propose a deviation. When $\pi^U \in \left[\bar{\pi}_m + (1-\delta)\lambda(\bar{x}-\theta), \pi_{\max}\right]$ and Assumption 3 holds, the median, not the agenda setter, trades-off the benefit of a deviation
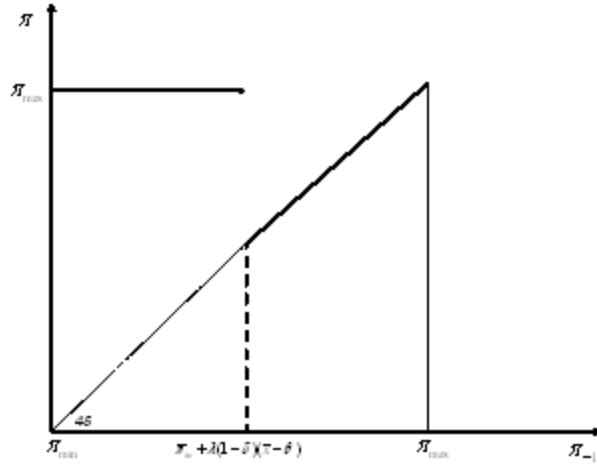
24

Figure 6: Proposal Rule of a Liberal Agenda Setter.

from π^U versus the cost of remaining with the policy implemented after the one-period deviation. If $\pi^U > \bar{\pi}_m + \lambda(1 - \delta)(\bar{x} - \theta)$, the short-run gain from the deviation does not compensate the median for the long-run inflation cost. Although deviations from π^U are profitable for the agenda setter in the short term as well as in the long term, these deviations are not proposed since they would be rejected by the committee. Finally, when $q < \bar{\pi}_m + (1 - \delta) \lambda(\bar{x} - \theta)$ the agenda setter obtains his preferred policy.[28]

This section reinforces the conclusion that commitment does not arise from having a conservative proposer, but from the separation of powers between the median, who can veto a policy change, and the agenda setter, who controls the agenda.

5 Conclusion

Our paper offers a rationale for delegating monetary policy to a committee dominated by a strong chairman, who controls the agenda but is constrained to put his proposal to a vote. We show that joining a committee by maintaining a strong agenda-setting power is a way for a decision maker to commit to a policy that in absence of committees is not time consistent. This result is observed because deviations from the optimal plan may irreversibly alter, *via* the

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[28]Whenever expectations move up before the voting game, the agenda setter is in a good bargaining position because a rejection of his proposal would cause a costly deflation surprise. This explains why the agenda setter is able to propose his ideal policy.

endogenous status quo, the bargaining power in future voting games. Taking future cost into account, the agenda setter is not willing to deviate from his ex ante optimal policy.

It is important to note that the disciplinary role of the status quo is effective only when the committee is composed of members with different ex ante preferred policies. Having a heterogenous committee is desirable in our model because it makes the threat of disagreement after a deviation credible and, consequently, may deter deviations from the ex ante optimal policy. To the best of our knowledge, this finding is an original contribution of this paper. However, if we were to design a committee in practice, some caution would be in order as the benefit of polarization should be put in balance with its possible costs, such as greater status quo bias in response to changing economic conditions and more difficult information aggregation.[29]

Throughout this paper, we have focused on policy making in monetary committees. We expect that the main intuition underlying our results would continue to hold in other contexts where credibility problems arise. For example, one could study a model of legislative bargaining in which policy makers vote over the current capital tax. As it is well known (see, for example, Fisher, 1980), the optimal tax on capital under commitment is not, in general, time consistent. This application is likely, however, to present a few challenges. First, the model would be less tractable because besides the political state variable (the status quo), strategies would also depend on the economic state variable (the current level of capital). Moreover, the optimal policy under commitment will not, in general, be constant over time, but will depend on the stock of capital.

We conclude by indicating a possible direction for future research. It may be reasonable to introduce uncertainty in our model. For instance, we could suppose that shocks change the ex ante optimal policy of each committee member. In this case, uncertainty would change the trade-off between the short-run benefit and the long-run cost of surprising the public, thereby affecting the set of time consistent policies. Moreover, uncertainty may concern the distribution of power within the committee (e.g., the identity of the agenda setter). It has been said that trigger strategy and "reputation models ... overexplain good outcomes" (Phelan, 2003), since they predict that good policies will always be implemented. Introducing uncertainty might

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[29]There is now a growing literature on information sharing in heterogenous committees. Coughlan (2000) shows that when committee members have different biases and these biases are known, full information aggregation is problematic. See, also, Austen-Smith and Feddersen (2006) and Gerardi and Yariv (2007).

then explain why governments seem to break promises unpredictably. For now, we leave this extension to future research.

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APPENDIX

A.1

Before proving Propositions 1,2 and 3, we show that the median is decisive, in the sense that a proposal is passed if and only if the median accepts it. First, we prove the following lemma:[30]

LEMMA 1: *Let $\{\widetilde{\pi}_s\}_{s=t}^{\infty}$ and $\{\widehat{\pi}_s\}_{s=t}^{\infty}$ be two policy sequences starting from an arbitrary time t and for an arbitrary π_t^e. The difference between the utilities associated to the two sequences is a monotone function of $\overline{\pi}_i$.*

PROOF OF LEMMA 1: To begin with, notice that subsequent expectations from time $t+1$ onwards coincide with the actual inflation rate because expectations correctly anticipate the equilibrium outcome after any history, not just along the equilibrium path. We write down the payoff associated to the sequence $\{\widetilde{\pi}_s\}_{s=t}^{\infty}$:

$$w_i(\widetilde{\pi}_t, \pi_t^e) + \sum_{s=t+1}^{\infty} \delta^s w_i(\widetilde{\pi}_s, \Pi(\widetilde{\pi}_{s-1}))$$

$$= -0.5(\theta + \widetilde{\pi}_t - \pi_t^e - \overline{x})^2 - 0.5 \sum_{s=t}^{\infty} \delta^s (\widetilde{\pi}_s - \overline{\pi}_i)^2 - 0.5 \sum_{s=t+1}^{\infty} \delta^s (\theta - \overline{x})^2.$$

The payoff associated to the sequence $\{\widehat{\pi}_s\}_{s=t}^{\infty}$ is

$$w_i(\widehat{\pi}_t, \pi_t^e) + \sum_{s=t+1}^{\infty} \delta^s w_i(\widehat{\pi}_s, \Pi(\widehat{\pi}_{s-1}))$$

$$= -0.5(\theta + \widehat{\pi}_t - \pi_t^e - \overline{x})^2 - 0.5 \sum_{s=t}^{\infty} \delta^s (\widehat{\pi}_s - \overline{\pi}_i)^2 - 0.5 \sum_{s=t+1}^{\infty} \delta^s (\theta - \overline{x})^2.$$

The derivative with respect to $\overline{\pi}_i$ of the difference of the two expressions is

$$\sum_{s=t}^{\infty} \delta^s (\widehat{\pi}_s - \widetilde{\pi}_s).$$

Since the derivative does not depend on $\overline{\pi}_i$, it follows that the difference in utility among any two sequences is monotone in $\overline{\pi}_i$. $\square$

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[30]I am grateful to an anonymous referee for suggesting this Lemma, which shortened the original proofs.

We can now prove that the median is decisive.

PROPOSITION A1: *A proposal is accepted if and only if it is accepted by the median.*

PROOF OF PROPOSITION A1: Let G_p denote the proposal rule that all voting representatives expect from the agenda setter. The current proposal is denoted by x. First, notice that, knowing G_p, each voting representative is able to foresee all the policies that the committee will implement if the current proposal is passed. The utility associated to this sequence is compared to the one obtained if the current status quo is kept for one more period. We now prove our proposition. Suppose that the median accepts proposal x. Then, by Lemma 1, all committee members that are either to the right or to the left of m also accept x. Therefore, since m is the median, the proposal is passed. The "only if" part is equally straightforward. Indeed, suppose by way of contradiction that the majority of members that accept a proposal does not include the median. This clearly contradicts Lemma 1.

A.2   PROOF OF PROPOSITION 1

PROOF OF PROPOSITION 1:

Step 1: For all $q \in X$, $\mathcal{G}_p(q)$ is accepted by a majority of committee members.

Proposals when $q \in \left[\pi_{\min}, \bar{\pi}_p\right)$ are approved by (at least) all policy makers i with $\bar{\pi}_i \geq \bar{\pi}_p$. Proposals when $q \in \left[\bar{\pi}_p, \bar{\pi}_m\right]$ are accepted by the entire committee simply because the current proposal coincides with the status quo. If $q \in \left(\bar{\pi}_m, \pi_{\max}\right]$, the coalition that approves the proposal $\mathcal{G}_p(q)$ includes all policy makers i with $i \leq m$.

We now check that there are no profitable deviations from the proposal strategy $\mathcal{G}_p$. Exploiting the one-shot deviation principle, we consider one period deviations from $\mathcal{G}_p$ and assume that, in the continuation game following a deviation, the committee plays according to the posited strategy profile $\mathcal{G}_p$.

Step 2: There are no profitable deviations from $\mathcal{G}_p$ if $q \in \left[\pi_{\min}, \bar{\pi}_p\right] \cup \left[2\bar{\pi}_m - \bar{\pi}_p, \pi_{\max}\right].$

If $q \in \left[\pi_{\min}, \bar{\pi}_p\right] \cup \left[2\bar{\pi}_m - \bar{\pi}_p, \pi_{\max}\right]$, the proposal is $\bar{\pi}_p$. Clearly, the agenda setter cannot improve upon that.

29

Step 3: There are no profitable deviations from $\mathcal{G}_p$ if $q \in (\bar{\pi}_p, 2\bar{\pi}_m - \bar{\pi}_p)$.

Let x denote a deviating proposal. The only deviations that would increase, for sufficiently large δ, the payoff to the agenda setter are deviations to the interval $(2\bar{\pi}_m - q, \pi_{\max}]$. These deviations, while costly in the short run for the agenda setter, are beneficial in the long run since they lower the steady state. Consider the policy sequence induced by x: $\{x, \mathcal{G}_p(x), \mathcal{G}_p(\mathcal{G}_p(x)), ...\}$. This sequence is compared by the committee to $\{q, \mathcal{G}_p(q), \mathcal{G}_p(\mathcal{G}_p(q)), ...\}$. Notice that the median clearly rejects deviations to $(2\bar{\pi}_m - q, \pi_{\max}]$. It follows from Proposition A1 that these proposals are not passed.

Therefore, we conclude that the strategy profile described in Proposition 1 is a PEC. $\square$

A.3 PROOF OF PROPOSITION 2

Before analyzing the dynamic game and proving Proposition 2, we make a few statements concerning the static game.

LEMMA 2: *Suppose that expectations are equal to q. Betraying private expectations and implementing policy x is weakly profitable for policy maker i in the current period if and only if $x \in \left[q, q + \frac{2\lambda(\bar{x}-\theta)-2(q-\bar{\pi}_i)}{1+\lambda}\right]$.*

PROOF OF LEMMA 2: Assume $\pi^e = q$. We are looking for all proposals that make betraying private expectations profitable in the one-shot game. That is, we look for all the $x \in X$ that satisfy the following inequality:

$$-0.5[\left(x - \bar{\pi}_i\right)^2 + \lambda\left(\theta - \bar{x} + x - q\right)^2] \geq -0.5[\left(q - \bar{\pi}_i\right)^2 + \lambda\left(\theta - \bar{x}\right)^2].$$

The left-hand side is the (current-period) utility of deviating from $\pi^e = q$, while the right-hand side is the (current-period) utility of not betraying private expectations. Since the left hand side is concave in x, the set of profitable deviating proposals is the interval between the two solutions of the polynomial, q and $q + \frac{2\lambda(\bar{x}-\theta)-2(q-\bar{\pi}_i)}{1+\lambda}$. Furthermore, notice that betraying private expectations is costly when $x \notin \left[q, q + \frac{2\lambda(\bar{x}-\theta)-2(q-\bar{\pi}_i)}{1+\lambda}\right]$. □

The expression $\frac{2\lambda(\bar{x}-\theta)-2(q-\bar{\pi}_i)}{1+\lambda}$ is the size of the largest profitable deviation from $\pi^e = q$. Notice that this expression can be negative: that is, i can gain from a deflation surprise.

COROLLARY 1: *Let $\pi^e = q$. If $\pi^e < \bar{\pi}_i + \lambda(\bar{x} - \theta)$, then policy maker i gains in the current period by generating surprise inflation. If $\pi^e > \bar{\pi}_i + \lambda(\bar{x} - \theta)$, then policy maker i gains from a deflation surprise. If $\pi^e = \bar{\pi}_i + \lambda(\bar{x} - \theta)$, no deviation is profitable in the current period.*

Another way of reading the previous corollary is that $\pi^e = \bar{\pi}_i + \lambda(\bar{x} - \theta)$ is the Nash equilibrium in the one-shot game.

Recall that by Assumption 1 we have $\bar{\pi}_p > \bar{\pi}_m$. We show that the distance between $\bar{\pi}_p$ and $\bar{\pi}_m$ is such that when $\pi^e \in \left[\bar{\pi}_p + (1 - \delta)\lambda(\bar{x} - \theta), \bar{\pi}_m\right]$ and $\pi^e = q$, the agenda setter does not gain *in the current period* by proposing an inflation rate greater than $\bar{\pi}_m$.

COROLLARY 2: *Let $q \in \left[\bar{\bar{\pi}}_p + (1 - \delta)\lambda(\bar{x} - \theta), \bar{\pi}_m\right]$ and $\pi^e = q$, the agenda setter suffers a utility loss in the current period by implementing a policy strictly greater than $\bar{\pi}_m$.*

PROOF OF COROLLARY 2: First, notice that $q + \frac{2\lambda(\bar{x}-\theta)-2(q-\bar{\pi}_i)}{1+\lambda}$, the largest profitable deviation found in Lemma 2, is decreasing in q given that $\lambda \in (0, 1)$. As a result, to prove Corollary 2 it is enough to check that the largest profitable deviation is smaller than or equal to $\bar{\pi}_m$ when the status quo is $\bar{\bar{\pi}}_p + (1 - \delta)\lambda(\bar{x} - \theta)$, the smallest state in the interval. This follows from Assumption 1. $\square$

COROLLARY 3: *Let $\pi^e = \frac{q(\lambda+1)-2\lambda(\bar{x}-\theta)-2\bar{\pi}_i}{\lambda-1} < q$, where q is the current status quo. Policy maker i is indifferent between keeping the status quo (thereby generating unexpected inflation $q-\pi^e > 0$) and confirming expectations by choosing π^e.*

PROOF OF COROLLARY 3: This is just the flip-side of Lemma 2. In fact, when $\pi^e = \frac{q(\lambda+1)-2\lambda(\bar{x}-\theta)-2\bar{\pi}_i}{\lambda-1}$ the largest possible deviation is q itself, which gives i the same utility as choosing π^e. $\square$

It follows from Lemma 2 that all proposals $x \notin \left[\frac{q(\lambda+1)-2\lambda(\bar{x}-\theta)-2\bar{\pi}_i}{\lambda-1}, q\right]$ give i a strictly lower utility than π^e.

PROOF OF PROPOSITION 2: First, we verify that $\mathcal{G}_p$ is accepted by $\frac{n+1}{2}$ representatives.

Step 1: For all $q \in X$, we show that $\mathcal{G}_p(q)$ is passed by the committee.

When $q \in \left[\pi_{\min}, \bar{\bar{\pi}}_p + (1 - \delta)\lambda(\bar{x} - \theta)\right)$ the median does not reject $\mathcal{G}_p(q)$ because a rejection would have an employment cost (due to the surprise deflation) as well as an inflation cost. When $q \in \left[\bar{\bar{\pi}}_p + (1 - \delta)\lambda(\bar{x} - \theta), \bar{\pi}_m\right]$ the agenda setter proposes the status quo. In this interval, proposals are approved by all representatives since a rejection is equivalent to an acceptance. When $q \in \left(\bar{\pi}_m, \bar{\pi}_m + \frac{2\lambda(\bar{x}-\theta)}{\lambda+1}\right)$, the committee accepts $\mathcal{G}_p(q)$ to remain in office. This follows from Assumption 2 after choosing $\chi = z - \bar{\pi}_m - \frac{2\lambda(\bar{x}-\theta)}{\lambda+1}$. Finally, when $q \in \left[\bar{\pi}_m + \frac{2\lambda(\bar{x}-\theta)}{\lambda+1}, \pi_{\max}\right]$ the median has no incentive to reject $\mathcal{G}_p(q)$ according to Corollary 3.

In the remaining steps, we will check that the agenda setter does not deviate from the proposal strategy $\mathcal{G}_p$. Each step focuses on a particular subset of the state space. However, for

32

each subset we will consider deviations to the *entire* policy space. As before, we will assume that in the continuation game following a deviation the committee plays according to the posited strategy profile $\mathcal{G}_p$.

Step 2: There are no profitable deviations for the agenda setter when $q \in \left[\pi_{\min}, \bar{\pi}_p + (1 - \delta) \lambda (\bar{x} - \theta) \right]$.

For all $q \in \left[\pi_{\min}, \bar{\pi}_p + (1 - \delta) \lambda (\bar{x} - \theta) \right]$, the posited proposal is $\bar{\pi}_p + (1 - \delta) \lambda (\bar{x} - \theta)$.

Deviations to inflation rates lower than $\bar{\pi}_p + (1 - \delta) \lambda (\bar{x} - \theta)$ are not profitable for the agenda setter. In fact, notice that these deviations have no cost in the long run, since in the next period according to $\mathcal{G}_p$ the outcome will be $\bar{\pi}_p + (1 - \delta) \lambda (\bar{x} - \theta)$, but they have a cost in the short run by Lemma 2.

We consider deviations inside the interval $\left(\bar{\pi}_p + (1 - \delta) \lambda (\bar{x} - \theta), \bar{\pi}_m \right]$. We write down the intertemporal utility of p on the interval $\left[\bar{\pi}_p + (1 - \delta) \lambda (\bar{x} - \theta), \bar{\pi}_m \right]$ as a function of the proposal x (assuming that $\mathcal{G}_p$ is played in the continuation game):

$$-0.5[\left(x - \bar{\pi}_p \right)^2 + \lambda \left(\theta - \bar{x} + x - \pi^e \right)^2] - \frac{\delta}{(1 - \delta)} 0.5[\left(x - \bar{\pi}_p \right)^2 + \lambda \left(\theta - \bar{x} \right)^2].$$

If the committee chooses $x \in \left(\bar{\pi}_p + (1 - \delta) \lambda (\bar{x} - \theta), \bar{\pi}_m \right]$ instead of $\bar{\pi}_p + (1 - \delta) \lambda (\bar{x} - \theta)$, in the current period there is a benefit in employment terms, as far as $x - \pi^e < 2 \left(\bar{x} - \theta \right)$. Notice that the employment boost only occurs in this period, since we assume that expectations correctly anticipate the equilibrium outcome after any history (not just along the equilibrium path). Moreover, deviating inside the interval $\left(\bar{\pi}_p + (1 - \delta) \lambda (\bar{x} - \theta), \bar{\pi}_m \right]$ causes a permanent inflation cost, because the deviation moves toward static policies. When $\pi^e = \bar{\pi}_p + (1 - \delta) \lambda (\bar{x} - \theta)$ the intertemporal utility is decreasing on the interval $\left[\bar{\pi}_p + (1 - \delta) \lambda (\bar{x} - \theta), \bar{\pi}_m \right]$. This is why deviations to that interval are not profitable. Finally, deviations to the interval $\left(\bar{\pi}_m, \pi_{\max} \right]$ are not profitable either. They have a short-run cost for p from Corollary 2. Moreover, they do not benefit p in the long run: in the very best scenario for p, the committee moves back to $\bar{\pi}_p + (1 - \delta) \lambda (\bar{x} - \theta)$.

Step 3: There exists a $\bar{\delta}_1 < 1$, such that for all $\delta \geq \bar{\delta}_1$ there are no profitable deviations when $q \in \left(\bar{\pi}_p + (1 - \delta) \lambda (\bar{x} - \theta), \bar{\pi}_m \right]$.

We consider different cases.

Step 3.1: The agenda setter does not deviate to the interval $\left[\pi_{\min}, \bar{\pi}_m\right).$

According to $\mathcal{G}_p$ the status quo is proposed. Deviations to policies strictly lower than q are profitable for p, since they lower the steady state inflation rate. However, they would be rejected by m, since they cause a drop in employment as well as a permanent decrease of the equilibrium inflation rate: as a result, they are not proposed. Deviations to the interval $\left(q, \bar{\pi}_m\right]$ are not proposed, since the intertemporal utility of p as a function of x, as we saw in the previous step, is decreasing on the interval $\left(\bar{\pi}_p + (1-\delta)\lambda(\bar{x}-\theta), \bar{\pi}_m\right].$

Step 3.2: There exists a $\bar{\delta}_1 < 1$, such that for all $\delta \geq \bar{\delta}_1$ there are no profitable deviations to the interval $\left(\bar{\pi}_m, \bar{\pi}_m + \frac{2\lambda(\bar{x}-\theta)}{\lambda+1}\right).$

Consider a deviation x belonging to the interval $\left(\bar{\pi}_m, \bar{\pi}_m + \frac{2\lambda(\bar{x}-\theta)}{\lambda+1}\right)$. After such a deviation, $\mathcal{G}_p$ prescribes that the committee will move up to z (recall that z was defined in Proposition 2) for one period and move back to $\mathcal{G}_p(z) = \frac{z(\lambda+1)-2\lambda(\bar{x}-\theta)-2\bar{\pi}_m}{\lambda-1}$ in two periods. Let $C_i(x,q)$ denote the net utility for central banker i from deviation x when the status quo is q and $\pi^e = q$. That is, for all $x \in \left(\bar{\pi}_m, \bar{\pi}_m + \frac{2\lambda(\bar{x}-\theta)}{\lambda+1}\right)$ and $q \in \left(\bar{\pi}_p + (1-\delta)\lambda(\bar{x}-\theta), \bar{\pi}_m\right]$,

$$C_i(x,q) = w_i(x,q) + \delta w_i(z,z) - (1+\delta)w_i(q,q).$$

For brevity, we write C_i instead of $C_i(x,q)$. Notice that $C_p < 0$ since the deviation is costly in the short run for p by Corollary 2. The agenda setter deviates to x if and only if the current status quo q satisfies

$$(q - \bar{\pi}_p)^2 > (\mathcal{G}_p(z) - \bar{\pi}_p)^2 - \frac{1-\delta}{\delta^2}C_p. \tag{A.1}$$

After solving the above inequality, we obtain that a deviation is profitable if and only if q belongs to the interval $\left(\bar{\pi}_p + \sqrt{\phi_P}, \bar{\pi}_m\right]$ where $\phi_P = (\mathcal{G}_p(z) - \bar{\pi}_p)^2 - \frac{1-\delta}{\delta^2}C_p.$

The median accepts deviation x if and only if q satisfies

$$(q - \bar{\pi}_m)^2 \geq (\mathcal{G}_p(z) - \bar{\pi}_m)^2 - \frac{1-\delta}{\delta^2}C_m. \tag{A.2}$$

We solve the above inequality and obtain that m accepts the deviation if and only if $q \in \left[\mathcal{G}_p(z), \bar{\pi}_m - \sqrt{\phi_m}\right]$, where $\phi_m = (\mathcal{G}_p(z) - \bar{\pi}_m)^2 - \frac{1-\delta}{\delta^2}C_m$. To prove Step 3.2 we need to show that the intervals $\left[\mathcal{G}_p(z), \bar{\pi}_m - \sqrt{\phi_m}\right]$ and $\left(\bar{\pi}_p + \sqrt{\phi_P}, \bar{\pi}_m\right]$ do not intersect. In other words, we must show that $\bar{\pi}_p + \sqrt{\phi_P} > \bar{\pi}_m - \sqrt{\phi_m}.$

Note that z depends on δ. Moreover, the limit of $\mathcal{G}_p(z)$ goes to $\bar{\bar{\pi}}_p$ when $\delta \to 1$. At the limit, as δ goes to 1, the median accepts deviation x only if $q = \bar{\bar{\pi}}_p$, while the agenda setter deviates only if $q \in \left(\bar{\bar{\pi}}_p, \bar{\bar{\pi}}_m\right]$. Then, the two intervals do not intersect at the limit. We find the derivatives of $\bar{\bar{\pi}}_p + \sqrt{\phi_P}$ and $\bar{\bar{\pi}}_m - \sqrt{\phi_m}$ with respect to δ and take their limit as δ goes to 1:

$$\lim_{\delta \to 1} \frac{\partial \left(\bar{\bar{\pi}}_p + \sqrt{\phi_P}\right)}{\partial \delta} = \frac{1}{2} \left(0\right)^{-1/2} \left(C_p\right) = -\infty.$$

$$\lim_{\delta \to 1} \frac{\partial \left(\bar{\bar{\pi}}_m - \sqrt{\phi_m}\right)}{\partial \delta} = -\frac{1}{2} \left(\left(\bar{\bar{\pi}}_p - \bar{\bar{\pi}}_m\right)^2\right)^{-1/2} \left(C_m\right) > -\infty.$$

This implies that there is a $\bar{\delta}_1 < 1$ such that for all $\delta \geq \bar{\delta}_1$ we have $\bar{\bar{\pi}}_p + \sqrt{\phi_P} > \bar{\bar{\pi}}_m - \sqrt{\phi_m}$. As a result, for sufficiently large δ deviations to the interval $\left(\bar{\bar{\pi}}_m, \bar{\bar{\pi}}_m + \frac{2\lambda(\bar{x}-\theta)}{\lambda+1}\right)$ are not feasible.

Step 3.3: The agenda setter does not deviate to $\left(\bar{\bar{\pi}}_m + \frac{2\lambda(\bar{x}-\theta)}{\lambda+1}, \pi_{\max}\right]$.

These deviations are profitable in the long run for the agenda setter only if p proposes a policy $x > q + \frac{2\lambda(\bar{x}-\theta)-2(q-\bar{\bar{\pi}}_m)}{1+\lambda}$. Compared to Case 2, it is easy to show that these deviations are rejected by m: they have a long-run cost for policy maker m as well as a short-run cost (by Lemma 2).

Step 4: There exists a $\bar{\delta}_2 < 1$, such that for all $\delta \geq \bar{\delta}_2$ there are no profitable deviations when
$$q \in \left(\bar{\bar{\pi}}_m, \bar{\bar{\pi}}_m + \frac{2\lambda(\bar{x}-\theta)}{\lambda+1}\right).$$

According to our proposal rule, expectations move to z. We must show that the committee actually chooses z. Fist, we write down the intertemporal utility of p on the interval $\left[\bar{\bar{\pi}}_m + \frac{2\lambda(\bar{x}-\theta)}{\lambda+1}, \frac{\bar{\bar{\pi}}_p(\lambda-1)+2\bar{\bar{\pi}}_m+\lambda((\lambda-1)(1-\delta)+2)(\bar{x}-\theta)}{\lambda+1}\right]$ for a given π^e and knowing that in the next period the committee will move to $\mathcal{G}_p(x) = \frac{x(\lambda+1)-2\lambda(\bar{x}-\theta)-2\bar{\bar{\pi}}_m}{\lambda-1}$:

$$-0.5[\left(x - \bar{\bar{\pi}}_p\right)^2 + \lambda \left(\theta - \bar{x} + x - \pi^e\right)^2] - \frac{\delta}{(1-\delta)} 0.5[\left(\mathcal{G}_p(x) - \bar{\bar{\pi}}_p\right)^2 + \lambda \left(\theta - \bar{x}\right)^2].$$

We can verify that z maximizes the above expression when $\pi^e = z$. At policy z the agenda setter achieves the optimal trade-off between the short-term cost and the long-run benefit of an inflation surprise. This implies that deviations to the interval $\left[\bar{\bar{\pi}}_m + \frac{2\lambda(\bar{x}-\theta)}{\lambda+1}, \pi_{\max}\right]$ are not proposed. We are left to show that deviations to the interval $\left[\pi_{\min}, \bar{\bar{\pi}}_m + \frac{2\lambda(\bar{x}-\theta)}{\lambda+1}\right)$ are not profitable. To prove this, assume that $\delta \geq \bar{\delta}_2$, where $\bar{\delta}_2$ is sufficiently large so that $z > \bar{\bar{\pi}}_m - \frac{2\lambda(\bar{x}-\theta)}{\lambda+1}$. Then, choose $\chi = z - \bar{\bar{\pi}}_m - \frac{2\lambda(\bar{x}-\theta)}{\lambda+1}$. Assumption 2 guarantees that the agenda setter, to avoid the replacement cost B, does not deviate to the interval $\left[\pi_{\min}, \bar{\bar{\pi}}_m + \frac{2\lambda(\bar{x}-\theta)}{\lambda+1}\right)$.

Step 5: *There are no profitable deviations when* $q \in \left[\bar{\pi}_m + \frac{2\lambda(\bar{x}-\theta)}{\lambda+1}, \frac{\bar{\pi}_p(\lambda-1)+2\bar{\pi}_m+\lambda((\lambda-1)(1-\delta)+2)(\bar{x}-\theta)}{\lambda+1} \right].$

In this interval the agenda setter is supposed to propose $\mathcal{G}_p(q) = \frac{q(\lambda+1)-2\lambda(\bar{x}-\theta)-2\bar{\pi}_m}{\lambda-1} \leq \bar{\pi}_m.$ A profitable deviation for p would be to propose $x \in (q, \pi_{\max}].$ These deviations are rejected by m by Lemma 2.

Step 6: *We check that there are no profitable deviations when* $q \in \left(\frac{\bar{\pi}_p(\lambda-1)+2\bar{\pi}_m+\lambda((\lambda-1)(1-\delta)+2)(\bar{x}-\theta)}{\lambda+1}, \pi_{\max} \right].$

In this interval, the agenda setter is supposed to propose $\pi^e = \bar{\pi}_p + (1-\delta)\lambda(\bar{x}-\theta).$ Proving this step is equivalent to proving Step 2, which showed that p has no incentive to deviate when $\pi^e = \bar{\pi}_p + (1-\delta)\lambda(\bar{x}-\theta).$

The steps above imply that the strategy profile described in Proposition 2 is a PEC for all $\delta \geq \max\left\{\bar{\delta}_1, \bar{\delta}_2\right\}$ □

A.4 PROOF OF PROPOSITION 3

Step 1: *We show that for all* q, $\mathcal{G}_{\hat{p}}(q)$ *is passed by the committee.*

For $q \in \left[\pi_{\min}, \bar{\pi}_m + (1-\delta)\lambda(\bar{x}-\theta) \right)$ the proposal is accepted (at least) by all $i \geq m$ by Assumption 2. When $q \in \left[\bar{\pi}_m + (1-\delta)\lambda(\bar{x}-\theta), \pi_{\max} \right]$ proposal $\mathcal{G}_{\hat{p}}(q)$ is accepted by all policy makers.

Step 2: *We show that the agenda setter does not want to deviate from* $\mathcal{G}_{\hat{p}}(q).$

First, we consider the incentive to deviate from $\mathcal{G}_{\hat{p}}(q)$ when $q \in \left[\pi_{\min}, \bar{\pi}_m + (1-\delta)\lambda(\bar{x}-\theta) \right).$ The agenda setter has no incentive to propose lower inflation rate and cannot propose larger inflation rate. When $q \in \left[\bar{\pi}_m + (1-\delta)\lambda(\bar{x}-\theta), \pi_{\max} \right]$, deviations above the status quo are rejected by m following what we showed in Step 2 in the proof of Proposition 2: in fact, in the interval $\left[\bar{\pi}_m + (1-\delta)\lambda(\bar{x}-\theta), \pi_{\max} \right]$ the intertemporal utility of m is decreasing in the current proposal.

The two steps above imply that the strategy profile described in Proposition 3 is a PEC. □

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