Political Influence and the Dynamic Consistency of Policy

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As shown in the pioneering work of Finn E. Kydland and Edward C. Prescott (1977) and others, discretionary policy-making generally leads to an outcome considered inferior to that which would emerge if the government could commit in advance to future policies.[1] Consider, for example, fiscal policy. Each individual's incentive to invest depends negatively on the expected future tax rate applied to the return from that investment. Recognizing this dependence, the policy maker may announce a plan to set future tax rates low. But, when policy is set on a period-by-period basis (i.e., under discretion), such an announcement lacks credibility, leading to the now-familiar credibility problem. In particular, once investment decisions have been made, the policy maker's *ex post* preferred policy involves a higher tax rate. Thus, when commitments by the government are not possible, the dynamically consistent equilibrium policy involves excessive taxation on capital.

Much of the research on the credibility problem, however, has neglected the obvious fact that political incentive constraints, created by existing institutions, also influence government policy outcomes. While others have demonstrated how political institutions can likewise generate inefficiencies, they fail to consider that, at the same time, these institutions can alter the credibility constraint and its implications for policy.[2] By contrast, this paper analyzes both credibility and political incentive constraints, demonstrating how political institutions may partially mitigate the inefficiencies arising from the credibility problem.[3]

The analysis focuses on influence activities. More specifically, following Gene M. Grossman and Elhanan Helpman (1994), who apply B. Douglas Bernheim and Michael D. Whinston's (1986) analysis of "menu auctions" to trade policy, we study how contributions by lobbies may influence equilibrium tax policy and government spending. The structure of the model is that of a common-agency problem. Multiple principals with competing interests (groups of individuals forming lobbies) individually take a costly action to induce the common agent (the policy maker) to pursue a policy which is more appealing from the principal's perspective. The emphasis of the present paper,

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[1] See Torsten Persson and Guido Tabellini (1990) for a useful survey of this literature.

[2] Alberto Alesina (1988), for example, shows that electoral competition, between two political parties representing two distinct ideological views, adds to the volatility of monetary policy over time. In a different setting, Alesina and Tabellini (1990) demonstrate that political instability can impart a positive bias on debt finance. For a discussion of these contributions (and others) that add to our understanding of the distortionary effects of politics on macroeconomic policy, see Persson and Tabellini (1990, 1997).

[3] The paper is loosely connected to other analyses of macroeconomic policy in a two-nation setting. In Kenneth Rogoff (1985a), for example, the policy maker of each nation faces a two-dimensional credibility problem: one that emerges from the effects of monetary policy on (domestic) inflationary expectations and another stemming from the expansionary effects of one nation's monetary policy on the other nation's economy. In such a setting, solving the second credibility problem (through monetary-policy coordination) can aggravate the first one; the presence of one distortion can reduce the severity of another. Similarly, building on Alesina and Tabellini (1990) who study debt finance, Tabellini (1990) finds that international policy coordination of fiscal policies can worsen the distortion created by (domestic) political instability. Also see Garfinkel (1994) who, in a very different setting, shows how political competition within a nation can lower the severity of (military) conflict between two nations, thereby increasing consumption opportunities for both. Below we discuss several other papers which are closer in spirit to our paper.

however, differs sharply from that of Grossman and Helpman (1994). Whereas they, abstracting from the credibility problem, attribute departures from the efficient policy (free trade) to the political process, we show how the political process may bring policy closer to that which supports the efficient outcome. Moreover, we endogenize the formation of active lobbies.

Our approach is similar to that taken by Persson and Tabellini (1993) and Carl E. Walsh (1995) in their analyses of the credibility problem in monetary policy which, if left unresolved, imparts a positive bias on inflation. Both papers show how a government (a single principal), having preferences that coincide with those of society, can design an incentive contract to induce the central bank (a single agent) to implement the efficient policy—i.e., the otherwise dynamically inconsistent policy that involves no inflationary bias. This optimal incentive contract is analogous to the endogenously determined compensation schedules offered by lobbies in our analysis. However, there are two crucial differences. First, because there are multiple principals who are not in complete agreement, the compensation schedules we study will produce different and sometimes conflicting incentives for the policy maker. Second, and more importantly, while the incentive contract in Persson and Tabellini (1993) and in Walsh (1995) is designed by the principal from an *ex ante* perspective, the compensation schedules are formulated by the organized lobbies from an *ex post* perspective.[4] Thus, we find that the credibility problem's influence on equilibrium policy is not eliminated by lobbying.[5]

In terms of its thrust and underlying logic, however, the paper is more closely related to that of Persson and Tabellini (1994), who in a similar setting show how the delegation of tax policy to a representative chosen in an election can resolve at least partially the credibility problem, thereby improving welfare relative to that which otherwise obtains when policy is chosen directly through an election. The key to this result is that, in a representative democracy with either a president or a legislature, elections held before investment effectively provide a means by which voters can make a commitment to future policy; voters choose a representative whose preferred tax rate is lower than that rate which would be chosen directly by voters in elections held each period after investment decisions have already been made. Our analysis similarly relies on a commitment mechanism, enabling us to endogenize the formation of lobbies. That is, we assume that, to be effective in their efforts, groups must organize in advance, specifically before investments are made.[6] But, in our analysis which applies to both democracies and nondemocracies, the outcome is determined largely by the groups that choose to lobby rather than by the median voter as in Persson and Tabellini's analysis. Indeed, we find that, as long as the extent to which individuals disagree is not too large, those who choose to lobby are precisely the groups that have a greater interest in keeping taxes low. One implication of the analysis is that reforms to limit such influence activities may aggravate the credibility problem.[7]

In what follows, the next section describes a simple two-period economic model on which the analysis is based. Section II studies the government's tax and spending policies in the absence of political constraints to highlight the credibility problem and its implications for the equilibrium tax policy. Section III introduces lobbying. Here the analysis characterizes the effects of such influence activities on the equilibrium tax policy initially taking as given the

[4] As argued by Bennett T. McCallum (1997 p. 108–09), the solution proposed by Persson and Tabellini (1993) and Walsh (1995) only shifts the credibility problem away from the central bank to the government responsible for enforcing the contract. Insofar as the (sovereign) government has the same preferences as the central bank, the credibility problem remains relevant.

[5] Although our analysis focuses on public spending and taxes, it may also apply to monetary policy, among other policies, as discussed in Section IV.

[6] Note that assuming a commitment mechanism for individuals to resolve the credibility problem is not inconsistent with the fundamental premise that the government lacks a commitment mechanism. Our assumed "technology" of group formation seems to be a reasonable constraint given actual difficulties of mobilizing individuals of a group; even if they have identical preferences, differences in their places of residence or employment can render (last-minute) collective decision-making problematic.

[7] However, as discussed below in Section III, subsection B, such reforms need not undermine the ability of lobbies to reduce equilibrium taxes.

formation of lobbies, and then endogenizes the formation of such groups to complete the analysis. Finally, Section IV offers some concluding remarks.

I. Analytical Framework

The two-period model we analyze is comparable to those models that demonstrate the credibility problem in tax policy, starting with Stanley Fischer (1980).[8] The primary difference is that our model admits heterogeneity in the population. In particular, the economy consists of n types of individuals, indexed by i and each of unit mass. Individuals live for two periods. In the first period $t = 1$, each receives an identical endowment e which can be consumed in the first period, c_{i1}, or invested for consumption in the second period, c_{i2}. Let z_i denote the investment made by an individual of type i. The before-tax, gross return from this investment is given by Rz_i, where $R > 1$.

While individuals of different types receive identical endowments and have access to the same investment technology, they do not share the same preferences. Variation in preferences across consumers concerns the composition of spending among private consumption goods, c, and public consumption goods, denoted by g in per capita terms. In particular, the preferences of a consumer of type i, U_i, are given by

$$(1) \quad U_i = \alpha_i[c_{i1} + u(c_{i2})] + (1 - \alpha_i)u(g),$$

where $\alpha_i \in (0, 1]$.[9] We assume that $u(\cdot)$ is at least twice continuously differentiable, strictly increasing and strictly concave. Furthermore, we assume that $u'(0) = \infty$.

One interpretation of the disagreement between consumers is that they do not hold the same ideological views—specifically, concerning the appropriate role of government in the economy. Those with a small value of α view government interventions as beneficial, while those with larger values of α prefer less government involvement in the economy. Alternatively, variation in α across individuals can be interpreted as a conflict over the distribution of income. The same tax rate is applied to all consumers; however, the marginal burden net of the marginal benefit of an additional unit of g is larger for those with a larger α than for those with smaller values of α.

Despite this disagreement, individuals will make the same investment decision. Specifically, each individual of type i, $i = 1, 2, \ldots, n$, takes τ and the investment decisions of others, z_j where $j \neq i$, as given; he chooses z_i to maximize (1) subject to the following budget constraints:

$$(2) \qquad c_{i1} = e - z_i \geq 0$$

$$(3) \qquad c_{i2} = Rz_i(1 - \tau),$$

where $\tau \in [0, 1]$ is the tax rate, chosen by the government in the second period as discussed below to finance g. The first-order condition is given by

$$(4) \qquad -1 + R(1 - \tau)u'_{ic} = 0,$$

where $u'_{ic} \equiv u'(Rz_i(1 - \tau))$ for all i. Under our assumptions that $u'(0) = \infty$ and that $u''(\cdot) < 0$, the first-order condition yields an interior optimum for z_i given $\tau < 1$.[10] Since the expression in (4) is independent of α_i, each consumer chooses the same investment: $z_i = z^*$ for all i. In turn, equations (2) and (3) imply that individuals will have the same consumption stream. Henceforth, we drop the i subscript for c and z and u'_c.

The optimality condition shown in (4) implicitly defines each individual's investment as a function of $\tau < 1$: $z^* = z(\tau)$ for all i. The net effect of an increase in the tax rate on investment depends on the balance of the familiar substitution and

[8] See Persson and Tabellini (1990, especially Section 6) for other examples.

[9] Our assumption that first-period consumption enters into the utility function linearly is made only for analytical convenience. Similarly, assuming an identical functional form for utility derived from private and public consumption simplifies the algebra considerably, but is not necessary for our results.

[10] We implicitly assume here that the no-borrowing constraint embedded in (2) is not binding. A sufficient condition is that $u'(Re(1 - \tau)) < 1$, which can be ensured by choosing a large value for the endowment or a large value for the rate of return.

income effects. To fix ideas, we assume that the substitution effect dominates the income effect for all $\tau \in [0, 1)$ so that $dz^*/d\tau < 0$.[11]

The government taxes the gross return from private investment to finance second-period government (or public) expenditures, g in per capita terms. In the absence of a loanable funds market, it faces the following budget constraint:

$$(5) \qquad g \leq \frac{1}{n} \sum_{i}^{n} Rz_i\tau = Rz^*\tau,$$

which is satisfied as an equality assuming that the government cannot use tax revenues to finance its own consumption. With the implicit definition of z^* in (4) and the government's budget constraint (5), one can easily verify that an increase in the tax rate will increase tax revenues to permit additional government spending ($dg/d\tau > 0$) if and only if investment is inelastic with respect to the tax rate: $|(dz^*/d\tau)(\tau/z^*)| < 1$.

II. The Credibility Problem in Tax Policy

In this section, we characterize policy without any political constraints to illustrate the potential credibility problem. The government is thought of here as a "benevolent" dictator, with the goal of maximizing the sum of all individuals' indirect utility. Using equations (1)–(3) and (5) as an equality, we can write the dictator's preferences, $W(z,\tau)$, as follows:

$$(6) \quad W(z,\tau) \equiv \sum_{i=1}^{n} U_i(z,\tau) = \sum_{i=1}^{n} [\alpha_i[e - z + u(Rz(1-\tau))] + [1-\alpha_i]u(Rz\tau)].$$

Under discretion, policy is formulated in period $t = 2$, after investment. Thus, taking z^* as given, the government chooses τ to maximize (6). The first-order condition to this problem is

$$(7) \quad F(z,\tau) \equiv \sum_{i}^{n} [-\alpha_i u'_c + (1-\alpha_i)u'_g]Rz = 0,$$

for $\tau \in (0, 1)$, where $u'_g \equiv u'(Rz\tau)$ and $u'_c \equiv u'(Rz(1-\tau))$, as previously defined. By the assumptions imposed on $u(\cdot)$ with (4), the solution to (7) will be an interior optimum.[12] Let that optimum be indicated by $\tau_D(z)$. Using (7) and (4), we can, in principle, simultaneously solve for $z(\tau_D)$ and $\tau_D(z)$. To simplify the algebra, we assume throughout that $u(\cdot)$ is homogeneous in its argument (c or g). Then, z can be factored out of u'_c and u'_g, implying that the equilibrium tax rate is independent of private investment decisions. Hereafter, this tax rate will be denoted by τ_D.

The ability to make binding commitments would effectively permit the government to influence individuals' expectations for future tax policy before the first-period investment decision is made, thereby internalizing the effects of policy on that investment decision. More formally, under commitment, the government would choose τ to maximize (6) subject to the constraint that $z^* = z(\tau^e)$, implicitly defined by (4) where τ^e is the second-period tax rate expected by individuals in the first period, and the constraint that $\tau = \tau^e$. Using the definition of $F(z(\tau),\tau)$ in (7), the first-order condition to this problem is given by

$$(8) \quad \tilde{F}(\tau) \equiv F(z(\tau),\tau) + \sum_{i}^{n} (1-\alpha_i)u'_g R\tau \frac{dz^*}{d\tau} = 0$$

[11] That is, we assume that $u'_c > -u''_c Rz(1-\tau)$, which also implies that an increase in the gross rate of return from investment, R, increases investment, z. Note, however, that the general results to follow concerning the possible welfare-enhancing effects of political incentive constraints would remain intact if we were to assume instead that $dz^*/d\tau > 0$. Differences in the details are noted below.

[12] The strict concavity of $u(\cdot)$ implies that the second-order condition is satisfied as a strict inequality.

for an interior optimum. This condition implicitly defines the government's hypothetical tax policy under commitment, indicated here by τ_C. Since $u(\cdot)$ is homogeneous, τ_C is independent of z.[13]

Evaluating (8) at $\tau = \tau_D$ as implicitly defined by (7) reveals that, by preventing the government from internalizing the effect of its tax policy on private investment, the credibility constraint in the absence of a commitment technology distorts tax policy. In particular, since $F(z,\tau_D) = 0$ and $dz^*/d\tau < 0$, (8) when evaluated at τ_D is negative, implying by the second-order condition that the tax rate applied to the return from private investment is excessive. That is, $\tau_D > \tau_C$. Thus, discretionary policy-making imparts a negative bias on private investment relative to the hypothetical outcome supported by commitment.[14]

The implications of the credibility problem for tax revenues and government spending is ambiguous, however. While the tax rate under discretion is higher, the tax base is smaller given $dz^*/d\tau < 0$. Using (7) and (8), one can easily verify that tax revenues, when evaluated at the commitment optimum $Rz(\tau_C)\tau_C$, are increasing in the tax rate.[15] But, a discrete move from commitment (τ_C) to discretion (τ_D) could imply either higher or lower tax revenues. In the case that tax revenues (or equivalently g) are lower under discretion, the inefficiency produced by the inability to make commitments is reflected in a decrease in both private investment and public consumption. Decreasing the tax rate to move to the other side of the "Laffer curve" would clearly make everyone better off relative to the discretionary regime. By contrast, when tax revenues are higher under discretion, individuals who have a relatively greater preference for consumption of public goods (i.e., a smaller α) may well be better off in the discretionary outcome than in the hypothetical one with commitment. Nonetheless, social welfare as defined by (6) is higher under commitment than under discretion where the credibility constraint is binding: $W_C \equiv W(z(\tau_C),\tau_C) > W_D \equiv W(z(\tau_D),\tau_D)$. But, as shown in the next section, without accounting for political constraints, this evaluation of the costs of discretionary policy-making is likely to be misleading.

III. Political Constraints and Equilibrium Tax Policy

Political constraints on policy-making can take a variety of forms. One obvious form particularly relevant for democracies is through the electoral process itself. Based on a model similar to that developed above, Persson and Tabellini (1994) show that a representative democracy, where individuals commit to a particular policy maker, resolves the credibility problem. Specifically, in equilibrium, it removes the excess of taxation on capital that would otherwise emerge in a direct democracy where individuals choose labor and capital taxes on a period-by-period basis to finance a given level of government expenditures. The equilibrium policy in a direct democracy maximizes the *ex post* preferences of the median voter, the decisive voter in any election. By contrast, in the representative-democracy equilibrium, voters commit in advance to a policy maker who is more conservative than the median voter—i.e., the one whose *ex post* preferences coincide with the *ex ante* preferences of the median voter. In our model, under the assumption that the distribution of types (α_i) is symmetric, the solution τ_D derived earlier would correspond to the direct democracy outcome, and a representative democracy could similarly improve upon that outcome through the election of a policy maker with $\alpha > \bar{\alpha} \equiv \sum_i^n \alpha_i/n$.[16]

[13] Our assumption that $u(\cdot)$ is homogeneous is sufficient but not necessary to ensure that the second-order condition is satisfied as a strict inequality.

[14] Alternatively, if $dz^*/d\tau > 0$, then $\tau_D < \tau_C$. But, even in this case where taxes and government spending are too low, the bias on private investment under discretionary policy-making remains negative.

[15] Specifically, using (7), the condition in (8) can be rewritten as

$$-\sum_i \alpha_i u_c' Rz + \sum_i (1-\alpha_i) u_g' \left[Rz + R\tau \frac{\partial z}{\partial \tau} \right] = 0.$$

Since the first term is negative, the second one must be positive for their sum to be equal to 0. Thus, if commitments were possible, $Rz + R\tau\partial z/\partial\tau > 0$ at the optimum.

[16] As discussed in Persson and Tabellini (1994), this solution is closely related to Rogoff's (1985b) perverse policy-maker solution: Appointing a *conservative* central

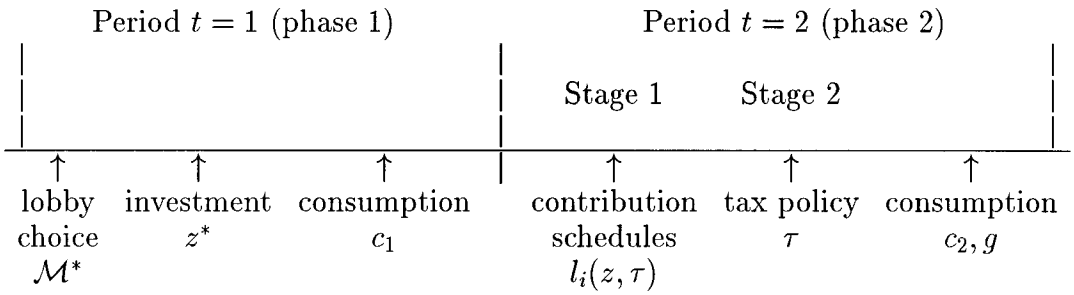

FIGURE 1. SEQUENCE OF EVENTS WITH LOBBYING

But, following Grossman and Helpman (1994) who apply Bernheim and Whinston (1986) to study the politics of trade policy, we consider in this section an alternative political constraint that applies to nondemocratic as well as democratic states—namely, lobbying. For the rest of the paper, we relax the assumption made earlier that the policy maker is concerned solely about social welfare; she also cares about contributions received from lobbies.

The political constraint on policy is embedded in the specification of the objective function of individuals in the private sector and that of the policy maker. Given z, individual i's second-period utility gross-of-contributions, $V_i(z,\tau)$, is

$$V_i(z,\tau) = \alpha_i u[Rz(1-\tau)] + (1-\alpha_i)u[(Rz\tau)]. \tag{9}$$

To incorporate lobbying, suppose that, of the n types of individuals, m types each form a lobby. Then let $\mathcal{M} \equiv \{i\}_{i=1}^{m}$ denote the set of lobbyists, where $m \leq n$. Collective lobbying by group i is represented by a contribution schedule, denoted by $l_i(z,\tau)$, that maps the tax rate onto the group's political contribution for a given z. Accounting for this contribution, the second-period joint welfare of group $i \in \mathcal{M}$ is written as

$$V_i(z,\tau) - l_i(z,\tau). \tag{10}$$

This formulation assumes, for tractability, that making a contribution imposes a utility cost on each of the individuals belonging to group $i \in \mathcal{M}$, but the contributions do not come out of each individual's investment return net of taxes.[17] The policy maker cares about social welfare and about these contributions. Her second-period preferences, $G(z,\tau)$, are given by

$$G(z,\tau) = \sum_i V_i(z,\tau) + b \sum_{i \in \mathcal{M}} l_i(z,\tau), \tag{11}$$

where $b > 0$.[18]

As shown in Figure 1, there are two phases in

banker whose tolerance for inflation is lower than that of society will lead to a lower inflationary bias in equilibrium, though possibly at a cost in the form of a higher variability in equilibrium output. When there is uncertainty about future government spending, a similar cost arises in Persson and Tabellini's (1994) model, implying that the equilibrium choice of the representative will not perfectly resolve the credibility problem.

[17] One can think of the contribution as the group's (costly) labor efforts in, for example, showing support for the policy maker or simply providing services for her.

[18] The results to follow would be unchanged qualitatively if we were to substitute $V_i(z,\tau) - l_i(z,\tau)$ for $V_i(z,\tau)$ as long as $b > 1$. A perhaps more serious objection to this specification is that it assumes transferable utility. See Avinash Dixit et al. (1997), who in abandoning this assumption develop a more general formulation of the common-agency problem that can capture the policy maker's concerns about distributional matters. Note, however, that the assumption of transferable utility in our model does not rule out the importance of distributional matters as they are captured by the parameter α. Of course, an extended analysis that does not assume transferable utility may yield important and interesting insights. But such an extension is beyond the scope of this paper and left for future research.

the process of lobbying, one corresponding to each period. The analysis of the next subsection studies the outcome of the second phase for any given outcome of the first phase. That is, we characterize the outcome of a two-stage game that takes place in the second period (phase), given the set of lobbies ($\mathcal{M}$). In the first stage of the second phase, each lobby $i \in \mathcal{M}$ simultaneously designs its contribution schedule, given the schedules chosen by the other lobbies; in the second stage, as anticipated by all groups i, the policy maker chooses τ to maximize her objective function given by (11).[19] With these results, the analysis of the following subsection turns back to the first phase of the lobbying: the endogenous determination of the formation of lobbies.

A. *Equilibrium Contributions and Taxes for Fixed $\mathcal{M}$*

Treating $\mathcal{M}$ as exogenous, Bernheim and Whinston (1986 Lemma 2) derive the necessary and sufficient conditions for a subgame-perfect Nash equilibrium in this game of lobbying.

Definition 1: A subgame-perfect Nash equilibrium consists of a vector of payment schedules and a tax policy, $\langle \{l_i^o(z,\tau)\}_{i \in \mathcal{M}}, \tau^o \rangle$, for a given $\mathcal{M}$ and z, such that

(i) τ^o maximizes $G(z,\tau)$.
(ii) τ^o maximizes $V_i(z,\tau) - l_i(z,\tau) + G(z,\tau)$ for all $i \in \mathcal{M}$.
(iii) There exists a τ_i^* for all $i \in \mathcal{M}$ that maximizes $G(z,\tau)$ and $l_i(z,\tau_i^*) = 0$.

Using these equilibrium conditions, we first characterize the equilibrium contribution schedules, and then we characterize the equilibrium tax rate in the equilibrium with lobbying.

The first condition of equilibrium is that the policy maker choose the tax rate, treating z and the contribution schedules offered by the lobbies as fixed, to maximize her own well-being. Assume that these schedules, denoted by $\{l_i(z,\tau)\}$, are differentiable around the equilibrium point τ^o, and let $l'_{i\tau} \equiv \partial l_i(z,\tau)/\partial\tau$. Then condition (i) implies

$$F(z,\tau) + b \sum_{i \in \mathcal{M}} l'_{i\tau} = 0, \tag{12}$$

where $F(z,\tau)$ is defined in (7).

The second condition of equilibrium requires that the tax policy maximize the joint welfare of lobby i and the government, implying

$$[-\alpha_i u'_c + (1-\alpha_i)u'_g]Rz - l'_{i\tau} + F(z,\tau) + b \sum_{j \in \mathcal{M}} l'_{j\tau} = 0, \tag{13}$$

for all $i \in \mathcal{M}$. If this condition were not satisfied for some lobby i, then that group could redesign its contribution schedule, $l_i(z,\tau)$, to induce the policy maker to adopt a more preferable tax policy. By (12), the last two terms in (13) sum to zero. Thus, the entire expression simplifies to

$$l'_{i\tau} = [-\alpha_i u'_c + (1-\alpha_i)u'_g]Rz, \tag{14}$$

revealing that the differentiable contribution schedules are truthful. Specifically, the change in the amount that lobby i is willing to pay the policy maker for a small change in τ equals the change in group's welfare resulting from that change in the tax rate.

In what follows, we restrict attention to globally truthful strategies. By integrating both sides of (14) over τ for which $l_i(z,\tau) > 0$, one can verify that lobby i's contribution schedule for all values of τ and given $\mathcal{M}$ is

$$l_i(z,\tau) = \max[0, V_i(z,\tau) - C_i], \tag{15}$$

[19] Note our implicit assumption here that lobbies are able to commit to their chosen compensation schedules—that is, to fulfill their promise to pay once policy has been set. This assumption can be reconciled with the notion that the government is unable to make binding commitments in two ways. First, whereas the time horizon of commitments by lobbies is a single phase or period (the second one), the government's commitment to future tax policy would involve a time horizon stretching over both phases (or both periods) and thus should be more difficult to make. Second, we can view the contribution schedule as a sort of contract, enforceable at the discretion of the government, either by the legal apparatus established by the government or by the force of the government (e.g., military). But, since a government is unlikely to punish itself, no such mechanism exists to compel the government to carry out its own promises. By virtue of its sovereignty, a government simply cannot make binding commitments.

where the constant C_i is determined from the third condition of the equilibrium with lobbying.

To proceed, consider an alternative tax rate, indicated by τ^{-i}, as that which would emerge in equilibrium if group i did not make a contribution:

$$\tau^{-i} \in \arg\max G^{-i}(z,\tau), \tag{16}$$

where, letting $\mathcal{M}\backslash\{i\}$ indicate the set of lobbies except group i,

$$G^{-i}(z,\tau) \equiv \sum_j V_j(z,\tau) + b \sum_{j \in \mathcal{M}\backslash\{i\}} l_j(z,\tau).$$

Now each lobby i has to provide the policy maker with at least as high a utility level as she could attain without a contribution by that group: $G^{-i}(z, \tau^o) + bl_i(z,\tau^o) \geq G^{-i}(z,\tau^{-i})$. But, the group is willing to contribute only the minimum that would induce the policy maker to set the tax rate at τ^o, implying that for all $i \in \mathcal{M}$,

$$l_i(z,\tau^o) = \frac{1}{b}[G^{-i}(z,\tau^{-i}) - G^{-i}(z,\tau^o)], \tag{17}$$

which is strictly positive by the definition of τ^{-i}.

With (15), equation (17) implies that the (constant) net benefit C_i, an anchor for the lobby function, is given by:

$$C_i = V_i(z,\tau^o) - \frac{1}{b}[G^{-i}(z,\tau^{-i}) - G^{-i}(z,\tau^o)] > 0. \tag{18}$$

If lobby i were to set C_i lower, the government would still set $\tau = \tau^o$, but at a higher price to that lobby. Conversely, if lobby i were to set C_i any higher, then the policy maker would choose τ^{-i} rather than τ^o, and lobby i's welfare net of contributions would fall discretely. Thus, no lobby group $i \in \mathcal{M}$ has an incentive to deviate from the choice of C_i shown in (18). Equation (15) and this solution for C_i together determine the (out-of-equilibrium) tax rate τ_i^* that, as required by condition (iii) in Definition 1, implies a zero contribution by lobby i, $l_i(z,\tau_i^*) = 0$, given the equilibrium payment schedules of all other groups $j \in \mathcal{M}\backslash\{i\}$.[20]

Having characterized the equilibrium contribution schedule, we now turn to the question of how lobbying influences the equilibrium tax rate. Substitute (14) back into equation (12) to obtain

$$F(z,\tau) + b \sum_{i \in \mathcal{M}} [-\alpha_i u_c' + (1 - \alpha_i)u_g']Rz = 0. \tag{19}$$

This condition implicitly defines the equilibrium tax rate, denoted by τ^o, when political constraints are operative. Using the definition of $F(z,\tau)$ in (7) again, we rewrite this condition in a more convenient form as

$$\left[1 + \frac{m}{n} b\right] F(z,\tau) - mb(\bar{\alpha}_{\mathcal{M}} - \bar{\alpha})(u_c' + u_g')Rz = 0, \tag{20}$$

where $\bar{\alpha}_{\mathcal{M}} \equiv \sum_{i \in \mathcal{M}} \alpha_i/m$ and, as previously defined, $\bar{\alpha} \equiv \sum_i^n \alpha_i/n$.

In the special case where $m = n$ so that every group forms a lobby and $\bar{\alpha}_{\mathcal{M}} = \bar{\alpha}$, the second term in (20) vanishes, implying that the condition simplifies to $F(z,\tau) = 0$—the same condition in (7) that implicitly defines τ_D. That is to say, when all groups lobby, the tax policy with political constraints is identical to that when policy is chosen similarly under discretion but without political constraints: $\tau^o = \tau_D$.

Political constraints have an impact on the equilibrium tax policy, τ^o, only when a subset of the groups ($m < n$) organize into lobbies. In particular, from (20), we have the following proposition.

[20] In particular, when strictly positive, lobby i's compensation schedule is given by

$$l_i(z,\tau) = V_i(z,\tau) - V_i(z,\tau^o) + \frac{1}{b}[G^{-i}(z,\tau^{-i}) - G^{-i}(z,\tau^o)].$$

But, substituting in τ^{-i} for τ in $V_i(z,\tau)$ makes this entire expression negative given the definition of τ^o. Hence, from (15), $l_i(z,\tau^{-i}) = 0$ and, by the definition of τ^{-i}, $\tau_i^* = \tau^{-i}$. In addition, one can easily verify that C_i will be at least as large as the hypothetical level of welfare obtained when the group makes no contribution, $V_i(z,\tau^{-i})$, given z.

PROPOSITION 1: *The tax rate which emerges in this subgame-perfect Nash equilibrium, τ^o, is less than* (*greater than*) *the tax rate under discretion with no political constraints, τ_D, if the mean value of α among those groups that lobby, $\bar{\alpha}_{\mathcal{M}}$, is greater than* (*less than*) *the population mean, $\bar{\alpha}$.*

PROOF:

Notice that the expression in (20), like that in (19), is decreasing in τ, and that the first term of that expression when evaluated at τ_D equals zero. Thus, the direction of the impact of political constraints on the equilibrium tax rate under discretion, the sign of $\tau^o - \tau_D$, equals the sign of the second term; and, since $u'(\cdot) > 0$, this sign is determined by that of $\bar{\alpha} - \bar{\alpha}_{\mathcal{M}}$.

The intuition here is simple. When choosing her tax policy, the policy maker attaches a larger weight to the utility of those groups which lobby. Specifically, equations (15) and (11) and condition (i) of Definition 1 together imply

$$\tau^o \in \arg\max \sum_{i \notin \mathcal{M}} V_i(z,\tau) + (1+b) \sum_{i \in \mathcal{M}} V_i(z,\tau). \tag{21}$$

Accordingly, if the organized groups, $i \in \mathcal{M}$, tend to have higher values of α such that $\bar{\alpha}_{\mathcal{M}} > \bar{\alpha}$, then the policy maker is induced to pursue a more conservative policy, as high-α groups would prefer, involving a lower tax rate perhaps at the expense of lower government spending. Conversely, if only lower-α groups lobby, then the policy maker pursues a less conservative policy involving higher taxes and presumably more government spending. Hence, to identify the effects of lobbying on the equilibrium tax rate, we must turn to the endogenous determination of the set of lobbies.

B. *The Equilibrium Formation of Lobbies*

Based on the equilibrium analysis of the second phase of lobbying, we now consider the first phase of this process to endogenize the formation of lobbies $\mathcal{M} \subseteq \mathcal{I} \equiv \{i\}_{i=1}^n$. Specifically, this section shows that not all optimizing groups will choose to lobby, and that those which are less likely to lobby may be precisely the groups with smaller α. We will then have shown that influence activities can bring the equilibrium policy closer to that which supports the efficient outcome.

In the first phase of the equilibrium process, which occurs in the first period before investment choices have been made as previously described, individuals of each type decide whether or not they will form a lobby and participate in the second phase, taking the other groups' decisions as given. A decision to form a lobby means that the individuals of the group must collectively incur a fixed cost, $\delta > 0$—for example, to organize their efforts effectively. For our purposes, δ can be arbitrarily close to zero. The presence of fixed costs here serves only as a commitment mechanism for groups in the private sector. As shown in (17), for a given z, all groups will want to make strictly positive contributions. But, individuals of any group $i \notin \mathcal{M}$, who have already chosen not to incur the fixed cost of organizing a lobby, simply cannot lobby in the second period. A decision not to organize in the first phase is, in effect, a binding commitment not to lobby in the second phase. Allowing groups to account for the effect of taxes on investment, this commitment capability is crucial for the possible welfare-enhancing effects of lobbying; however, it is only an imperfect substitute for the policy maker's ability to commit to future policy.

Each group's choice of whether or not to organize a lobby depends on the payoff it would obtain from participating in the second phase of lobbying as analyzed in the previous section relative to the payoff obtained if it were not to participate at all. After some manipulations using the calculations from above, the net benefit to group i from lobbying for any given $\mathcal{M}$, $B_i(\mathcal{M})$, is

$$B_i(\mathcal{M}) = V_i(z_i^o, \tau_i^o) - \frac{1}{b}\left[G^{-i}(z_i^o, \tau^{-i}) - G^{-i}(z_i^o, \tau_i^o)\right] - V_i(z^{-i}, \tau^{-i}) + \alpha_i(z^{-i} - z_i^o) - \delta, \tag{22}$$

where now τ_i^o denotes the equilibrium tax rate, assuming that group i lobbies given the choices by all other groups $j \in \mathcal{M}\backslash\{i\}$; z_i^o denotes equilibrium investment in anticipation of this tax rate; τ^{-i} denotes the equilibrium tax rate given $i \notin \mathcal{M}$, which is identical to the tax rate defined previously in (16) by the homogeneity of $u(\cdot)$; and z^{-i} denotes the alternative equilibrium investment in anticipation of this

tax rate. The sum of the first two terms in (22) equals group i's second-period utility, given that it lobbies, net of the group's contribution, or equivalently $C_i > 0$ as shown in (18). The third term equals the second-period utility, given group i chooses not to lobby. Finally, the sum of the last two terms equals the net change in first-period utility as the result of a decision to lobby.

In an equilibrium of the first phase $\mathcal{M}^*$, no single group has an incentive to deviate unilaterally from the current configuration of lobbies.

Definition 2: $\mathcal{M}^*$ is an equilibrium set of active lobbies when

(i) $B_i(\mathcal{M}^*) > 0$ for all $i \in \mathcal{M}^*$.
(ii) $B_i(\mathcal{M}^* \cup i) \leq 0$ for all $i \notin \mathcal{M}^*$.

Although this definition provides a conceptual framework to delineate the patterns of the equilibrium with lobbying, the actual equilibria which emerge are too diverse to characterize for all possible values of the parameters.

Nevertheless, when the degree of polarization in preferences is moderate, the equilibria share a common feature. To illustrate this feature, we formulate a flexible representation of the α's. Specifically, take any element of an n-dimensional vector $(\beta_i)_{i=1}^n$ which satisfies $\Sigma_{i=1}^n \beta_i = 1$ and, for all i, $0 < \beta_i < 1$. Then, define

$$\alpha_i(\varepsilon) \equiv \bar{\alpha} + \tilde{\beta}_i \varepsilon, \tag{23}$$

where $\tilde{\beta}_i \equiv \beta_i - 1/n$, $\varepsilon > 0$ and, as previously defined, $\bar{\alpha}$ denotes the mean value of α. These definitions imply that $\Sigma_{i=1}^n \tilde{\beta} = 0$ and, consistent with our definition of $\bar{\alpha}$, that $\Sigma_{i=1}^n \alpha(\varepsilon_i)/n = \bar{\alpha}$. By an appropriate choice of the β's, any (discrete) distribution of the α's, symmetric or not, can be represented. Once the β's are chosen, the ordering of the α's are invariant to the size of ε. The larger is ε, the larger is the degree of heterogeneity or, equivalently, the degree of polarization in preferences. In fact, an increase in ε can be thought of as a mean-preserving spread in the distribution of α.[21]

With this representation for α_i letting the fixed cost δ go to zero, we can show how a group's incentive to lobby depends on its type, α_i.

PROPOSITION 2: *Consider two groups $i = h$, j, where $\alpha_h > \alpha_j$. For all $\mathcal{M}$ and for ε above but close to* 0, *the group $i = h$ having a greater relative preference for private consumption (i.e., a higher α_i) has a greater incentive to lobby: $B_h(\mathcal{M}) > B_j(\mathcal{M})$ when $h, j \in \mathcal{M}$ and $B_h(\mathcal{M} \cup h) > B_j(\mathcal{M} \cup j)$ when $h, j \notin \mathcal{M}$.*

PROOF:
See the Appendix.

This proposition implies that, when the dispersion in preferences is not too large, a group's incentive to lobby increases with its type, α_i, for any n groups and any set of lobbies, $\mathcal{M}$.

The ordering of incentives to lobby, however, is not sufficient to determine the equilibrium set of active lobbies, $\mathcal{M}^*$. We need to determine whether any groups benefit from lobbying. From (22), letting the fixed cost δ go to 0 and assuming that the degree of polarization is small, one can verify with tedious calculations that lobbying is *ex ante* beneficial to some but not to every group.

PROPOSITION 3: *For ε slightly greater than* 0, *the net benefit of lobbying to the group which places the greatest relative value on private consumption ($\alpha_H \equiv \max\{\alpha_i\}$) is strictly positive if either all groups lobby or only this one group: $B_H(\mathcal{I})$, $B_H(\{H\}) > 0$. By contrast, the net benefit of lobbying to the group which places the lowest relative value on private consumption ($\alpha_L \equiv \min\{\alpha_i\}$) is strictly negative if either all groups lobby or only this group: $B_L(\mathcal{I})$, $B_L(\{L\}) < 0$.*

PROOF:
See the Appendix.

Propositions 2 and 3 enable us to demonstrate the existence of an equilibrium with lobbying in which some lower α-type groups do not participate. To do so we construct the method of finding an equilibrium $\mathcal{M}$. First, order the set of weights such that $\alpha_1 < \alpha_2 < \cdots < \alpha_n$. Proposition 3 implies that $\mathcal{M} = \mathcal{I}$ is not an equilibrium. So, consider the following algorithm for finding $\mathcal{M}^*$, starting with $i = 1$:

[21] Note, however, that to ensure $\alpha_i \leq 1$ for all i, ε must not get too large. Given $\beta_i < 1$, a sufficient condition which we impose is that $\varepsilon < n(1 - \bar{\alpha})/(n - 1)$.

(i) For $j = i$, if $B_j(\{j, j+1, \ldots, n\}) < 0$ and $B_{j+1}(\{j+1, j+2, \ldots, n\}) \geq 0$ then, by Proposition 2, declare $\mathcal{M}^* = \{j+1, j+2, \ldots, n\}$ and stop.

(ii) If not, then by Proposition 2, $B_j(\{j, j+1, \ldots, n\}) < 0$ and $B_{j+1}(\{j+1, j+2, \ldots, n\}) < 0$. In this case, repeat step (i) for $j = i + 1$.

Proposition 3 implies, in addition, that the algorithm stops with a nonempty set $\mathcal{M} \subset \mathcal{I}$. This reasoning establishes the following proposition.

PROPOSITION 4: *For small but positive ε, there exists an equilibrium, $\mathcal{M}^* \subset \mathcal{I}$, in which the lowest α-type groups choose not to lobby, such that $\bar{\alpha}_{\mathcal{M}} > \bar{\alpha}$.*

Together with Proposition 1, this proposition implies that the tax rate supported in equilibrium when policy is set under discretion subject to political constraints is lower than that which is supported in the absence of political constraints.[22] The existence of such an equilibrium suggests that activities need not create losses in addition to those created by the policy maker's inability to commit; rather, influence activities may serve to reduce such losses. Hence, reforms to restrict such activities need not be welfare improving.

Such restrictions, however, need not preclude the emergence of a second-best solution as described in Proposition 4. Public-interest groups, particularly those with the greatest incentives to lobby before the reform, might continue to exert their influence on policy makers in other ways. In extreme cases, the groups might resort to less legitimate means of influence, such as making bribes.[23]

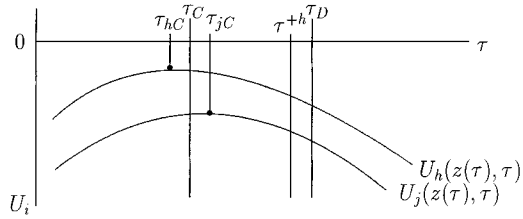

FIGURE 2. DISPERSION IN PREFERENCES AND PREFERRED TAX RATES

C. *Discussion*

Some intuition for our central result summarized in Proposition 4 can be seen by considering the *ex ante*, preferred tax policies for two groups, $i = h, j$ where $\alpha_j < \bar{\alpha} < \alpha_h$ for $\varepsilon > 0$. Each group's *ex ante*, preferred tax rate maximizes $U_i(z(\tau), \tau)$ as defined in (6), accounting for the effect of changing the tax rate on investment, $dz^*/d\tau < 0$. Let the *ex ante* optimizing choice of τ (implicitly defined by the condition $dU_i/d\tau = 0$) be denoted by τ_{iC}, $i = h, j$. When $\varepsilon = 0$ so that there is no dispersion in preferences, the two conditions corresponding to the solutions for τ_{iC}, $i = h, j$, are identical to (8), which implicitly defines τ_C, the optimizing choice of τ when government commitments are possible. Hence, when $\varepsilon = 0$, $\tau_{hC} = \tau_{jC} = \tau_C < \tau_D$. Figure 2 shows, in addition to τ_C and τ_D, the two tax rates preferred *ex ante* by these two groups for a strictly positive value of ε and a choice of $\tilde{\beta}$'s, $\tilde{\beta}_h > 0$ and $\tilde{\beta}_j < 0$, which imply $\alpha_h > \bar{\alpha} > \alpha_j$. While both τ_C and τ_D depend on $\bar{\alpha}$ which is fixed, the *ex ante* preferred tax rate for each group i depends on α_i which varies with ε. As ε increases slightly

[22] If we were to assume that $dz^*/d\tau > 0$, a similar result would obtain: Since the alternative assumption that $dz^*/d\tau > 0$ implies a negative (rather than a positive) bias in taxes, the political equilibrium where ε is just above 0 would have only low-α type groups organizing in the first period to lobby, or $\bar{\alpha}_{\mathcal{M}^*} < \bar{\alpha}$, which from Proposition 1 implies higher taxes and, thus, higher investment in the political equilibrium. Hence, political incentive constraints can reduce the bias in tax policy under discretion regardless of the direction of that bias.

[23] Of course, the reforms could call for the imposition of large penalties on those policy makers who accept bribes, thereby reducing the value that any policy maker places on contributions. In our analysis, such a mandate could be captured by a reduction in the parameter b. Simulations (not reported here) indicate, however, that such reforms would make lobbying only by groups that prefer lower taxes a more likely outcome for any given amount of disagreement between the groups. [Details are available on request from the authors.] Our intuition for this finding is as follows: A reform which makes the policy maker less responsive to influence activities lowers the benefit (and thus the net benefit) of lobbying to all groups. Hence, in an equilibrium with such a reform in place, fewer groups are likely organize. But, the ordering of all groups' incentive to lobby is preserved, implying that the groups most likely to remain organized as a lobby are precisely those whose influence activities alone support a second-best outcome with a lower tax rate and less public spending.

above 0, τ_{hC} falls below τ_C, whereas τ_{jC} rises above τ_C moving toward but remaining below τ_D, the tax rate which emerges under discretion without political constraints.

Now consider the tax rate which emerges when group h lobbies alone, τ^{+h}. Since group h commands a greater weight in the policy maker's objective function in this case and $\alpha_h > \bar{\alpha}$, $\tau^{+h} < \tau_D$ and $z(\tau^{+h}) > z(\tau_D)$. As evident from Figure 2, both groups would prefer in an *ex ante* sense this tax rate to τ_D. Of course, given private investment $z(\tau^{+h})$, group j would have in the second period an incentive to lobby to influence tax policy. However, before investment decisions are made, group j prefers not to organize and, thus, makes a commitment in the first period not to lobby in the next period.[24] While this preference ordering need not hold for group j generally, a sufficient condition for group j to have no incentive to lobby given the group h's choice to lobby and the decision by all other groups not to lobby is that $\tau^{+h} > \tau_{jC}$. In this case which is more likely for small ε as depicted in Figure 2, lobbying by group j would push the equilibrium tax rate further away from τ_{jC} above τ^{+h}. In short, the asymmetry in the groups' incentives to lobby stems from the coexistence of heterogeneous preferences and the credibility problem which by itself leads to excessive taxation even by a benevolent government. When the degree of heterogeneity in preferences (ε) is moderate, lobbying by higher α-types pulls the tax rate chosen in the equilibrium with lobbying closer to the desired *ex ante* tax rate (which accounts for the effect of tax policy on private investment) for all groups.

As the degree of heterogeneity in preferences gets large, however, the sort of equilibrium described in Proposition 4 need not emerge. Let group j, where $\alpha_j < \bar{\alpha}$, be that group having the largest value of α among all those groups not belonging to $\mathcal{M}^*$. Now consider the tax rate that results when all organized groups (in $\mathcal{M}^*$) lobby, τ^o, and that which results when all organized groups plus group j lobby, τ^{o+j}, where $\tau^{o+j} > \tau^o$.[25] A sharp rise in ε above 0 with $\mathcal{M}$ fixed at $\mathcal{M}^*$ causes τ^o to fall and τ^{o+j} to rise. At the same time, τ_{jC} rises, moving toward and then beyond τ^o, and thereby increasing the *ex ante* net benefits for group j and even for other groups $i \notin \mathcal{M}^*$ to lobby. As ε rises, therefore, there is a greater incentive for more of the low-α type groups to organize. When all groups $i = 1, 2, \ldots, n$ organize, the outcome is nearly identical to that of the discretionary regime without political constraints.[26] The only distinction is that, in the equilibrium with political constraints, each groups' second period net welfare, C_i given in (18), is smaller by the amount of the group's contribution, $l_i(z,\tau)$. From a social-welfare perspective (in contrast to that of the politically motivated policy maker), the political incentive constraints created by lobbying in this case only add to the losses created by the credibility constraint alone when the difference between the two groups' preferences becomes too large. But, when the degree of polarization is moderate, the introduction of constraints through influence activities can weaken the severity of the credibility constraint.[27]

IV. Concluding Remarks

Influence activities such as lobbying can impose political discipline, serving as an imperfect substitute for the hypothetical ability

[24] Notice that the tax rate which would emerge if group j were to lobby alone, τ^{+j}, is greater than τ_D, since this group would command a larger weight in the policy maker's objective function in this case and $\alpha_j < \bar{\alpha}$. Despite that group's (*ex ante*) preference for the lower tax rate ($\tau^{+j} > \tau_{jC}$), τ^{+j} is the equilibrium rate given that group j lobbies alone and $z = z(\tau^{+j})$. However, even given $z = z(\tau^{+j})$, group h has an incentive to lobby to lower the equilibrium tax rate. Moreover, accounting for the effect of the equilibrium tax rate with lobbying on private investment, z^*, group j prefers the outcome which emerges when it chooses not to organize. Hence, τ^{+j} cannot be an equilibrium outcome.

[25] To verify that $\tau^{o+j} > \tau^o$, evaluate the optimality condition for τ^o, (20) with $\mathcal{M} = \mathcal{M}^*$, at τ^{o+j}, which is itself implicitly defined by (20) for $\mathcal{M} = \{\mathcal{M}^* \cup j\}$. That expression simplifies to

$$-\frac{b}{n} F(\tau^{o+j}, z^{o+j}) - b(\bar{\alpha} - \alpha_j)(u_c' + u_g') R z^{o+j}.$$

Assuming $\tau^o < \tau_D$, the first term is negative. Thus, since (20) is decreasing in τ, $\alpha_j < \bar{\alpha}$ is a sufficient condition for $\tau^{o+j} > \tau^o$.

[26] Extensive numerical simulations (not reported here) suggest that the size of the equilibrium set of lobbies $\mathcal{M}^*$ is increasing in the degree of polarization, ε. Details are available from the authors.

[27] Numerical simulations show that this possible benefit can be realized in equilibrium for finite—not just infinitesimal—degrees of polarization. Details are available from the authors.

of the policy maker to commit to future tax policies. Such discipline comes into play when only those with "right" preferences (i.e., the groups having higher α's) actively lobby. While extending previous analyses of the game with lobbying (e.g., Grossman and Helpman, 1994), we endogenize the formation of lobbies to complete our own analysis. Specifically, we show the existence of an equilibrium in which only the "right" types lobby. Such an equilibrium is more likely to be observed when the degree of polarization in preferences is moderate. In any case, lobbying cannot eliminate the problem of excessive taxation that arises typically in a discretionary policy-making setting. The reasoning is twofold: the compensation schedules are designed after investments take place, and the compensation schedules offered do not embody the preferences of a single principal, but rather multiple principals having different preferences. Nevertheless, lobbying can reduce the severity of the problem. Thus, consistent with the theory of the second best, while political incentives alone can generate inefficiencies, they can be welfare improving when there already exists another distortion such as that created by the credibility problem.

From a positive perspective, our analysis, like that of Persson and Tabellini (1994), offers an explanation for why observed taxes are not quite as high as one would predict based on the credibility problem alone. Both explanations build on political institutions with a commitment mechanism for individuals when the government is not able to make binding commitments to future policies announced today. But, whereas Persson and Tabellini's explanation is relevant for democracies only, ours is relevant for both democracies and nondemocracies.

Based on our model, one would expect that existing lobbies are more likely to produce such a second-best result when the lobbies' preferences lean against the positive bias in tax policy. Indeed, taxes which tend to discourage savings and investment have been kept at bay by the persistent involvement of lobbyists pushing for lower corporate tax rates and larger investment tax subsidies on behalf of public interest organizations such as the American Council for Capital Formation. The effectiveness of these organizations to influence the legislators and policy is well documented.[28] Some lobbies have been instrumental in strengthening tax code provisions that are conducive to technological research and development efforts.

Although we have focused on the credibility problem in the government's tax policy, our analysis should have some relevance for other policies similarly plagued by this problem when preferences are not identical across principals. Consider, for example, the credibility problem in monetary policy. In the standard model where there exists some friction that keeps output and employment too low, the benevolent policy maker has an incentive to create "surprise" inflation so as to increase output and employment. But, because individuals incorporate that incentive into their expectations, the equilibrium is characterized by excessive inflation with no output benefits—an inflationary bias. Our analysis could be applied to this problem assuming that (i) the economy is populated by individuals having different incomes, and (ii) inflation has some distributional consequences. Suppose, for example, that during times of relatively low inflation, there is a redistribution of income from the poor to the rich.[29] Hence, whereas individuals in the lower-income groups tend to favor more expansionary monetary policies, those in the higher-income groups tend to favor more restrictive monetary policies. In this setting, following the logic of our analysis, a second-best outcome would emerge in the political equilibrium when only those in the higher-income groups organize—either formally or informally—to influence the government official(s) in charge of monetary policy. Even if the distribution of income is symmetric, individuals in the higher-income groups would have a relatively greater incentive to lobby than would those in the lower-income groups due to the *positive* bias in inflation that emerges in the absence of lobbying. Of course, in nations wherein a conservative, independent central bank has been established, the effectiveness of such activities

[28] See, for example, Walter Beacham et al. (1989) and Foundation for Public Affairs (1996).

[29] Douglas A. Hibbs, Jr. (1987) provides some empirical support for this assumption with U.S. data.

to influence policy are likely to be lower.[30] At the same time, however, the perceived need to influence policy is lower insofar as such monetary institutions themselves serve to reduce the severity of the credibility problem.[31]

Another application left for future research concerns protectionist trade policies that allow firms of "injured" industries to develop and adopt, at a fixed cost, new cost-reducing technologies, whereby they can compete more effectively in the global market. These protectionist measures must be temporary; the longer they are in place, the smaller is the incentive of firms to make the necessary adjustments. However, as shown in a number of papers—e.g., Kiminori Matsuyama (1990) and Aaron Tornell (1991)—a temporary protectionist trade policy, though *ex ante* optimal, may not be dynamically consistent. Once protection has been put into place, returning to free trade will not be optimal if firms have not already taken action to enhance their competitiveness in the global market; anticipating that response by the government, firms have no incentive to incur the fixed cost of adjustment. Hence, temporary protection becomes permanent protection. But, when others who purchase the goods produced by protected firms either for direct consumption or as an intermediate good are hurt by protection while it is in place, political incentive constraints (whether they be through lobbying, voting or campaign contributions) may be sufficient to induce the policy maker to liberalize trade eventually, thereby making the temporary protectionist trade policy incentive compatible and, thus, effective.[32] In the United States, for example, trade liberalization is promoted by lobbies that often represent foreign businesses. Though not directly representing the immediate interests of domestic constituents, such lobbies too can enhance the efficiency of the economy.

Appendix

Before proving Propositions 2 and 3, we establish a couple preliminary results. The first follows immediately from the definition of $\alpha_i(\varepsilon)$ shown in equation (23), as well as those for τ_i^o, τ^{-i}, z^o, and z^{-i} given in the main text.

LEMMA A1: *When* $\varepsilon = 0$, $\alpha_i = \bar{\alpha}$ *which implies* $\tau^{-i} = \tau^o$ *for any given* z, $z^{-i} = z^o$, *and* $\partial V_i(z^o, \tau^o)/\partial \tau|_{\varepsilon = 0} = 0$, *for all* i.

The next one follows from Lemma A1 and the definition of $B_i(\mathcal{M})$ shown in equation (22).

LEMMA A2: *Consider any two groups,* $i = h$, j *where* $\alpha_h > \alpha_j$, *and let* $\delta = 0$. *Then, for all* $\mathcal{M} \subseteq \mathcal{I} \equiv \{i\}_{i=1}^n$, $B_h(\mathcal{M}) = B_j(\mathcal{M}) = 0$ *when evaluated at* $\varepsilon = 0$.

PROOF OF PROPOSITION 2:

Given Lemma A2, to show that groups with a greater relative preference for private consumption have a greater incentive to lobby, we only need to identify the effect of an increase in ε from 0 on the difference between $B_h(\mathcal{M})$ and $B_j(\mathcal{M})$:

LEMMA A3: *For all* $\mathcal{M} \subset \mathcal{I}$ *with* $m \geq 2$, *if* h, $j \in \mathcal{M}$ *and* $\alpha_h > \alpha_j$, *then*

$$\left.\frac{dB_h(\mathcal{M})}{d\varepsilon}\right|_{\varepsilon = 0} > \left.\frac{dB_j(\mathcal{M})}{d\varepsilon}\right|_{\varepsilon = 0}.$$

[30] This is not to say that independent central banks are necessarily immune from political pressures. Even the Federal Reserve, which is thought to be a fairly independent central bank, is subject to political pressures, especially from the executive branch of the U.S. government, as documented by Thomas Havrilesky (1993). Rather, there is less room for individuals of the private sector to have any (direct) influence on monetary policy.

[31] Whether this institutional approach, a reputational approach, or the political-influence approach adopted in this paper yields a more effective means of reducing the severity of the credibility problem is an interesting question, but well beyond the scope of this paper.

[32] A similar problem exists in environmental policy which aims to promote more environmental-friendly investments by firms. Because the benefits of such investments are not fully captured by the firms, the government has imposed temporary regulations to provide a better alignment of the firms' interests with those of society. Lobbies' efforts ensure that such regulations are renewed.

PROOF:

Differentiating the expression for $B_i(\mathcal{M})$ in (24) yields:

$$\text{(A1)} \quad \frac{dB_i(\mathcal{M})}{d\varepsilon} = \frac{dV(z^o,\tau^o)}{d\varepsilon} - \frac{dV(z^{-i},\tau^{-i})}{d\varepsilon} + \frac{d}{d\varepsilon}\alpha_i[z^o - z^{-i}] - \frac{1}{b}\left[\frac{dG^{-i}(z^o,\tau^{-i})}{d\varepsilon} - \frac{dG^{-i}(z^o,\tau^o)}{d\varepsilon}\right].$$

Repeated applications of Lemma A1 to the terms in this expression imply

$$\left.\frac{dV_i(z^o,\tau^o)}{d\varepsilon}\right|_{\varepsilon=0} - \left.\frac{dV_i(z^{-i},\tau^{-i})}{d\varepsilon}\right|_{\varepsilon=0} = \frac{\partial V_i}{\partial z}\frac{dz^0}{d\varepsilon} - \frac{\partial V_i}{\partial z}\frac{dz^{-i}}{d\varepsilon}$$

$$\frac{d}{d\varepsilon}\alpha_i[z^{-i} - z^o]|_{\varepsilon=0} = \alpha_i\left[\frac{dz^{-i}}{d\varepsilon} - \frac{dz^o}{d\varepsilon}\right]$$

$$\left.\frac{dG^{-i}(z^o,\tau^{-1})}{d\varepsilon}\right|_{\varepsilon=0} = \left.\frac{dG^{-i}(z^o,\tau^o)}{d\varepsilon}\right|_{\varepsilon=0}.$$

Using the first-order condition for z^*, (4), we find

$$\frac{\partial V_i(z^o,\tau^o)}{\partial z}\frac{dz^0}{d\varepsilon} - \alpha_i\frac{dz^0}{d\varepsilon} = (1-\alpha_i)R\tau^o u'(Rz^o\tau^o)\frac{dz^0}{d\varepsilon}$$

$$\frac{\partial V_i(z^{-i},\tau^{-i})}{\partial z}\frac{dz^{-i}}{d\varepsilon} - \alpha_i\frac{dz^{-i}}{d\varepsilon} = (1-\alpha_i)R\tau^{-i}u'(Rz^{-i}\tau^{-i})\frac{dz^{-i}}{d\varepsilon}.$$

Furthermore, the assumed homogeneity of $u(x)$ for $x = c$ and g implies that

$$\left.\frac{dz^0}{d\varepsilon}\right|_{\varepsilon=0} - \left.\frac{dz^{-i}}{d\varepsilon}\right|_{\varepsilon=0} = \frac{dz^o}{d\tau^o}\left[\frac{d\tau^o}{d\varepsilon} - \frac{d\tau^{-i}}{d\varepsilon}\right].$$

Thus,

$$\text{(A2)} \quad \left.\frac{dB_i(\mathcal{M})}{d\varepsilon}\right|_{\varepsilon=0} = (1-\alpha_i)R\tau^o u'(Rz^o\tau^o) \times \frac{dz^o}{d\tau}\left[\frac{d\tau^o}{d\varepsilon} - \frac{d\tau^{-i}}{d\varepsilon}\right]$$

for $i = h, j$. This expression can be used to see how the difference between $B_h(\mathcal{M})$ and $B_j(\mathcal{M})$ moves as ε increases from 0. Since, at $\varepsilon = 0$, $(1 - \alpha_i) = (1 - \bar{\alpha})$,

$$\left.\frac{dB_h(\mathcal{M})}{d\varepsilon}\right|_{\varepsilon=0} - \left.\frac{dB_j(\mathcal{M})}{d\varepsilon}\right|_{\varepsilon=0} = -(1-\bar{\alpha})R\tau^o u'(Rz^o\tau^o)\frac{dz^o}{d\tau}\left[\frac{d\tau^{-h}}{d\varepsilon} - \frac{d\tau^{-j}}{d\varepsilon}\right].$$

Since, by assumption, $dz/d\tau < 0$,

$$\operatorname{sign}\left\{\left.\frac{dB_h(\mathcal{M})}{d\varepsilon}\right|_{\varepsilon=0} - \left.\frac{dB_j(\mathcal{M})}{d\varepsilon}\right|_{\varepsilon=0}\right\} = \operatorname{sign}\left\{\frac{d\tau^{-h}}{d\varepsilon} - \frac{d\tau^{-j}}{d\varepsilon}\right\}.$$

Now we proceed to show that the right-hand side of the expression above is positive. First notice that by the definition of τ^{-i}, $\partial G^{-i}(z, \tau^{-i})/\partial\tau = 0$ for $i = h, j$ and all z and ε. Thus, from the implicit function theorem and the homogeneity of $u(\cdot)$,

$$\frac{d\tau^{-i}}{d\varepsilon} = -\frac{\partial^2 G^{-i}(z,\tau^{-i})}{\partial\tau\partial\varepsilon}\Big/\frac{\partial^2 G^{-i}(z,\tau^{-i})}{\partial\tau^2}$$

for $i = h, j$ and all z and ε. For $\varepsilon = 0$, Lemma A1 implies

$$\frac{d\tau^{-i}}{d\varepsilon} = -\frac{\partial^2 G^{-i}(z^o,\tau^o)}{\partial\tau\partial\varepsilon}\Big/\frac{\partial^2 G^{-i}(z^o,\tau^o)}{\partial\tau^2}.$$

In addition, Lemma A1 implies that

$$\left.\frac{\partial^2 G^{-h}(z^o,\tau^o)}{\partial \tau^2}\right|_{\varepsilon=0} = \left.\frac{\partial^2 G^{-j}(z^o,\tau^o)}{\partial \tau^2}\right|_{\varepsilon=0}$$

which is negative by the assumptions imposed on $u(\cdot)$. Hence, at $\varepsilon = 0$,

$$\operatorname{sign}\left\{\frac{d\tau^{-h}}{d\varepsilon} - \frac{d\tau^{-j}}{d\varepsilon}\right\} = \operatorname{sign}\left\{\left.\frac{\partial^2 G^{-h}(z^o,\tau^o)}{\partial\tau\partial\varepsilon}\right|_{\varepsilon=0} - \left.\frac{\partial^2 G^{-j}(z^o,\tau^o)}{\partial\tau\partial\varepsilon}\right|_{\varepsilon=0}\right\}.$$

To proceed, notice that by the definition of $G^{-i}(z,\tau)$ given in the text

$$G^{-h}(z,\tau) - G^{-j}(z,\tau) = b[V_j(z,\tau) - V_h(z,\tau)]$$

for any given τ and ε. Thus, at $\varepsilon = 0$,

$$\frac{\partial^2 G^{-h}(z^o,\tau^o)}{\partial\tau\partial\varepsilon} - \frac{\partial^2 G^{-j}(z^o,\tau^o)}{\partial\tau\partial\varepsilon} = -bRz^o[u'(Rz^o(1-\tau^o)) + u'(Rz^o\tau^o)] \times \left[\frac{d\alpha_j}{d\varepsilon} - \frac{d\alpha_h}{d\varepsilon}\right].$$

From the representation of α_i specified in the main text (25), $d\alpha_i/d\varepsilon = \tilde{\beta}_i$; and, our assumption that $\alpha_h > \alpha_j$ implies $\tilde{\beta}_h > \tilde{\beta}_j$. Hence, the expression above is positive, implying that $d\tau^{-h}/d\varepsilon > d\tau^{-j}/d\varepsilon$. This completes the proof of Lemma A3.

To complete the proof of Proposition 2, we need to establish a result similar to Lemma A3. The only difference is that it covers the cases in which $i = h$, $j \notin \mathcal{M}$, including that where $\mathcal{M}$ has only one element and that where $\mathcal{M}$ has no elements.

LEMMA A4: *For all $\mathcal{M} \subset \mathcal{I}$, if $h, j \notin \mathcal{M}$ and $\alpha_h > \alpha_j$, then*

$$\left.\frac{dB_h(\mathcal{M}\cup\{h\})}{d\varepsilon}\right|_{\varepsilon=0} > \left.\frac{dB_j(\mathcal{M}\cup\{j\})}{d\varepsilon}\right|_{\varepsilon=0}.$$

PROOF:

This proof proceeds along the same lines as that for Lemma A3, and so will be presented here only in brief. Suppose that $i \notin \mathcal{M}$. Then define τ^{+i} as the hypothetical tax rate that emerges when the set of groups $\mathcal{M} \cup \{i\}$ lobbies. Using this definition and the line of reasoning used in the proof of Lemma A3 above, we have

$$\left.\frac{dB_i(\mathcal{M}\cup\{i\})}{d\varepsilon}\right|_{\varepsilon=0} = (1-\alpha_i)R\tau^o u'(Rz^o\tau^o)\,\frac{dz^o}{d\tau}\left[\frac{d\tau^{+i}}{d\varepsilon} - \frac{d\tau^o}{d\varepsilon}\right].$$

This expression for $i = h, j$ implies

$$\operatorname{sign}\left\{\left.\frac{dB_h(\mathcal{M}\cup\{h\})}{d\varepsilon}\right|_{\varepsilon=0} - \left.\frac{dB_j(\mathcal{M}\cup\{j\})}{d\varepsilon}\right|_{\varepsilon=0}\right\} = \operatorname{sign}\left\{\frac{d\tau^{+j}}{d\varepsilon} - \frac{d\tau^{+h}}{d\varepsilon}\right\}.$$

One can verify applying the logic of the previous proof that, since $\alpha_h > \alpha_j$ by assumption, $d\tau^{+j}/d\varepsilon > d\tau^{+h}/d\varepsilon$. This completes the proof of Lemma A3, which with Lemmas A2 and B1, establishes Proposition 2.

PROOF OF PROPOSITION 3:

Lemma A2 implies that, when evaluated at $\varepsilon = 0$, $B_H(\mathcal{M}) = B_L(\mathcal{M}) = 0$ for all $\mathcal{M}$. Suppose all groups lobby: $\mathcal{M} = \mathcal{I} \equiv \{i\}_{i=1}^n$. In this case,

$$\tau^o = \tau_D = \arg\max\left\{(1+b)\sum_{i\in\mathcal{I}} V_i\right\}.$$

Since $\sum_{i\in\mathcal{I}} \alpha_i = n\bar{\alpha}$ for all ε, the tax rate when all groups $i \in \mathcal{I}$ lobby is independent of ε: $d\tau_D/d\varepsilon = 0$. Thus, from the expression in (A1), we have

$$\frac{dB_i(\mathcal{I})}{d\varepsilon} = -(1-\alpha_i)R\tau^{-i}u'(Rz^{-i}\tau^{-i})\,\frac{dz^{-i}}{d\tau}\,\frac{d\tau^{-i}}{d\varepsilon},$$

which implies $\text{sign}\{dB_i(\mathcal{I})/d\varepsilon\} = \text{sign}\{d\tau^{-i}/d\varepsilon\}$ for all i. From the implicit function theorem and the second-order condition for τ^{-i}, for any i, we have

$$\text{sign}\left\{\frac{d\tau^{-i}}{d\varepsilon}\right\} = \text{sign}\left\{(1+b)\sum_{k\in\mathcal{I}\setminus\{i\}}\frac{\partial^2 V_k(z,\tau^{-i})}{\partial\tau\partial\varepsilon} + \frac{\partial^2 V_i(z,\tau^{-i})}{\partial\tau\partial\varepsilon}\right\}.$$

Lemma A2 implies

$$\frac{\partial^2 V_k(z,\tau^{-i})}{\partial\tau\partial\varepsilon} = -Rz\tilde{\beta}_k[u'(Rz(1-\tau^{-i})) + u'(Rz\tau^{-i})]$$

and, by the definition of $\tilde{\beta}_i$ given in the main text,

$$(1+b)\sum_{k\in\mathcal{I}\setminus\{i\}}\tilde{\beta}_k + \tilde{\beta}_i = (1+b)\sum_{k\in\mathcal{I}}\tilde{\beta}_k - b\tilde{\beta}_i = -b\tilde{\beta}_i.$$

Thus, we have

$$(1+b)\sum_{k\in\mathcal{I}\setminus\{i\}}\frac{\partial^2 V_k(z,\tau^{-i})}{\partial\tau\partial\varepsilon} + \frac{\partial^2 V_i(z,\tau^{-i})}{\partial\tau\partial\varepsilon} = Rzb\tilde{\beta}_i[u'(Rz(1-\tau^{-i})) + u'(Rz\tau^{-i})].$$

Finally, note that $\tilde{\beta}_H \equiv \max\{\tilde{\beta}_i\} > 0 > \min\{\tilde{\beta}_i\} \equiv \tilde{\beta}_L$, which establishes $B_H(\mathcal{I}) > 0 > B_L(\mathcal{I})$.

Now suppose that $\mathcal{M}$ is an empty set. In this case, following the line of reasoning used above, one can verify that

$$\text{sign}\left\{\frac{dB_i(\{i\})}{d\varepsilon}\right\} = \text{sign}\left\{-\frac{\tau^{+i}}{d\varepsilon}\right\} = \text{sign}\{\tilde{\beta}_i\}.$$

As such, the assumptions which imply $\tilde{\beta}_H \equiv \max\{\tilde{\beta}_i\} > 0 > \min\{\tilde{\beta}_i\} \equiv \tilde{\beta}_L$ establish $B_H(\{H\}) > 0 > B_L(\{L\})$ and thereby complete the proof.

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