AN ENDOGENOUS POLICY MODEL OF HIERARCHICAL GOVERNMENT[1]

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ABSTRACT

Endogenous policy models usually neglect that government policies are frequently the result of decisions taken by different agents, each enjoying some degree of autonomy. In this paper, policies are the outcome of the choices made by two agents within a hierarchy: a legislator decides on the budget to be spent by a bureaucrat. Each policymaker can be lobbied by one or two interest groups. Our results, concerning the effects of multi-tier lobbying and legislatorial oversight, substantially qualify conventional wisdom related to one-tier lobbying. The potential advantages of a double opportunity to influence decisionmaking are confronted with the disadvantages of extra lobbying expenditure and separation of powers. In particular, the reaction of the legislator to lobbying at the bureaucratic tier may make lobbying wasteful even when there is no competition from other lobbies. In case of competition, the ability of a group to prevail depends on the relative access at both tiers. The analysis focuses on the effects of changes of influence across stages. Furthermore, competition for influence at the bureaucratic tier may work as a substitute for legislatorial oversight. Extensions of the model indicate its usefulness for the analysis of decisionmaking in other multilevel governance structures, like federations or firms.
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1. INTRODUCTION

The theory of endogenous policy describes how self-interested agents influence the choices made regarding government policies. Similarly, rent-seeking models describe how resources are expended by interest groups in the same quest for political favors.[2] Other models combine endogenous policy with rent-seeking outlays or focus on the use of campaign contributions to influence policy.[3] These different perspectives on interest groups and endogenous policy have in common that, in general, a single policymaker or level of government is portrayed as subject to influence. This assumption contrasts with the general observation that government is often organized in different levels of more or less autonomous decisionmaking. Think, for example, of a legislature and a bureaucracy, of central and local governments, or of a president and a parliament in a presidential democracy. A policy is in fact shaped by the different decisions taken at different political and/or administrative tiers. This offers multiple opportunities to interest groups to affect political decisionmaking. Also, efforts to influence a particular tier may depend on a lobby's ability to affect decisionmaking at another tier. Moreover, competition among lobbies is not restricted to one tier but may extend across different tiers. In reality, therefore, lobbying is a more complex activity than it is usually investigated. According to Richardson (1993, p.4), in the US, for example: "pressure groups take account of (and exploit) the multiplicity of access points which is so characteristic of the American system of government – the presidency, the bureaucracy, both

[2] For surveys of lobbying models see, for example, Austen-Smith (1997), Potters and Sloof (1996) and van Winden (1999, 2003). Nitzan (1994) and Tollison (1997) provide a review of the literature on rent-seeking.
[3] See, among others: Grossman and Helpman (2002), Morton and Cameron (1992), Potters et al. (1997), Ursprung (1990).

houses of Congress, the powerful congressional committees, the judiciary and state and local government".

The existence of multiple opportunities to influence decisionmaking may not be as advantageous for an interest group as it seems at first sight. Multi-tier lobbying may produce an increase in lobbying expenditures that can be wasteful, particularly when more groups compete for influence. Moreover, with more levels of decisionmaking, lobbying at one tier may trigger a (negative) reaction by a decisionmaker at a different tier which can make lobbying overall more costly.

New questions, then, arise regarding the exercise of influence at the different levels of government: would a divided government improve the payoff of an influential interest group compared to the traditional model of a unitary government? Would the existence of multi-tier lobbying affect the payoffs of the public decisionmakers? Does lobbying at one tier affect lobbying at another tier? Would an influence group concentrate its efforts at a single tier or would it rather try to affect different tiers? This paper tries to help answering these and other related questions.

We present a political economic model where policy discretion exists at two government levels. At the higher level, a legislator ('L') decides on the size of the government budget (tax revenue). L is assumed to have distinct preferences concerning the allocation of the budget over two public goods, each of which is consumed by a different group of individuals. L is interested in the welfare of the groups - as such, or for future electoral support– as well as in the contributions they can offer (in an attempt to influence L's decisions). The actual distribution of the budget across the public goods is effectively decided at a lower level, by a bureaucrat ('B').[4] B can only disregard the preferences of L at a personal cost, for example, in terms of career prospects or loyalty.

[4] It is beyond the scope of this paper to investigate the reasons for the delegation of decision power to the bureaucrat. We only observe that, in reality, delegation is very common and can be justified in numerous ways: lack of expertise of the legislator, reduction of implementation time, shift of responsibility, or to prevent time inconsistency problems concerning policy announcements of the legislator.

However, B may be compensated by contributions offered by the groups to affect the budget allocation decision. The realism of this setting is exemplified by the fact that legislators often decide on the total budget for a particular policy program (such as defense, health care, education or agricultural subsidies), while bureaucrats have some discretionary power regarding the allocation of the budget within the program (e.g., the location of defense facilities, hospitals or schools, or the designation of the crops for which agricultural subsidies are available).[5] For simplicity, the hierarchical relationship between L and B is investigated in a reduced form, through the weight that B attaches to L's objective. Lobbying is modeled using the Bernheim and Whinston (1986) menu-auction framework. Their common agency model has been adopted in several political economic studies, starting with the analysis of lobbying for tariffs by Grossman and Helpman (1994).[6] We contribute to this analysis by focusing on sequential decisionmaking by different agents.

The main novelty with respect to previous studies on bureaucratic capture [see Laffont and Tirole (1993)] is that the same interest group(s) lobbying B may now also lobby and affect the (re-)action of L. This opportunity for lobbies constitutes an additional instrument of political influence but may also imply further expenditures and socially wasteful activities. We will show that a multi-tier decisionmaking process may indeed be harmful for the lobbies, and even for the public decisionmakers.

[5] Another example, concerning fiscal federalism, is that decisions regarding grants, determining aggregate expenditures, are made at a higher level of government whereas decisions regarding the allocation of grants are taken at a lower level.

[6] Bennedsen (2000) investigates lobbying in state owned enterprises; Dharmapala (1999) analyzes the capture of committees for spending programs. Dixit (1996b), studies the endogenous decision on consumer and producer taxes and subsidies. Dixit et al. (1997) extend the Bernheim-Whinston model to the case when utilities are not transferable. Besley and Coate (2001) and Grossman and Helpman (1996) apply this model to electoral competition, while Bardhan and Mookherjee (2000) extend that analysis to investigate whether central or local electoral competitions will be more captured. Persson and Tabellini (1994) and Mazza and van Winden (2002) study lobbying in a federal context. Rama and Tabellini (1998) present a model where capital and labor compete by lobbying the government for trade and wage policies.

A standard tenet in the literature on lobbying says that the policymaker cannot lose from lobbying, while the interest group benefits, unless there is competition from other groups. Moreover, the unorganized citizens lose. However, strikingly different results are obtained once one allows for lobbying at different decisionmaking tiers. For instance, if only one group lobbies, L is worse off with lobbying than without. Nonetheless, providing access for lobbying is still incentive compatible for L, given that lobbying cannot be excluded effectively at B's tier. Furthermore, in that case, the lobby may also be worse off while the unorganized electorate may not be harmed, because of the reaction of L to the capture of B. On the other hand, the capture of L may improve the payoff of B through an increase in the contribution received by the latter. Our analysis shows that, in general, the policymakers are likely to be better off with competitive lobbying than when confronted with a single organized interest group.

An interesting result in the context of hierarchical decisionmaking is that competitive lobbying may be a substitute for legislatorial influence. This holds as long as all groups, in the welfare of which L is interested, lobby. In fact, since lobbying follows the preferences of the groups, L's influence cannot produce any policy improvement to the groups. This provides an explanation for the apparently contradicting empirical observations of influencing activities directed at bureaucrats together with a bureaucratic policy that may be in line with the objectives of the legislators [Schlozman and Tierney (1986), Krause (1996)]. However, the influence of L on B does reduce the amount of contributions transferred by the lobbies to B. Therefore, the lobbies may still find that is profitable to lobby L for more influence over B, as it will be shown below.

Furthermore, imperfect control makes the budget chosen by L a second-best instrument of influence. Our analysis shows that the budget decreases with B's autonomy or when a group with strong influence at B's tier becomes relatively less influential at L's level. Due to this response by

L, we also find that an increase in a group's influence at B's level can nonetheless have a negative effect on the amount of the public good that the group is interested in.

There are some related studies of multi-staged lobbying that should be mentioned here. They differ from the present one by not offering a complete analysis in terms of endogenous policy and lobbying expenditures. Hillman and Katz (1987), Katz and Tokatlidu (1996) and Gradstein and Konrad (1999) concentrate on rent dissipation in hierarchies of rent-seeking contests. Hoyt and Toma (1989) focus on the choice of groups of residents in allocating lobbying efforts between local and central policymakers. However, they do not pay attention to the influence that lobbying at one level has on the policy decisions taken at the other level. Austen-Smith (1993) presents a model where one interest group can influence the decisionmaking of two legislative bodies (a committee and the House) via strategic information transmission. In his model lobbying expenditures are taken as given [see also Sloof (2000)].

This paper also relates to the growing literature on the separation of political powers, seen as a system to improve political accountability [Persson et al. (1997), Alesina and Rosenthal (1996, 2000)]. This literature has so far paid little attention to the consequences of the separation of powers on lobbying and, vice versa, on the effects that lobbying may have on the policy outcome of a divided government, issues that are central to this paper.

The paper is organized as follows. The basic model is introduced in section 2. Section 3 presents the equilibrium analysis and comparative-statics results concerning the cases where either one or two groups lobby the decisionmakers. In section 4 we address the issue of legislatorial oversight and discuss some insights provided by our model. Section 5 concludes.

2. THE MODEL

Consider an economy where individuals are divided into two groups, of size n_1 and n_2. Members of each group have the same preferences and derive utility from disposable income and the consumption of a group-specific pure public good G_m, with $m=1,2$.[7] Preferences are reflected by the following quasi-linear utility function:

$$u_m = (1-t)y_m + h_m(G_m) \qquad m = 1,2 \qquad (1)$$

where t is an income tax rate and y_m denotes before-tax income; we assume that h_m is a continuous function and has a positive first-order and a negative second-order derivative and $lim_{Gm®0}(dh_m/dG_m)=¥$ and $lim_{Gm®¥}(dh_m/dG_m)=0$. Government output results from the choices made by two public agents, L and B, at different decisionmaking levels. L chooses the income tax rate t, and assigns the resulting tax revenue, R^o $tS_m n_m y_m=tY$, to B's budget. The latter is assumed to actually determine the share s $(1-s)$ of R to be allocated for the production of G_1 (G_2). Public goods are obtained through a linear transformation function: $G_1=sR$ and $G_2=(1-s)R$.

In line with the common agency framework of Bernheim and Whinston (1986), a group m may decide to influence decisionmaking by submitting a 'menu' of policy contingent contributions to one or both of the public agents. Contributions can be generally interpreted as something which is beneficial for the receiver and costly for the donor.[8]

[7] Rents with group-specific public good characteristics are rather common in reality. Think of those resulting from regulation protecting the interests of groups of producers or consumers, or from the provision of local services [see Persson and Tabellini (2002)].

[8] Contributions can include anything that can sway the specific choices of another individual and implies a cost for the lobbies. For example, favorable policies can be (implicitly) exchanged for future employment

The sequence of events is as follows. First, at the higher decisionmaking level, interest group m decides on offering L a schedule $C_m°(t)$, mapping every feasible tax rate into a contribution. Subsequently, the latter chooses a $t°$ maximizing his or her own objective function and obtains the corresponding monetary (equivalent) reward $l_m C_m°(t°) \geq 0$ from group m. The parameter $l_m > 0$ reflects the 'shadow price' of lobbying faced by group m, which may differ among groups [Hillman and Riley (1989)]. Group m then turns to B, offering a schedule $E_m°(s)$, which maps feasible budget shares, determining the provision level of group's public good, into a contribution to the latter. Subsequently, B chooses $s°$ optimally in line with B's objective function, and receives a reward $b_m E_m°(s°) \geq 0$, where $b_m > 0$ reflects the shadow price of lobbying B.[9] Note that if $l_m < 1$ or $b_m < 1$, lobbying implies a social cost. Redistribution takes place both at B's level (zero-sum game) and at L's level (where the size of the overall budget is chosen).

The assumption that the interest groups lobby the decisionmakers in a sequential fashion - first L, then B - can be justified by observing that the identity of B may not be known to the interest groups at the time t is chosen. Moreover, in public finance, the budgetary process is typically separated into two main stages: first, the total budget is determined, thereafter its allocation. It would then be rather difficult for interest groups to lobby simultaneously the decisionmakers at both stages, even if their identity were known from the beginning.

After including lobbying expenditures in (1), and aggregating over the group members, we obtain the following net utility function for group m:

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opportunities ('revolving doors'), in-kind services (e.g. 'wining and dining', perks, free rented cars, holidays, etc.), volunteer labor, or even plain bribes. Politicians, and occasionally the bureaucrats, can also use contributions for funding political campaign, staff and/or party expenditures. For evidence on contributions affecting legislative decisions, see Potters and Sloof (1996). See also Baldwin and Magee (2000), Goldberg and Maggi (1999).

[9] In common agency models of lobbying it is assumed that policies and schedules are adhered to. Reputation and repeated interaction are typically referred to for supporting commitment [for evidence, see Snyder (1992) and Stratmann (1995, 1998)]. In one-shot games, factors like ethical commitment ('word of honor') may play a similar role.

$$V_m = U_m(s,t) - C_m(t) - E_m(s) \qquad m = 1,2 \tag{2}$$

where $V_m \equiv n_m v_m$ and $U_m \equiv n_m u_m$. Regarding the objective functions of the decisionmakers, we assume that L is interested both in contributions from the groups and social welfare. Apart from a differential ability of lobbying, groups may differ in terms of political relevance (think of future elections, for example). This leads to the following objective function for L, to be maximized over $t \in T=[0,1]$:[10]

$$P_L = S_m l_m C_m(t) + l_u S_m q_m V_m(s,t) \qquad l_m, l_u, q_m > 0 \tag{3}$$

In (3), l_u indicates the weight that L attaches to the (weighted) welfare of the social groups in society, relative to contributions, and q_m expresses the political relevance of group m. This weight can be the outcome of electoral competition, as Coughlin et al. (1990) show in a model with probabilistic voting, where expected plurality maximizing candidates attach weights to the groups according to their homogeneity.[11] Lobbying occurs only if contributions are positively evaluated by L; this requires that the *net* reward $(l_m - l_u q_m)C_m \equiv l_m C_m \geq 0$. Thus, a group is able to lobby only when the shadow price of lobbying is sufficiently low (l_m sufficiently high) compared to L's interest in the group's welfare, such that $l_m > 0$.

[10] We assume that L cares for the net welfare of the groups, for one thing because it seems rather unintuitive to believe that the legislator would not consider lobbying expenditures, in a complete information framework. A similar approach, of including net instead of gross utility in the social welfare aggregation, is adopted by Coate (2001), Lohmann (1998), and Rama and Tabellini (1998).

[11] For an alternative underpinning, related to information, see Grossman and Helpman (1996).

Turning next to agent B, we assume that this decisionmaker is interested not only in the contributions offered by lobbyists, but also in the concerns of L. This may be due to social norms (bureaucratic loyalty), career concerns, or an independent (intrinsic) concern for social welfare [see, e.g., Peacock (1994)].[12] Formally, B chooses $s \hat{I} S=[0,1]$ such that the following objective function is maximized:

$$P_B = S_m b_m E_m(s) + bP_L(s) = S_m b_m E_m(s) + b[l_u S_m q_m U_m(s) + S_m l_m C_m] \qquad (4)$$

where b_m º b_m-$bl_u q_m$ ($b, b_m > 0$), and b indicates the weight that B attaches to the objective of L, or, put differently, the degree of (indirect) control of L over B. For a group to lobby B, it should hold that $b_m > 0$. One interpretation of (4), related to career concerns, would be that E_m represents future earnings in the private sector (discounted by b_m) which are traded off against future earnings in the public sector (determined by P_L, discounted by b).

For later reference, it is convenient to indicate first the policies selected in case of no lobbying at all. Solving backwards (beginning with the second stage where t is given) and letting s^n stand for the policy selected by B and t^n for the policy selected by L, these policies are implicitly determined by:

$$S_m q_m U_{ms}(s^n; t^n) = 0 \quad \text{and} \quad S_m q_m U_{mt}(t^n) = 0 \qquad (5)$$

[12] Although, in general, highly incomplete contracts in the public sector may allow for opportunistic behavior of the bureaucrats, they could be motivated mainly by an independent interest in social welfare. For simplicity, we neglect this possibility which would affect $bl_u q_m$ but would not qualitatively affect our results. As for the assumption of an exogenous b, this will be relaxed in Section 4. An alternative view of b, not pursued here, is that it represents the relative bargaining strength of L [as suggested by Dixit (1997)].

where the additional subscripts are used to indicate partial total derivation.[13] The conditions of (5) show that, without any lobbying, B's behavior fully accords with L's preferences.

3. TWO-TIER LOBBYING

In this section we analyze the cases where either only one group or both groups lobby at the two tiers of decisionmaking. To save space, all proofs are relegated to the Appendix.

3.1. Monopsonistic lobbying

Suppose, first, that only one group (i) is able to lobby (or 'buy' policies from) the decisionmakers. Perhaps due to a lack of access, lobbying may be too costly for the other group (j) or it may be insufficiently organized, so that b_j£$b\,l_u q_j$ and l_j£$l_u q_j$. Consequently, C_j=0 and E_j=0 holds in the objective functions (3) and (4) for L and B, respectively. This analysis would be relevant for 'particularistic' policies that are specifically offered only to one lobbying group and the costs of which are so widely spread among the population that they do not elicit any counteracting opposition [see Baron (1994), Grossman and Helpman (1996)]. The game is solved by backward inductions, starting at the lower tier where B chooses an optimal allocation s^i Î S, given the contribution schedule $E_i^i(s)$ offered by the group i (where the superscript indicates that only group i is lobbying). Then, at the higher tier, the interest group offers a contribution schedule $C_i^i(t)$ to L who then chooses a tax rate t^i Î T, taking into account the reactions at the lower tier (s^i, E_i^i). In

[13] Second order condition for s^n is guaranteed by concavity, whereas a sufficient condition for equilibrium t^n is: $0>n_1 q_1 s^n h_1{}^2[s^n+t^n(ds^n/dt)]+n_2 q_2(1-s^n)h_2{}^2[(1-s^n)-t^n(ds^n/dt)]$ which is satisfied if $s^n+t^n(ds^n/dt)$ is sufficiently close to 1.

equilibrium, the contribution schedules are such that, at the margin, the contribution will be equal to the benefit of lobbying. It is straightforward to show that s^i and t^i are determined by the following conditions:

$$b_i U_{is}(s^i;t^i) + b l_u q_j U_{js}(s^i;t^i) = 0 \quad \text{and} \quad l_i[U_{it}(t^i)-E^i_{it}(t^i)] + l_u q_j U_{jt}(t^i) = 0 \qquad (6)$$

for $j \neq i$ and $i,j=1,2$. Comparing (6) and (5) reveals that lobbying induces the decisionmakers to maximize a weighted *gross* 'political welfare function'. Since the interest group (i) maximizes its utility, the social welfare parameter l_u shows up only in the weight of the inactive group ($b l_u q_j$). The weight attached to the welfare of the lobbying group - b_i, which reflects its lobbying ability – has become larger. This group exploits its advantage of being the only lobby by offering (strictly positive) contributions, C_i^i and E_i^i, that just compensate each decisionmaker for selecting a policy that is more favorable to i compared to the outcome under no lobbying at the respective tier. At each tier separately, the lobby gains and the unorganized group loses from the biased policy. Moreover, by just compensating each policymaker for the biased policy, monopsonistic lobbying implies a 'full capture' of the decisionmaker by the interest group.

However, this does not necessarily mean that a decisionmaker cannot benefit from lobbying compared to no lobbying at all, because lobbying at one tier may affect the payoff of the decisionmaker at the other tier. For the overall effect of lobbying on the payoff of the decisionmakers, we have to compare with the outcome obtained if there is no lobbying at both tiers.

PROPOSITION 1. Compared with the outcome obtained in the absence of lobbying, monopsonistic lobbying at both tiers causes that: (i) L's payoff decreases; (ii) B's payoff may increase or decrease; *(iii) the lobby's payoff may increase or decrease; (iv) the unorganized group's payoff may increase, if the lobby's payoff decreases, otherwise it decreases..*

The most striking result in this Proposition is that the interest group may not benefit from its influencing activity, *even though it is the only one to lobby*. The reason for this counterintuitive result is the fact that the policy outcome depends on the choices made by two different agents (*divided government*) that are sequentially lobbied (*two-tier lobbying*).

Because of the separation of powers, the reaction of L to the lobbying of B is directed at reducing the stakes for lobbying at that tier, by manipulating the budget R. As a consequence, L's policy choice may produce an overall outcome that is worse for the interest group than the outcome obtained without lobbying at all. However, the latter may now be too costly to induce, through a contribution to L. Because of the incentive incompatibility to refrain from 'buying' B, after arriving at the second decisionmaking stage, the opportunity of lobbying may be detrimental to the interest group.[14] Technically, this happens for s^i very close to s^n such that the change in distribution of the tax revenue is dominated by the size of the latter. It is somewhat interesting that, in this case, it may also happen that the reaction of L is able to fully compensate the unorganized group – and, at an extreme, even make it better off- for the opponent's lobbying.

Two-tier lobbying may also harm both decisionmakers, in contrast to the conventional wisdom. Although L is (just) compensated for giving in to the lobby, the fall-back outcome is changed by lobbying at the other tier. L loses from any contribution paid to B and the policy change it induces

[14] Notice that lobbying at L's stage is still incentive compatible for the organized group, when it lobbies also B (see the Appendix).

at that tier. L can never gain, therefore, and would rather ban lobbying if that would also hold for agent B. B, on the other hand, may benefit from being lobbied, if that causes a sufficient increase in the contribution received. The outcome that a decisionmaker may benefit from the capture of another decisionmaker, at a different tier, differs from previous results in the literature [e.g. Hillman and Katz (1987), Spiller (1990)] because it does not assume that a superior can simply seize part of the lobby contributions received by a subordinate.

3.2. Competitive lobbying

We now consider the competitive lobbying case, where both groups are able to lobby at both levels of decisionmaking ($l_m, b_m > 0$ for all m).

LOWER TIER

At the lower tier, for any given $t \hat{I} T$ and C_m, B chooses an allocation $s^* \hat{I} S$ that maximizes (4), given the contribution schedules E_m offered by the lobbies. As before, the solution of the game implies the implicit maximization of a weighted gross 'social welfare function':

$$S_m b_m U_{ms}(s^*) = 0 \qquad m = 1,2 \tag{7}$$

However, now only b_m (reflecting the shadow price of lobbying) shows up as weight. This is due to the fact that, for an equilibrium, the net welfare of each group should be maximized, entailing $U_{ms}(s^*) = E_{ms}(s^*)$.[15]

[15] As can be seen from (4), for the same reason, it also holds that $S_m b_m E_{ms}(s^*) = 0$, which means that implicitly a weighted sum of the lobbies' contributions is maximized. This equivalence would be important for interpreting empirical data.

Again, an equilibrium analysis shows that each lobby pays a strictly positive contribution to B that just compensates the latter for moving away from the policy that B would find optimal if the group concerned does not lobby. As one may expect, it turns out that lobbying competition tends to favor B, compared with the previous case of monopsonistic lobbying. The opposite applies to the lobbying groups, since a policy change that is beneficial to the one will always be detrimental to the other. This effect is particularly evident if the groups have the same political influence, before and after lobbying [cf. (5) and (7)]. Then, contributions will exactly offset each other and lead to the very same allocation as in the absence of lobbying. In this symmetric case, we have 'full capture' of the interest groups by B, because only the latter profits from the lobbying. Contributions are a pure waste for the groups in this situation, and they would be better off without any lobbying. However, in the latter case, each group would have an incentive to start lobbying. The interest groups face a prisoner's dilemma and the lack of coordination induces them to contribute, although at most one group can benefit from lobbying.

From this section on, we will follow the convention of focusing on '(globally) truthful strategies' for the lobbies, which means that the equilibrium contribution schedules reveal the willingness to pay for any policy different from s^*.[16] The next proposition shows that our model allows for outcomes different from a standard result in the rent-seeking literature, namely that the introduction of competition increases lobbying expenditure.[17]

[16] Theorem 1 in Bernheim and Whinston (1986) shows that truthful strategies do not imply a cost for the players because they are included in their best-response set.

[17] In a lottery-model of rent-seeking contests [Tullock (1980)], the entry of a new player with different preferences increases the overall spending, in general [see, e.g., Ellingsen (1991)]. Appelbaum and Katz (1986) and Wenders (1987) show that when the rent is a transfer from the loser(s) to the winner of the contest, then transfer-avoiding activities from the losers leads to larger rent-seeking expenditure than in the case of contests for pre-determined rents. In a similar context, Fabella (1995) finds that the entry of an opponent increases the expenditure of a single incumbent as well as the overall lobbying expenditure.

PROPOSITION 2. Compared with a monopsonistic lobbying equilibrium, the entry of another lobby can lead to a reduction or an increase in the contribution given by the incumbent group i as well as in the aggregate amount of lobbying expenditure.

The differences with the standard result are due to the endogeneity of the rent and the heterogeneity of the influence weights and the prices of lobbying of the groups. When a monopsonist lobby i has a high shadow price of lobbying, its lobbying expenditure may be rather high. Under competitive lobbying, though, the same group obtains a less favorable biased policy and that may reduce the compensation offered to B. If the opponent group j, on the other hand, faces a low shadow price, lobbying expenditure by this group can be rather low and even smaller than the decrease in group i's expenditure.

UPPER TIER

As holds for the lower tier, equilibrium analysis regarding the upper tier shows that each group has an incentive to lobby the policymaker by offering a contribution schedule $C_m(t)$. Confronted with these policy contingent contribution schedules, L chooses $t^* \hat{I}\, T$ to maximize (3) taking into account the equilibrium behavior of the players at the lower decisionmaking level (s^*, E_1^*, E_2^*). Replicating the procedure for the lower tier, in equilibrium, L chooses a tax rate t^* such that:

$$S_m l_m [U_{mt}(t^*) - E_{mt}^*(t^*)] = 0 \qquad (8)$$

The intuition is the same as that provided for eq.(7). As demonstrated in the Appendix, L's direct concern for the welfare of the interest groups (l_u) and their electoral influence (q_m) are relevant in the choice of t^* only because of their influence on contributions E_m^* at the lower tier. In this

respect, one can say that lobbying directed at political subordinates disciplines the activity of the master.

Using the solution to the complete game, we can now compare the payoffs of the decisionmakers in the different situations of competitive and monopsonistic lobbying. The next proposition summarizes the results obtained.

PROPOSITION 3. Compared with the outcome in the absence of lobbying, in general, competitive lobbying has ambiguous effects on the payoffs of the policymakers and the interest groups. However, if L benefits from lobbying then also B does, and if B loses then also L does. Moreover, at most one interest group can benefit from competitive lobbying, but both can lose.

As can be expected, it turns out that L benefits from lobbying if the weight attached to social welfare (l_u) is sufficiently low. However, if one lobby is hardly effective (i.e. l_m º $l_m - l_u q_m$ goes to zero) then we are in a situation approaching monopsonistic lobbying that will be detrimental for L (see Proposition 1). A similar reasoning applies to B. If b_m (º $b_m - b l_u q_m$) is very low for one m, the situation approaches monopsonistic lobbying. In that case, B is kept indifferent with respect to the no-lobbying outcome that actually reflects the objective of L. Since L loses if l_m ® 0 (i.e. l_u sufficiently large), B would also lose in that case. However, B seems more likely to gain from competitive lobbying, since (only) B benefits from the contributions received by the decisionmaker at the other tier. Moreover, not all groups can win. This is a consequence of the purely redistributional nature of the lobbying activity. On the other hand, if the political influence of the groups sufficiently balances, both interest groups will lose because of the then only wasteful

expenditures, due to the lobbying competition (as we had already seen at the lower tier). The lobbies are trapped in a prisoner's dilemma, with lobbying being a dominant strategy at each tier. Even though lobbying can be a pure waste for all social groups, in general a ban on lobbying may be less viable under competitive lobbying, because then not only B but also L may gain, in contrast with the case of monopsonistic lobbying (see Proposition 1).

3.3. Cross-tiers effects of changes in influence under competitive lobbying

Changes in the political influence of a group at one tier may have consequences for the lobbying activity as well as the political outcome at the other tier. In this subsection we will focus on a group's allocation of its lobbying activities across the different tiers. A comparative-statics analysis will demonstrate the problematic nature of limiting the theoretical and empirical investigation of lobbying contributions to a specific policy or a single decisionmaking level if groups have access to different tiers. We will also discuss some implications for the size of the public sector.

To obtain sharper results regarding the policies (t, s) and contributions (C_m, E_m), we adopt the following symmetric specification for the utility derived from the group-specific public goods in (1): $h_m(G_m)=G_m^{1/2}$. Although admittedly restrictive, it enables us to show some novel results concerning lobbying. Moreover, the intuition provided suggests that these results may hold more generally.

Cross-tiers effects of political influence

An increase in the effectiveness of a group in lobbying B (b_i) appears to have an asymmetric effect on that group's contributions to L (C_i^*). A larger b_i leads to larger contributions when $t^{i\circ}>t^*$, where $t^{i\circ}$ indicates the out-of-equilibrium tax rate that would be selected if only group i would lobby L, while both groups lobby B. If the tax rate to be selected in equilibrium is regarded as "low" by the group $(t^{i\circ}>t^*)$, an increase in b_i, meaning a larger budget share for the provision of the group's

public good G_i, gives an incentive to group i for intensifying its lobbying of L to increase t. Similarly, when the equilibrium tax rate is "high" according to the group ($t^{i\circ}<t^*$), the group has a weaker incentive to lobby for a tax reduction if b_i increases.[18] In contrast, the effect on the contribution to B (E_i^*) is ambiguous, since it depends on the group's relative shadow price of lobbying at both tiers. If, instead, group i's effectiveness in lobbying L (l_i) increases, the opponent group j invests relatively more in lobbying L (that is, E_j^*/C_j^* is inversely related to l_i) when its effectiveness is sufficiently larger than that of group i (more specifically, l_i£$l_u q_j<l_j$). This result shows that, in reaction to an increase in the political effectiveness of a competing lobby, an interest group may further concentrate its lobbying activity on this policymaker with whom it has already a comparative advantage in lobbying. This lobbying "specialization" is related to counteractive lobbying [cf. Austen-Smith and Wright (1994)].

Size of the public sector

An increase in the effectiveness of a group in lobbying B (b_i) may not only negatively affect the budget provided to B (t^*) but even the level of the public good provided to that group (G_i). That happens, for example, when l_i/b_i is sufficiently low (so that group i faces a relatively high cost for lobbying L but gains substantially from lobbying B), while l_j/b_j (i¹j) is sufficiently high. By reducing the budget, L limits the transfer of resources from group j, having relatively more influence on L, to group i. Roughly put, it may be better for a lobby "not to put all the eggs in one basket". If a policy results from decisions taken by different agents, it may not be advantageous to concentrate efforts on improving the effectiveness of lobbying a particular agent. Moreover, t^* increases with the degree of L's influence on B (b). The intuition is that L limits the budget assigned to B when it is difficult to effectuate the policy L prefers [for empirical support, see Crain

[18] In contrast, the effect on the contribution to B (E_i^*) is ambiguous, since it depends on the group's relative shadow price of lobbying at both tiers.

and Muris (1995)].[19] This finding goes against the conventional (public choice) wisdom that bureaucratic discretion boosts the size of the public sector. Finally, we find that the size of the public sector is positively affected by an increase in L's interest in social welfare (l_u) and/or in the electoral influence of the groups (q_m). The reason is that, for given b, they imply a larger impact of L's interests on the objective of B [cf.(4)].

4. FURTHER RESULTS ON HIERARCHICAL INFLUENCE

A glance at (7) shows that, for given t, the allocation s^* selected by B is not affected by the degree of hierarchical influence (expressed by the parameter b), under competitive lobbying. B's choice under L's oversight is just the same as with no oversight ($b=0$). Although the result is surprising, the intuition is rather straightforward: since the policy selected by B maximizes the utilities of all interest groups, L's oversight cannot improve the result for them and is irrelevant for B's choice. However, if not all groups are able to lobby B, hierarchical influence does affect the budget allocation.[20]

This outcome has some important implications. In particular, it may provide a new intuition regarding the contrasting empirical results reported in the literature with respect to bureaucratic discretion [cf. Krause (1996)]. Well-known empirical studies by Weingast and Moran (1983) and Weingast (1984) on the activity of the U.S. Commissions show that, even though these

[19] Examining data concerning state expenditures in the U.S. for the period 1982-1988, they find that revenues tend to be higher when a legislator choosing taxes has control over the way that funds are spent than in case the revenues and spending are controlled by two different authorities.

[20] Notice that this result is quite general as it does not depend on assumptions concerning the value of the weights or the form of the utility function. Moreover, it also holds if the legislator is assumed to care for gross instead of net social welfare, as long as the same weight (q) is assigned to the welfare of the groups, as in case of a utilitarian social welfare function.

Commissions appear to be scarcely monitored, their policies are nonetheless strongly influenced by congressional committees (presumably, through other instruments of control over bureaucratic activity, like internal competition or appointments). However, the hypothesis of (strong) legislatorial control seems at odds with the results of a survey by Schlozman and Tierney (1986), for example, showing that bureaucratic agencies represent an important target for interest group lobbying.[21] This suggests that agencies may indeed enjoy substantial discretion in policy implementation; otherwise, why bother influencing them?

Our analysis offers a potential explanation for these contrasting observations of a lack of monitoring activity, bureaucratic autonomy, and yet policymaking consistent with the legislatorial objective. If all politically relevant groups have access to lobbying, scarce monitoring by legislators may be due to the ineffectiveness of control. At the same time, however, if the competition among the lobbies is sufficiently balanced (symmetric), the policy selected by B will perfectly match the preferences of L. Therefore, the implementation of the policy preferred by L does not need a strong control over B. It may be selected even in the absence of any control ($b=0$), in which case B cares for contributions only.

Even though stronger control may not influence the budget allocation of B, it nonetheless reduces the amount of lobbying contributions (E_m^*), for any given t. The intuition is that, in the absence of hierarchical influence, B would only be interested in contributions. This would increase the cost for group i to compensate B for not choosing the policy preferred by group j. The reason is that now B does not take into account the welfare loss that group i would suffer if the policy preferred by group j is selected (instead of that chosen in a competitive lobbying equilibrium).

[21] Schlozman and Tierney (1986) mention that two-thirds of the 175 politically active organizations represented in Washington that were interviewed "indicated that executive agencies are a very important focus of organizational activity; only 6 percent deemed it not too important" (p.330).

However, if we do not take t as given, a tightening of L's oversight may lead to an increase in E_i^*, because of a positive effect on t^*. This happens if group i has sufficiently small electoral influence compared with group j, that is, if q_i/q_j is sufficiently small. In fact, a larger b can even induce a group to shift resources from L's tier to B's tier (E_i^* increases and C_i^* decreases). Consequently, a larger influence of L over B may not only increase, instead of decrease, the contributions to the subordinate agent but may also reduce the contributions received by the political master. Nonetheless, a negative effect of b on E_i^* is still possible if q_i/q_j is sufficiently high.

PROPOSITION 4. Hierarchical influence under competitive lobbying: for any given t and C, a stronger influence of L on B (larger b) has no effect on B's policy but reduces lobbying expenditure (E). The latter result may be reversed through a positive effect of b on t^*.

These results suggest that the effect of legislatorial oversight may manifest itself in the effort invested in lobbying bureaucracy, rather than the policy selected. This points at an interesting alternative explanation of (costly) political supervision: legislatorial control may in fact be induced by lobbies that are willing to offer a share of what they may save in terms of lobbying expenditures. In the literature on bureaucracy and regulatory capture, it is often assumed that the legislator invests resources to oversee bureaucratic agencies with the aim of promoting the interests of the legislator's constituency. Our model suggests that the legislator may (in addition) be induced to do so by the interest groups themselves if (s)he cares for their welfare. They can offer part of the resources saved in lobbying the bureaucrat to the legislator in exchange for control

and be better off than under no control. In this event, legislatorial control is clearly endogenous in the policymaking process and it depends on the incentives provided by the interest group.[22]

5. CONCLUDING DISCUSSION

The main contribution of this paper concerns the analysis of lobbying activity in a divided government. The existence of different levels of decisionmaking complicates a great deal the decisions of the lobbies, because the allocation of lobbying activity depends not only on the institutional links between the decisionmakers but also on the reaction of the political superior to lobbying, especially at the subordinate tier. In addition, two-tier lobbying makes the payoffs of the decisionmakers more interdependent, introducing new perspectives for the analysis of legislatorial control and lobbying regulation. More generally, the model presented in this study may be helpful for a better understanding of policymaking in a multi-level decisionmaking structure. We close with some applications regarding the political economic analysis of fiscal federalism and the firm.

In a fiscal federalism framework, the higher level decisionmaker (L) would be the central government deciding on a general grant (R) to be transferred to a local government (B). The latter

[22] To elaborate this point a bit further, assume that the budget R assigned to B is exogenously given, such that L's influence has the effect of reducing the cost of lobbying B without affecting s^* (as discussed above). Then, L chooses the amount of (costly) oversight by solving the following program:

$$Max_b\, P_L = S_m\{ l_m C_m(b) + l_u q_m [U_m(s^*) - E_m^*(s^*,b)]\} - M(b)$$

Now, each group lobbies L by setting a contribution schedule contingent on the amount of oversight b that represents a public good for the lobbies. With $M(b)$ we indicate the cost of monitoring the bureaucrat ($M(0)=0$, $M_b>0$ and $M_{bb}>0$). Since s^* does not depend on b, no oversight will be exerted if $b_m \leq 0$ for all m, because then $E_m^*=0$. Thus, for $l_u>0$, $max_m\{b_m/l_u q_m\}$ constitutes the upperbound for the amount of oversight exerted by L (if $l_u=0$, $C_m(b)=0$, because b does not affect E_m^*). In Mazza and van Winden (1998) it is shown that both groups are willing to contribute for improving control, since this cost is lower than the benefit they obtain.

decides on the allocation of the grant for the provision of local public goods favoring specific interest groups. Our analysis suggests that the size of the grant and its division over the different local public goods will be dependent on the extent to which the interests of the central policymakers are taken into account by the local policymakers. A greater influence of an interest group on a local government may trigger a decrease in the general grant, when an opponent group is influential at the national level [see Oulasvirta (1997)]. A related application concerns the effects that decentralization and the subsidiarity principle in the EU have on the size of government. On this issue, Persson and Tabellini (1994) show that central financing of state public goods will exacerbate free-riding. As a consequence, lobbying by the different states of the central (federal) legislator will increase public expenditure beyond the level selected in a decentralized system, where each state pays for its own provision. Mazza and van Winden (2002), however, arrive at precisely the opposite result – a decrease in public expenditure- by taking into account the existence of two autonomous decisionmakers at the Union level (the Council and the Commission) and including two-tier lobbying by state groups.

Firms are characterized by agency problems that are to some extent similar to those of political institutions.[23] The institutional framework of our model may prove to be useful to investigate the issue of corporate control. A firm's governance can be hypothesized to be in the hands of two agents acting at a different hierarchical level: the board of directors and a senior executive. As indicated by Milgrom and Roberts (1992), directors "have the power to set dividends, to hire, fire, and set compensation of the senior executives", but the latter "may have effective control of many of the decisions that are nominally controlled by the board" (pp.314-5), although the board's preferences may not be disregarded without cost. On the 'demand' side, groups of powerful

[23] According to Dixit (1996a, p.51): "in a firm, for example, the managers act as agents of equity owners, who are the principals. The hierarchy of a firm often involves other agency relations, for example between managers and line supervisors, or purchasers and outside suppliers".

stockholders, banks or institutional investors (the principals) may have little direct control over management decisions, but may nonetheless be influential over the directors, who are elected and replaced by them. Moreover, some stockholders have sufficient incentives to overcome free-riding and exert effort to gain influence over corporate policy, also considering the effect this may have on the performances of other companies in which they have invested [Shleifer and Vishny (1986)]. The influencing activities may have the form of reward schemes to managers and directors based, for example, on their approval for higher salaries, bonuses etc., or better jobs in other corporations, or simply money and gifts. To apply our model, notice that stockholders may easily have conflicting interests about the management strategy, for example concerning the amount of profits to be reserved (R, in our model).[24] This amount is chosen by the board (L) and is allocated over two different projects (G_1 and G_2) by an executive officer (B). The analysis presented in this paper shows that when groups with different preferences try to affect decisionmaking, their efforts may offset each other, with little or no influence on the policy selected. This result can provide some additional intuition for the little influence that shareholders frequently seem to have in a corporation. Moreover, the comparative-statics results (section 3.3) suggest that a stronger alliance between managers and directors (an increase in b) might have a positive effect on the share of profits that are re-invested (t^*).

[24] On the political economy of dividend policy, see Desai et al. (2002).

APPENDIX

Monopsonistic lobbying **(section 3.1.)**

Without loss of generality, assume that only group 1 is organized to lobby. Starting from the lower tier, group 1 offers to B a contribution schedule $E_1(s)$.[25] From Lemma 2 in Bernheim and Whinston (1986), an equilibrium $\left(\{E_1^1\}, s^1\right)$ has to maximize the objective function of the agent (B) and the joint payoff of the latter and each single principal (in this case group 1 only).[26] Thus, also the utility of group 1 is maximized: B chooses an allocation $s^1 \in S=[0,1]$ that maximizes $P_B=(b_1-b\lambda_u q_1)E_1^1(s)+b[\lambda_u S_m q_m U_m(s)+\lambda_1 C_1]$ - for $m=1,2$ and $\lambda_m \geq (\lambda_m-\lambda_u q_m)$- and also such that $U_{1s}(s^1)=E_{1s}^1(s^1)$, for any given $t \in T$ and C. The combination of the two conditions implies that, in equilibrium, $b_1U_{1s}+b\lambda_u q_2 U_{2s}=0$ [cf. first part of (6)].[27] Comparing (5) and (6), $1>s^1>s^n>0$ is obtained from the assumptions of strict concavity concerning (1) and $b_1>b\lambda_u q_1$. Since the contribution schedule is set optimally, E_1^1 is just sufficient to make B not worse off than by choosing s^n; the latter policy maximizes the social welfare part of P_B and causes zero contributions from 1. This implies $P_B(s^1)=b[\lambda_u S_m q_m U_m(s^n)+\lambda_1 C_1]$, or:

$$E_1^1 = (b\lambda_u/\beta_1)S_m q_m [U_m(s^n)-U_m(s^1)] \qquad \text{(A.1)}$$

[25] Without loss of generality, we restrict the analysis to nonnegative schedules [cf. Bernheim and Whinston (1986, Lemma 1)].

[26] Otherwise, any principal could rearrange its schedule in a way that makes profitable for B to maximize the joint payoff, leaving the lobby with a higher payoff. Moreover, the equilibrium definition states there must be some 'unfavorable' policy for the group, but still optimal for B, for which the lobby offers a contribution equal to zero. Otherwise, the group's payoff would improve by reducing the *schedule*, such that nil is contributed to B for that specific policy, without affecting B's decision.

[27] Strict concavity of U_m in s guarantees that the second order sufficient condition is satisfied.

where $\beta_1 \equiv b_1 - b\lambda_u q_1$. From the definition of s^n (5) and strict concavity, we obtain $E_1^1>0$, since $s^n \neq s^1$. B is just compensated for choosing s^1 instead of s^n and the whole surplus goes to the monopsonist lobby. From (A.1): $\beta_1[U_1(s^1)-E_1^1]=b_1[U_1(s^1)-U_1(s^n)]+b\lambda_u q_2[U_2(s^1)-U_2(s^n)]+\beta_1 U_1(s^n)$. Recalling the first order condition for s^1 (6) and $s^1 \neq s^n$, from strict concavity of U_m: $U_1(s^1)-E_1^1(s^1)>U_1(s^n)$. Lobbying improves the payoff of group 1 and clearly reduces the payoff of the inactive group 2.

Turning now to the upper tier, the derivation of an equilibrium follows the same procedure as described above. Taking into account the lower tier equilibrium strategy (E_1^1,s^1), L chooses a tax rate $t^1 \in T=[0,1]$ that maximizes $P_L=(\lambda_1-\lambda_u q_1)C_1^1(t)+\lambda_u[\Sigma_m q_m U_m(s^1(t),t)-q_1 E_1(s^1(t),s^n(t),t)]$, and also the joint payoff together with the lobby. Solving simultaneously, we obtain $t^1 \equiv argmax_{t \in T}\lambda_1[U_1(s^1(t),t)-E_1^1(s^1(t),s^n(t),t)]+\lambda_u q_2 U_2(s^1(t),t)$ leading to the second equation in (6), assuming, as in the sequel, that the second order condition is satisfied. To reduce notation, from now on, we adopt the convention that $U_m(s^w(t),t) \equiv U_m(s^w,t)$ (m=1,2; w=1,n) and $E_1^1(s^1(t),s^n(t),t) \equiv E_1^1(t)$. Now, group 1 offers a contribution C_1^1 for t^1 that leaves L indifferent between t^1 and the tax rate t^u that would not elicit lobbying expenditure at L's tier (but it would at B's tier), if (optimally) selected by L.[28] Thus, C_1^1 is such that $P_L(s^1,t^1)= \lambda_u[\Sigma_m q_m U_m(s^1,t^u)-q_1 E_1^1(t^u)]$, or:

$$C_1^1 = (\lambda_u/\lambda_1)\{q_1[U_1(s^1,t^u)-E_1^1(t^u)-U_1(s^1,t^1)+E_1^1(t^1)]+q_2[U_2(s^1,t^u)-U_2(s^1,t^1)]\} \qquad \text{(A.2)}$$

where $\lambda_1 \equiv \lambda_1-\lambda_u q_1$. From the definition of t^u: $C_1^1 \geq 0$; and, from (A.2) and the definition of t^1: $U_1(t^1)-E_1^1(t^1)-C_1^1 \geq U_i(t^u)-E_1^1(t^u)$ meaning that group 1 has an incentive to lobby L. In both cases, strict inequality holds for $t^1 \neq t^u$.[29]

[28] Note that t^u is generally different from t^n [cf. (5)] that is obtained when E_m equals zero for all m.
[29] If we neglect the special case of $U_1(s^1,t)-E_1^1(t)$ maximized at t^1, then $t^u \neq t^1$ is obtained, and $C_1^1>0$.

PROPOSITION 1

Denote with $P_B(s^1,t^1)$ and $P_L(s^1,t^1)$ the payoffs of B and L when they are lobbied by group 1, and with $P_B(s^n,t^n)$ and $P_L(s^n,t^n)$ their payoffs when they are not lobbied.

(i) $P_L(s^n,t^n)>P_L(s^1,t^1)$ if and only if $l_u S_m q_m[U_m(s^n,t^n)-U_m(s^1,t^1)]> l_1 C_1^1-l_u q_1 E_1^1(t^1)$ or, from (A.2): $S_m q_m[U_m(s^n,t^n)-U_m(s^1,t^u)]+q_1 E_1^1(t^u)>0$, implying, after rearranging, $S_m q_m[U_m(s^n,t^n)-U_m(s^n,t^u)]+ S_m q_m[U_m(s^n,t^u)-U_m(s^1,t^u)]+q_1 E_1^1(t^u)>0$. This inequality is satisfied because the first term is nonnegative, by the definition of t^n (5), the second term is strictly positive by the definition of s^n (5), $s^n \neq s^1$, and $E_1^1>0$ for any $t \hat{I} T$.

(ii) To prove that lobbying (at both stages) may have an ambiguous effect on the payoff of B, comparing with the case of no lobbying, assume for the moment that E_1^1 strictly increases with t. From (A.2), $P_B(s^1,t^1) \gtreqless P_B(s^n,t^n)$ if and only if: $(b_1-b l_u q_1)E_1^1(t^1)+b\{l_u S_m q_m[U_m(s^1,t^1)+U_m(s^1,t^u)-U_m(s^1,t^1)-U_m(s^n,t^n)]+l_u q_1[E_1^1(t^1)-E_1^1(t^u)]\} \lesseqgtr 0$. Recall that $(b_1-b l_u q_1)E_1^1(t^u)=b l_u S_m q_m[U_m(s^n,t^u)-U_m(s^1,t^u)]$. Thus: $P_B(s^1,t^1) \gtreqless P_B(s^n,t^n)$ if and only if $b_1[E_1^1(t^1)-E_1^1(t^u)] \gtreqless b l_u S_m q_m[U_m(s^n,t^n)-U_m(s^n,t^u)]$.

Assume $t^u>t^1$. Then, $E_1^1(t^1)<E_1^1(t^u)$ and also $P_B(s^1,t^1)<P_B(s^n,t^n)$, since $S_m q_m[U_m(s^n,t^n)-U_m(s^n,t^u)] \geq 0$ from the definition of t^n (5). Assume instead $t^1>t^n$. Using $(b_1-b l_u q_1)E_1^1(t^n)=b l_u S_m q_m[U_m(s^n,t^n)-U_m(s^1,t^n)]$, we have that $P_B(s^1,t^1)>P_B(s^n,t^n)$ if $b_1[E_1^1(t^1)-E_1^1(t^n)]+b l_u\{q_1[U_1(s^1,t^u)-E_1^1(t^u)-U_1(s^1,t^n)+E_1^1(t^n)]+q_2[U_2(s^1,t^u)-U_2(s^1,t^n)]\}>0$. The first term between brackets is positive by the initial assumption of E_1^1 strictly increasing with t, and the second term between brackets is nonnegative, because of the definition of t^u [see above (A.2)]. Thus, $P_B(s^1,t^1)>P_B(s^n,t^n)$.

In order to complete the proof, we need to show that E_1^1 is increasing in t and that $t^u>t^1$ or $t^1>t^n$ are possible. To do so, we adopt a specific example that will prove to be useful also for showing

further results. In this example we assume $h_1=(sR)^{1/2}$ and $h_2=[(1-s)R]^{1/2}$ in (1), where R^{o} $tS_m n_m y_m$. In this way, it can be shown that $t^u > t^1$ if (y_1/y_2) is sufficiently large and $t^1 > t^n$ if l_u and (y_1/y_2) are sufficiently small, establishing the proof.

All the calculations related to the specific example are not presented here, but available upon request.

(iii) From previous results, we know that $U_1(s^1,t^1)-E_1^1(t^1)-C_1^1 \geq U_i(s^1,t^u)-E_1^1(t^u) > U_i(s^n,t^u)$; for b_1 sufficiently larger than $bl_u q_1$ the increase in redistribution (from s^n to s^1), due to lobbying at B's stage, is expected to dominate the tax effect, leading to $U_1(s^1,t^1)-E_1^1(t^1)-C_1^1 > U_i(s^n,t^n)$, as indeed can be shown making use of the specific example introduced above. On the contrary, for b_1 sufficiently close to $bl_u q_1$ (such that $s^1 \approx s^n$) the opposite result can be obtained for some sets of parameters. They include cases where s^n and s^1 both tend to one or zero, such that $h_1(s^1,t^1)$ tends to $h_1(s^n,t^n)$ and the disposable income effect (linear in V_1) dominates.

(iv) The result $P_L(s^n,t^n) > P_L(s^1,t^1)$ implies, in case that group 1 profits from lobbying, that the unorganized group 2 loses, because $l_u q_2[U_2(s^n,t^n)-U_2(s^1,t^1)] > l_1 C_1^1 + l_u q_1\{[U_1(s^1,t^1)-E_1^1(t^1)-C_1^1]-U_1(s^n,t^n)\} > 0$. If instead group 1 loses from lobbying then a necessary condition for group 2 benefiting [i.e. $U_2(s^n,t^n)-U_2(s^1,t^1)<0$] is that $l_u q_1\{U_1(s^n,t^n)-[U_1(s^1,t^1)-E_1^1(t^1)-C_1^1]\} > l_1 C_1^1 > 0$, but calculations for *(iii)* show that $U_1(s^n,t^n) > [U_1(s^1,t^1)-E_1^1(t^1)-C_1^1]$ is obtained for l_u sufficiently low and l_1 sufficiently high in contrast with the previous necessary condition.

A necessary condition for group 2 benefiting [i.e. $U_2(s^n,t^n)-U_2(s^1,t^1)<0$] is that $U_1(s^n,t^n) > U_1(s^1,t^1)$, since $S_m q_m U_m(s^n,t^n) \geq S_m q_m U_m(s^n,t^1)$, by the definition of t^n and $S_m q_m U_m(s^n,t^1) > S_m q_m U_m(s^1,t^1)$ by the definition of s^n. Again, using the specific example, we can verify that $U_2(s^n,t^n) \leq U_2(s^1,t^1)$ is feasible.

***Competitive lobbying* (section 3.2.)**

LOWER TIER

The derivation of (7) follows straightforwardly from the equilibrium definition mentioned at the beginning of this Appendix. Now, a policy has to maximize the joint payoff of the decisionmaker and *each* single lobby, acting in a noncooperative fashion, as well as the payoff of that decisionmaker. Therefore, s^* maximizes P_B and U_m for all m. For any $t \in T$ and C_m, from (6) and (7): $s^1 > s^*$, since $b_m \neq b_m - bl_u q_m > 0$ for all m. Comparison of (5) and (7) shows that 'fully capture' ($s^* = s^n$) is obtained if $b_m = q_m$ for all m (in which case, $bl_u < 1$). To check the net payoffs of the lobbies, we refer to the previous procedure for deriving the lobbying expenditure of each group. Each group j offers noncoopeatively a contribution such that, for any given $t \in T$ and C_m:

$$P_B(s^*) = P_B(s^i) \tag{A.3}$$

where s^i is B's policy when only group i ($i \neq j$; $i,j=1,2$) offers a positive contribution. Denote with E_m^* an optimal contribution schedule from any group m, under competitive lobbying. Since s^* maximizes the utility of each group: $U_i(s^*) - E_i^*(s^*) \geq U_i(s^i) - E_i^*(s^i)$. From (A.3) and (4): $\beta_2 E_2^*(s^*) = \beta_1[E_1^*(s^1) - E_1^*(s^*)] + bl_u\{q_2[U_2(s^1) - U_2(s^*)] + q_1[U_1(s^1) - U_1(s^*)]\} \geq \beta_1[U_1(s^1) - U_1(s^*)] + bl_u\{q_2[U_2(s^1) - U_2(s^*)] + q_1[U_1(s^1) - U_1(s^*)]\}$; or: $E_2^*(s^*) \geq (1/\beta_2)\{b_1[U_1(s^1) - U_1(s^*)] + bl_u q_2[U_2(s^1) - U_2(s^*)]\} > 0$ by (6), since $s^1 \neq s^*$. By symmetry, $E_m^*(s^*) > 0$ for all m.

Clearly, if $s^* = s^n$, i.e. the lobbies do not affect the policy - as in the case when $b_m = q_m = q$ for all m- and yet pay positive contributions,[30] both groups are worse off with competitive lobbying than

[30] In fact: $E_j^*(s^*) \geq [1/q(1-bl_u)]\{q[U_i(s^j) - U_i(s^n)] + bl_u q[U_j(s^i) - U_j(s^n)]\} > 0$, for $i \neq j$, because s^j maximizes $qU_i + bl_u qU_j$ and $s^i \neq s^n$.

without any lobbying ('full capture' by B). On the contrary, if $s^* \neq s^n$, a group can benefit from lobbying. For example, for group 2, $U_2(s^*)-E_2^*(s^*)>U_2(s^n)$ if, after substituting for $E_2^*(s^*)$ as derived above (with the equality sign), $b_2[U_2(s^*)-U_2(s^n)]>b_1[U_1(s^1)-U_1(s^*)]+bl_u q_2[U_2(s^1)-U_2(s^*)]$; that can be rewritten as $\sum_m b_m[U_m(s^*)-U_m(s^n)]+bl_u \sum_m q_m[U_m(s^n)-U_m(s^1)]>b_1[U_1(s^1)-U_1(s^n)]$, which holds for b_1 sufficiently low, for example; since $b_1 \to 0$ implies that $s^1 \to s^n$ (and $s^* \to s^2$) such that the right hand side tends to zero whereas the left hand side is strictly positive, recalling the definition of s^* (7). However, if both groups compete through lobbying, at most one group can be better off: if group 2 benefits from competitive lobbying, group 1 loses, because $U_2(s^*)-E_2^*(s^*)>U_2(s^n)$ implies that $U_2(s^*)>U_2(s^n)$ and, consequently, $s^*<s^n$. But, then: $U_1(s^n)>U_1(s^*)>U_1(s^*)-E_1^*(s^*)$.

<u>Truthful Nash equilibrium</u>

From Bernheim and Whinston (1986), E_m^* represents a truthful strategy relative to $s°$ if and only if for all $s \in S$: either $U_m(s)-E_m^*(s)=U_m(s°)-E_m^*(s°)$ or $U_m(s)-E_m^*(s)<U_m(s°)-E_m^*(s°)$ and $E_m^*(s)=0$. Recalling that $U_m(s^m)>U_m(s^*)-E_m^*(s^*)$, truthfulness implies $U_m(s^*)-E_m^*(s^*)=U_m(s^m)-E_m^*(s^m)$. This refinement of the contribution set leads to the following unique equilibrium pair of contributions, from (A.3) and (4), for any given $t \in T$ and C_m:

$$E_1^*(s^*) = (1/\beta_1)\{b_2[U_2(s^2)-U_2(s^*)]+bl_u q_1[U_1(s^2)-U_1(s^*)]\} \quad \text{and}$$

$$E_2^*(s^*) = (1/\beta_2)\{b_1[U_1(s^1)-U_1(s^*)]+bl_u q_2[U_2(s^1)-U_2(s^*)]\} \qquad \text{(A.4)}$$

$E_m^*(s^*)>0$ from the definition of s^i (6). From (A.4): $U_j(s^*)-E_j^*(s^*)-U_j(s^i)=(1/\beta_j)\sum_m b_m[U_m(s^*)-U_m(s^i)]>0$ by (7) and $s^i \neq s^*$. This means that a group j has an incentive to lobby if the opponent i lobbies. But, if $s^*=s^n$, the interest groups would clearly better off if they could coordinate on not lobbying. From now on we focus on the truthful Nash equilibrium (E_1^*,E_2^*,s^*).

PROPOSITION 2

Comparing (A.1) and (A.4) it is evident that $E_i^*(s^*)>E_i^i(s^i)$ for bl_u sufficiently small. Using the example introduced in the proof of Proposition 1 (ii) we can show that this as well as the opposite result can hold, and also that $S_m E_m^*(s^*)<E_i^i(s^i)$ holds, for a ratio $ß_j n_j/ß_i n_i$ sufficiently large.

UPPER TIER

For expositional reasons, denote: $U_1(t) \circ U_1(s^*;t)-E_1^*(s^*,s^2;t)$ and $U_2(t) \circ U_2(s^*;t)-E_2^*(s^*,s^1;t)$. From (A.4): $U_1(t)=(1/ß_1)\{b_1[U_1(s^*;t)-U_1(s^2;t)]+b_2[U_2(s^*;t)-U_2(s^2;t)]\}+U_1(s^2;t)$ and $U_2(t)=(1/ß_2)\{b_2[U_2(s^*;t)-U_2(s^1;t)]+b_1[U_1(s^*;t)-U_1(s^1;t)]\}+U_2(s^1;t)$. In line with the equilibrium definition at the beginning of this Appendix, L chooses a tax rate t^*, taking into account (7) and (A.4), such that: $S_m l_m U_{mt}(t^*)=0$ [cf.(8)]. To derive the contributions offered to L, we take as a reference $t^{i\circ}$ which indicates the tax rate chosen when only group i lobbies L (but both groups lobby B), implicitly defined by $l_i U_{it}(t^{i\circ})+l_u q_j U_{jt}(t^{i\circ})=0$.[31] At the lower tier, a group $j \neq i$ sets C_j^* such that L is left indifferent between $t^{i\circ}$ and the competitive lobbying outcome t^*, i.e. $P_L(s^*(t^*),t^*)=P_L(s^*(t^{i\circ}),t^{i\circ})$. From truthfulness, we obtain:

$$C_1^*(t^*) = [1/l_1]\{l_2[U_2(t^{2\circ})-U_2(t^*)]+l_u q_1[U_1(t^{2\circ})-U_1(t^*)]\} \quad \text{and}$$

$$C_2^*(t^*) = [1/l_2]\{l_1[U_1(t^{1\circ})-U_1(t^*)]+l_u q_2[U_2(t^{1\circ})-U_2(t^*)]\} \tag{A.5}$$

where $l_m \circ l_m - l_u q_m>0$ for all m; $C_m^*(t^*)\geq 0$, by the definition of $t^{i\circ}$ (and $C_m^*(t^*)>0$ for $t^{i\circ} \neq t^*$).[32]

[31] Comparison with (8) shows that $t^* \neq t^{i\circ}$, if we exclude the extreme cases where $U_{jt}=0$ at t^*.

[32] Also at the upper tier, as well as the lower tier, an interest group has an incentive to counteract lobbying of the opponent: $U_j(t^*)-C_j^*(t^*)-U_j(t^{i\circ})=[1/l_j]S_m l_m[U_m(t^*)-U_m(t^{i\circ})] \geq 0$ from the definition of t^*.

PROPOSITION 3

Let $P_B(s^*,t^*)$ and $P_L(s^*,t^*)$ be the payoffs of the decisionmakers with competitive lobbying and $P_B(s^n,t^n)$ and $P_L(s^n,t^n)$ their payoffs in the case with no contributions. It can be seen from the objective functions of the policymakers that $[P_L(s^*,t^*)>P_L(s^n,t^n)]\Rightarrow[P_B(s^*,t^*)>P_B(s^n,t^n)]$ and $[P_B(s^*,t^*)<P_B(s^n,t^n)]\Rightarrow[P_L(s^*,t^*)<P_L(s^n,t^n)]$. Starting from the first result, after substituting for (A.5), $P_L(s^*,t^*)>P_L(s^n,t^n)$ if and only if: $l_2[U_2(t^{2\circ})-U_2(t^*)]+l_uq_1[U_1(t^{2\circ})-U_1(t^*)]+l_1[U_1(t^{1\circ})-U_1(t^*)]+l_uq_2[U_2(t^{1\circ})-U_2(t^*)]>l_uS_mq_m[U_m(s^n,t^n)-U_m(t^*)]$; $P_L(s^*,t^*)>P_L(s^n,t^n)$ is then possible, for example, for l_u sufficiently small since, for $l_u\rightarrow 0$, the difference between $t^{i\circ}$ and t^* increases so that $l_2[U_2(t^{2\circ})-U_2(t^*)]+l_1[U_1(t^{1\circ})-U_1(t^*)]>0$. In this case, also $P_B(s^*,t^*)>P_B(s^n,t^n)$: L and B profit from competitive lobbying.

On the contrary, L may be better of without any lobbying if lobbying at the lower stage is particularly wasteful and if lobbying gives L little benefit. From (3), notice that $P_L(s^*,t^*)<P_L(s^n,t^n)$ if and only if $S_ml_mC_m^*-l_uS_mq_mE_m^*<l_uS_mq_m\,[U_m(s^n,t^n)-U_m(s^*,t^*)]$. If $l_uS_mq_m$ is very large, such that $l_1,l_2\rightarrow 0$; then $t^*\rightarrow t^{2\circ},t^{1\circ},t^n$ and $l_mC_m^*$®0. Then, $S_ml_mC_m^*-l_uS_mq_mE_m^*$ could be very small and even negative, whereas $l_uS_mq_m[U_m(s^n,t^n)-U_m(s^*,t^*)]$ is still strictly positive, for $t^*\rightarrow t^n$, because of the definition of s^n (5) and $s^*\neq s^n$.

At the lower tier, $P_B(s^*,t^*)<P_B(s^n,t^n)$ if $S_ml_mC_m^*+(1/b)S_mb_mE_m^*<l_uS_mq_m[U_m(s^n,t^n)-U_m(s^*,t^*)]$. With respect to the previous case for L, this outcome needs that also b is sufficiently large. A large b reduces the left hand side also through its negative effect on E_m^*.[33] However, this outcome represents a rather extreme case, since high b and l_u tend to imply low b_m; in this case competitive lobbying converges to the no-lobbying outcome.

[33] See, *infra*, the proofs for the results in section 4.

As for the interest groups, when $P_L(s^*,t^*)<P_L(s^n,t^n)$ it follows that $U_m(s^n,t^n)>U_m(t^*)-C_m^*(t^*)$ for at least one m. This establishes that an interest group can lose from competition. It could also happen that all lobbies lose, for example when $s^*=s^n$. A sufficient condition, in this case, is that $U_m(s^n,t^n)\geq U_m(s^n,t^*)$ for all m. This result is described using the specific example introduced in the proof of Proposition 1. In that example $U_m(s^n,t)$ is strictly concave in t. Then, defining $t^m\in argmax U_m(s^n,t)$ we can find a set of parameters such that $t^m\geq t^n\geq t^*$, implying that $U_m(s^n,t^n)\geq U_m(s^n,t^*)$, for all m.

On the other hand, it results that not all groups can benefit from competitive lobbying at both stages. Assume that it is not true and $U_m(s^*,t^*)-E_m^*(s^*,t^*)-C_m^*(s^*,t^*)>U_m(s^n,t^n)$ for all m. Then, $\sigma_m q_m[U_m(s^*,t^*)-U_m(s^n,t^n)]>0$ or, after rearranging, $\sigma_m q_m\{[U_m(s^n,t^*)-U_m(s^n,t^n)]+[U_m(s^*,t^*)-[U_m(s^n,t^*)]\}>0$; but this is not true since the first and the second terms are negative by the definition of t^n and s^n, respectively [cf. (5)]. However, it is possible for one lobby i to benefit from competitive lobbying, i.e.: $U_i(t^*)-U_i(t^n)>C_i^*(s^*,t^*)+U_i(s^n,t^n)-U_i(t^n)$. This happens, for example, when the opponent group is powerless at both stages (in this way competitive lobbying approaches monopsonist lobbying that is often advantageous for the monoponist, as shown). In fact, first notice from (A.5) that $U_i(t^*)-U_i(t^n)>C_i^*(s^*,t^*)$ if and only if: $\sum_m \lambda_m[U_m(t^*)-U_m(t^n)]+\lambda_u\sum_m q_m[U_m(t^n)-U_m(t^{j\circ})]+\lambda_j[U_j(t^n)-U_j(t^{j\circ})]>0$ for $j\neq i$. First two terms within brackets are strictly positive by the definition of t^* (8) and t^n (5) that are generally different from t^n and $t^{j\circ}$, respectively; then, for $\lambda_j\to 0$,[34] we have $U_i(t^*)-U_i(t^n)>C_i^*(s^*,t^*)$. Using (A.4) evaluated at t^n and rearranging, $U_i(s^n,t^n)-U_i(t^n)<0$ if and only if $\sum_m b_m[U_m(s^*)-U_m(s^n)]+b\lambda_u\sum_m q_m[U_m(s^n)-U_m(s^j)]+b_j[U_j(s^n)-U_j(s^j)]>0$. If $b_j\to 0$, then $s^j\to s^*$ and $s^n\to s^j$, and the left-hand side converges to $\sum_m b_m[U_m(s^*)-U_m(s^n)]$ which is strictly positive.

[34] Implying that $t^*\to t^{i\circ}\equiv argmax_t[\lambda_i U_i(t)+\lambda_u q_j U_j(t)]$ and $t^{j\circ}\to t^{u\circ}\equiv argmax_t \lambda_u\sum_m q_m U_m(t)$.

Cross-tiers effects of changes in influence under competitive lobbying **(section 3.3.)**

The results are derived exploiting the specific utility function introduced in the proof of Proposition 1. Again, these calculations are available upon request.

Further results on hierarchical influence **(section 4)**

PROPOSITION 4

Eq.(7) shows that s^* is unaffected by b, for given t. To see the effect of hierarchical influence (i.e. the parameter b) on lobbying expenditures at B's tier, start by assuming that B is only interested in contributions, i.e. $b=0$. From (A.3), group 2 sets a contribution schedule such that $b_1E_1^{-b}(s=1)= S_m b_m E_m^{-b}(s^*)$,[35] where the superscript $-b$ denotes the lack of control, whereas group 1 sets a schedule such that $b_2E_2^{-b}(s=0)=S_m b_m E_m^{-b}(s^*)$. Truthfulness implies $E_1^{-b}(s=1)-E_1^{-b}(s^*)=U_1(s=1)-U_1(s^*)$ and $E_2^{-b}(s=0)-E_2^{-b}(s^*)=U_2(s=0)-U_2(s^*)$. After substituting, $E_j^{-b}(s^*)=(b_i/b_j)[U_i(s^{-bi})-U_i(s^*)]$, where $s^{-b1}=1$ and $s^{-b2}=0$.

From (A.4), $E_j^*(s^*) \gtrless E_j^{-b}(s^*)$ if and only if $b_j\{b_i[U_i(s^i)-U_i(s^*)]+bl_u q_j[U_j(s^i)-U_j(s^*)]\} \gtrless ß_j b_i[U_i(s^{-bi})-U_i(s^*)]$; or: $ß_j b_i[U_i(s^i)-U_i(s^{-bi})]+bl_u q_j b_i[U_i(s^i)-U_i(s^*)]+bl_u q_j b_j[U_j(s^i)-U_j(s^*)] \gtrless 0$.

Since $U_i(s^i)£U_i(s^{-bi})$, and $S_m b_m[U_m(s^i)-U_m(s^*)]<0$ by (7) as s^i ¹ s^*, the left-hand side is negative; thus: $E_j^{-b}(s^*)>E_j^*(s^*)$. To show that the latter result can be reversed, and that E_j may increase trough the effect on t^*, for q_j/q_i sufficiently low for example, once more we use the specific example introduced earlier.

[35] A competitive equilibrium s^* is unaffected by b.

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