A joint Initiative of Ludwig-Maximilians-Universität and Ifo Institute for Economic Research

CESifo Working Papers

CORPORATE LOBBYING AND COMMITMENT FAILURE IN CAPITAL TAXATION

Nicolas Marceau
Michael Smart*

CESifo Working Paper No. 676 (1)

February 2002

Category 1: Public Finance

CESifo
Center for Economic Studies & Ifo Institute for Economic Research
Poschingerstr. 5, 81679 Munich, Germany
Phone: +49 (89) 9224-1410 - Fax: +49 (89) 9224-1409
e-mail: office@CESifo.de
ISSN 1617-9595

* Thanks to Robin Boadway, Steve Coate, Ian Cromb, Arthur Hosios, Didier Laussel, Casey Mulligan, Pierre Pestieau, Yves Richelle, two referees, and especially Joanne Roberts for some very helpful suggestions.

CESifo *Working Paper No. 676*
February 2002

CORPORATE LOBBYING AND COMMITMENT FAILURE IN CAPITAL TAXATION

Abstract

This paper investigates the effects of lobbying by corporations when investments are irreversible and government cannot commit to tax policies. We show that industries which rely more heavily on sunk capital lobby more vigorously and are generally more successful in obtaining tax breaks. Thus lobbying can mitigate the capital levy problem. Nevertheless, these industries invest less in long-run equilibrium than more flexible ones. We then consider the effects of relaxing legal restrictions on corporate lobbying. When the deadweight costs of lobbying fall, taxes on sunk capital tend to fall, but political contributions may rise, as lobbyists compete more intensively for political favors. On balance, a ban of lobbying may therefore cause investment to rise or fall.

JEL Classification: H2.

Nicolas Marceau
CREFE and Département des sciences économiques
Université du Québec
C.P. 8888 Succursale Centre-Ville
Montréal QC H3C 3P8
Canada

Michael Smart
Department of Economics
University of Toronto
150 St. George St.
Toronto ON M5S 3G7
Canada
smart@economics.utoronto.ca

Democratic governments must be responsive to the desires of voters, and so they may find it difficult to commit to stable policies over time. One consequence of commitment failure of concern to public finance economists is the "capital levy problem" (Barry Eichengreen, 1990). In this standard view, high taxes on irreversible investments are tempting to governments since they seem to impose small deadweight costs. But this is anticipated by rational investors, so that saving is reduced, and sunk investments are discouraged in favor of more flexible ones.[1]

While the problem doubtless arises in a number of real-world situations, the picture of commitment failure that emerges seems in general too bleak. We argue that a richer theory of political equilibrium leads to very different conclusions. While owners of sunk capital do not—in the language of Albert O. Hirschman (1970)—have a good "exit" option in the face of taxation, there remain significant opportunities for "voice" in a democratic society. In this paper, we show how lobbying by firms on behalf of shareholders can mitigate—and even reverse—the logic of the capital levy problem.[2]

Of course, anyone can lobby for tax breaks, and most large firms in the United States are said to do so.[3] The key to our argument, therefore, is that owners of sunk capital are more willing than other lobbyists to "pay" for tax breaks. There is little incentive to lobby when capital is mobile among industries, and physical assets can easily be transformed to alternative uses: with full mobility, the benefits of tax reductions would be quickly dissipated as new investment entered the industry and, conversely, shareholders can avoid bearing tax increases by simply redirecting their funds to other sectors. Thus preferential tax treatment is a public good to which individual firms or industry associations have little incentive to contribute. In contrast, when capital investments are sunk irreversibly in physical capital equipment that has few alternative uses, lobbying can act to protect short-run profits in an industry.

To explore this notion, we consider a model in which firms initially announce investment plans and raise capital. Subsequently, industry lobby groups offer direct financial support to a legislator contingent on future tax

---

[1]This problem is closely analogous to the "hold-up problem" in private contracts subject to renegotiation (Oliver E. Williamson, 1985).

[2]A number of other explanations have been advanced in the literature for why governments are able to resist imposition of capital levies, including the role of reputation (Laurence J. Kotlikoff, Torsten Persson and Lars E. O. Svensson, 1988) and the possibility that commitment power is greater in a representative democracy (Persson and Guido Tabellini, 1994).

[3]The impact of lobbyists on tax policy in the U.S. has been only informally documented, but the evidence suggests that taxation is a primary consideration determining contributions of political action committees for many corporations. In a recent series of detailed interviews with corporate executives, for example, when asked to cite examples of their PACs' achievements, "about 90 per cent" cited tax breaks they had obtained (Dan Clawson *et al.*, 1998). See also Fred S. McChesney (1997) for a discussion of the role of industry lobbies in shaping the 1986 U.S. Tax Reform Act.

policies, and tax rates are determined to maximize the politician's preferences over contributions and political support. Finally, after tax rates have been announced, firms may change their investment decisions before production occurs, although doing so is costly.

In this model, if lobbying were not permitted, then tax rates would be higher for industries with greater adjustment costs, and investment would be inefficiently low in all industries. We show in Proposition 1 that the introduction of lobbying must reduce the dependence of tax rates on adjustment costs: in this sense, lobbying always mitigates the capital levy problem. In fact, for plausible restrictions on parameters, firms with higher adjustment costs will lobby so much more vigorously that they actually face lower tax rates in equilibrium than more flexible firms. This reverses the standard conclusion about capital levies. This key prediction of the model appears to fit the pattern of effective tax rate differentials actually observed among industries in the U.S. and elsewhere.[4] Tax preferences are frequently targeted at industries—such as oil and gas, mining, and real estate—in which capital investments are essentially irreversible. (Indeed, investments in mineral exploration and development, for example, are quite literally "sunk".) As well, many preferences in the U.S. tax code seem to be directed at sunk assets, including: (i) expensing of "intangible" assets such as advertising and goodwill, (ii) tax credits for research and development expenditures, and (iii) preferential treatment of residential housing investments.

We then consider the implications of lobbying for the pattern of investment among firms, which depends on the tax vector chosen by the politician and the contributions offered by lobbies in equilibrium. Despite facing lower taxes, industries that rely on sunk capital invest less in equilibrium than more flexible ones (Proposition 2). The reason is that lower taxes on sunk assets must be supported by higher contributions from industry lobby groups, which themselves act as distortionary taxes on investment by member firms. Thus lobbying can never eliminate the capital levy problem entirely, and investment in all industries is lower than if government could commit to tax rates before investments are sunk.

In fact, investment and consumer welfare may be lower when lobbying is permitted than when it is not. To show this, we examine the impact of changes in the deadweight costs of lobbying. (For example, when deadweight costs are zero, direct cash bribes are permitted; when deadweight costs are 100 per cent of contributions, lobbying is effectively banned.) When the cost of lobbying falls, the politician is more easily swayed, and taxes on all industries tend to decrease. Nevertheless, Proposition 3 shows that investment may fall in some industries, as competition among the lobbies is intensified and political contributions rise. In general, the effect is to reallocate investment towards sectors that are the most effective lobbyists, rather than those that are most productive. It is even possible that lobbying causes such a small reduction in taxes and large increase in contributions that investment is lower in all industries than it would be if lobbying were banned. Thus

[4]See Jane G. Gravelle (1994) for a discussion of corporate tax differentials.

the case for lobbying as a solution to government's commitment problem is weaker than it would at first appear.

I The model

A The economy

Consider a competitive economy with n consumption goods. Firms in industry $i = 1, \ldots, n$ employ a constant returns to scale technology $F_i(Z, L)$ to produce output from capital Z and labor L. To incorporate investment adjustment costs in a simple way, we suppose that each firm chooses an initial investment level K; subsequently, after government has announced its tax policies and producer prices are known, the firm hires labor and has an opportunity to adjust its investment plan. Doing so is costly, however: adjusting investment from K to Z costs the firm $H(Z, K)$ units of labor (the numeraire). We assume that $H(Z, K)$ also exhibits constant returns to scale and let $G(Z/K) = H(Z/K, 1)$ denote adjustment costs per unit of initial investment; $G(z)$ is convex, and $G(1) = 0$.

In addition to adjustment costs, the firm must pay the rental price of the capital Z that is ultimately installed. Since the wage–rental ratio will be fixed in equilibrium for a reason explained shortly, we set the rental price of capital to one without further loss of generality. Because of the constant returns assumptions, the firm's (short-run) profit per unit of initial capital can be written as a function

$$\pi_i(p_i) = \max_{(z,l)} p_i F_i(z, l) - G_i(z) - z - l \tag{1}$$

where p_i is the producer price in the industry. The aggregate output of the industry is therefore by Hotelling's lemma $y_i(p_i, K_i) = \pi_{i,p}(p_i)K_i$, where K_i is initial capital stock. Short-run profits accrue to owners of old capital, who are the residual claimants in the industry.

To close the model, we must specify consumer demands and factor supplies. Consumers are one of two types, which we label "workers" and "capitalists". Both types of consumer are endowed with labor, which they supply to firms in order to purchase consumption goods. Workers may supply their labor only to firms producing consumption goods, whereas capitalists may work in either the production of consumption goods or of capital goods. Capital goods are produced using a linear technology, with one unit of labor required for each unit of capital produced. Since capitalists must be indifferent between working in the two sectors of the economy (we assume an interior solution to the capitalists' problem), the rental price of capital is fixed at one in equilibrium. All consumers, whether workers or capitalists, have identical preferences for consumption and labor supply, and preferences are separable in consumption goods and quasi-linear in labor supply: $U(x, l) = \sum_i u_i(x_i) - l$. When q_i is the consumer price of good i, therefore, aggregate consumer surplus in market i is given by some function $s_i(q_i)$, and market demands are $x_i(q_i) = -s_i'(q_i)$ (Roy's identity).

B Government

Government levies specific taxes $t_i = q_i - p_i$ on each of the consumption goods. These tax rates are announced after firms have chosen old capital stocks K_i, but before the final production plan (L_i, Z_i) has been chosen. This difference in timing is the crucial distinction between old and new capital: new capital is free to move among industries to avoid taxes—or indeed can be consumed as leisure—whereas old capital cannot. Given initial investment K_i, the market for commodity i clears at prices such that

$$x_i(q_i) = y_i(p_i, K_i) \tag{2}$$

which implicitly defines the equilibrium producer price as a function of the consumer price, say $p_i = \phi_i(q_i, K_i)$. Let excise tax revenue generated from industry i be $R_i(q_i, K_i) = (q_i - \phi_i(q_i, K_i))x_i(q_i)$. To simplify notation, we also write $\pi_i(q_i)$ the rate of profit as a function of the consumer price, using (2).

To provide a benchmark for the analysis which follows, we derive second-best efficient tax policies for the model. Suppose that government is able to commit to tax rates announced before initial investments $(K_1, \ldots, K_n)$ are sunk, and it seeks to maximize a weighted average of welfare of workers and capitalists

$$W(q, K) = \sum_i \left[s_i(q_i) + \beta\pi_i(q_i)K_i\right] \tag{3}$$

where $\beta < 1$ is the weight on capitalists' welfare. The government is constrained to set taxes to meet an exogenous revenue constraint, $\sum_i R_i(q_i, K_i) \geq \bar{R}$.

Since $\pi_i = 0$ for all i in long-run equilibrium, government correctly anticipates that capital will earn no rents, and that excise taxes will be fully shifted forward to consumers. Producer prices are therefore fixed at $p_i = \pi_i^{-1}(0)$, and optimal tax rates $t_i^r(\mu^r)$ satisfy

$$\frac{t_i^r}{q_i^r} = \frac{1 - \mu^r}{\mu^r}\frac{1}{\epsilon_i} \tag{4}$$

where μ^r is the marginal cost of public funds at the optimum and $\epsilon_i = q_i x_i'/x_i$ the price elasticity of demand. This is the standard Ramsey tax formula.

When government cannot commit to policy before investment is sunk, but lobbying cannot occur, tax rates depart from the Ramsey formula, with higher rates levied on industries that rely more on sunk capital, so that industry supply is less elastic in the short run. This occurs for two reasons. First, a tax on an inelastic industry appears to distort consumer demands less and so have lower excess burden. Second, part of the tax on an inelastic industry is shifted backward to owners of old capital, which is desirable given government's distributional preferences. Of course, neither of these effects operates in long-run equilibrium, as initial investments are adjusted to equalize the return to capital in all sectors, and all taxes are shifted forward to consumers.

C Lobbying

After initial investments K_i have been sunk, firms in each industry form an organization to lobby government over taxes. As in B. Douglas Bernheim and Michael D. Whinston (1986), lobbying activities are described by a menu-auction game: each lobby group chooses a schedule that specifies the level of contributions to the politician that will be paid in exchange for each policy that can feasibly be enacted. The vector of tax rates levied is then chosen unilaterally by a politician. We assume the politician's objective is a linear combination of welfare W and the sum of contributions C_i from each industry,

$$\Omega(q, C) = W(q, K) + \alpha \sum_i C_i(q) \tag{5}$$

In this formulation, the parameter α indexes the sensitivity of the politician to political contributions. Preferences of this form can be derived from a model of political competition in which contributions are used by parties to sway impressionable voters in the population—see Gene M. Grossman and Elhanan Helpman (1996).[5] Later in the paper, we investigate the impact of changes in α induced by regulations imposed on political lobbying.

Membership in the group is mandatory for all firms in the industry, and the group finances its political contributions with taxes on member firms that are proportional to their stocks of old capital. The lobbyist then designs its contribution schedule to maximize net profit in the industry, $\pi_i(q_i)K_i - C_i$. We restrict the contribution functions C_i to be chosen from some compact set $\mathcal{C}_i$.

II Equilibrium tax policies, contributions, and investment

To describe equilibrium in the economy, we initially take the vector of old capital stocks K to be fixed. (We later address the long-run equilibrium allocation of investment.) Given K, an equilibrium of the model is a vector of consumer prices q^* and a vector of industry contribution schedules $(C_i^*(\cdot))_{i \in N}$ that jointly satisfy:

1. The politician chooses a vector of consumer prices that are a best response to contribution schedules: i.e. $q^* \in \arg\max \Omega(q, C)$.
2. Each lobbyist chooses a contribution schedule C_i^* that is a best response to the schedules offered by other lobbies: i.e. $(q^*, C_i^*(\cdot)) \in \arg\max \pi_i(q_i)K_i - C_i(q)$ subject to item 1.

We confine our attention to equilibria of the game in which all lobbyists offer *truthful* contribution schedules (Bernheim and Whinston, 1986). A schedule C_i is said to be truthful if there exists a scalar v_i such that $C_i(q) = \max\{\pi_i(\phi_i(q_i, K_i))K_i - v_i, 0\}$ for all q. Thus a truthful contribution schedule

[5] See however Timothy Besley and Stephen Coate (2001) for a dissenting view of lobbying and electoral competition.

is one that offers to pay the politician the lobby's total willingness to pay for any policy vector, net of some target profit level v_i. Confining attention to truthful Nash equilibria is not as restrictive as it may seem: Bernheim and Whinston show that lobby i's best response correspondence to *any* strategies of its opponents contains a truthful strategy.[6]

Moreover, a truthful Nash equilibrium policy vector q^* has a simple characterization:[7] it maximizes a weighted sum of welfare and the profits of old capitalists:

$$V(q, K) = \sum_i [s_i(q) + (\alpha + \beta)\pi_i(q_i)K_i] \tag{6}$$

Equilibrium contributions from the lobbies induce the government to internalize the preferences of old capitalists. Naturally, this leads to tax policies more propitious to capitalists than in an equilibrium without lobbying.

A Tax policies

In a truthful Nash equilibrium, then, the effect of political contributions is merely to increase the weight on profit in the government's objective from β to $\alpha + \beta$. Defining $\eta_i = p_i^* y_{i,p}/y_i$ as the short-run price elasticity of supply at the optimum, the first-order condition for t_i^* can be written

$$t_i^* = t_i^r(\mu^*) + \frac{\mu^* - \beta - \alpha}{\mu^*}\frac{p_i^*}{\eta_i} \tag{7}$$

Thus equilibrium tax rates differ from Ramsey tax rates by an additive term that depends on the marginal cost of public funds (MCPF) μ^* and the weight on profits in the politician's objectives, as well as the supply elasticity.

The effect of lobbying on taxes can immediately be discerned by comparing (7) to the tax rate that would be implemented if there were no lobbying, so that $\alpha = 0$. In the latter case, since $\beta < \mu^*$,[8] tax rates would be decreasing in the supply elasticity η_i: sunk industries would face higher taxes than flexible ones. Introduction of lobbying tends to decrease taxes in all industries through the direct effect of α on (7). However, this will also typically increase the MCPF μ^*, as government must increase at least some tax rates to meet its revenue requirement. On balance, then, lobbying tends to decrease taxes on sunk industries, at the expense of higher taxes for flexible industries. This reflects the idea that industries which rely more heavily on sunk capital lobby more vigorously and are rewarded with lower tax rates in equilibrium. In this sense, lobbying must always mitigate the capital levy problem in the model.

[6] An intuitive argument for the result is as follows. At the equilibrium policy q^*, each lobby must bid its true *marginal* willingness to pay; otherwise it could change the slope of its contribution function and induce the politician to move the policy in the direction of higher net profit. But then there is no loss in bidding true willingness to pay, net of the equilibrium payoff v_i, at every policy vector that is not chosen in equilibrium.

[7] See Bernheim and Whinston (1986), Lemma 2. Grossman and Helpman (1994) show the same property holds for any differentiable contribution functions.

[8] It is possible to show that, for any required revenue $\bar{R} > 0$, $\mu^* > \min\{\alpha+\beta, 1\}$ Since $\beta < 1$, it follows that $\mu^* > \beta$.

Indeed, the effect of lobbying can be strong enough even to reverse the pattern of tax rates imposed in equilibrium.[9] Observe that the second term in (7) is negative and increasing in η_i when $\alpha + \beta > \mu^*$. This gives:

Proposition 1 *Suppose that short-run elasticities of supply and demand are independent of prices. Then firms which rely more on sunk capital (η lower) face lower tax rates if and only if $\alpha + \beta \geq \mu^*$.*

When the politician is sufficiently responsive to lobby contributions, sunk industries in fact face lower taxes than flexible ones. This ambiguity in the pattern of equilibrium tax rates reflects the two offsetting effects of investment flexibility in the model.[10] On the one hand, government regards inflexible industries as relatively cheap sources of revenue—once investment is sunk, taxes on these sectors appear to have low deadweight loss and positive distributional effects. On the other hand, these industries lobby most effectively, offering more in political contributions for tax reductions per dollar of deadweight loss than more flexible sectors. Which effect dominates depends on the responsiveness of the politician to lobby contributions. When contributions are valued highly compared to revenues ($\alpha + \beta > \mu^*$), government would choose to make a lump-sum transfer from government revenues to capitalists if it were possible to do so. When this is so, the effect of lobbying dominates the conventional deadweight loss effect, and inflexible sectors face lower taxes than flexible ones.

It is also instructive to compare equilibrium taxes to efficient, Ramsey taxes. Observe that when $\alpha + \beta = \mu^*$ then the second term in (7) vanishes, so that tax rates are independent of supply elasticities and proportional to Ramsey taxes. Nevertheless, tax rates in all sectors would exceed Ramsey levels, because $\mu^* > \mu^r$: the MCPF in equilibrium must exceed the Ramsey level. Thus lobbying cannot eliminate the distortions associated with commitment failure, even if α had felicitously been chosen to eliminate the dependence of tax rates on supply elasticities. To establish this assertion, however, we must look at the determination of equilibrium lobby contributions and investment levels, which is the subject of the next sections.

B Political contributions

We have argued lobbying will offset government commitment failure in the sense that it leads to lower taxes on inflexible sectors, relative to flexible ones. It remains to be seen, however, how lobbying influences the distortions in

[9] In the model, the degree of investment flexibility is an exogenous characteristic of firms, rather than a choice. Alternatively, firms might wish to make investments that increase flexibility, and so become less attractive targets for taxation. In the same vein, Eckhard Janeba (2000) shows firms may build excess capacity in multiple jurisdictions, creating a credible threat to move production offshore when taxes are high.

[10] Here, irreversibility of investment is measured by the short-run supply elasticity. Note that if all industries have identical Cobb–Douglas production functions and the adjustment cost function is $G_i(z) = (1 + \gamma_i)^{-1} z^{1+\gamma_i} - z$, then the short-run supply elasticity is proportional to $1/\gamma_i$, and is independent of prices and increasing in marginal adjustment costs, as required for the proposition.

long-run investment decisions that are at the heart of the capital levy problem. Do inflexible firms invest more or less than comparable flexible firms? Would investment be higher or lower if lobbying were banned altogether?

Characterizing investment requires us to determine the equilibrium contribution levels C_i^*, about which so far we have said nothing. In general, equilibrium contributions and payoffs in a common agency game need not be unique; with multiplicity in the subgame, equilibrium investment would also not be unique. In the more restrictive economic environment considered here, however, it is possible to guarantee uniqueness of the equilibrium contribution levels.[11] We show this as follows.

If C_i^* is a best response to the contributions of other lobbies, then it must minimize the amount paid in equilibrium, while ensuring government implements the equilibrium policy q^* in place of any alternative that is less favorable to lobby i. More formally, Bernheim and Whinston (1986, Lemma 2) show that when C_i^* is a best response, there exists $\hat{q}^i \in \arg\max \Omega(q, C^*)$ with the property that $C_i^*(\hat{q}^i) = 0$ and $\Omega(q^*, C^*) = \Omega(\hat{q}^i, C^*)$. Thus, rearranging Ω in (5), each contribution schedule must satisfy

$$\alpha C_i^*(q^*) = W(\hat{q}^i, K) - W(q^*, K) + \alpha \sum_{j \neq i} \left[C_j^*(\hat{q}^i) - C_j^*(q^*) \right] \tag{8}$$

Thus each lobby's contribution compensates the politician for the loss in consumer welfare and the loss in contributions from other lobbies in choosing the equilibrium policy q^* instead of the policy $\hat{q}^i$ that would be chosen if i did not contribute. Define $V_{-i}(q, K) = V(q, K) - \alpha \pi_i(q_i) K_i$ as the weighted sum of preferences of government and all lobby groups, excluding group i. To guarantee uniqueness of equilibrium contributions, we require that the optimal tax problem be "well-behaved" in the sense that, if a single industry did not lobby, all other industries would face lower tax rates.[12]

Lemma 1 *When the optimal tax problem is well-behaved, the unique truthful Nash equilibrium net profit levels satisfy*

$$v_i(K) \equiv \pi_i(q_i^*) K_i - C_i^*(q^*) = \alpha^{-1} \left[\max_q V(q, K) - \max_q V_{-i}(q, K) \right]. \tag{9}$$

To see why this is the unique equilibrium, observe that C_i^* is a best response for i if it is the least costly way to induce government to implement the equilibrium policy q^* in place of $\hat{q}^i$, the policy government would choose if i contributed nothing. Since all other lobbyists make positive contributions at $\hat{q}^i$, and contributions are truthful, then C_i^* must compensate government for the profit to other industries that is foregone when q^* is chosen (which

[11] Grossman and Helpman (1994) discuss uniqueness in a related example with two lobbies. See also the extensive discussion in Avinash Dixit, Grossman and Helpman (1997).

[12] This condition is satisfied if the log of the revenue function in each market is sufficiently concave in prices. The result relies on a more general theorem in Didier Laussel and Michel Le Breton (2001). We are indebted to Didier Laussel for pointing out an error in our original proof of this proposition and suggesting an alternative approach.

equals the change in contributions from the other lobbies), as well as the loss in consumer welfare W.

C The allocation of investment

In view of Lemma 1, a long-run equilibrium allocation of capital K^* is a solution to the system of no-arbitrage equations

$$v_i(K^*) = 0 \qquad (i \in N) \tag{10}$$

In what follows, we analyze *stable* equilibria, *viz.* those vectors K^* for which the Jacobian of net profits $D_K v(K^*)$ is negative definite. Because lobbying leads to spillovers in investment decisions of the various industries (i.e. because $\partial v_i / \partial K_j \neq 0$) equilibrium comparative statics are extremely complicated in general. We will therefore assume that, in any long-run equilibrium, feedback effects among industries are sufficiently small that, when long-run profit v_i at the initial equilibrium rises as the result of a parameter change, investment in the industry must rise to restore equilibrium.[13] When this is the case,

$$\text{sign}\,\frac{\partial K_i^*(\theta)}{\partial \theta_l} = \text{sign}\,\frac{\partial v_i(K^*, \theta)}{\partial \theta_l}$$

for any parameter θ_l. To derive the comparative static properties of equilibrium investment, we then need only apply the envelope theorem to (9) in order to calculate the local change in equilibrium profit dv_i in response to a change in the parameter of interest.

To simplify the analysis, we henceforth assume $\beta = 0$; that is, government assigns no weight to capitalists' short-run profits in "true" economic welfare, and the weight on profit induced by lobbying is just α. This assumption makes the effect of lobbying more stark, but seems unlikely to affect qualitative results.

III Investment and Lobbying

A Adjustment costs and investment

We are now in a position to ask whether the more intensive lobbying activities of inflexible industries cause them to invest more in equilibrium of the model. To this end, we index industry adjustment costs by a scalar parameter $a_i \geq 0$, so that $G_i(z) = G(z, a_i)$. We assume:

A1. $G_{za}(z, a) \geq 0$ if and only if $z \geq 1$.

A2. For all i and all (p_i, a_i),

$$\frac{d\pi}{da} \equiv \pi_a(p, a) + \pi_p(p, a)\, \frac{dp}{da}\bigg|_{x \text{ fixed}} \leq 0$$

[13] This property holds if off-diagonal elements of $D_K v$ are sufficiently near zero.

In geometric terms, Assumption A1 states that an increase in the adjustment cost parameter a causes an anti-clockwise rotation in the short-run marginal cost curve, around the point of no adjustment ($z = 1$). Thus an increase in a raises the marginal cost of production if the firm is expanding investment and decreases it if the firm is contracting. Assumption A2 states that an increase in adjustment costs, holding market demand fixed, cannot cause profit to rise, despite its effect on the market-clearing price for the commodity. (This is a restriction on technology alone, since the market clearing conditions imply that $dp/da = -\pi_{pa}/\pi_{pp}$.) This rules out the implausible case in which an increase in adjustment costs would raise industry profit, even if tax rates were fixed. With these restrictions, we can establish:

Proposition 2 *Assume A1 and A2. Then industries with higher adjustment costs invest less in equilibrium, despite facing lower tax rates.*

Inflexible industries may obtain preferential tax treatment through lobbying, but only at the cost of higher political contributions, which themselves act as a distortionary tax on investment (paid to the politician directly rather than to the fisc). The proposition shows that the higher contributions paid by inflexible industries more than offset the value of tax breaks that are purchased from the politician. Thus the net investment distortion is greater, and equilibrium investment lower, in inflexible sectors.

B Is lobbying desirable?

Proposition 2 has a further implication: investment in all industries must be lower in an equilibrium with lobbying than in the efficient, “Ramsey” allocation in which government can commit to taxes before investment is sunk. A formal proof of this assertion can be found in our working paper (Marceau and Smart, 2000), but the argument is straightforward. Eq. (7) shows that even fully flexible industries (with infinite short-run supply elasticities) must underinvest, relative to the Ramsey level, because the marginal cost of public funds in equilibrium can be no lower than its Ramsey level. Since investment is a decreasing function of adjustment costs, it follows that investment is too low in all industries. Thus lobbying can mitigate the capital levy problem but never eliminate it entirely; lobbying is not a perfect substitute for commitment.

A comparison of greater practical relevance is between the equilibrium level of investment in an industry when lobbying is permitted and when it is banned altogether. To address this question, we extend the model in a simple way to incorporate deadweight costs of lobbying: we suppose that, for each dollar spent by the lobby group, only a fraction $(1 - \tau)$ is received by the politician, where $\tau \in [0, 1]$. Deadweight costs might reflect regulatory restrictions on political contributions. For example, if cash bribes are permitted than $\tau = 0$, whereas $\tau > 0$ if contributions are restricted to in-kind transfers of vacation trips, aid in seeking re-election, and so on. If lobbying is banned altogether then $\tau = 1$. It is easy to see that, if the weight on contributions in the politician's objective is some $\alpha_0 > 0$, then the weight on profits in the induced policy objective function $V(q, K)$ is just $\alpha = \alpha_0(1-\tau)$. We therefore represent a "marginal" tightening of regulations by a decrease in α, and an outright ban by a shift to $\alpha = 0$.

One might expect that an increase in α would simply lower taxes in all industries and so increase investment. However, an increase in α also intensifies competition among lobbies for political favors, which may cause equilibrium contributions to rise. Calculating $\partial v_i/\partial\alpha$ from (9) immediately yields the following result.

Proposition 3 *Deregulation of lobbying (an increase in α) causes investment to fall in industry i if and only if equilibrium consumer surplus is smaller when industry i does not lobby, i.e. $W(q^*) > W(\hat{q}^i)$.*

Proposition 3 provides a condition for identifying politically disadvantaged groups, whose net profits fall when lobbying is deregulated. These are groups for which consumer welfare would fall if they chose not to lobby, and which must therefore pay higher contributions when the politician cares relatively little about welfare. When industry i does not lobby, it will face a higher tax rate than in equilibrium, and the politician will place relatively more weight on consumer welfare and less on profits when choosing q. Thus one might think the politician would necessarily choose taxes such that $W(\hat{q}^i) > W(q^*)$. But this intuition ignores standard second-best considerations: the higher tax imposed on commodity i also tends to exacerbate distortions in other markets, and so to increase the aggregate deadweight costs of taxation. On balance, welfare may be lower when i does not lobby.

Indeed, it is even possible that investment in all industries increases monotonically in α, so that investment is maximized when lobbying is banned altogether. We show this with the following example.

Example 1: A ban on lobbying maximizes investment. Suppose that demand and profit functions are identical in all industries, and that price elasticities of demand and supply are constant. In this case, (7) shows the equilibrium q^* is a uniform tax system. But a uniform tax must also maximize consumer welfare—this can be seen by substituting $\alpha + \beta = 0$ into (7). Since q^* maximizes W, we have $W(q^*) > W(\hat{q}^i)$, and all industries are politically disadvantaged in the sense of Proposition 3. As α rises through deregulation, the intensified lobbying efforts of all industries merely cancel each other out, and the politician continues to implement a uniform tax system. However, the political contributions necessary to support the equilibrium rise with α in all industries, so that consumer prices are higher and investment is lower.

It follows that investment and consumer welfare are maximized in this example when lobbying is banned ($\alpha = 0$). When this is so, investment in all industries attains the efficient, Ramsey level. The example is an extreme one, since all industries rely to the same extent on sunk investment, and a government subject to commitment failure would have no reason to depart from the Ramsey tax rule in the absence of lobbying. But the example shows that political contributions may result in efficiency losses, even if they have no deadweight cost themselves, through their effect on industrial costs and prices.

Example 2: Lobbying increases investment in all sectors. In a mild extension of our model, suppose that commodity tax revenues are returned to consumers as equal per capita lump-sum transfers. This fixes the MCPF at unity in the Ramsey and equilibrium tax formulas (4) and (7). It follows that the Ramsey tax rates are zero, but in equilibrium all industries pay taxes

$$\frac{t_i^*}{p_i^*} = \frac{1-\alpha}{\eta_i}$$

(Notice that all industries receive net subsidies in the case that $\alpha > 1$.) Because government has access to a lump-sum tax on consumers, tax rates of different industries are no longer linked through the government budget constraint. Therefore, if industry i did not lobby, the politician would assign it a price $\hat{q}_i^i = \operatorname{argmax} s_i(q)$, while other industries would continue to receive their equilibrium prices q_j^*. It follows that

$$W(\hat{q}^i) - W(q^*) = s_i(\hat{q}_i^i) - s_i(q_i^*) > 0$$

Applying Proposition 3, an increase in α causes contributions to fall and investment to rise in all industries. Investment is therefore higher when any degree of lobbying is permitted than when it is banned. Indeed, to alleviate the capital levy problem, lobbying should be facilitated as much as possible: the political process should be designed to make the deadweight costs of influence activities as low as possible.

IV Conclusion

Business tax systems in the U.S. and elsewhere exhibit substantial intersectoral differences in tax rates that create deadweight losses, often while serving no obvious public policy objective. We have argued some of these tax differences may be attributed to differences in industries' reliance on sunk capital, and the resulting differences in the intensity of their lobbying efforts.

At first blush, our argument suggests that business tax lobbying can mitigate government's incentives to impose confiscatory levies on sunk capital. But our results suggest the case for allowing lobbying activities is far more ambiguous. While lobbying tends to reduce the overall tax burden on sunk capital, political contributions represent additional costs which in turn deter investment. The result is that some industries and assets gain at the expense of others, and lobbying leads to further misallocation of capital in the economy towards politically favored groups. In extreme cases, in fact, all industries might lose from lobbying, if inter-sectoral differences in investment flexibility are sufficiently small. More generally, some industries are likely to benefit from lobbying, at the expense of others and of consumers, but the investment distortions introduced through political influence activities must be weighed against the conventional distortions resulting from over-taxation of sunk capital in order to provide a full assessment of the effects of lobbying.

Appendix

Proof of Lemma 1. Let $\Pi_j(q_j) = \pi_j(q_j)K_j$ (we suppress K_j throughout the proof) and $W_j(q_j) = s_j(q_j) + \Pi_j(q_j)$. Let

$$\Gamma(S) = \max_q \sum_{j\in N} W_j(q_j) + \alpha \sum_{j\in S} \Pi_j(q_j)$$

be the joint payoff that can be obtained by the government agent and any set $S \subseteq N = \{1, \ldots, n\}$ of lobby groups. Our proof relies on the following result, due to Laussel and Le Breton (2001), which we state without proof.

Lemma 2 (Laussel and Le Breton, 2001, Proposition 3.3) *Assume that* $\Gamma(S)$ *is concave, i.e.* $S \subset T$ *implies* $\Gamma(S \cup \{i\}) - \Gamma(S) \geq \Gamma(T \cup \{i\}) - \Gamma(T)$*. Then the truthful Nash equilibrium payoff* v_i *to each lobby* i *is unique, with* $\alpha v_i = \Gamma(N) - \Gamma(N \setminus \{i\})$.

To prove the proposition, let

$$W^*(\delta, \omega, S) = \max_q \sum_{j\in N} W_j(q_j) + \alpha \sum_{j\in S} \Pi_j(q_j) + \delta\Pi_k(q_k) + \omega\Pi_i(q_i)$$
$$\text{subject to} \sum_{j\in N} R_j(q_j) \geq \bar{R}$$

where $S \subset N$, $i, k \in N \setminus S$, $i \neq k$. Let $q_j^*(\delta, \omega, S)$, $j \in N$ be the solutions to this problem. By assumption, $W_j(R_j^{-1}(z))$ is concave in z for all j, so that $q_i^*(\delta, \omega, S)$ is non-decreasing in δ for all (ω, S). Of course, $q_i^*(0, \omega, S \cup \{k\}) = q_i^*(\alpha, \omega, S)$. Thus

$$q_i^*(0, \omega, S \cup \{k\}) = q_i^*(\alpha, \omega, S) \leq q_i^*(\alpha, \omega, S \cup \{k\})$$

Applying induction on k, it follows that $S \subseteq T \implies q_i^*(\alpha, \omega, S) \leq q_i^*(\alpha, \omega, T)$ for all (α, ω). Thus, in this well-behaved case, increasing the set of industries that lobby leads to non-lobbying industries facing higher taxes.

Obviously, $W^*(0, 0, S) = \Gamma(S)$ and $W^*(0, \alpha, S) = \Gamma(S \cup \{i\})$. By the envelope theorem and the fundamental theorem of calculus,

$$\Gamma(S \cup \{i\}) - \Gamma(S) = \int_0^\alpha \Pi_i(q_i^*(0, \omega, S), K_i) d\omega$$

Thus, $\Pi_i(q_i^*(0, \omega, S) \geq \Pi_i(q_i^*(0, \omega, T)$ for all $S \subseteq T \subseteq N$ implies $\Gamma(S \cup \{i\}) - \Gamma(S) \geq \Gamma(T \cup \{i\}) - \Gamma(T)$. That is, Γ is concave. The result then follows from applying Lemma 2. □

Proof of Proposition 2. Applying the envelope theorem to (9) yields

$$\frac{\partial v_i}{\partial a_i} = K_i^* \left[\pi_{i,a}^* + \pi_{i,p}^* \phi_{i,a}^*\right] + \alpha^{-1} \left[\hat{\mu}\hat{\phi}_{i,a}\hat{y}_i - \mu^* \phi_{i,a}^* y_i^*\right] \tag{11}$$

where an asterisk on a function indicates it is evaluated at the equilibrium prices q^*, and a hat that it is evaluated at the out-of-equilibrium prices $\hat{q}^i$.

The first term in brackets on the right-hand side of (11) is non-positive in view of Assumption A2. To show the second term is negative, we require $\hat{\phi}_{i,a} \leq 0 \leq \phi_{i,a}^*$. Note from (2) that

$$\phi_{i,a} = \frac{\partial \phi_i(q_i, K_i, a_i)}{\partial a_i} = -\frac{\pi_{i,pa}(p_i, K_i, a_i)}{\pi_{i,pp}(p_i, K_i, a_i)}$$

and $\pi_{i,pa} = -G_{za} z_{i,p}$, so that Assumption A1 implies $\phi_{i,a} \geq 0$ if and only if $z_i \geq 1$. Next we show $z_i^* \geq 1 \geq \hat{z}_i$: firms invest *ex post* in equilibrium but would disinvest if their industry did not lobby. To see this, note A1 implies $z(p_i, a_i) \geq 1$ if and only if $\pi(p_i, a_i) \geq 0$: since *ex post* adjustment is costly, new investment is positive if and only if the shadow value of installed capital exceeds its opportunity cost. But the no-arbitrage condition (10) for K_i^* implies $\pi_i^* = C_i^*/K_i^* \geq 0$, so $z_i^* \geq 1$ and $\phi_{i,a}^* \geq 0$.

Finally we show $\pi_i(\hat{p}_i^i, a_i) \leq 0$ so that $\hat{z}_i \leq 1$. Suppose not: Then, since $C_i^*(\hat{q}^i) = 0$ by construction, we have

$$\pi_i(\hat{p}_i^i, a_i) - \frac{C_i^*(\hat{q}^i)}{K_i^*} > 0 = \frac{v_i(K^*, a)}{K_i^*}$$

But then $C_i^*(\cdot)$ is not a best response for i (industry profits would be higher if the industry simply were not to contribute), a contradiction. Thus $\hat{z}_i \leq 1$ and $\hat{\phi}_{i,a} \leq 0$. □

References

Bernheim, B. Douglas and Michael D. Whinston, "Menu auctions, resource allocation, and economic influence," *Quarterly Journal of Economics*, 1986, *101*, 1–31.

Besley, Timothy and Stephen Coate, "Lobbying and welfare in a representative democracy," *Review of Economic Studies*, 2001, *68* (97-042).

Clawson, Dan, Alan Neustadtl, and Denise Scott, *Money talks: Corporate PACs and political influence*, New York: Harper Collins, 1998.

Dixit, Avinash, Gene M. Grossman, and Elhanan Helpman, "Common agency and coordination: General theory and application to government policy making," *Journal of Political Economy*, 1997, *105*, 752–769.

Eichengreen, Barry, "The capital levy in theory and practice," in R. Dornbusch and M. Draghi, eds., *Capital markets and debt management*, London: Cambridge University Press, 1990.

Gravelle, Jane G., *The economic effects of taxing capital income*, MIT Press, 1994. Cambridge MA.

Grossman, Gene M. and Elhanan Helpman, "Protection for sale," *American Economic Review*, 1994, *74*, 833–850.

_ **and** _ , "Electoral competition and special interest politics," *Review of Economic Studies*, 1996, *63*, 265–286.

Hirschman, Albert O., *Exit, Voice, and Loyalty: Responses to Decline in Firms, Organizations, and States*, Cambridge MA: Harvard University Press, 1970.

Janeba, Eckhard, "Tax competition when governments lack commitment: Excess capacity as a countervailing threat," *American Economic Review*, 2000, *90*, 1508–1519.

Kotlikoff, Laurence J., Torsten Persson, and Lars E. O. Svensson, "Social contracts as assets: A possible solution to the time consistency problem," *American Economic Review*, 1988, *78*, 662–677.

Laussel, Didier and Michel Le Breton, "Conflict and cooperation: The structure of equilibrium payoffs in common agency," *Journal of Economic Theory*, 2001, *102*, 93–128.

Marceau, Nicolas and Michael Smart, "Business tax lobbying," Technical Report 102, CREFE, Université du Québec à Montréal 2000.

McChesney, Fred S., *Money for nothing: Politicians, rent extraction, and political extortion*, Harvard University Press, 1997. Cambridge MA.

Persson, Torsten and Guido Tabellini, "Representative democracy and capital taxation," *Journal of Public Economics*, 1994, *55*, 53–70.

Williamson, Oliver E., *The Economic Institutions of Capitalism*, New York: The Free Press, 1985.