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Working Paper

Political ownership

Working paper, No. 11-99

Provided in Cooperation with:

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Suggested Citation: Bennedsen, Morten (1999) : Political ownership, Working paper, No. 11-99, Copenhagen Business School (CBS), Department of Economics, Frederiksberg, <https://hdl.handle.net/10398/7563>

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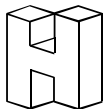
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Institut for Nationaløkonomi

Handelshøjskolen i København

Working paper 11-99

POLITICAL OWNERSHIP

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Political Ownership

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Abstract

Political involvement in the operation of an enterprise, whether it is private or state owned, creates opportunities for interest groups to influence the allocation of resources. Resource allocation transfers rent both between unions and private owners within the firm and between these organized insiders and the disorganized taxpayers. I investigate how insiders' lobby activities distorts resource allocation in a state owned enterprise. Then I show that efficiency in labor allocation is improved when cash flow is transferred to private owners. Finally, I analyze how transferring control rights affects efficiency in resource allocation when there are restrictions on side payments between the interest groups.

JEL CLASSIFICATION: D21, D23, D78, H11 and L33.

KEYWORDS: Ownership Structure, Influence Externality, Side Payments, Resource Allocation.

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1 Introduction

Privatization programs, whether in transition economies, in developing countries or in developed market economies, are often motivated by an urge to depoliticize economic activities and to increase efficiency in resource allocation. For instance, in the former communist countries, the depoliticization of the economy through transfer of ownership is often regarded as the single most important step to improve efficiency in the operation of enterprises [Frydman and Rapaczynski (1993) and Boycko et al. (1995)].

There is by now a significant body of world-wide evidence documenting the inefficiency of many state owned enterprises [e.g. World Bank (1995 and 1997) and Boycko et al. (1996)]. Observers have suggested that such inefficiencies are closely related to the political process. The problems are exaggerated by the extreme kind of separation of ownership and control which exists in state owned enterprises: the taxpayers, who are the ultimate claimants to the cash flow, have almost zero influence on the controlling managers in the firm.

While the politically induced efficiency cost is broadly accepted, it is still an open question, and the main topic of this article, why transfer of ownership changes this channel of inefficiency. In the words of Frydman and Rapaczynski (1993):

“The assumption underlying the claim about the effectiveness of privatization as an instrument of depoliticization is that it is somehow more difficult for the state to use its political power on behalf of special interests that cannot achieve their objectives through the market, if the state does not own the enterprises to which these special interests raise their claims..... In general, however, the ordinary regulatory powers of the state provide more than sufficient means for the state bureaucrats to dispense their largesse to any special constituency, ..., without the additional power deriving from state ownership. Under special political and economic conditions, subsidies to private enterprises are in fact not necessarily more difficult or infrequent than those to state companies,...”.

The key issue investigated in the following discussion is precisely why transfer of ownership “depoliticizes” the management of an enterprise. I analyze a model of ownership in the spirit of Shleifer and Vishny (1994)

and Boycko et al. (1996) but focusing on how organized interest groups influence political decision making. The empirical fact that not all agents in society are organized creates an influence externality which distorts resource allocation in a state owned enterprise. Even though privatization does not remove the politicians' interest in the enterprise, it does affect the actions of organized interest groups and thus affects the politicians' preferred resource allocation.¹

The analysis takes the distribution of control and cash flow as given and derives the level of unproductive excess labor and the amount of subsidy received from the government. First, I show how the distribution of cash flow between the government and the private owners affects the resource allocation in the firm. I assume the benefit of inefficient labor allocation is extracted by an influence-seeking union. When the disorganized taxpayers are residual claimants, the cost of inefficient labor allocation is not internalized by any party which can influence the government. A transfer of cash flow to private owners internalizes the cost within the owners' influence activity and this increases efficiency in labor allocation.

Second, I show how the allocation of control rights matters when there are restrictions on transfers between the two interest groups and the government uses tax-financed resources to accommodate the interest groups. These restrictions increase the union's cost of lobbying for excess employment when private owners control the labor allocation in the firm.

An interesting feature of the model is its ability to explain the observation that privatizing a firm can unite workers and management in lobbying the government. Under private control, there can exist an equilibrium where the owners accept inefficient employment allocation in exchange for receiving a subsidy and the union lobbies the government to give the subsidy to the firm. The existence of this equilibrium emphasizes that transferring

¹Bolton (1995) suggests the separation of ownership and control in a state owned enterprise is not essentially different from a private firm. I argue the opposite in this paper. Owners possessing a non-trivial part of the cash flow in private firms organize and influence the control holding managers. In state owned enterprises the cash flow belongs to the disorganized taxpayers, each of whom possesses a trivial part of the total cash flow. The taxpayers cannot overcome the free-rider problem of organizing themselves and, therefore, cannot influence the control-holding managers.

control to the owners in one area, such as labor allocation, increases their ability to affect other policy areas, such as allocation of subsidies. Furthermore, since this equilibrium depends on the government possessing a sufficiently large amount of cash flow in the firm, the analysis illustrates the danger of transferring control rights to private owners without transferring cash flow rights.

This paper combines two distinct literatures. In the positive literature on privatization, Shleifer and Vishny (1994) study a game between a politician interested in excess employment for political reasons and a manager (private owner) of a firm. They compare transfer of property rights under three different bargaining environments: no restrictions on bribes, where property rights are neutral, as the Coase Theorem predicts; no bribes allowed; and, finally, an exogenous “decency” restriction on how large a subsidy the politician can offer the firm.² In a simpler, but similar model, Boycko et al. (1996) analyze the effect of privatizing when side-payments are not feasible. The key assumption for deriving non-neutrality of property rights is that the political cost of lost profit differs from the political cost of giving out a subsidy and both are lower than the private cost of lost profit.³

I model the relationship between the organized interest groups and the government as an extensive form contribution game first analyzed by Bernheim and Whinston (1986). Analyzing special interest groups’ influence on economic policy in extensive form games is by now a standard approach

²One benefit of the additional political structure in the present paper is that non-neutrality of cash flow rights is derived without any decency constraint. Shleifer and Vishny assume the marginal cost of taxation is different from one. This induces an asymmetry at the bargaining table since the share of the cost borne by the politician is evaluated differently from the share borne by the manager. However, the optimal choice of excess labor is through the tax function linked to the optimal amount of subsidy. By construction, there is a unique level of optimal excess employment and the amount of subsidy acts as a buffer. The effect of introducing the decency constraint is to block the buffer role of the subsidy.

³A different normative approach to privatization has been to focus on how information structures change with ownership, see Laffont and Tirole (1991), Schmidt (1996), Shapiro and Willig (1993) and Vickers and Yarrow (1988, Chapter 2). This literature emphasizes both how the ability to construct optimal incentive schemes under asymmetric information and how the ability to monitor production efficiency depend on ownership structure.

in the political economy literature [see survey in Persson (1998)]. Simple contribution games have been used to study a wide range of topics, e.g. trade theory [Grossman and Helpman (1994 and 1996)] and public finance [Dixit, Grossman and Helpman (1997)]. A key feature in these models is the government's biased accountability towards agents organized in interest groups: the policy outcome is as if the government chooses policy to maximize a weighted average of some representative voter's welfare (e.g. the average or the median voter) and the special interest groups' welfare.

Finally, let me declare what this paper is not about. As stated above, I take the distribution of property rights as given and do not address what incentives politicians have to change this distribution. Eventhough, I do not directly analyze incentives to privatize or nationalize firms, the focus in the present paper on political influence can be considered a starting point for a new perspective on the theory of privatization.⁴⁵

The rest of the paper is organized as follows: Section 2 lays out the model. Section 3 analyzes the case where the government possesses control rights and where cash flow rights are transferred from the government to the private owners. Section 4 analyzes the effect of giving control rights to the private owners. Finally, conclusions are drawn in Section 5. All proofs are in the Appendix.

2 The Model

Consider an economy with a single firm and a continuum of agents, normalized to 1. The agents are divided into three non-overlapping groups: a fraction n_u belongs to a worker union, which organizes all the workers in the

⁴Debande and Friebel (1997) analyze privatization in a model with incomplete contracts and private information where managers and politicians receive exogenously given private benefits of excess employment.

⁵Other important issues not dealt with in this paper are the role of competition and the question of restructuring. Efficiency improvement triggered by increased competition is a frequently mentioned argument for privatization, as emphasized by Vickers and Yarrow (1988). For the question about privatization and firms' incentives to restructure, see Aghion et al. (1994), Aghion and Blanchard (1996) and Markou and Waddams Price (1999).

firm; a fraction n_o belongs to the group of private owners, i.e. this group possesses rights to control resource allocation in the firm and/or to receive the generated cash flow; and finally, a fraction $(1 - n_u - n_o)$ does not have any specific connection with the firm. For simplicity, I call the last group of agents taxpayers (even though workers and owners pay taxes too).

There are two resources to be allocated in the firm: excess labor and a subsidy. Let $l \in L \equiv \{0, \bar{l}\}$, $\bar{l} > 0$, be the amount of unproductive excess labor in the firm. The exogenously given wage level is normalized to one, thus the cost of excess labor is equal to l . The subsidy, $s \in S \equiv \{0, \bar{s}\}$, $\bar{s} > 0$, is a transfer from the government to the firm. There is a social cost of giving the subsidy, such that the subsidy is worth only rs , $r < 1$, to the firm. This cost may be a transaction cost of using the banks; an opportunity cost of financing the government's activities through distortionary taxes; or, it may be money "stolen" on the way from the central bank to the firm. In any case, the cost $(1 - r)s$ does not contribute to social welfare.

Let $\alpha, 0 \leq \alpha \leq 1$, be the share of cash flow from the firm received by the private owners and let $1 - \alpha$ be the share of cash flow received by the government's budget. The parameter α , therefore, determines the distribution of cash flow rights. The distribution of control rights is as follows: the government controls the amount of subsidy at any time and the level of excess labor can either be controlled by the government (Section 3) or controlled by the private owners (Section 4).

Assumption 1 (Contractability).

- a) Property rights are long term contractible.*
- b) The government cannot contract on future resource allocations.*

Assumption 2 (Side Payments).

- a) The union and the group of private owners - but not the taxpayers - can lobby the government through campaign contributions conditioned on future resource allocation.*
- b) The union and the owners cannot make side payments to each other and the government cannot make side payments to the interest groups.*

Assumption 1 states that it is harder for a government to commit to

detailed contracts over longer periods relating to policy issues which are part of the ongoing political process than to commit to contracts specifying the distribution of property rights [see e.g. Wilson (1989)]. It allows me to take the allocation of property rights as exogenously given and focus on the connection between the distribution of property rights and the allocation of resources.

Assumption 2 a) reflects the fact that politicians can be influenced, but only agents with a specific interest in a particular policy issue can overcome the free rider problem of creating an interest group and use this influence opportunity [see Olson (1965)]. Thus, the disorganized taxpayers are not able to influence the government through lobbying. Contributions are non-negative payments conditioned on the implemented resource allocation in the firm., i.e. the set of feasible contributions is the set of mappings $\mathcal{C} \equiv L \times S \rightarrow R_+$.

Assumption 2 b), which is necessary only for the control results in Section 4, states that an interest group can more easily influence the government through side-payments than it can influence the opposite interest group. The reason may be that a liquidity constrained lobby can lobby a government through a variety of instruments, e.g. campaign contributions, bribes, mobilization of the electorate, endorsement of parties, provision of information and time (voluntary work).⁶ The last part of Assumption 2 c) captures the observation that in democracies politicians do not make side-payments to interest groups using their private money. Instead politicians use tax-financed resources to pay back interest groups for their contribu-

⁶ The following story motivates this framing: Assume the benefit of the project is partly a monetary reward to the union workers and partly a non-monetary private benefit to a broader group of agents, e.g. the union workers, their families and the local community. When this broader group is liquidity constraint they can, conditionally on receiving the project, \bar{l} , offer side payments partly through money (lower wages) and partly through voluntary work. Political parties absorb both contributions in money and in time (voluntary campaign work, mobilizing rally support, writing letters to the newspapers), whereas the owners have little use for non-monetary contributions from agents not already working in the firm.

Notice, side payments from the owners to the union is never an issue in this analysis, therefore, only union members need to be liquidity constrained.

tions.⁷

The firm's profit when $l = s = 0$ is without loss of generality normalized to zero. Thus, the tax requirement, T , is given by,

$$T(l, s) = s + (1 - \alpha)(l - rs). \quad (1)$$

The Treasury pays the full cost of the subsidy and its share of the cost of excess labor, but it receives a share of the benefit of this subsidy afterwards. It is assumed that taxes are distributed equally between all agents in the economy.⁸

The union's payoff is the benefit from excess employment minus the amount of taxes and contributions it internalizes.

$$V_u \equiv bl - n_u T(l, s) - c_u(l, s). \quad (2)$$

The union's benefit from excess employment bl , $0 < b < 1$, may reflect friction in the matching process between firms and workers, institutional restrictions such as minimum wages, or it may reflect the increased power the union receives from having more members employed. For later use, it is convenient to define the agents gross utility, W , from resource allocation. For the union this is given by $W_u(l, s) = bl - n_u T(l, s)$.

The payoff function for the group of private owners is,

$$V_o \equiv \alpha(-l + rs) - n_o T(l, s) - c_o(l, s). \quad (3)$$

The owners receive a fraction of the firm's cash flow, and pay taxes and net side payments, c_o . Notice $W_o(l, s) = \alpha(-l + rs) - n_o T(l, s)$.

⁷As pointed out by the referee, in a more general setting such restrictions should be equilibrium behavior rather than institutional restrictions. Such a generalization requires the model to incorporate the electorate's inference about the competence of politicians after observing them using private or campaign money to bribe interest groups.

⁸In the present analysis, as in most other political economy models, it is implicitly assumed the government controls a limited set of policy instruments. In the absence of restrictions on the set of instruments there would be no incentives to use inefficient resource allocation to transfer rent between agents. In the same spirit, if the government could set a firm-specific corporate tax rate, the sale of cash flow in the firm would be orthogonal to the net cash flow received by the residual claimants of the firm. By choosing α as a given parameter it is implicitly assumed that there is a fixed corporate tax rate in the economy and the government is not able to make firm-specific taxes.

The aggregated payoff function for the unorganized group of taxpayers is simply their share of the total taxes,

$$V_t = -(1 - n_u - n_o)T(l, s) \quad (4)$$

which is equal to $W_t(l, s)$.

The government cares about the aggregated utility of all the other agents and the amount of contributions, c_g , it receives from the interest groups,

$$\tilde{V}_g \equiv \tilde{h}(V_u + V_o + V_t) + c_g.$$

The parameter \tilde{h} measures the weight the government puts on social welfare relative to campaign contributions. The lower \tilde{h} the more efficient is the influence technology and \tilde{h} therefore depends both on the politicians' personal preferences and on institutional features. I assume $\tilde{h} < 1$, i.e. the government strictly prefers to receive side payments from the lobbies. Rewriting and dividing (5) by the constant $(1 - \tilde{h})$ yield,

$$V_g = -(1 - b)hl - (1 - r)hs + c_u(l, s) + c_o(l, s), \quad (5)$$

$$\text{where } V_g = \frac{\tilde{V}_g}{1 - \tilde{h}} \text{ and } h = \frac{\tilde{h}}{1 - \tilde{h}} > 0.$$

The government's gross utility from resource allocation is $W_g(l, s) = -(1 - b)hl - (1 - r)hs$.

The two kinds of social cost play an important role in the following analysis. The positive social cost of labor ($1 - b > 0$) reflects that it could be used better elsewhere in the economy. The positive social cost of giving out subsidy ($1 - r > 0$) is *not* necessary to show that the distribution of property rights affects resource allocation, but it is essential to explain why employment may be distorted in private firms too. Social welfare maximization requires $s = l = 0$ and I denote this the *first best* resource allocation.

The timing of the contribution game is shown in Figure 1. At Date 0 organized interest groups make conditional offers to the government. In the state ownership case, where the government controls excess labor, these offers consist of contributions. At date 1 the government chooses the optimal excess labor and subsidy levels taking into account the social welfare and the

conditional contributions from the interest groups. In the private ownership case, where the private owners control excess labor, the owners and the union offer conditional contributions, and in addition, the owners offer levels of excess employment conditioned on the amount of subsidy provided from the government. At Date 1 the government chooses the optimal amount of subsidy.

FIGURE 1 HERE

Finally, I assume for simplicity that the union, in the absence of contributions from the owners, prefers to lobby for excess employment for any distribution of cash flow rights.⁹

3 Government Controls Excess Labor

In this section it is assumed that the government controls the allocation of both excess labor and the subsidy. The game between the government and the interest groups is completely specified by the list of the government's action space, the agents gross utility from resource allocation and the allocation of control. I denote the game $\Gamma_g = [S \times L, \{W_i\}_{i=\{u,o,g\}}]$, where subscript g in Γ_g refers to government control of the allocation of excess labor. Γ_g is formally a game of common agency [see Bernheim and Whinston (1986)].

Definition 1.

$\{c_u^*, c_o^*, l^*, s^*\}$ is a Subgame Perfect Equilibrium in Γ_g if and only if

⁹The condition for this when $\alpha = 0$ is that the benefit from excess employment net of the union's increased tax payment $(b - n_u)\bar{l}$ exceeds the minimum contributions necessary to trigger $l = \bar{l}$, i.e. $(1 - b)h\bar{l}$. This condition simplifies to $\frac{b - n_u}{h(1 - b)} \geq 1$.

1. $c_j^* \in \mathcal{C}$, $j \in \{u, o\}$ and $\{l^*, s^*\} \in L \times S$.
2. c_u^* maximizes V_u in \mathcal{C} , subject to c_o^* and $\{l, s\} = \text{Argmax}_{\{l, s\} \in L \times S} V_g$.
3. c_o^* maximizes V_o in \mathcal{C} , subject to c_u^* and $\{l, s\} = \text{Argmax}_{\{l, s\} \in L \times S} V_g$.
4. $\{l^*, s^*\}$ maximize V_g in $L \times S$, subject to $c_u = c_u^*$ and $c_o = c_o^*$.

In general there exist many equilibria in this game and I will follow the contribution game literature and require the interest groups to use truthful contribution strategies:

Definition 2.

$c_i(l, s)$, $i = u, o$, is a truthful contribution strategy relative to $\{l^*, s^*\}$ in game Γ_g if and only if $\forall \{l, s\} \in L \times S$

$$c_i(l, s) = \max\{0, W_i(l, s) - W_i(l^*, s^*) + c_i(l^*, s^*)\}.$$

$\{c_u^*, c_o^*, l^*, s^*\}$ is a Truthful Nash Equilibrium if it is a Subgame Perfect Equilibrium and $\{c_u^*, c_o^*\}$ are truthful contribution strategies.

If there exist two different policies such that an interest group offers the government a strictly positive contribution in both cases, then truthfulness means that the difference in contribution should reflect the variation in the interest group's gross utility from these two policies.¹⁰

The following lemma is a simple application of Theorem 2 in Bernheim and Whinston (1986):

Lemma 1.

1. A Truthful Nash Equilibrium exists.
2. Let $\{c_u^*, c_o^*, l^*, s^*\}$ be a Truthful Nash Equilibrium, then

$$\{l^*, s^*\} \in \text{Arg} \max_{\{l, s\} \in L \times S} W_g + W_o + W_u.$$

¹⁰Bernheim and Whinston have shown that the interest groups can essentially without cost restrict them self to play truthful strategies, because the set of best responses to any strategies played by one's opponents includes a strategy that is truthful. Furthermore, they have shown that Truthful Nash Equilibria are the only stable equilibria to non-binding communication among the players, i.e. they are coalition-proof.

Truthful strategies make the government internalize the rent of the interest groups through contribution. Thus the government's derived problem is to choose a policy that maximizes the sum of its' own and the interest groups' gross utility from resource allocation.

The next two propositions characterize the connection between distribution of cash flow rights and resource allocation in the firm:

Proposition 1 (Cash Flow Rights and Excess Labor).

The excess employment in the firm is positive if and only if the private owners possess less than α^l of the cash flow rights, where $\alpha^l \equiv \frac{b(1+h)-(h+n_o+n_u)}{1-n_o-n_u}$.

The benefit from having positive excess labor is received by the union, but the cost is shared between the owners and the non-organized taxpayers. The influence externality, arising from the interest groups not internalizing all the rent from their actions, creates distortions in the allocation of excess labor in a state owned enterprise in the absence of any private cash flow stake. A transfer of cash flow rights to the private owners improves efficiency in labor allocation because it reduces the share of the labor cost born by the unorganized taxpayers. When the union's lobby activity distorts social welfare, it is possible to avoid this distortion by letting another interest group with the same influence opportunity bear the full cost.

Proposition 1 provides half the answer to the puzzle raised by Frydman and Rapaczynski in the introduction. The government's incentive to overstaff state owned enterprises arises from the associated political gains. Transfer of cash flow rights does not *per se* change the government's ability to pursue politically motivated goals in the allocation of labor. Instead transfer of cash flow shifts some of the cost of these distortions from invisible taxpayers to well-organized private owners who in response lobby the government to obtain a higher efficiency in employment allocation. Hence, transfer of cash flow changes the government's optimal policy.

Proposition 2 (Cash Flow Rights and the Subsidy).

The government provides the subsidy to the firm if and only if the private owners possess more than α^s of the cash flow rights, where $\alpha^s \equiv \frac{(1-r)(h+n_o+n_u)}{r(1-n_o-n_u)}$.

The benefit of increasing the subsidy is split between the private owners and the budget, but the cost is fully levied on the poorly organized taxpayers. A transfer of cash flow rights increases the amount of subsidy provided to the firm, because it increases the private owners incentives to lobby for the subsidy.

From the treasury's point of view both l and s are subsidies to the firm. The direct subsidy \bar{s} costs the treasury $(1 - r(1 - \alpha))\bar{s}$ and the indirect subsidy in the form of lost profit due to inefficient labor allocation costs the treasury $(1 - \alpha)\bar{l}$. Propositions 1 and 2 show that a transfer of cash flow from the government to the private owners improves efficiency in labor allocation but may increase the socially costly direct subsidy. The effect on the total subsidy (i.e. the direct and the indirect effect) is ambiguous.

Propositions 1 and 2 are applications of the Coase Theorem [Coase (1960)] which in this setting states that the allocation of resources maximizes the negotiating parties' total welfare. The distribution of property rights determines the distribution of rent between the negotiating parties and the unorganized taxpayers and thus affects the allocation of resources.¹¹

Corollary 1 (Comparative Static).

- a) α^l decreases and α^s increases in n_u and n_o .
- b) α^l decreases and α^s increases in h .

Part a) states that the more agents belonging to an interest group, the less private cash flow rights are necessary to avoid excess labor and the more private cash flow rights are necessary to trigger a subsidy. This implies that efficiency increases when more agents join the interest groups. Neutrality of the cash flow distribution is reestablished in the unrealistic case where all agents in the society have the same access to lobby the government.

Part b) states the more effective the lobby technology is (the lower h), the more private cash flow rights are necessary to avoid excess labor and the less private cash flow rights are necessary to trigger a subsidy, i.e. the more difficult it is to avoid distortions from lobby activities. Efficiency of

¹¹It is worthwhile to emphasize that the equilibrium resource allocation is neutral to changes in the distribution of cash flow rights between the interest groups as is also discussed by Dixit et al. (1997)

the influence mechanism is closely related to the organization of the society. One possible interpretation is, therefore, that building democratic and legal institutions which reduce the ability of special interest groups to influence politicians can improve social welfare. For instance, building institutions that decrease corruption in a society may make it harder for a powerful lobby to influence the government through illegal bribes.

4 Private Owners Control Excess Labor

I now proceed to analyze the case where the private owners control excess labor and the government controls the subsidy. The game is defined by $\Gamma_o = [S \times L, \{W_i\}_{i=\{u,o,g\}}]$, where subscript o refers to private control of excess labor. At Date 0, the owners offer contributions and excess labor conditional on the level of subsidy from the government. Formally, the owners set of feasible strategies is given by $\mathcal{C}_o \times \mathcal{L}_o$, where $\mathcal{C}_o \equiv S \rightarrow R_+$ and $\mathcal{L}_o \equiv S \rightarrow L$. As in the previous section, the union offers contributions conditional on the level of excess labor and the amount of subsidy. At Date 1, the government chooses the amount of subsidy, taking into account the impact on excess labor and contributions.

A Subgame Perfect Equilibrium in this game is defined as follows:

Definition 3.

$\{c_u^*, c_o^*, l^*, s^*\}$ is a Subgame Perfect Equilibrium in Γ_o if and only if

1. $c_u^* \in \mathcal{C}$, $c_o^* \in \mathcal{C}_o$, $l^* \in \mathcal{L}_o$ and $s^* \in S$.
2. c_u^* maximizes V_u in \mathcal{C} , subject to c_o^* , l^* and $s = \operatorname{argmax}_{s \in S} V_g$.
3. $\{c_o^*, l^*\}$ maximize V_o in $\mathcal{C}_o \times \mathcal{L}_o$, subject to c_u^* and $s = \operatorname{argmax}_{s \in S} V_g$.
4. s^* maximizes V_g in S , subject to $c_u = c_u^*$, $c_o = c_o^*$ and $l = l^*$.

To make the analysis in this section consistent with the analysis in the previous section I will impose a truthfulness condition on the lobbies contribution strategies:

Definition 4.

c_i , $i = u, o$, is a truthful contribution strategy relative to $\{l^*, s^*\} \in \mathcal{L}_o \times S$ in game Γ_o if and only if $\forall s \in S$ either

$$c_i(l^*(s), s) = \max\{0, W_i(l^*(s), s) - W_i(l^*(s^*), s^*) + c_i(l^*(s^*), s^*)\}, \quad i = u,$$

$$c_i(s) = \max\{0, W_i(l^*(s), s) - W_i(l^*(s^*), s^*) + c_i(s^*)\}, \quad i = o.$$

$\{c_u^*, c_o^*, l^*, s^*\}$ is a Truthful Nash Equilibrium if it is a Subgame Perfect Equilibrium and $\{c_u^*, c_o^*\}$ are truthful contribution strategies.

The motivation for this definition is the same as in the previous section: if there exist two different policies such that an interest group offers the government a strictly positive contribution in both cases, then truthfulness means that the difference in contribution should reflect the variation in the interest group's gross utility from these two policies *taking the strategy of the other interest group as given*.¹²

Lemma 2.

1. A Truthful Nash Equilibrium exists.
2. The best response correspondence of any interest group contains a truthful contribution strategy.
3. $\{c_u^*, c_o^*, l^*, s^*\}$ is a Subgame Perfect Equilibrium with positive excess employment if and only if there exist c_u^t and c_o^t such that $\{c_u^t, c_o^t, l^*, s^*\}$ is a Truthful Nash Equilibrium with positive excess employment.

The only Subgame Perfect Equilibrium outcomes that cannot be sustained as Truthful Nash Equilibrium outcomes are the ones where the in-

¹² Notice, there exists a stronger form of truthfulness, where the union does not take the owners' strategy as given, i.e. c_u , is a truthful contribution strategy relative to $\{l^*, s^*\}$ in game Γ_o if and only if $\forall \{l, s\} \in L \times S$,

$$c_u(l, s) = \max\{0, W_u(l, s) - W_u(l^*(s^*), s^*) + c_u(l^*(s^*), s^*)\}.$$

Using this stronger requirement, yields a smaller set of Truthful Nash Equilibria and therefore sharper predictions from the model. I comment on this in footnote 15 below.

terest groups could be strictly better off by coordinating their strategies.¹³

In general there are three different policy outcomes that can be sustained in equilibrium. The first is the *labor-for-subsidy* outcome where the owners offer excess employment conditional on receiving a subsidy from the government and the union pressures the government to accommodate the owners' demand for a subsidy. The second is the *subsidy-for-contribution* outcome where the owners choose zero excess employment and lobby successfully for a subsidy. Finally, the first-best outcome $l = 0$ and $s = 0$ can be sustained in equilibrium if the incentives to lobby are sufficiently small.¹⁴ The policy outcome is in general not unique, since the labor-for-subsidy and the subsidy-for-contribution equilibrium can coexist. In such cases both interest groups strictly prefer the former equilibrium and the government is often indifferent.¹⁵ It is therefore reasonable, but not necessary for any of the following propositions, to believe that the interest groups trigger the labor-for-subsidy equilibrium by coordinating their strategies.

¹³For example, let $\bar{l} = 4, \bar{s} = 10, b = r = \frac{3}{4}, n_u = n_o = 0, h = 1$ and $\alpha = \frac{1}{4}$. Under private control, $\{c_u^*, c_o^*, l^*, s^*\}$, given by,

$$\begin{aligned} c_u^*(0, 0) &= 0, & c_u^*(0, 10) &= 0, \\ c_u^*(4, 0) &= 0, & c_u^*(4, 10) &= 0, \\ c_o^*(0) &= 0, & c_o^*(10) &= 0, \\ l^*(0) &= 0, & l^*(10) &= 4, \\ s^* &= 0, \end{aligned}$$

is a non-truthful Subgame Perfect Equilibrium. A truthful equilibrium would require the owners and the union to increase their contribution in the case the government provided the subsidy. Consider the alternative contribution strategies, where the union offers the government $2\frac{1}{2}$ and the owners offer 1 conditionally on the government provides the subsidy. This triggers a Truthful Nash Equilibrium where the subsidy is provided. Comparing these two equilibria, notice both interest group are strictly better off in the latter and the government is indifferent between them.

¹⁴With private control over l , excess labor and zero subsidy cannot be an equilibrium, since excess labor is costly for the owners and they do not have any incentives to incur this cost.

¹⁵To be precise: the government is indifferent between a subsidy-for-contribution and a labor-for-subsidy Truthful Nash Equilibrium, if the union provides zero contribution in the subsidy-for-contribution equilibrium whenever the government does provide the subsidy, i.e. in the worst outcome for the union. It is worth emphasizing that using the sharper truthful requirement given in footnote 12 eliminates the multiplicity of equilibria and picks the labor-for-subsidy equilibrium in cases where these two equilibria coexist under the truthful requirement given in Definition 4.

Proposition 3 (Transfer of Control Decreases Excess Employment).

Transfer of control from the government to the private owners never increases excess employment and it decreases excess employment for some parameter values.

In the appendix I have listed sufficient conditions for excess employment decreases after control is transferred to the private owners. In the following I provide a graphic explanation of the result.

The only equilibrium with positive excess employment is the *labor-for-subsidy* equilibrium. In this equilibrium, the owners' strategy is to offer excess labor and a contribution conditionally on receiving the subsidy,

$$l(s) = \begin{cases} 0 & \text{if } s = 0 \\ \bar{l} & \text{if } s = \bar{s} \end{cases} \quad \text{and} \quad c_o(s) = \begin{cases} 0 & \text{if } s = 0 \\ \delta & \text{if } s = \bar{s} \end{cases}$$

where $\delta \geq 0$ is some number. To support a labor-for-subsidy equilibrium, the union's contribution must make the government indifferent between subsidizing or not,

$$c_u(\bar{l}, \bar{s}) = (1 - b)h\bar{l} + (1 - r)h\bar{s} - \delta.$$

There are three additional requirements for these strategies to support a labor-for-subsidy equilibrium. First, given the owners' strategy, the union triggers the first-best outcome by offering contributions strictly less than $(1 - r)h\bar{s} + (1 - b)h\bar{l} - \delta$. Hence, the union's participation constraint, *UPC*, is

$$\begin{aligned} b\bar{l} - n_u(1 - \alpha)\bar{l} - n_u(1 - r(1 - \alpha))\bar{s} - (1 - b)h\bar{l} - (1 - r)h\bar{s} + \delta &\geq 0 \Leftrightarrow \\ \delta &\geq -(b - n_u - (1 - b)h)\bar{l} + (1 - r)(h + n_u)\bar{s} + n_u(r\bar{s} - \bar{l})\alpha. \end{aligned} \quad (UPC)$$

Second, the owners can also trigger the first-best outcome by choosing $l = 0$, so their participation constraint is,

$$\begin{aligned} (\alpha r - n_o(1 - r(1 - \alpha))\bar{s} - (\alpha + n_o(1 - \alpha))\bar{l} - \delta &\geq 0 \Leftrightarrow \\ \delta &\leq -n_o((1 - r)\bar{s} + \bar{l}) + (1 - n_o)(r\bar{s} - \bar{l})\alpha. \end{aligned} \quad (OPC)$$

Finally, the owners can choose $l = 0$ and make a sufficiently high contribution to trigger the subsidy-for-contribution equilibrium. Hence, the owners incentive constraint is,

$$\begin{aligned}
(\alpha r - n_o(1 - r(1 - \alpha))\bar{s} - (\alpha + n_o(1 - \alpha))\bar{l} - \delta &\geq \\
(\alpha r - n_o(1 - r(1 - \alpha))\bar{s} - (1 - r)h\bar{s}) &\Leftrightarrow \\
\delta &\leq (1 - r)h\bar{s} - n_o\bar{l} - (1 - n_o)\bar{l}\alpha. \quad (OIC)
\end{aligned}$$

FIGURE 2 HERE

The three constraints are drawn in Figure 2 in the $\alpha \delta$ plan for the case where $\bar{l} = 0.6$, $\bar{s} = 1$, $b = r = \frac{4}{5}$, $n_u = \frac{1}{5}$, $n_o = \frac{1}{50}$ and $h = 1$. When the government controls l , the union induces excess employment by compensating the government for the loss in social welfare and the loss in contributions from the private owners. Thus, the excess labor is implemented if and only if $\alpha \leq \alpha^l$. However, when the owners possess control, they can always trigger either the subsidy-for-contribution or the first-best outcome. Excess employment is induced only if the government is compensated and the equilibrium makes the owners better off. The set of equilibria with positive excess employment under private control is thus the shaded area between the three curves in Figure 2, i.e. positive excess employment requires that $\alpha \in [\underline{\alpha}_o, \bar{\alpha}_o]$. From equation (OPC) it is noticed that a necessary condition for existence of a labor-for-subsidy equilibrium is $r\bar{s} - \bar{l} > 0$, which states that the owners' gain from receiving the subsidy is larger than the additional cost of excess employment.

Proposition 3 states that the set of α 's sustaining a *labor-for-subsidy* equilibrium is a proper subset of $[0, \alpha^l]$. That is $\bar{\alpha}_o$ in Figure 2 is always to the left of α^l . The owners improved bargaining position increases the

union’s cost of inducing excess employment. This increased cost of excess employment combined with an unchanged benefit (weakly) improves efficiency in labor allocation.

It is worth noticing from Figure 2 that transfer of control also improves efficiency in labor allocation when α is sufficiently small and the owners constitute a non-trivial part of the taxpayers. This happens if the owners’ benefit from the subsidy minus the cost of excess labor is less than the amount they pay in increased taxation.

Proposition 4 (Transfer of Control Increases the Subsidy).

Transfer of control from the government to the private owners never decreases the subsidy and it increases the subsidy for some parameter values.

By committing to efficient labor allocation independently of the amount of subsidy received, the owners are essentially in the same situation as when they lobbied the government for the subsidy in Section 3. Since this is the worst they can do, transferring control never decreases the level of subsidy. In Figure 2 this means that independently of who controls the labor decision the subsidy is provided if $\alpha \geq \alpha^s$. Furthermore, the owners have the option of trading excess labor for a subsidy and this option can yield a positive utility for the owners even if it does not pay for them to lobby directly for the subsidy. In the figure this happens for $\alpha \in [\underline{\alpha}_o, \bar{\alpha}_o]$. In this range, transfer of control increases the amount of subsidy provided to the firm.

Proposition 3 and 4 provide the second half of the answer to the puzzle raised in the introduction. Transfer of control “depoliticizes” the firm because it improves the owners’ position in the negotiations and this affects the government’s preferred outcome. Some observers of the privatization process in Russia and Eastern Europe argue that transferring control “depoliticizes” a firm because it makes it harder for corrupt bureaucrats to misuse resources in the firm in their own interest [e.g. Shleifer (1998)]. The argument for “depoliticization” given in this analysis complements such arguments in societies governed by corrupt decision makers and is furthermore also applicable to democratic non-corrupt societies.

Increasing the power of the private owners improves social welfare if the owners’ preferences are aligned with the interest of the general society.

However, it is worth emphasizing that transferring control to the owners in one area, such as labor allocation, increases their ability to affect other policy areas by colluding with other interest groups.¹⁶ In this model, other policy areas include only the allocation of the subsidy, but in general the argument could be applied to a broader range of policy issues affecting the welfare of the owners. Control is power and power is not neutral.

The labor-for-subsidy equilibrium suggests an explanation of the observation that after privatization both owners and unions lobby governments for more subsidy. The owners offer excess labor in exchange for a cheap subsidy. The union, benefitting from the excess labor, persuades the government to accept the owners' offer. It is therefore possible that transferring control increases the amount of subsidy without decreasing the level of excess employment. An example of this is provided in Figure 2 in the case where $\alpha \in [\underline{\alpha}_o, \bar{\alpha}_o]$. A control transfer in such a case increases the total amount of subsidy from the Treasury which confirms Frydman and Rapaczynski's claim that "Under special political and economic conditions, subsidies to private enterprises are in fact not necessarily more difficult or infrequent than those to state companies,...".

The final proposition characterizes the existence of a labor-for-subsidy equilibrium.

$$\bar{l}/\bar{s} \in \left[\frac{(1-r)(h+n_u) + n_u r \alpha}{b(1+h) - h - n_u(1-\alpha)} ; \min \left\{ \frac{\alpha r - n_o(1-r(1-\alpha))}{\alpha + n_o(1-\alpha)} ; \frac{(1-r)h}{\alpha + n_o(1-\alpha)} \right\} \right]. \quad (6)$$

Proposition 5 (Labor-for-Subsidy Equilibrium).

a) Condition (6) is a sufficient condition for existence of an equilibrium with positive excess employment when the private owners control excess employment.

b) If $\alpha + n_o(1-\alpha) \leq b(1+h) - h - n_u(1-\alpha)$, then condition (6) is also a necessary condition for existence of an equilibrium with positive excess employment when the private owners control excess employment.

¹⁶See Tirole (1992) for a survey of the collusion literature.

Equation (6) reflects the three requirements discussed above in the special case where the owners offer zero contribution. If the labor subsidy ratio is too small, then it is too costly for the union to compensate the government for both the welfare loss of giving out the subsidy and for inefficient labor allocation. On the other hand if the labor subsidy ratio is too high, then either the owners prefer the efficient resource allocation (second term) or they prefer to lobby directly for the subsidy (third term). If the condition in Part b) is satisfied, then the existence of a labor-for-subsidy equilibrium with zero contribution from the owners is a necessary condition for the existence of any labor-for-subsidy equilibrium.

5 Conclusion

In principle, transfers of cash flow and control from a government to private owners do not *per se* depoliticize a firm, since the government regulates the operation of a private firm as well as the operation of a state owned firm. However, such transfers change the abilities and incentives of interest groups to influence the political decision making, implying that a government's preferred policy for a private enterprise differs from its preferred policy for a state owned enterprise. This explains why resource allocation is affected by shifts in ownership structure.

There are at least three directions in which future research can be directed. First, the model can be extended to analyze the consequences of giving control over labor allocation to the union. In the present model the union would always choose positive excess labor. By introducing other policy variables of interest to the union - such as wages - it may be possible to analyze in which cases the union can have incentives to pick the efficient labor allocation. Second, the approach has been to assume the existence of two essentially unexplained institutions, namely a union and a government. It would be a fruitful exercise to analyze how these institutions are formed from first principles. Finally, it is an obvious extension to analyze why property rights change. In my model, any government strictly prefers to control the firm - but not necessarily to own all cash flow rights - since

the government can always do weakly better than under private control. To explain why firms are privatized or nationalized it is thus necessary to appeal to factors outside the model, such as pressure from international institutions. A promising way to proceed would be to introduce alternative ideologies into the government's preferences.

Acknowledgements

This is a chapter of my Harvard PhD thesis “Political Ownership and the Behavior of Special Interest Groups.” I am indebted to my supervisors Oliver Hart and Andrei Shleifer for their ongoing support and involvement in this project. Furthermore, I wish to thank Sven Feldmann, Elhanan Helpman, Christian Schultz, Thomas Sjöström, Catherine Waddams Price and in particular Torsten Persson and an anonymous referee for many useful comments and suggestions. The paper has also benefitted from comments from seminar participants at Cambridge University, EARIE98, Harvard University, I.E.A. (Barcelona), I.I.E.S. (Stockholm), London Business School, Stockholm School of Economics, University College of London, University of Copenhagen, University of Århus, Zeuthen Lecture Workshop 1998 and Århus Business School. Financial support from the Danish Social Science Research Council and Industriens Realkreditfond is gratefully acknowledged.

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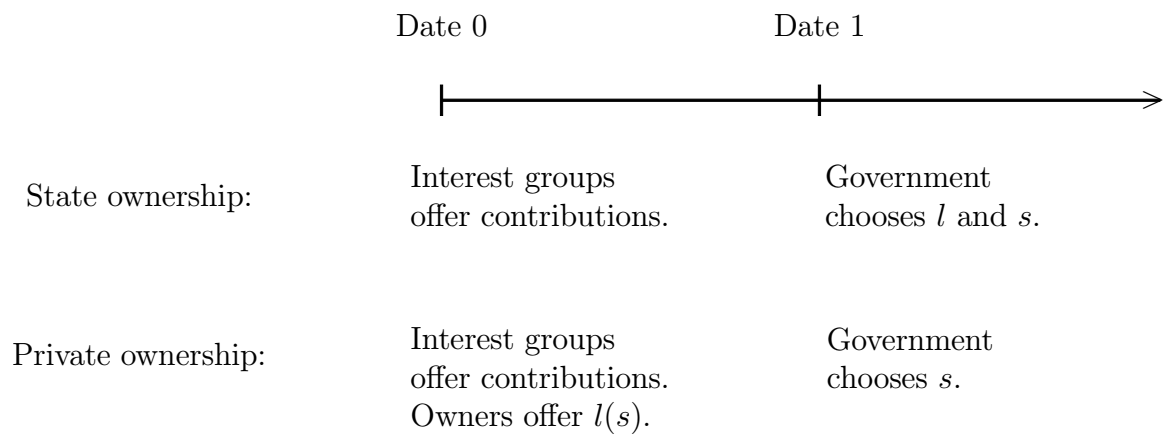


Figure 1: time line.

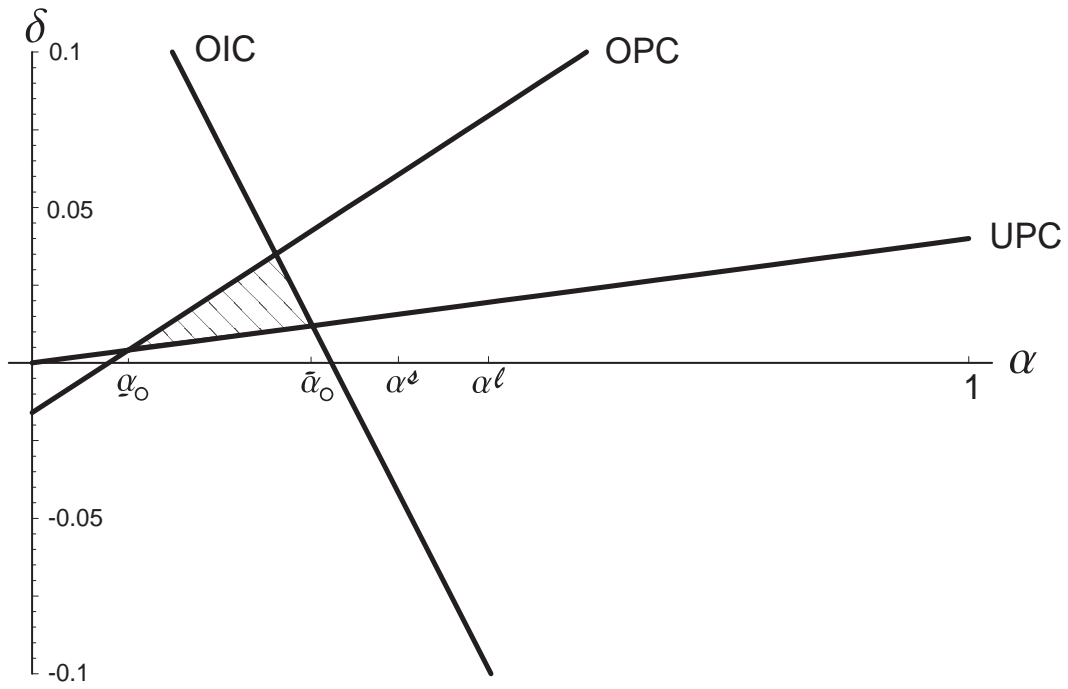


Figure 2: Equilibria with excess employment under private control for $\bar{l} = 0.6$, $\bar{s} = 1$, $b = r = \frac{4}{5}$, $n_u = \frac{1}{5}$, $n_o = \frac{1}{50}$ and $h = 1$. In this example $\alpha^l = 0.49$, $\alpha^s = 0.39$, $\underline{\alpha}_0 = 0.10$, and $\bar{\alpha}_0 = 0.30$.

Appendix

Proof of Proposition 1 and 2

Proof. Lemma 1 states that if $\{c_u^*, c_o^*, l^*, s^*\}$ is a Truthful Nash Equilibrium, then

$$\{l^*, s^*\} \in \text{Arg} \max_{\{l, s\} \in L \times S} W_g + W_o + W_u.$$

Solving this problem for l and s yields,

$$l = \bar{l} \text{ only if } -(1-b)h\bar{l} - \alpha\bar{l} + b\bar{l} - (n_o + n_u)(1-\alpha)\bar{l} \geq 0$$

$$\Leftrightarrow \alpha \leq \alpha^l \equiv \frac{b(1+h) - (h + n_o + n_u)}{1 - n_o - n_u},$$

$$l = 0 \text{ only if } -(1-b)h\bar{l} - \alpha\bar{l} + b\bar{l} - (n_o + n_u)(1-\alpha)\bar{l} \leq 0$$

$$\Leftrightarrow \alpha \geq \alpha^l,$$

and

$$s = \bar{s} \text{ only if } -(1-r)h\bar{s} + \alpha r\bar{s} - (n_o + n_u)(1-r(1-\alpha))\bar{s} \geq 0$$

$$\Leftrightarrow \alpha \geq \alpha^s \equiv \frac{(1-r)(h + n_o + n_u)}{r(1 - n_o - n_u)},$$

$$s = 0 \text{ only if } -(1-r)h\bar{s} + \alpha r\bar{s} - (n_o + n_u)(1-r(1-\alpha))\bar{s} \leq 0$$

$$\Leftrightarrow \alpha \leq \alpha^s.$$

□

Proof of Proposition 1

Proof. Part a)

$$\frac{\partial \alpha^l}{\partial (n_o + n_u)} = \frac{(b-1)(1+h)}{(1-n_o-n_u)^2} < 0$$

and

$$\frac{\partial \alpha^s}{\partial (n_o + n_u)} = \frac{(1-r)(1+h)}{r(1-n_o-n_u)^2} > 0.$$

Part b)

$$\frac{\partial \alpha^l}{\partial h} = \frac{b-1}{1-n_o-n_u} < 0$$

and

$$\frac{\partial \alpha^s}{\partial h} = \frac{1-r}{r(1-n_o-n_u)} > 0.$$

□

Proof of Lemma 2

Proof. I first prove the following claim:

Claim 1.

- (i) $(l, s) = (\bar{l}, 0)$ is never an equilibrium resource allocation.
- (ii) In any Subgame Perfect Equilibrium of Γ_o with $(l^*, s^*) \neq (0, 0)$,
 - (a) The government is indifferent between allocating the subsidy or not.
 - (b) Given $l(\cdot)$, there exists $s_u \in S$ such that $c_u(l(s_u), s_u) = 0$ and $s_o \in S$ such that $c_o(s_o) = 0$.

Proof. (i) Assume not. The owners are strictly better off by offering zero excess employment and zero contributions. Contradiction.

(ii) Assume not. $(l^*, s^*) \neq (0, 0) \Rightarrow c_i(l^*, s^*) > 0$ for some $i = u, o$. Group i can lower its contribution slightly without affecting the government's preferred choice. This deviation makes group i strictly better off. Contradiction. (iib) Assume this is not true for the union. Consider strategy c'_u given by $c'_u(l(s), s) = c_u(l(s), s) - \epsilon$ and $c'_u(l, s) = c_u(l, s)$ for $l \neq l(s)$. This does not affect the government's choice and leaves the union strictly better off. Contradiction. Same argument can be applied to the owners. \square

Part (1): Existence of a Truthful Nash Equilibrium can be proved by example:

$$(*) \left\{ \begin{array}{l} \text{Case: } \alpha < \alpha^s. \\ \text{Case: } \alpha \geq \alpha^s. \end{array} \right. \left\{ \begin{array}{l} s^* = 0, \\ l^*(\bar{s}) = l(0) = 0, \\ c_o^*(0) = 0, \\ c_o^*(\bar{s}) = \alpha r \bar{s} - n_o(1 - r(1 - \alpha))\bar{s}, \\ c_u^*(0, 0) = c_u^*(\bar{l}, 0) = \max\{0, \alpha r \bar{s} - n_o(1 - r(1 - \alpha))\bar{s} - (1 - r)h\bar{s}\}, \\ c_u^*(0, \bar{s}) = c_u^*(\bar{l}, \bar{s}) = 0. \\ s^* = \bar{s}, \\ l^*(\bar{s}) = l^*(0) = 0, \\ c_o^*(0) = 0, \\ c_o^*(\bar{s}) = (1 - r)h\bar{s} + n_u(1 - r(1 - \alpha))\bar{s}, \\ c_u^*(0, 0) = c_u^*(\bar{l}, 0) = n_u(1 - r(1 - \alpha))\bar{s}, \\ c_u^*(0, \bar{s}) = c_u^*(\bar{l}, \bar{s}) = 0. \end{array} \right.$$

Part (2): Define $BR_u(c_o, l) : \mathcal{C}_o \times \mathcal{L}_o \rightarrow \mathcal{C}$ and $BR_o(c_u) : \mathcal{C} \rightarrow \mathcal{C}_o \times \mathcal{L}_o$ as the union's respective the owners' best response correspondence.

Fix $c_u \in BR_u(c_o, l)$ and let s^* be the government's choice when the interest groups use strategies c_u, c_o and l . Define c_u^t such that $c_u^t(l(s^*), s^*) = c_u(l(s^*), s^*)$, $c_u^t(l(s), s) = \max\{0, W_u(l(s), s) - W_u(l(s^*), s^*) + c_u(l(s^*), s^*)\}$, for $s \neq s^*$ and $c_u^t(l, s) = \max\{0, W_u(l, s) - W_u(l(s^*), s^*) + c_u(l(s^*), s^*)\}$

for $(l, s) \in L \times S$, where $l \neq l(s)$. This contribution strategy is truthful and yields the same utility for the union as using c_u . This is obvious if the government still chooses s^* . If the government instead chooses $s \neq s^*$ it follows that $c_u^t(l(s), s) > c_u(l(s), s) \geq 0$ implying that $W_u(l(s), s) - c_u^t(l(s), s) = W_u(l(s^*), s^*) - c_u(l(s^*), s^*)$.

Fix $(c_o, l) \in BR_o(c_u)$ and let s^* be the government's choice when the interest groups use strategies c_u, c_o and l . Let $c_o^t(s^*) = c_o(s^*)$ and $c_o^t(s) = \max\{0, W_o(l(s), s) - W_o(l(s^*), s^*) + c_o(s^*)\}$. c^t is a truthful contribution strategy and using strategy (c_o^t, l) leaves the owners with the same payoff as strategy (c_o, l) .

Part (3): Sufficiency follows from Part (ii).

Necessity. Let $\{c_u^*, c_o^*, l^*, s^*\}$ be a Subgame Perfect Equilibrium with $l^*(s^*) = \bar{l}$. Claim (i) implies $s^* = \bar{s}$. Furthermore, $c_u^*(\bar{l}, \bar{s}) > 0$ and $c_u^*(0, 0) = 0$: if the first was not true, then the owner would strictly prefer to offer $l(0) = l(\bar{s}) = 0$ and if the second was not true then the union could benefit from lowering both $c_u(\bar{l}, \bar{s})$ and $c_u(0, 0)$. From $\{c_u^*, c_o^*, l^*, s^*\}$ being a Subgame Perfect Equilibrium it follows $c_u(\bar{l}, \bar{s}) \leq \text{Max}\{0, W_u(\bar{l}, \bar{s}) - W_u(0, 0)\}$. Hence, c_u^* is a truthful strategy relative to (l^*, s^*) .

Notice, $c_o^*(0)$ can be positive in a Subgame Perfect Equilibrium, since $s = 0$ is an out of equilibrium action. However, define c_o^t such that $c^t(\bar{s}) = c^*(\bar{s})$ and $c_o^t(0) = 0$. From $\{c_u^*, c_o^*, l^*, s^*\}$ being a Subgame Perfect Equilibrium it follows $c_o(\bar{s}) \leq \text{Max}\{0, W_o(l^*(\bar{s}), \bar{s}) - W_o(l^*(0), 0)\}$. Hence, c_o^t is a truthful strategy relative to (l^*, s^*) . \square

Proof of Proposition 3

Proof. It is to be proved that $\alpha < \alpha^l$ is a necessary condition for existence of an equilibrium with excess employment when the owners control l . Claim (iia) implies the government incentive constraint is binding, i.e. the union's contribution is,

$$c_u(\bar{l}, \bar{s}) = \frac{1-r}{h} \bar{s} + \frac{1-b\bar{l}}{h} \bar{l} - \delta.$$

where $\delta \geq 0$ is the contribution from the owners.

Due to Lemma 2 I can without loss of generality solve directly for a Subgame Perfect Equilibrium instead of a Truthful Nash Equilibrium. I am interested in the largest set of equilibria with $l = \bar{l}$. Since $s = \bar{s}$ is a necessary condition for this, there is no loss in assuming that the union pays zero contribution whenever $l = 0$ or $s = 0$. Anything else would increase the government's incentive to choose $s = 0$ and thus trigger $l = 0$.

Rewrite equation (UPC) to

$$\bar{l} \geq \frac{(1-r)(h+n_u) + n_u r \alpha}{b(1+h) - h - n_u(1-\alpha)} \bar{s} - \frac{\delta}{b(1+h) - h - n_u(1-\alpha)} \equiv \underline{k}_{upc}, \quad (7)$$

equation (OPC) to

$$\bar{l} \leq \frac{(\alpha r - n_o(1 - r(1 - \alpha)))\bar{s}}{\alpha + n_o(1 - \alpha)} - \frac{\delta}{\alpha + n_o(1 - \alpha)} \equiv \bar{k}_{opc}, \quad (8)$$

and equation (OIC) to

$$\bar{l} \leq \frac{(1 - r)h}{\alpha + n_o(1 - \alpha)}\bar{s} - \frac{\delta}{\alpha + n_o(1 - \alpha)} \equiv \bar{k}_{oic}. \quad (9)$$

A necessary and sufficient condition for the existence of an equilibrium with $l > 0$ is that there exists $\delta \geq 0$ such that equations (7), (8) and (9) are satisfied. A necessary condition is that there exists a $\delta \geq 0$ s.t. $\bar{k}_{oic} \geq \underline{k}_{upc}$ or

$$\begin{aligned} & \left[\frac{(1 - r)h}{\alpha + n_o(1 - \alpha)} - \frac{(1 - r)(h + n_u) + n_u r \alpha}{b(1 + h) - h - n_u(1 - \alpha)} \right] \bar{s} \\ & \geq \left[\frac{1}{\alpha + n_o(1 - \alpha)} - \frac{1}{b(1 + h) - h - n_u(1 - \alpha)} \right] \delta. \end{aligned} \quad (10)$$

Case $\alpha + n_o(1 - \alpha) \leq b(1 + h) - h - n_u(1 - \alpha)$. Condition (10) requires

$$\begin{aligned} \frac{h}{\alpha + n_o(1 - \alpha)} & \geq \frac{(h + n_u) + n_u \frac{r}{1-r} \alpha}{b(1 + h) - h - n_u(1 - \alpha)} \Rightarrow \\ \alpha & < \frac{b(1 + h) - (h + n_o + n_u)}{1 - n_o - n_u} \equiv \alpha^l. \end{aligned}$$

Case $\alpha + n_o(1 - \alpha) > b(1 + h) - h - n_u(1 - \alpha)$. In this case a necessary condition is found from using an upper bound, $\bar{\delta}$, for δ . Equation (9) yields

$$\bar{\delta} \equiv (1 - r)h\bar{s} - (\alpha + n_o(1 - \alpha))\bar{l}.$$

Putting this upper bound into equation (7) yields

$$\begin{aligned} (b(1 + h) - h - n_u(1 - \alpha))\bar{l} & \geq n_u(1 - r(1 - \alpha))\bar{s} + (\alpha + n_o(1 - \alpha))\bar{l} \Rightarrow \\ \alpha & < \frac{b(1 + h) - (h + n_o + n_u)}{1 - n_o - n_u} \equiv \alpha^l. \end{aligned}$$

□

Furthermore, a sufficient condition for a transfer of control strictly decreases excess employment is $\alpha < \alpha^l$ and there does not exist a $\delta \geq 0$ s.t. equations (UPC), (OPC) and (OIC) are satisfied, i.e. if

$$\begin{aligned} & \min \{ -n_o((1 - r)\bar{s} + \bar{l}) + (1 - n_o)(r\bar{s} - \bar{l})\alpha; (1 - r)h\bar{s} - n_o\bar{l} - (1 - n_o)\bar{l}\alpha \} \\ & < \max \{ 0; -(b - n_u - (1 - b)h)\bar{l} + (1 - r)(h + n_u)\bar{s} + n_u(r\bar{s} - \bar{l})\alpha \}. \end{aligned}$$

Proof of Proposition 4

Proof. Equilibrium (*) given in the proof of Lemma 2 proves the existence of an equilibrium with $s = \bar{s}$ whenever $\alpha \geq \alpha^s$. Notice, the owners can always trigger this equilibrium by offering zero excess labor. From $s = \bar{s}$ being a necessary condition for $l = \bar{l}$ it follows that subsidy never decreases. Finally, Figure 2 provides a range of examples where the amount of subsidy strictly increases. \square

Furthermore, the amount of subsidy strictly increases if $\alpha < \alpha^s$, there exists a $\delta \geq 0$ s.t. equations (UPC), (OPC) and (OIC), i.e. if

$$\begin{aligned} & \min \{ -n_o((1-r)\bar{s} + \bar{l}) + (1-n_o)(r\bar{s} - \bar{l})\alpha; (1-r)h\bar{s} - n_o\bar{l} - (1-n_o)\bar{l}\alpha \} \\ \geq & \max \{ 0; -(b-n_u - (1-b)h)\bar{l} + (1-r)(h+n_u)\bar{s} + n_u(r\bar{s} - \bar{l})\alpha \}, \end{aligned}$$

and the labor-for-subsidy equilibrium is selected.

Proof of Proposition 5

Proof. For $\delta = 0$, the three requirements are derived in equations (7), (8) and (9). Equation (10) shows that in the case where $\alpha + n_o(1-\alpha) \leq b(1+h) - h - n_u(1-\alpha)$ the existence of a labor for subsidy equilibrium with $\delta = 0$ is a necessary condition for the existence of any labor-for-subsidy equilibrium. \square