A Principal-Agent Approach to a Self-administered Organization with an Elected Principal

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Abstract

We consider a self-administered organization characterized by a principal elected by the agents and establish conditions under which self-administration leads to either stronger or weaker incentives than an organization which only pursues exogenous objectives such as profit maximization. While the output of the organization that accrues to society is controlled by the effort of the agents and by nature, the pay-off of the principal also includes rents from office. Generally, two different contractual regimes may obtain, either a hard regime with strong incentives and low fixed payments or a soft regime with weak incentives and high fixed payments.

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1 Introduction

Self-Administration is a traditional but still dominant organizational structure of various public institutions. A specific element of self-administration is the endogeneity of at least part of the organization's agenda. This is because in a self-administered organization the principal often is determined by the agents in some selection procedure. At many public universities in Continental Europe, for instance, the head (the rector or the president) is elected by the members of the university.

In the present paper we take a closer look at the principal-agent relationship that is associated with such a self-administrated organization. We develop a simple principal-agent model with a principal elected by the agents and establish conditions under which self-administration leads to either stronger or weaker incentives than an organization which only pursues exogenous objectives such as profit maximization. While the output of the organization that accrues to society is controlled by the effort of the agents and by nature, the pay-off of the principal also includes rents from office. Generally, two different contractual regimes can be optimal from the point of view of the principal, either a hard regime with strong incentives and low fixed payments or a soft regime with weak incentives and high fixed payments. Whether the principal establishes the hard regime or the soft one, depends on how much the principal values the rents from office relative to the output of the organization.

The examination of the specific incentives of executives in public organizations is of central concern in the public finance literature.

Early contributions include the now classical papers by Niskanen (1971) and Romer and Rosenthal (1979). In recent years, contract theoretic approaches to public organizations have been developed. Dewatripont et al. (1999) consider career concerns of public bureaucrats. Dixit (2002) discusses various specifics of public organizations in the moral hazard framework á la Holmström (1979). Besley and Ghatak (2005) consider public organizations characterized by a specific mission and analyze an optimal matching between principals and agents. Canton (2005) distinguishes between extrinsic and intrinsic motivation of agents in public organizations and establishes contracts that give agents an incentive to reveal their motivation type.

The present paper adds to the contract theoretical approach to public organizations by incorporating a voting mechanism. In order to capture the self-administration aspect of public organizations we combine a simplified version of the standard moral hazard framework and a probabilistic voting model in the tradition of Coughlin (1982). We thus assume that the voting behavior of the agents depends on the utility they derive from the contractual relationship with the principal. The principal, in turn, considers the agents' voting preferences when making contractual offers. This will be seen to have a significant impact on the agents' incentives to generate output within the organization.

The remainder of the paper is organized as follows. In section 2 we present the model. Section 3 then establishes the contractual regimes that may obtain in equilibrium. Section 4 briefly concludes.

2 The Model

We employ a simplified version of the principal-agent framework in line with the model of Besley and Ghatak (2005). Our organization consists of a single principal and a unit-measure continuum of ex ante identical agents. The organization is self-administered in the sense that the principal is appointed to office by vote of the organization's members, that is by the agents. In the beginning the principal is already in office, but can be reelected once. The principal charges each agent with a project that can either be successful or fail. If an agent leads her project to success, the output is $y > 0$, otherwise the output is zero.

The probability p that an agent's project is successful is given by the effort $e \in [0,1]$ the agent devotes to the project, that is $p = e$. This implies that probabilities of success are independently distributed across agents. Devoting e effort units to her project, an agent incurs costs amounting to $c(e) = e^2/2$.

The principal cannot observe agents' effort so that contracts can only be conditioned on agents' output. Due to limited-liability constraints each agent has to be rewarded a monetary wage of at least $\underline{w} \geq 0$.[1] Uncontractible effort thus implies moral hazard on the agents' side. Alternatively to accepting the contract offered by the principal each agent has an outside opportunity that leads to a payoff of zero.

Confining attention to linear rewarding schemes, ex ante or ex-

[1] An alternative interpretation is that the principal is legally obliged to pay a fixed wage of at least $\underline{w}$.

pected utility of each agent is given by

$$Eu = p\,b + w - \frac{1}{2}e^2 \tag{1}$$

where w is the fixed part of the reward and b is a bonus only paid to an agent if her output amounts to y.

Once agents have devoted effort to their projects and the projects' output has materialized, the principal candidates for a second term in office. Agents make their voting decisions on the basis of the utility level they so far have derived from their employment in the organization. This assumption incorporates a certain psychological element in the agents' voting preferences for the current incumbent (principal) as the latter is somehow made responsible by the agents for their job-related well-being. We consider a simplified probabilistic voting model in the tradition of Coughlin (1982). Let π denote the probability that an agent votes for the current principal, then it is determined by

$$\pi(u) = \begin{cases} 0, & \text{if } u < \underline{u} \\ \bar{\pi} \in (0,1], & \text{if } u \geq \underline{u} \end{cases} \tag{2}$$

where u measures an agent's ex post utility, i.e. the utility she obtains once her project's outcome has been realized. By $\underline{u}$ the utility level is measured below which no agent is willing to vote for the current incumbent with positive probability. In what follows we assume that $\underline{u} = \underline{w}$. This implies that an agent does only consider to vote for the incumbent, if she has realized a payoff that she could have had realized within the organization anyway by devoting no effort at all to her project.

Ex post utility u of an agent may assume two different levels,

$$u = \begin{cases} u_s = b + w - \frac{1}{2}e^2, & \text{if successful} \\ u_n = w - \frac{1}{2}e^2, & \text{if not} \end{cases} \tag{3}$$

depending on whether she has led her project to success or not.

The payoff that accrues to the principal if she will be elected for another term is given by r. We will refer to r as a rent from office. It may include monetary as well as non-monetary benefits such as privileges and prestige associated with holding the office. The principal's utility, however, is not solely driven by the rent from office but also by the (net) output of the organization. Thus, expected utility of the principal may be written as

$$Ev = p\,y - p\,b - w + [p\,\pi(u_s) + (1-p)\,\pi(u_n)]\,r. \qquad (4)$$

Interaction between the principal and the agents can be described as a sequential game with a sequence of events as illustrated in Figure 1.

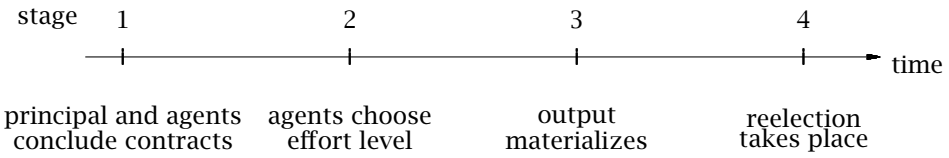

Figure 1: Sequence of Events

In the first stage of the game the principal and the agents conclude contracts. In the second stage each agent chooses her effort. The agents' effort levels determine the probabilities of successful project outcomes that materialize in the third stage. Finally, in the fourth stage the principal candidates for a second term in office and the agents vote.

3 Equilibrium

Voting strategies of the agents in stage four of the game are fully characterized by equations (2) and (3) with $\underline{u} = \underline{w}$. Thus, we can directly move to the second stage. This stage addresses the standard moral hazard problem. As an agent's effort cannot be observed or contracted on, she will choose her effort so that her expected utility, given by (1), reaches a maximum. In our model the agents' strategy space is normalized to the unit interval. Considering that $p = e$, the first order condition for the optimal effort level of an agent then yields

$$e = \min\{b, 1\}. \tag{5}$$

In the first stage the principal will offer contracts to the agents consisting of a fixed wage w and a bonus payment b. Considering equations (2), (3), (4) and (5), $p = e$ and $\underline{u} = \underline{w}$, each agent will be offered a contract that solves

$$\max_{\{w \geq \underline{w},\, 0 \leq b \leq 1\}} b\,y - b^2 - w + [b\,\pi(u_s) + (1-b)\,\pi(u_n)]\,r, \tag{6}$$

subject to

$$\pi(u_s) = \begin{cases} 0, & \text{if} \quad w + b - b^2/2 < \underline{w} \\ \bar{\pi}, & \text{otherwise} \end{cases},$$

$$\pi(u_n) = \begin{cases} 0, & \text{if} \quad w - b^2/2 < \underline{w} \\ \bar{\pi}, & \text{otherwise} \end{cases}.$$

Generally, two different cases can be distinguished. In the first case $\pi(u_s) = \bar{\pi}$ and $\pi(u_n) = 0$, and in the second case $\pi(u_s) = \pi(u_n) = \bar{\pi}$. That is, in the first case only successful agents vote for the prin-

cipal, whereas in the second case both, successful and unsuccessful agents vote for her.[2]

In the first case program (6) reduces to

$$\max_{\{w \geq \underline{w},\, 0 \leq b \leq 1\}} b\,y - b^2 - w + b\,\bar{\pi}\,r, \tag{7}$$

which leads to

$$w = \underline{w}, \tag{8}$$

$$b = \min\left\{\frac{1}{2}(y + \bar{\pi}\,r), 1\right\}. \tag{9}$$

Generally, the bonus in this case is larger and, thus, incentives are more powerful than in the standard model. In the standard model the principal derives utility only from the organization's output and chooses a bonus payment given by $b = \min\{y/2, 1\}$. In contrast, in the present model the principal has a double motive to strengthen incentives as it also effects the outcome of the election. With an increase in the bonus payment a greater share of agents will be successful. This increases the probability that the principal becomes reelected.

In the second case program (6) reduces to

$$\max_{\{w,\, 0 \leq b \leq 1\}} b\,y - b^2 - w + \bar{\pi}\,r, \tag{10}$$

subject to

$$w - \frac{1}{2}b^2 \geq \underline{w}.$$

The solution is

$$w = \underline{w} + \frac{1}{18}y,$$

$$b = \min\left\{\frac{1}{3}y, 1\right\}.$$

[2]The case $\pi(u_s) = 0$ and $\pi(u_n) = \bar{\pi}$ and the case $\pi(u_s) = \pi(u_n) = 0$ can be excluded. Both cases would either imply a negative bonus b or would violate the limited liability constraint $w \geq \underline{w}$.

Incentives in the second case are weaker than both, in the standard model of a principal only concerned about the organization's output and in the preceding case where the principal waives the votes of the unsuccessful agents. For making the probability of being re-elected maximal, the principal takes all the votes he can get by offering a contract that raises the fixed wage so that ex post utility of every agent, either successful or not, becomes sufficiently large. To outbalance the larger fixed wage the bonus is lower in this case implying weaker incentives.

It remains to be answered which of the two incentive regimes, the strong one or the weak one, obtains in equilibrium. Clearly, it will be that regime which guarantees the principal the higher level of expected utility. In order to compare the principal's expected utility in the two regimes, assume for a moment that $b < 1$ in both cases. The principal's expected utility in the strong regime then reads

$$Ev_1 = \frac{1}{4}(y + \overline{\pi}\, r)^2 - \underline{w}, \tag{11}$$

and in the weak regime

$$Ev_2 = \frac{1}{6}y^2 + \overline{\pi}\, r - \underline{w}. \tag{12}$$

From equations (11) and (12) the set of y-r-combinations can be derived so that the principal is just indifferent between the two incentive regimes. Equating Ev_1 and Ev_2 and solving for y, one finds that

$$y = f(r) = -3\bar{\pi}\, r + \sqrt{6}\,\sqrt{2\,\bar{\pi}\, r + \bar{\pi}^2 r^2}. \tag{13}$$

For $y < f(r)$, the weak regime obtains in equilibrium and for $y > f(r)$ the strong one obtains. However, it still has to be clarified

whether the principal may have an incentive to set b equal to one. If the principal chooses the weak regime, $b = 1$ can be excluded. This is because equation (13) implies that $f(r) < 3$, whereas in the weak regime b will only equal one if $y \geq 3$. In contrast, in the strong regime, the principal will set b equal to one if $y \geq g(r)$, where $g(r)$ is defined by

$$g(r) = 2 - \bar{\pi}\, r, \tag{14}$$

as can be inferred from equation (9).

Figure 2 illustrates these results. The parabola $f(r)$ pictures the set of y-r-combinations given by (13) and the downward sloping straight line $g(r)$ pictures the combinations given by (14). In area A condition $y < f(r)$ holds and the weak regime obtains in equilibrium with $b = y/3$. In area B condition $f(r) < y < g(r)$ holds and the strong regime obtains with $b = (y + \bar{\pi}\, r)/2$. In area C condition $y > g(r)$ holds and the strong regime obtains with $b = 1$.

The interpretation of these results is as follows. In a context where the rents from office take a high value relative to the output of the organization, the principal will offer contracts with weak incentives and high fixed payments. Those contracts make even unsuccessful agents well-off so that everyone votes for the principal with positive probability. This is the case if for every agent the job is profitable not only ex ante but also ex post, that is when effort costs are weighted against realized rather than expected payments. The price that has to be paid for such a weak incentive scheme is lower output of the organization.

In contrast, if the value of the rents from office are not so important for the principal relative to the output of the organization,

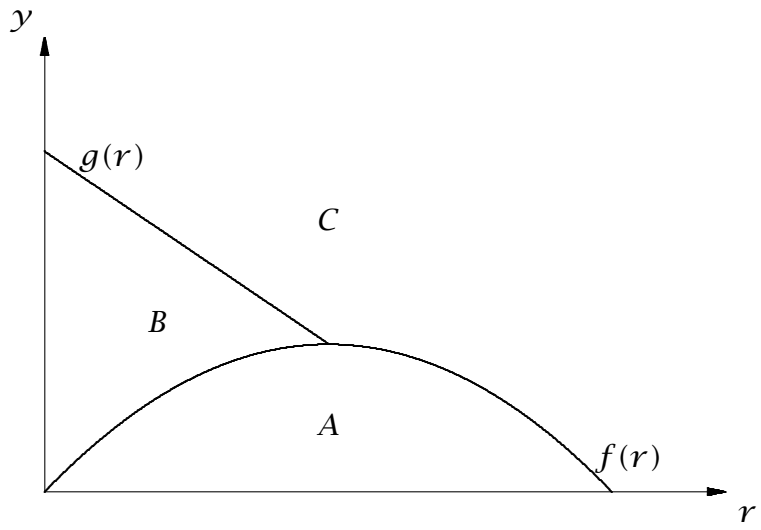

Figure 2: Equilibrium Regimes

the principal will offer contracts with strong incentives. She then waives the votes of unsuccessful agents in order to induce higher effort and thus higher expected output.

The case of the bonus payment being set to one is more of technical nature. It is mainly due to the simple linear structure of the model. In fact, it implies that the principal will implement the first best if both the value of the organization's output and the rents from office are sufficiently high.

4 Conclusion

We have analyzed a self-administered organization where the head of the organization (the principal) is elected by the members of the organization (the agents). As in the standard moral hazard model the effort of the agents cannot be observed or be part of a contract.

Under these premises two different types of contracts may obtain in equilibrium. Equilibrium contracts either implement stronger or weaker incentives than in the standard moral hazard model. In the first case only successful agents consider to vote for the principal. In the second case all agents vote for the principal with positive probability. Whether or not stronger incentives are dominating depends on the value the principal attaches to rents from office relative to the organization's output. If rents from office have a relatively high value, the principal implements a weak incentive regime, and a strong incentive regime if they are relatively low.

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