Executive Agencies and Privatization:

Economics of the New Public Management[*]

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by

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Abstract

The purpose of this paper is to explore a theory of government governance choice that explains what makes the differences among three organizational systems; an executive agency system, a privatization, and a bureaucratic system. We mainly focus on the executive agency system. The results obtained in our paper are summarized as follows. Firstly, we show that the main benefit of an executive agency system is to stabilize an agent's effort and a related activity of a parent department, even though it cannot achieve the first-best allocation of resources. Then, we compare the three organizational systems to show the distinguished characteristics of the executive agency system.

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1. Introduction

The radical public sector reform such as the introduction of executive agencies and privatization has been one of the major controversial economic issues throughout the last decades. While this wave of reforms began in the UK, the USA, Australia, and New Zealand, it has recently been extended to the other developed, transitional, and developing economies. Although the public sector reform has been rapid and far-reaching, economic theory still finds it difficult to understand the implications of the public sector reform; for example, it cannot explain what makes the differences among a (traditional) bureaucratic organization, an executive agency, and a privatization. The purpose of this paper is to explore the theory of government governance choice that explains what makes the differences among the three organizational regimes endogenously.

In the UK, the Financial Management Initiative (FMI) was launched by the government in 1982. The FMI sought to promote the system of the new public management in which authority and responsibility are delegated as far as possible to middle and junior managers of the public sector who are accountable for meeting their costs and performance targets. It was operationalized through three major elements: top management systems, decentralized budgetary control, and performance appraisal. A review of the progress of the FMI in 1987 brought the Next Steps Programme, which argued that each department of the public sector should be made up of agencies providing goods and services in a quasi-commercial environment and small head-office staff serving the minister's policy requirements. As a result, there are now 130 such agencies, employing some 386 000 civil servants, or 75 per cent of the total (see Minogue (1998)). Each agency is operated under a chief executive who has a reporting line to ministers and acts as the agency's accounting officer to Parliament. The agency negotiates the use of departmental resources with its parent department and the Treasury under an obligation of the accountability for its use to Parliament. The resulting contractual agreement sets out the service performance and financial targets as well as the resources to be entrusted to the agency. The performance of the agency is measured against output, financial and service quality targets set in five-year framework documents; and incentive systems linked to performance will apply to the agency.

Indeed, all the services provided by agencies are viewed as possible candidates for privatization. These services may be privatized by a further innovation in the public management known now as market testing, which involves offering to competitive tender discrete services or activities provided currently through agencies.

In the other developed countries, similar reforms were introduced in Canada and New Zealand. In Canada, special operating agencies apply private sector norms in the planning and delivery services to government departments, and delegate greater authority to individual managers and employees. The radical public reform in New Zealand created executive agencies whose outputs and performance were contractually monitored. In Japan, the government has also planned to adopt the agency system (Independent Administration Corporation) in 2002 by reviewing the British experience.

To discuss the mechanism and the workings of such a stewardship system of the public sector, we need to model the following four components of the system. First, authority and responsibility are decentralized and delegated to a chief executive of each agency. There is considerable scope for chief executives to manage their own businesses in the pursuit of targets set for them. Second, since the manager of each agency is given greater freedom to manage, the efficiency and effectiveness of the performance of the agency needs to be assessed through various instruments of performance appraisal. Although performance appraisal is traditionally made by standards for the process of execution (input), the principle of the new public management has recently required standards of the outcome or at least the output of the civil service. Third, for effective performance appraisal, the manager of each agency is obliged to present and answer to an account of its execution to the principal (Parliament) entrusting the responsibility. To attain the greater accountability of the executive agency system, we may assume an independent external body (such as the National Audit Office (NAO)) that reports to Parliament its examinations of the activities of agencies. Finally, each agency is offered an incentive scheme so as to be motivated to meet its targets and subject itself to an examination of its accounts to Parliament. This incentive scheme needs to depend on a set of performance indicators that link the allocation of departmental resources to measured performance of the outcome or the output of the civil service.

To model the executive agency system theoretically and consider what makes the differences among the traditional bureaucratic organization, the executive agency, and the privatization, we also need to investigate a strategic interaction among the benevolent Parliament (principal), the parent department (small head office), and the execution department or the executive agent (steward). We mainly consider the case in which the parent department delegates authority and responsibility to a chief executive of the execution department; and Parliament offers a performance incentive contract to the execution department (but not to the parent department).[1] This case is called the

[1] If Parliament offers a performance incentive contract to the parent department, then we can think that the parent department itself becomes an executive agency. However,

executive agency system. Then, we compare the case with a privatization and a bureaucratic system.

More specifically, taking account of the considerations stated above, we build a model of the public sector that supplies educational or medical services by combining both the efforts (inputs) of the parent and execution departments. For simplicity, we assume that the input expended by the parent department is publicly observable. However, the input expended by the execution department is not observable. In contrast, educational or medical service levels provided by the public sector are publicly observable and measured using some performance indicators (outputs). Although the performance indicators cannot be drawn up to relate any outcomes that directly affect the social welfare level but are unobserevable to outside parties, they can measure the supply (output) level of educational or medical services provided by the public sector. A performance incentive scheme offered by Parliament to the execution department thus depends on the supply (output) level of educational or medical services provided by the public sector.

The results obtained in our paper are summarized as follows. Firstly, we show that even though the executive agency system cannot achieve the first-best allocation of resources, it has a main benefit to stabilize an execution department's or an agent's effort and a related activity of a parent department. That is, it alleviates the revenue fluctuation caused by a changing market price, which in turn guarantees the agent's induced effort. Secondly, we compare the three organizational systems to find the distinguished characteristics of the executive agency system. For example, we show that both the responses of the agent's effort and the parent department's activity to the budget are different between in the executive agency system and in a privatization: In the executive agency system, as the budget increases, the agent's effort may decrease because of the complementarity in the outcome function, while it certainly increases in the privatization. Also, we see that the levels of the agent's effort and the parent department's related activity in the executive agency system are larger than those in the bureaucratic system.

Although no formal model has been constructed to discuss the executive agency, our research is related to several strands of literature. It is often stated that the issue of the executive agency is similar to the issue of the scope of the firm examined by Grossman and Hart (1986) and Hart and Moore (1990). In these models, the ownership of an asset may confer authority and gives the owner the right to make decisions about the use of

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because of several social and political reasons, we assume that the parent department cannot be an executive agency nor be privatized.

this asset. Aghion and Tirole (1997) distinguish between formal authority (the right to decide) and real authority (the effective control over decisions). In their framework, even if formal authority is given to an agent, real authority cannot necessarily be conferred on him unless he has enough information to make decisions. Aghion and Tirole develop a theory of the allocation of formal and real authority within organizations. Applying the theory to the principal-agent model, they consider what conditions facilitate the delegation of formal authority to a subordinate. Using their terminology, we may interpret the executive agency model as the A-formal authority in which the information gathering effort of the principal is small; on the other hand, we may view the traditional bureaucracy model as the P-formal authority in which the information gathering effort of the agent is small. Nevertheless, Aghion and Tirole neither consider in their model the performance contract nor the accountability problem that is essential to the investigation of the executive agency. Furthermore, their results cannot determine what conditions lead to the A-formal authority in which the information gathering effort of the principal is small or to the P-formal authority in which the information gathering effort of the agent is small.

Gertner, Scharfstein, and Stein (1994), Harris and Raviv (1996), Stein (1997), and Brusco and Panunzi (2000) examine the role of corporate headquarters in allocating scarce resources to a single project or competing projects in an internal capital market.[2] The internal capital market can be interpreted as a conglomerate firm in which several technologically distinct projects are combined under the same company. These studies discuss the following question: under what circumstances can it make sense to allocate scarce funding through the internal capital market instead of the external capital market in which each technologically distinct project is set up as a stand-alone company that raises external financing on its own? Since the model of the internal capital market investigates an optimal scheme of the internal allocation of funds among different divisions of a conglomerate firm, it shares some features with the executive agency model. However, the analysis of the workings of the internal capital market differs from that of the executive agency in several respects. First, the model of the internal capital market concentrates on the role of the monitoring of corporate headquarters and

[2] Gertner, Scharfstein, Stein (1994) and Harris and Raviv (1996) argue a model in which the internal capital market finances only a single project when headquarters faces no credit constraint. On the other hand, Stein (1997) studies a model in which the internal capital market finances competing multiple projects when headquarters is constrained by credit constraints. Brusco and Panunzi (2000) investigate a model in which headquarters reallocate the cash flow generated in one division to finance the project of another division.

the reporting mechanism of divisional managers, whereas the model of the executive agency is concerned with a performance contract that depends on verifiable outputs. Second, the focus of the model of the internal capital market is on the comparison between the benefits and costs of the conglomerate firm and the stand-alone alternative. On the other hand, our study compares the benefits and costs of the executive agency with those of not only the traditional bureaucratic organization but also the privatization. Third, the accountability problem does not matter in the model of the internal capital market. Finally, the objective function of corporate headquarters and divisional managers in the conglomerate firm model are considerably different from those of agents in the executive agency model.

Perhaps, the most significant difference between the model of the previous literature and our model is that Parliament cannot control the input of the parent department directly, nor can it offer the parent department any performance contract even though we suppose a three-layer hierarchical model. In this respect, we can argue that the executive agency problem is much closer to that of the central bank independence with a performance contract à la Walsh (1995) or an inflation target à la Svensson (1997). Fujiki, Osano, and Uchida (1998) extend a model of the strategic interaction between the central bank and the fiscal authority à la Beetsma and Bovenberg (1997) by allowing for the possibility that the society can offer a performance contract or a targeting scheme to the central bank. Taking the society as Parliament, the fiscal authority as the parent department, and the central bank as the execution department, we can show that our executive agency model has the same structure as their central banking model.

The rest of our paper is organized as follows. Section 2 describes the basic model of the executive agency system. Section 3 characterizes an equilibrium of the executive agency system. Section 4 gives a comparison between the executive agency system and a bureaucratic one. Section 5 concludes our paper.

2. The Basic Model

In this section, we describe a setting of an executive agency system. There are four players in the model; Parliament (P), a parent department (M), an executive agent (A), and a group of individuals (I).

An executive agent (A) has a utility function $u^A \equiv u^A[T - C(a)]$, where T is total revenue. T includes revenue from the market $R(y) \equiv py$, where p represents the market price given, and the payment from Parliament described shortly. $C(a)$ represents his disutility incurred by implementing an effort a. ($C'(a) > 0$ and

$C''(a) > 0$.) The effort a is not publicly observable. We assume that the executive agent is risk averse, and his expected utility can be represented by the certainty equivalent CE, which will be described later.

A parent department gets the amount of money called a budget $\tilde{B}$ from the individuals to implement the activities b and d. For simplicity, we assume $b + d = \tilde{B}$ and both b and d are publicly observable. To implement the activities, the parent department incurs a cost $C^m(b,d)$, where $C^m{}_b(b,d) > 0$, $C^m{}_d(b,d) > 0$, $C^m{}_{bb}(b,d) > 0$, and $C^m{}_{dd}(b,d) > 0$[3]. The level of the cost $C^m(b,d)$ is observable, so we assume that Parliament can reimburse it by using the transfer t^m from the individuals.

Parliament offers a payment to the executive agent. However, she cannot observe the effort level a executed by the agency, so she has to plan an incentive payment scheme $S(y) = a + by \quad (a \geq 0, b \geq 0)$, where $y = f(a,b) + e$ is observable output. $f(a,b)$ represents an unobservable outcome, and $e \sim N(0, s^2)$ is a random term. Note that the level of the outcome depends not only on the effort level exerted by the agent but also on the activity level allocated by the parent department. Concerning the outcome function, we assume $f_a(a,b) > 0$, $f_b(a,b) > 0$, $f_{aa}(a,b) < 0$, $f_{bb}(a,b) < 0$, and $f_{ab}(a,b) \geq 0$. The last condition states a complementarity between the agent's effort and the parent department's activity.

For simplicity, we assume each individual in the group has the same utility function, so that the group's utility function is represented by $u^I \equiv U(f(a,b)) + V(d) - M$, where $U'(.) > 0$, $U''(.) < 0$, $V'(.) > 0$, $V''(.) < 0$, and M represents total expenditure paid by the individual. We also assume a group of individuals are risk neutral.

The timing of the game is the following. In the first stage, Parliament offers the incentive payment scheme $S(y) = a + by$ and the parent department activates both b and d, simultaneously. In the second stage, after observing them, the executive agency implements his effort a. Then, the uncertainty e realizes, and $S(y)$ is paid to the agency in the third stage.

To examine the characteristics of the equilibrium, let us prepare the first-best solution as a benchmark. We can define the first-best as an environment where the executive agent's effort is observable and controllable, and lump-sum transfers can be employed. So the first-best problem is stated as follows.

$$\max_{b,d,a,t,t^m} W \equiv U(f(a,b)) + V(d) - \tilde{B} - t - t^m \qquad (1)$$

$$s.t.\ \ b + d = \tilde{B} \qquad (2)$$

$$t - C(a) \geq 0 \qquad (3)$$

$$t^m - C^m(b,d) \geq 0 \qquad (4)$$

Noticing that $t^{**} = C(a^{**})$ and $t^{m^{**}} = C^m(b^{**}, \tilde{B} - b^{**})$, we can rewrite the problem.

$$\max_{b,a} W \equiv U(f(a,b)) + V(\tilde{B} - b) - \tilde{B} - C(a) - C^m(b, \tilde{B} - b)$$

Then, the first-best solution is characterized as follows.

$$U'(f(a^{**}, b^{**}))f_a - C'(a^{**}) = 0 \qquad (5)$$

$$U'(f(a^{**}, b^{**}))f_b - V'(\tilde{B} - b^{**}) - C_b^m + C_d^m = 0 \qquad (6)$$

3. The Equilibrium of the Executive Agency System

Let us derive the equilibrium of the executive agency system stated in section 2. Following the standard backward induction argument, we need to examine the executive agency's problem in the second stage. Given the incentive payment scheme $S(y) = a + by$ and the activities of the parent department $\{b, d\}$, the agent's problem is stated as follows.

$$\max_a CE^A \equiv a + (b + p)f(a,b) - C(a) - \frac{1}{2}r^A(b + p)^2 s^2 \qquad (7)$$

Note that the agent's objective function, i.e., his expected utility, is represented by the certainty equivalent CE^A. r^A measures his absolute risk aversion. Then, we have the following first-order condition, immediately.

$$(b + p)f_a(a^*, b) = C'(a^*) \qquad (8)$$

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[3] The subscripts represent partial derivatives.

(8) characterizes $a^* = a(b, b; p)$. According to the standard comparative static exercises, we have the followings.

$$a_b^* \equiv \frac{\partial a^*}{\partial b} = -\frac{1}{D} f_a = \frac{\partial a^*}{\partial p} \equiv a_p^* > 0 \tag{9}$$

$$a_b^* \equiv \frac{\partial a^*}{\partial b} = -\frac{1}{D}(b + p) f_{ab} \geq 0, \tag{10}$$

where $D \equiv (b + p) f_{aa} - C''(a) < 0$. For the analysis developed below, we report the following second derivative.

$$a_{bb}^* = -\frac{1}{D^2}\{[f_{aa} a_b^* + f_{ab}]D - f_a(b + p)[f_{aaa} a_b^* + f_{aab}] - C'''(a^*) a_b^*\}. \tag{11}$$

Similarly, we have a_{bp}^*. Then, it is easily checked that $a_{bp}^* = a_{bb}^* = a_{bb}^*$.

Next, consider the parent department's problem in the first stage. Given (8) and anticipating the incentive payment scheme offered by Parliament, it solves the following problem.

$$\max_{b,d,t^m} U(f(a^*, b)) + V(d) - \tilde{B} - C^m(b, d) \tag{12}$$

$$s.t. \quad b + d = \tilde{B} \tag{13}$$

Since Parliament reimburses the parent department for the cost it incurs, we already substitute $t^m = C^m(b, d)$ in (12). Note that the parent department does not worry about the individuals' payments to the executive agent, although it concerns their benefits $U(.)$ and $V(.)$. Substituting (13) into (12), we can rewrite the problem as follows.

$$\begin{aligned} &\max_b U(f(a^*, b)) + V(\tilde{B} - b) - \tilde{B} - C^m(b, \tilde{B} - b) \\ &= U(f(a(b, b; p), b)) + V(\tilde{B} - b) - \tilde{B} - C^m(b, \tilde{B} - b) \end{aligned} \tag{14}$$

Then, we have the first-order condition.[4]

$$U'(f)\left[f_a \frac{\partial a^*}{\partial b} + f_b \right] - V'\left(\tilde{B} - b^*\right) - C_b^m + C_d^m = 0 \qquad (15)$$

Similarly, Parliament's problem in the first stage is described as follows.

$$\begin{aligned} \max_{\{a,b\}} \; & U\left(f\left(a^*, b\right)\right) + V\left(\tilde{B} - b\right) - a - (b + p) f\left(a^*, b\right) \\ & = U\left(f\left(a(b, b; p), b\right)\right) + V\left(\tilde{B} - b\right) - a - (b + p) f\left(a(b, b; p), b\right) \end{aligned} \qquad (16)$$

$$s.t. \;\; CE^A \equiv a + (b + p) f\left(a^*, b\right) - C\left(a^*\right) - \frac{1}{2} r^A (b + p)^2 s^2 \geq 0 \qquad (17)$$

Note that Parliament is concerned about the individuals' payment only to the executive agent. This contrasts with the parent department's objective function (12).

At first, we note that a should be determined in order for (17) to be binding, i.e., $CE^A = 0$. Hence, the problem can be rewritten as we did in the parent department's problem.

$$\max_b \; U\left(f\left(a(b, b; p), b\right)\right) + V\left(\tilde{B} - b\right) - C\left(a(b, b; p)\right) - \frac{1}{2} r^A (b + p)^2 s^2 \qquad (18)$$

Then we have the following first-order condition.[5]

$$U'(f) f_a \frac{\partial a^*}{\partial b} - C'\left(a^*\right) \frac{\partial a^*}{\partial b} - r^A (b + p) s^2 = 0 \qquad (19)$$

Then, we see that equations (8), (15), and (19) characterize the executive-agency equilibrium, b^*, b^*, $d^* = \tilde{B} - b^*$, and $a^* = a\left(b^*, b^*; p\right)$. As noted earlier, a^* is determined by $CE^A = 0$.

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[4] The second-order condition, which appears shortly in comparative static exercises, is assumed to hold.

[5] As stated in footnote 3, the second-order condition can be shown in comparative static exercises.

Let us examine the characteristics of the executive-agency equilibrium. For this purpose, we try comparative statics.

Since $a^* = a(b^*, b^*; p)$ is indirectly determined by b^* and b^*, we need to totally differentiate only (15) and (19). Then we have

$$\begin{bmatrix} A & B \\ B & C \end{bmatrix}\begin{bmatrix} db^* \\ db \end{bmatrix} = \begin{bmatrix} 0 & -F & 0 & V''(\tilde{B} - b^*) \\ (\tilde{b} + p)s^2 & -G & (\tilde{b} + p)r^A & 0 \end{bmatrix}\begin{bmatrix} dr^A \\ dp \\ ds^2 \\ dB \end{bmatrix} \qquad (20)$$

where

$$A \equiv U''(f)[f_a a_b^* + f_b]^2 + U'(f)[f_{aa}(a_b^*)^2 + 2f_{ab}a_b^* + f_a a_{bb}^* + f_{bb}], \\ + V''(B - b^*) - C_{bb}^m + 2C_{bd}^m - C_{dd}^m \ (< 0)$$

$$B \equiv U''(f) f_a a_b^* [f_a a_b^* + f_b] + U'(f)[f_{aa} a_b^* a_b^* + f_a a_{bb}^* + f_{ab} a_b^*],$$

$$C \equiv U''(f)[f_a a_b^*]^2 + U'(f)[f_{aa}(a_b^*)^2 + f_a a_{bb}^*] - [C''(a^*)(a_b^*)^2 + C'(a^*)a_{bb}^*] - r^A s^2 \ (< 0),$$

$$F \equiv U''(f) f_a a_p^* [f_a a_b^* + f_b] + U'(f)[f_{aa} a_p^* a_b^* + f_a a_{bp}^* + f_{ab} a_p^*],$$

$$G \equiv U''(f)(f_a)^2 a_b^* a_p^* + U'(f)[f_{aa} a_b^* a_p^* + f_a a_{bp}^*] - [C''(a^*)a_b^* a_p^* + C'(a^*)a_{bp}^*] - r^A s^2.$$

At first, we report a basic but important feature of the executive-agency equilibrium.

Proposition 1

The change in market price does not affect either the effort level exerted by the agency or the activities implemented by the parent department.

(Proof)

According to the standard comparative static exercises, we have

$$\frac{\partial b^*}{\partial p} = \frac{1}{|M|}\begin{vmatrix} -F & B \\ -G & C \end{vmatrix} \quad \text{and} \quad \frac{\partial b^*}{\partial p} = \frac{1}{|M|}\begin{vmatrix} A & -F \\ B & -G \end{vmatrix}$$

where M represents the matrix of the left-hand side of (20) and $|M| > 0$ from the

stability condition. Also, we have

$$\frac{da^*}{dp} = a_b^* \frac{\partial b^*}{\partial p} + a_b^* \frac{\partial b^*}{\partial p} + a_p^* . \qquad (21)$$

Note that $C = G$ and $B = F$ in the above equation, since $a_b^* = a_p^*$ and $a_{bp}^* = a_{bb}^* = a_{bb}^*$. So, we have $\frac{da^*}{dp} = a_b^* \left[1 + \frac{\partial b^*}{\partial p} \right] + a_b^* \frac{\partial b^*}{\partial p}$ and $\frac{\partial b^*}{\partial p} = 0$. Here,

$$1 + \frac{\partial b^*}{\partial p} = \frac{1}{AC - B^2} \left[A(C - G) + B(F - B) \right] = 0 . \qquad (22)$$

Therefore, we have $\frac{da^*}{dp} = a_b^* \left[1 + \frac{\partial b^*}{\partial p} \right] + a_b^* \frac{\partial b^*}{\partial p} = 0$. Q.E.D.

The intuition of the above result can be stated as follows. From (8), we see that market price p has exactly the same effect on the effort level exerted by the executive agency as b of the incentive scheme does. Actually, the effort level a depends on the sum of $(b + p)$. On the other hand, Parliament is concerned about the individual's welfare determined by the effort level a, which in turn depends on $(b + p)$. So, Parliament can adjust the level of b according to the level of market price in order to derive the appropriate effort level. On the other hand, the parent department does not worry about the payment from the individuals to the executive agent. Therefore, both the activity levels and the effort level are not affected by the market price.

Next, let us consider the effect of uncertainty or the degree of risk aversion on the executive agent's effort level in the equilibrium. In a standard problem concerning moral hazard, we imagine that an increase in uncertainty or the degree of risk aversion makes it difficult for a principal to induce an agent's high effort. That is because she has to increase a fixed pay and to decrease a piece rate in order to ensure the agent's expected utility. This property can be shown in our model *only when the agent's effort and the parent department's activity do not reveal complementarity in the outcome function, i.e.,* $f_{ab}(a,b) = 0$. Let us check that point.

Consider the change in the degree of risk aversion r^A, for example. The effect of the

degree of risk aversion on the agent's effort is calculated by

$$\frac{\partial a^*}{\partial r^A} = a_b^* \frac{\partial b^*}{\partial r^A} + a_b^* \frac{\partial b^*}{\partial r^A}. \tag{23}$$

Here we have

$$\frac{\partial b^*}{\partial r^A} = \frac{1}{|M|}\begin{vmatrix} A & 0 \\ B & (b+p)s^2 \end{vmatrix} < 0, \tag{24}$$

because $|M| > 0$ and $A < 0$. On the other hand,

$$\frac{\partial b^*}{\partial r^A} = \frac{1}{|M|}\begin{vmatrix} 0 & B \\ (b+p)s^2 & C \end{vmatrix} \tag{25}$$

can be negative or positive, since the sign of B is ambiguous, which comes from the complementarity between a and b through the outcome function. Actually, when $f_{ab}(a,b) = 0$, we have $a_b^* = 0$ and $a_{bb}^* = 0$, which in turn means $B < 0$. Then we have $\frac{\partial b^*}{\partial r^A} < 0$. The change in uncertainty s^2 has the same effect as r^A does. We should note that the activity implemented by the parent department, b^* can be affected (i.e., decrease) by the agent's attitude toward risk, even when $f_{ab}(a,b) = 0$. This comes mainly from the concavity of $U(f)$.

Similarly, we can see that an increase in the budget allocated to the parent department has a similar effect on the agent's effort. That is,

$$\frac{\partial a^*}{\partial \tilde{B}} = a_b^* \frac{\partial b^*}{\partial \tilde{B}} + a_b^* \frac{\partial b^*}{\partial \tilde{B}}, \tag{26}$$

where $\frac{\partial b^*}{\partial \tilde{B}} > 0$ but the sign of $\frac{\partial b^*}{\partial \tilde{B}}$ is ambiguous because of the complementarity between a and b through the outcome function. We report these properties as a

proposition.

Proposition 2

(i) An increase in uncertainty or the degree of risk aversion diminishes the agent's effort and the parent department's activity related to the outcome when $f_{ab}(a,b)=0$. *When* $f_{ab}(a,b)>0$, *they can make the agent's effort and the department's activity increase.*

(ii) An increase in the budget allocated to the parent department expands the agent's effort and the parent department's activity related to the outcome when $f_{ab}(a,b)=0$. *When* $f_{ab}(a,b)>0$, *they can make the agent's effort decrease.*

Finally, compare the levels of the executive agent's effort and the parent department's related activity at the executive agency equilibrium with those at the first best. We may guess that both the levels at the equilibrium are lower than at the first best. However, this is not always the case in our environment. That is because the activity of the parent department whose cost-concern is only its disutility can induce the agent's high effort through the complementarity in the outcome function. Let us show this point by a numerical example.

Suppose that $U(f)=f(a,b)$, $V(d)=d=\tilde{B}-b$, $C^m(b,d)=0.5\left(b^2+d^2+bd\right)$, $C(a)=0.5a^2$, $f(a,b)=0.5ab$. Consider the case of $\tilde{B}=5$. Using (5) and (6), we have the first best solution, i.e., $a^{**}=1.0$ and $b^{**}=2.0$. On the other hand, the executive-agency equilibrium is characterized by $a^{*}=0.5$ and $b^{*}=2.0$. However, for $\tilde{B}=10$, $a^{**}=2.667$ and $b^{**}=5.333$, while $a^{*}=3.502$ and $b^{*}=7.502$. That is, a sufficient amount of budget allocated to the parent department can allow it to implement a high activity related to the outcome, since it does not worry about the agent's disutility, which in turn induces the agent's higher effort. This induced effort is, however, excessive from the social point of view.

4. Comparisons with a Privatization and a Bureaucratic System

In this section, we compare the executive agency system with a privatization and a bureaucratic system.

4.1 Privatization

Privatization has many aspects to be considered, so that we can see different characterizations of privatization in the literature.[6] We define privatization by featuring two aspects: The first one is the assumption that the executive agent cannot obtain an incentive payment scheme from Parliament, so her revenue yields only from the market. The second aspect of privatization in our model is about the behavior of the parent department, who is assumed to be a first mover that has a strategic incentive to control indirectly the agent. Then, the timing of the game under the privatization system is the following. First, the parent department determines the activity levels b and d. After observing them, the agent determines the effort level a. Then, the uncertainty e is realized in the last stage.

The executive agent chooses the effort level a which solves the problem;

$$\max_a CE^A \equiv pf(a,b) - C(a) - \frac{1}{2} r^A p^2 s^2, \tag{27}$$

when $CE^A \geq 0$. When CE^A becomes negative, she will choose $a = 0$. So, the privatization system has a distortion in the sense that it may not implement the project when the agent's expected utility is not guaranteed. However, we should note that the parent department in a first-mover position possibly corrects the distortion by adjusting its activity levels.

Before examining the parent department's behavior, let us summarize the agent's behavior. When $CE^A \geq 0$, the agent implements $\hat{a} = a(b; p)$ such that

$$pf(\hat{a}, b) = C'(\hat{a}). \tag{28}$$

So we have

$$\hat{a}_b = -\frac{pf_{ab}}{pf_{aa} - C''(\hat{a})} (\geq 0) \quad \text{and} \quad \hat{a}_p = -\frac{f_a}{pf_{aa} - C''(\hat{a})} (> 0).$$

Consider the parent department's problem.

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[6] See Vickers and Yarrow (1988), Schmidt (1996), etc. for the discussion about privatization.

$$\max_b U(f(\hat{a},b))+V(\tilde{B}-b)-\tilde{B}-C^m(b,\tilde{B}-b)$$
$$=U(f(a(b;p),b))+V(\tilde{B}-b)-\tilde{B}-C^m(b,\tilde{B}-b) \quad (29)$$

$$s.t.\ CE^A \equiv pf(\hat{a},b)-C(\hat{a})-\frac{1}{2}r^A p^2 s^2 \geq 0 \quad (30)$$

When the constraint is binding, i.e., $CE^A = 0$, at the solution, the activity level $\hat{b}$ is characterized by $CE^A \equiv pf\left(a(\hat{b};p),\hat{b}\right)-C\left(a(\hat{b};p)\right)-\frac{1}{2}r^A p^2 s^2 = 0$. When the constraint is not binding, $\hat{b}$ is such that

$$U'(f)\left[f_a\frac{\partial \hat{a}}{\partial b}+f_b\right]-V'(\tilde{B}-\hat{b})-C_b^m+C_d^m=0 \quad (31)$$

Note that (31) is exactly the same equation as (15).

Firstly, let us focus on the no-binding case. Then, a standard comparative static exercise shows

$$\frac{\partial \hat{b}}{\partial p}=-\frac{\hat{F}}{\hat{A}} \quad \text{and} \quad \frac{\partial \hat{b}}{\partial \tilde{B}}=\frac{1}{A}V''(\tilde{B}-\hat{b})(>0),$$

$\hat{a}_p$

where $\hat{F}$ and $\hat{A}$ are the same as F and A respectively, except that they are evaluated at $\hat{b}$. The sign of $\frac{\partial \hat{b}}{\partial p}$ is ambiguous. When $f_{ab}(a,b)=0$, however, we have $\frac{\partial \hat{b}}{\partial p}<0$ and $\hat{a}_b=0$, which imply $\frac{\partial \hat{a}}{\partial p}=\hat{a}_b\frac{\partial \hat{b}}{\partial p}+\hat{a}_p=\hat{a}_p>0$. Similarly, from $\frac{\partial \hat{b}}{\partial \tilde{B}}>0$, we obtain $\frac{\partial \hat{a}}{\partial \tilde{B}}=\hat{a}_b\frac{\partial \hat{b}}{\partial \tilde{B}}\geq 0$. These characteristics are different from those in the executive agency equilibrium.

Next, consider the characterization of the equilibrium at the case in which the constraint is binding. First of all, let us draw the region of the binding case in terms of market price and other parameters. Totally differentiating CE^A at the equilibrium, we have

$$\frac{dCE^A}{dp} = \frac{\partial CE^A}{\partial \hat{a}}\left[\hat{a}_b \frac{\partial \hat{b}}{\partial p} + \hat{a}_p\right] + \frac{\partial CE^A}{\partial \hat{b}}\hat{b}_p + \frac{\partial CE^A}{\partial p}, \qquad (32)$$

$$= pf_b\hat{b}_p + \left[f\left(\hat{a},\hat{b}\right) - r^A p s^2\right]$$

$$\frac{dCE^A}{d\tilde{B}} = \frac{\partial CE^A}{\partial \hat{a}}\hat{a}_b \frac{\partial \hat{b}}{\partial \tilde{B}} + \frac{\partial CE^A}{\partial \hat{b}}\hat{b}_{\tilde{B}} + \frac{\partial CE^A}{\partial \tilde{B}} = pf_b\hat{b}_{\tilde{B}}, \qquad (33)$$

etc. Using these properties, we can draw the boundaries of three cases; no production, binding, no binding. (See Figures 1 and 2.)

Then, for the binding case, the following must hold.

$$CE^A \equiv pf\left(a\left(\hat{b};p\right),\hat{b}\right) - C\left(a\left(\hat{b};p\right)\right) - \frac{1}{2}r^A p^2 s^2 = 0. \qquad (34)$$

Totally differentiating (34) with the use of (28), we have

$$pf_a d\hat{b} - r^A p s^2 dp - \frac{1}{2}p^2 s^2 dr^A - \frac{1}{2}p^2 r^A ds^2 = 0. \qquad (35)$$

So, we obtain $\frac{\partial \hat{b}}{\partial p} > 0$, $\frac{\partial \hat{b}}{\partial r^A} > 0$, $\frac{\partial \hat{b}}{\partial s^2} > 0$, and $\frac{\partial \hat{b}}{\partial \tilde{B}} = 0$.

Let us summarize the main properties as a proposition.

Proposition 3

Under the privatization system, the following properties hold.

$\hat{a}_p$

(i) *For* $CE^A > 0$, $\frac{\partial \hat{b}}{\partial p} < 0$ *and* $\frac{\partial \hat{a}}{\partial p} > 0$ *when* $f_{ab}(a,b) = 0$. *Also,* $\frac{\partial \hat{b}}{\partial \tilde{B}} > 0$ *and* $\frac{\partial \hat{a}}{\partial \tilde{B}} \geq 0$

(ii) For $CE^A = 0$, $\frac{\partial \hat{b}}{\partial p} > 0$ *and* $\frac{\partial \hat{a}}{\partial p} > 0$. *Also,* $\frac{\partial \hat{b}}{\partial \tilde{B}} = 0$ *and* $\frac{\partial \hat{a}}{\partial \tilde{B}} = 0$.

Welfare comparison between two systems seems to be complicated, since the privatization system involves three different phases, whose possibility depends on the levels of parameters.

4.2 A Bureaucratic System

In a bureaucratic system, we assume that the parent department does not only implement the activities b and d, but also it offers an incentive payment scheme to the executive agent in place of Parliament. (We assume the parent department cannot observe the effort level of the executive agency, either.) Let $\tilde{S}(y) = \tilde{a} + \tilde{b}y$ denote the incentive scheme offered by the parent department. The timing of the game is the same as in the executive agency system, except that in the first stage, the parent department does not only implement the activities but also offers the incentive payment scheme.

The agent's problem is totally the same as in the executive agency model. That is, the agency's behavior is summarized by

$$\left(\tilde{b} + p\right) f_a\left(a^{\#}, b\right) = C'\left(a^{\#}\right) \tag{36}$$

Anticipating his behavior, the parent department designs the incentive payment and the allocation of B in the first stage. The parent department's problem is summarized as follows.

$$\max_{\{b,d\},\{\tilde{a},\tilde{b}\},t^m} U^M \equiv U\left(f\left(a^{\#}, b\right)\right) + V(d) - B - t^m - m\left[\tilde{a} + \left(\tilde{b} + p\right) f\left(a^{\#}, b\right)\right] \tag{37}$$

$$s.t.\ \ CE^A \equiv \left(\tilde{a} + g\right) + \left(\tilde{b} + d\right) f\left(a^{\#}, b\right) - C\left(a^{\#}\right) - \frac{1}{2} r^A \left(\tilde{b} + d\right)^2 s^2 \geq 0 \tag{38}$$

$$t^m - C^m(b, d) \geq 0, \tag{39}$$

$$b + d = B, \tag{40}$$

where $m \geq 0$, which can be considered as a parameter of the parent department's distributive concern: When $m > 1$, the department considers the individuals' payments to the executive agent more costly than those to itself. Substituting $t^m = C^m(b, d)$ and using (40), we rewrite the objective function.

$$U^M = W + (1 - m)\left[C(a) + \frac{1}{2} r^A \left(\tilde{b} + p\right) s^2\right] - mCE^A, \tag{41}$$

where $W \equiv U(f(a,b)) + V(B-b) - B - C(a) - C^m(b, B-b)$. Then, we note that a should be determined in order for (24) to be binding, i.e., $CE^A = 0$.

Then, we have the following conditions.

$$U'\left(f\left(a^{\#}, b^{\#}\right)\right) f_a \frac{\partial a^{\#}}{\partial \tilde{b}} - m\left[C'\left(a^{\#}\right)\frac{\partial a^{\#}}{\partial \tilde{b}} + r^A\left(\tilde{b} + d\right)s^2\right] = 0 \qquad (42)$$

$$U'\left(f\left(a^{\#}, b^{\#}\right)\right)\left\{f_a \frac{\partial a^{\#}}{\partial b} + f_b\right\} - V'\left(B - b^{\#}\right) - mC'\left(a^{\#}\right)\frac{\partial a^{\#}}{\partial b} - C_b^m + C_d^m = 0 \qquad (43)$$

Let us focus on the case of $m = 1$. Then, the following proposition is easily verified.

Proposition 4

When $m = 1$, the bureaucratic model does not induce less welfare than the executive agency model does.

Comparing (15) and (19) with (42) and (43), we also see the following result immediately.

Proposition 5

When $m = 1$ and $f_{ab} = 0$, the executive agency model achieves the same welfare level as the bureaucratic model.

Let us compare the effort or activity level between the bureaucratic and the executive-agency system. Does the bureaucratic system induce higher levels of the executive agent's effort and the parent department's related activity b than the executive agency system? If so, the transition to privatization under the bureaucratic system seems speedier than under the executive agency system in the sense that the agent can obtain enough revenue from the market in order to go into business by itself. However, the following proposition denies this possibility.

Proposition 6

When $m = 1$, $a^{\#} < a^*$ and $b^{\#} < b^*$.

The proof of the proposition can be easily checked by comparing (15) and (19) with

(42) and (43). This proposition suggests that the transition to privatization is easier from the executive agency system than from the bureaucratic system.

6. Conclusion

We have analyzed a model of an executive-agency system that determines a strategic interaction between Parliament, the parent department, and the executive agent in the public sector. The results obtained in our paper are summarized as follows. Firstly, we have shown that even though the executive agency system cannot achieve the first-best allocation of resources, it has a main benefit to stabilize an agent's effort and a related activity of a parent department. That is, it alleviates the revenue fluctuation caused by a changing market price, which in turn guarantees the agent's induced effort. Then, we have compared the three organizational systems to show the distinguished characteristics of the executive agency system. For example, we have shown that the responses of the agent's effort and the parent department's activity to the budget are quite different between the executive agency system and a privatization.

Clearly, this is just a beginning of understanding the workings of the executive agency and the welfare analysis of government governance. One avenue for future research is to examine the role of government organizational structures in modeling the information generation and fund allocation processes among execution departments. As has been already mentioned, the literature of the internal capital market discusses the workings of corporate headquarters in allocating scarce resources to a single project or competing projects in the conglomerate firm although the model of the internal capital market is different from that of government governance in several points. Stein (1997) and Brusco and Panunzi (2000) argue that the winner-picking effect of reallocating funds to the most profitable divisions is the bright side of the internal capital market. However, Brusco and Panunzi also indicate that taking away from the manager the cash flow of his division reduces his ex ante incentives to spend effort to generate the cash flow. Thus, the choice of the organizational structure is determined by the trade-off between the gain of reallocating funds to the most profitable divisions and the cost of reducing managerial incentives in the conglomerate firm.[7] Stein (2000) compares

[7] Boot and Schmeits (2000) discuss the issue that the conglomerate firm has a diversification benefit of co-insurance among divisions because the co-insurance lowers the pooled funding rate of the conglomerate firm and reduces an incentive of each division to take more risky projects. On the other hand, they also suggest that the conglomerate firm also causes negative incentive effects of co-insurance and reduced market discipline because it makes the default probability and the pooled funding rate

decentralization and hierarchy in the design of the firm organization. He shows that a decentralized approach is more likely to be attractive if information about each individual project is "soft" and cannot be credibly transmitted to the other agent who produces it. In contrast, he also indicates that large hierarchical firms with multiple layers of management are more likely to allow for efficient reallocations of funds across operating units if information can be costlessly passed along within the hierarchy. Although the organization model of the firm differs from that of government in many respects, these arguments would suggest that the executive agency is more likely to be at a comparative advantage if the cost of information transmission within the hierarchy is sufficiently high.

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less sensitive to risk-taking.

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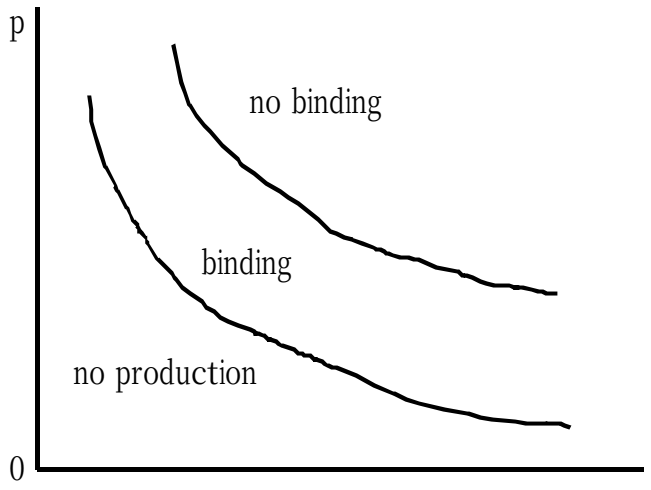

Figure 1: The relationship between p and r^A in a privatization system

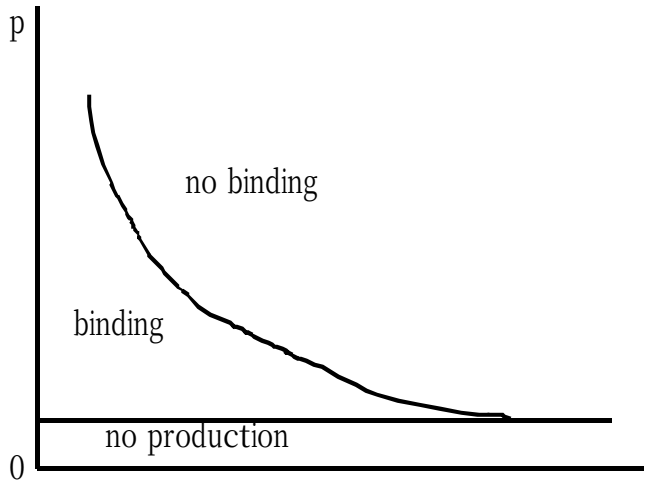

Figure 2: The relationship between p and $\tilde{B}$ in a privatization system