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Tax Evasion and Occupational Choice : A Theoretical Analysis

Hisashi Ikeda

In this paper we incorporate occupational choice between an entrepreneur and a worker into tax evasion. For that purpose we cannot ignore the labor market since wage rate obviously affects this occupational choice. In addition many authors (for instance, Marreli (1984), Marreli and Martina (1988), Yaniv (1988), and Slemrod and Yitzhaki(2002)) argue that wage earners' possibilities of tax evasion are greatly limited and entrepreneurs may be tax evaders. We take this argument into consideration, we assume that an entrepreneur can become a tax evader and a worker cannot.

And we analyze not only the effects on tax evasion but also on total output in the economy, because if the government succeeds in decreasing tax evasion but at the same time decreases total output in the economy, its policy might not be desirable.

JEL Classification : H26, J24, K42
Key Words : 源泉所得税制度，脱税，職業選択

On Executive Agency Systems*

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Abstract

A public sector executive agency system induces a greater effort from an executive agent via an incentive payment scheme at the cost of public sector decentralization. We show that the level of revenue the agent obtains from a market determines the welfare superiority of executive agency systems relative to bureaucratic systems.

Keywords: Executive agency; Incentive payment scheme
JEL classification: H11; L32

1. Introduction

Radical public sector reform such as the introduction of an executive agency system, or privatization, has been a major controversial economic issue over the last two decades. While this wave of reforms began in the UK, the USA, and New Zealand, it has recently been extended to other countries. The UK government launched the Financial Management Initiative (FMI) in 1982. The FMI sought to promote an executive agency system in which authority and responsibility are delegated as far as possible to middle and junior public sector managers who are accountable for meeting their cost and performance targets.[1] In Japan, the government introduced another type of executive agency system (the Independent Administration Corporation) in 2001 after reviewing the British experience. The main feature of these executive agency systems is the introduction of an incentive payment scheme for an executive agent.[2]

In this short paper, we characterize executive agency systems and examine their benefits and costs.[3] We then show that the main benefit of executive agency systems is to induce an appropriate level of

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1 See Minogue (1998) for the FMI system.

2 For the detailed features of the executive agency system in Japan, see Akai, Mizuno and Osano (2003).

3 Although no formal model has been constructed to discuss executive agency systems, our research is related to the literature on the scope or the authority of the firm like Grossman and Hart (1986), Hart and Moore (1990), and Aghion and Tirole (1997).

effort from an executive agent by the introduction of an incentive payment scheme, while it comes at the cost of public sector decentralization. In particular, when the revenue that the executive agent obtains from a market is extremely low or high, executive agency systems are superior to (traditional) bureaucratic systems from a welfare point of view.

2. The model

There are three active players in a political decision making game: an executive agent, a parent department, and Parliament. As noted in section 1, the main feature of these executive agency systems is considered to be the introduction by Parliament of an incentive payment scheme for an executive agent.

An executive agent (A) has a utility function $u^A \equiv u^A[T - C(a)]$, where T is total revenue to the agent: $T = py + S(y)$, where y is an observable output, p is the market price of the output, and $S(y)$ is the incentive payment scheme. The number of participants in business seminars held at a university is an example of the observable output y, if the executive agency system is applied to the higher education industry. $C(a)$ represents the agent's disutility incurred by implementing an unobservable effort a. ($C'(a) > 0$ and $C''(a) > 0$.) We assume that the executive agent is risk averse, and the agent's expected utility can be represented by the associated certainty equivalent CE^A.

A parent department has a budget $\bar{B}$ to implement the activities b and d. b is an activity related to the executive agent and d is the other.[4] For simplicity, we assume that $b + d = \bar{B}$ 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 $C^m{}_{dd}(b,d) > 0$[5]. The level of the cost $C^m(b,d)$ is observable, so that Parliament can reimburse it by using the transfer t^m.

Parliament provides a linear incentive payment scheme $S(y) = \alpha + \beta y$, where α and β are constants, and $y = f(a,b) + \varepsilon$. $f(a,b)$ represents an unobservable outcome such as the total quality of the business seminars (the comfortableness of the facilities, the contents of the speeches, etc.), and $\varepsilon \sim N(0,\sigma^2)$ 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. We assume $f_a(a,b) > 0$, $f_b(a,b) > 0$, $f_{aa}(a,b) < 0$, $f_{bb}(a,b) < 0$, and $f_{ab}(a,b) \geq 0$.[6]

For simplicity, the utility function of consumer groups 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 consumers. We assume that consumers are risk neutral.

The timing of the game is as follows. In the first stage, Parliament offers the incentive payment scheme $S(y) = \alpha + \beta y$ and the parent department allocates the budget between b and d. In the second stage, after observing them, the executive agent implements an effort a. Then, the uncertainty ε is realized, and $S(y)$ is paid to the agent in the third stage.

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[4] For example, if the agent is a university, d is an activity related to elementary school education.

[5] The subscripts represent partial derivatives.

[6] The last condition states a complementarity between the agent's effort and the parent department's activity.

The first-best allocation

Before characterizing 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. The first-best problem is then stated as follows.

$$\max_{b,d,a} W \equiv U(f(a,b)) + V(d) - \bar{B} - C(a) - C^m(b,d) \qquad s.t.\ b + d = \bar{B} \tag{1}$$

Note that because of the possibility of lump-sum transfers to the agent, the cost incurred by the agent's risk-averse attitude does not appear in (1). The first-best solution is then characterized as follows.

$$U'(f(a^{**},b^{**}))f_a - C'(a^{**}) = 0 \tag{2}$$

$$U'(f(a^{**},b^{**}))f_b - V'(\bar{B} - b^{**}) - C^m_b + C^m_d = 0 \tag{3}$$

3. The equilibrium

3.1 *The executive agent in the second stage*

Given the incentive payment scheme $S(y) = \alpha + \beta y$ and the budget allocation $\{b, d\}$, the agent's problem in the second stage is stated as follows.

$$\max_{a} CE^A \equiv \alpha + (\beta + p)f(a,b) - C(a) - \frac{1}{2}r^A(\beta + p)^2\sigma^2 \tag{4}$$

where r^A measures the agent's absolute risk aversion. Note that the agent's risk premium (the last term in (4)) depends not only on the coefficient of the incentive scheme but also on the market price.

We then immediately have the following first-order condition.

$$(\beta + p)f_a(a^*, b) = C'(a^*) \tag{5}$$

where $a^* = a(b, \beta; p)$ have the following properties.

$$a^*_\beta \equiv \frac{\partial a^*}{\partial \beta} = -\frac{1}{D}f_a = \frac{\partial a^*}{\partial p} \equiv a^*_p > 0 \text{ and } \quad a^*_b \equiv \frac{\partial a^*}{\partial b} = -\frac{1}{D}(\beta + p)f_{ab} \geq 0, \tag{6}$$

where $D \equiv (\beta + p)f_{aa} - C''(a) < 0$. It is easily seen that $a^*_{bp} = a^*_{b\beta} = a^*_{\beta b}$.

3.2 *Parliament and parent department in the first stage*

In the first stage, Parliament and the parent department determine $S(y) = \alpha + \beta y$ and $\{b, d\}$, simultaneously and independently.

Consider the parent department's problem. We assume that the parent department is concerned about the consumers' benefits from the services it offers and the cost it incurs providing the services.

Given (6) and anticipating the incentive payment scheme offered by Parliament, the parent department solves the following problem.

$$\max_{b,d,t^m} U(f(a^*,b)) + V(d) - \bar{B} - C^m(b,d) \qquad s.t.\ b + d = \bar{B} \tag{7}$$

Note that the parent department does not worry about individuals' payments to the executive agent $S(y) = \alpha + \beta y$. This can be a fault caused by a facet of the executive agency system, i.e., a decentralization of public sector governance. The solution is then characterized under the assumption of interior maximum.[7]

$$U'(f)\left[f_a \frac{\partial a^*}{\partial b} + f_b\right] - V'(\bar{B} - b^*) - C_b^m + C_d^m = 0 \tag{8}$$

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

$$\max_{\{\alpha,\beta\}} U(f(a^*,b)) + V(\bar{B} - b) - \alpha - (\beta + p)f(a^*,b) \tag{9}$$

$$s.t.\ CE^A \equiv \alpha + (\beta + p)f(a^*,b) - C(a^*) - \frac{1}{2}r^A(\beta + p)^2\sigma^2 \geq 0 \tag{10}$$

Note that Parliament is concerned about the consumers' benefits net of their payment to the executive agent. A fault of the executive agency system is the absence of consideration of the administrative cost in the parent department section. (One should compare (9) with the parent department's objective function (7).)

Using the property that should be determined in order for (10) to be binding, i.e., $CE^A = 0$, and assuming an interior optimum, we have the following first-order condition.

$$U'(f)f_a \frac{\partial a^*}{\partial \beta} - C'(a^*)\frac{\partial a^*}{\partial \beta} - r^A(\beta + p)\sigma^2 = 0 \tag{11}$$

We then see that equations (5), (8), and (11) characterize the executive agency equilibrium; β^*, b^*, $d^* = \bar{B} - b^*$, and $a^* = a(\beta^*, b^*; p)$.

3.3 *The characteristics of the equilibrium*

To examine the characteristics of the executive agency equilibrium, we try comparative statics. Since $a^* = a(\beta^*, b^*; p)$ is indirectly determined by β^* and b^*, we need to totally differentiate only (8) and (11). While we derive some interesting results from the comparative statics, here we report on one basic but important feature of the executive agency equilibrium.[8]

Proposition 1. *Change in market price does not affect either the agent's effort level or the activities implemented by the parent department:* $\frac{\partial a^*}{\partial p} = \frac{\partial b^*}{\partial p} = 0.$

[7] The second-order condition, derived below in comparative static exercises, is assumed to hold.

[8] The proposition is derived by noticing $a^*_\beta = a^*_p$ and $a^*_{bp} = a^*_{b\beta} = a^*_{\beta b}$, so that the proof is omitted.

The intuition of the above result can be stated as follows. From (5), we see that market price p has exactly the same effect on the agent's effort level as β in the incentive scheme. In fact, the effort level a depends only on the sum of $(\beta + p)$. Parliament can adjust the level of β according to the market price in order to derive the appropriate effort level. On the other hand, the parent department is not concerned about the payment from individuals to the executive agent. Therefore, neither activity levels or effort level is affected by the market price.

Next, compare the agent's effort level at the executive agency equilibrium with that at the first-best optimum. Although we may guess that effort level at the equilibrium is lower than at the first best, this is not always the case in our environment. That is because the objectives of both the parent department and Parliament are concerned only with the cost of their respective activities. Let us show this point by a numerical example.

Suppose that $U(f) = 35 + f(a,b)$, $V(d) = d = \bar{B} - b$, $C^m(b,d) = 0.5(b^2 + d^2 + bd)$, $C(a) = 0.5a^2$, $f(a,b) = 0.5ab$. Consider the case of $\bar{B} = 5$. Using (2) and (3), 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 $\bar{B} = 10$, $a^{**} = 2.667$ and $b^{**} = 5.333$, while $a^* = 3.502$ and $b^* = 7.502$. That is, a sufficient amount of budget given to the parent department can allow it to implement a large b, since it does not worry about the agent's disutility, which in turn induces the agent's greater effort. This induced effort is, however, excessive from the social point of view.

4. A Comparison with Bureaucratic Systems

In this section, we compare executive agency systems with traditional bureaucratic systems.

4.1 *A bureaucratic system*

In a bureaucratic system, the authority to allocate resources is centralized in one government sector that does not employ any incentive payment scheme. That is, not only does the parent department allocate the budget to b and d, but it can also give a transfer t to the executive agent. Its justification comes from the fact that many countries have never before used explicit incentive payment schemes until their public sector reforms. The parent department can still be a first mover in our political decision making game, so that the timing of the game is similar to that of the executive agency game.

As in the executive agency system, we consider the agent's problem first. The executive agent chooses the effort level a that solves the following problem.

$$\max_a CE^A \equiv t + pf(a,b) - C(a) - \frac{1}{2}r^A p^2 \sigma^2. \tag{12}$$

The solution $a^\#$ can be characterized by $pf_a(a^\#, b) = C'(a^\#)$, where $a^\# = a(b;p)$ has similar

Table 1: Welfare Comparison ($\bar{B}$ = 5)

	FB	EA	BU						
			p=0.1	p=0.2	p=0.5	p=1.0	p=1.1	p=1.5	p=2.0
a	1.0	0.5	0.0787	0.1648	0.4615	1.0	1.0963	1.3846	1.5
b	2.0	2.0	1.575	1.6484	1.8462	2.0	1.9934	1.8462	1.5
EW	29.0	28.625	28.631	28.636	28.635	28.5	28.445	28.135	27.625

Table 2: Welfare Comparison($\bar{B}$ = 10)

	FB	EA	BU						
			p=0.1	p=0.2	p=0.5	p=1.0	p=1.1	p=1.5	p=2.0
a	2.6667	3.5022	0.21	0.4396	1.2308	2.6667	2.9236	3.6923	4.0
b	5.3333	7.5022	4.1995	4.3956	4.9231	5.3333	5.3156	4.9231	4.0
EW	5.6667	3.4049	3.3489	3.6912	4.5962	5.1667	5.0812	4.0962	2.0

properties to $a^* = a(b, \beta; p)$.

Anticipating his behaviour, the parent department allocates $\bar{B}$ between b and d offering the transfer t in the first stage. The parent department's problem is summarized as follows.

$$\max_{b,t} U(f(a^\#, b)) + V(\bar{B} - b) - \bar{B} - C^m(b, \bar{B} - b) - [t + pf(a^\#, b)] \tag{13}$$

$$s.t.\ CE^A \equiv t + pf(a^\#, b) - C(a^\#) - \frac{1}{2} r^A p^2 \sigma^2 \geq 0 \tag{14}$$

Note that the parent department's objective function is exactly the same as the consumers'. This is a good aspect of the bureaucratic system: a centralization of public sector governance. We also see that the parent department has the one and only one incentive tool that induces the agent's effort: the level of related activity b. This is a fault of the system.

Using the property that t should be determined in order for $CE^A = 0$, we have the following first-order condition with respect to the activity b.

$$U'(f(a^\#, b^\#))\{f_a a_b^\# + f_b\} - V'(B - b^\#) - C_b^m + C_d^m - C'(a^\#) a_b^\# = 0 \tag{15}$$

4.2 *Comparison of an Executive Agency System and a Bureaucratic System*

Let us compare the levels of expected welfare under the two systems. The benefit of the executive agency system is that it has two incentive variables (i.e., β and b) to induce an appropriate level of effort from the executive agent, although it comes at the cost of the decentralization of the government's governance. On the other hand, the bureaucratic system has the benefit of centralization and the cost of having only one incentive variable b. These benefits and costs can appear explicitly when the market price of the observable output y changes. Let us see this point by a numerical

example used in section II. Suppose again that $U(f) = 35 + f(a, b)$, $V(d) = d = \bar{B} - b$, $C^m(b, d) = 0.5(b^2 + d^2 + bd)$, $C(a) = 0.5a^2$, and $f(a, b) = 0.5ab$. Tables 1 and 2 summarize the results for the cases of $\bar{B}$ = 5 and $\bar{B}$ = 10.

When $\bar{B}$ = 5, as the market price is high ($p \geq 1$), the executive agency system achieves higher expected welfare than the bureaucratic system. On the other hand, when $\bar{B}$ = 10, as the market price is extremely low (p = 0.1) or high (p = 2.0), the executive agency system achieves higher expected welfare than the bureaucratic system. From these numerical examples, we learn that the level of revenue that the executive agent obtains from a market, associated with the budget level, determines the welfare superiority of the executive agency system because of the effectiveness of the incentive payment variable β to induce the agent's effort.

5. Concluding Remarks

This short paper characterized executive agency systems and examined their benefits and costs. We showed that the main benefit of executive agency systems is to induce an appropriate level of effort from an executive agent by the introduction of an incentive payment scheme, while it comes at the cost of public sector decentralization. When the revenue that the executive agent obtains from a market is extremely low or high, executive agency systems are superior to (traditional) bureaucratic systems from a welfare point of view.

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