DISCUSSION PAPER

September 2011

No. 50

Wages as a Strategy for Preventing Corruption

by

Hideki SATO*

Faculty of Economics,
Kyushu-Sangyo University

-----
*E-Mail: hsato@ip.kyusan-u.ac.jp

Wages as a Strategy for Preventing Corruption*

Hideki Sato
Kyushu-Sangyo University

Abstract

This note is concerned with a commitment towards incentive wages to tax auditors as anti-corruption strategy. We shall clarify a scheme that pays allowances tax auditors so that they do not tempted to take bribes is not socially desirable
Keywords: Anti-Corruption, Wages, Tax evasion

-----
*This paper is a modification of Sato (2010).

1 Introduction

Under its “National Strategy for Preventing and Combating Corruption towards 2020”, the Vietnamese government has been committed to raising the wages of civil servants in an effort to prevent corruption. This idea that low wages result in an expansion of corruption has been the conventional wisdom since Myrdal (1968). Using the example of income tax collection, this paper will show that, in terms of financial resources, improving the wages of public officials for the purpose of preventing corruption may not necessarily be socially desirable.

This paper will apply agency theory to the three layers of government-tax agency-taxpayers, to derive the optimal tax structure. The implications of applying agency theory in the derivation of an optimal tax structure in particular are as follows. That is, for a given policy, when the government is able to make a commitment to that policy, the government acts as a Stackelberg leader as part of a strategic interdependence with taxpayers, who are led by the policy to react in an optimum way. Then by using agency theory, it is possible to derive the optimum policies to which the government should be committed.

Not only has the issue of corruption not been considered in previous agency theory based studies on income tax (for example, Reinganum and Wilde (1985), Border and Sobel (1987), Mookherjee and Png

(1989; 1990), and Melumad and Mookherjee (1989)), except for Mookherjee and Png (1989) research into optimal income tax structures has also been left unexplored.

This paper is organized as follows. In section 2 below, the basic model will be set up, and then in Section 3 the optimal tax structure based on perfect information will be derived as a benchmark. Sections 4 through 6 contain the model for imperfect information. Specifically, Section 4 derives the optimal tax structure under the assumption that the public service has well established ethics and no corruption. Then, Sections 5 and 6 will derive optimal tax structures under the assumptions, respectively, of a collusion-free case where corruption is tolerated and a collusion-proof case where corruption is prevented through wages. Finally, Section 7 will summarize the conclusions.

2 Basic Model

Consider the three layers made up of government-tax agency-taxpayers. In this paper, in determining the tax structure, spending levels shall be considered to be exogenously set, which shall be referred to as spending constraints. In this sense, under these spending constraints, the government develops a tax structure that allows them to maximize the economic welfare. In terms of the tax authorities, there can be considered to be both cases in which agents operate with discipline, and those in which they have incentives to accept bribes, or corruptible cases.

For simplicity, taxpayers shall be assumed to be in one of two income brackets, designated as I_L and I_H (where, $0 < I_L < I_H$). Furthermore, income distribution shall be assumed to be exogenous, with the probability density of $I_i, i = L, H$ set as $q_i \in (0,1)$. Where,

$$q_L + q_H = 1 \tag{1}$$

For each income bracket, q_i shall not be affected by the withdrawal of individuals from the bracket, and thus each income layer shall be assumed to include many taxpayers, allowing for the consideration of typical taxpayer behaviors within each income bracket.

Real income levels for all taxpayers shall be assumed to be provided exogenously. Further, the income levels of (typical) taxpayers shall be private information. Hereafter, this private information shall be referred to as a “type”.

Thus for simplicity, type $i, i = L, H$ taxpayers are assumed to spend all of their disposable income on the single kind of private consumption. If the level of type i private consumption is x_i, and the reporting of I_i for the statutory income tax T_i (where, $0 < T_i < I_i, i = L, H$, $T_H > T_L > 0$), the value of x_i shall specifically be one of $\bar{x}_i$, $\hat{x}_i$, or

$\tilde{x}_i$. In other words, if reported properly,

$$\bar{x}_i = I_i - T_i, i = L, H \tag{2}$$

and if found to be reported falsely,

$$\hat{x}_i = I_i - T_j - F, i, j = L, H, j \neq i \tag{3}$$

Alternatively, if the false report is not discovered,

$$\tilde{x}_i = I_i - T_j, i, j = L, H, j \neq i \tag{4}$$

Together with the fact that $T_H > T_L$, since $F > 0$, it is irrational for low income earners to make false reports. Thus for (3), only $\hat{x}_H = I_H - T_L - F$, and for (4), only $\tilde{x}_H = I_H - T_L$ are possible. In order to derive the optimal tax structure then, the utility function shall be defined as

$$u_i = \ln(x_i) \tag{5}$$

Hereafter, the right hand sides of (2) – (4) shall be used for x_i.

Utilitarian economic welfare, W, shall be defined by

$$W = q_L \ln\left(I_L - T_L\right) + q_H \ln\left(I_H - T_H\right) \tag{6}$$

Based on the traditional framework of optimal income tax theory, it is considered that the government must raise funds through income tax for the payment of exogenous expenses. The government must determine a tax structure $\left(T_L, T_H\right)$ to maximize utilitarian economic welfare spending under these spending constraints.

3 Optimal Tax Structure with Perfect Information

As a benchmark, this paper analyzes the case of a type with perfect information. In this case, there is no organizational *raison d'etre* for monitoring authorities. If R is exogenous spending, the government's concern is to determine a tax structure $\left(T_L, T_H\right)$ which maximizes W under the constraints of

$$q_L T_L + q_H T_H = R \tag{7}$$

Here, if (1) or (4) are substituted into an objective function, the following is obtained.

$$W = q_L \ln\left(I_L - T_L\right) + \left(1 - q_L\right)\ln\left(I_H - \left(\frac{R - q_L T_L}{1 - q_L}\right)\right) \qquad (8)$$

Solving the first level conditions for T_L gives

$$-\frac{q_L}{I_L - T_L} + \left(1 - q_L\right)\frac{\frac{q_L}{1 - q_L}}{I_H - \left(\frac{R - q_L T_L}{1 - q_L}\right)} = 0 \qquad (9)$$

Considering that $q_L > 0$ and

$\left(1 - q_L\right) I_H + q_L T_L > \left(1 - q_L\right) T_H + q_L T_L = R$, solving for T_L gives

$$T_L = R - \left(1 - q_L\right)\left(I_H - I_L\right) \qquad (10)$$

Substituting these results into the constraint function gives

$$T_H = R + q_L\left(I_H - I_L\right) \qquad (11)$$

Summarizing the above results, with the definition of $\Delta I = I_H - I_L$ gives

Proposition 1: Optimal income tax with perfect information is

$$T_L = R - q_H \Delta I \; ; T_H = R + q_L \Delta I \; .$$

From proposition 1, we see that in certain circumstances, regardless of the type, optimal income tax is an increasing function of R. Furthermore, with regard to income gaps (ΔI), T_L (T_H) is a decreasing (increasing) function. Also, rewriting formulas (10) and (11), it can be seen that gross income ($q_H I_H + q_L I_L$) is a decreasing function.

Since disposable income for any type is given by

$$I_i - T_i = q_H I_H + q_L I_L - R, i = L, H \tag{12}$$

In equilibrium, the after tax utility level is the same. In other words,

$$u_L = u_H = \ln\left(q_H I_H + q_L I_L - R\right) \tag{13}$$

Thus, for exogenous spending, in general terms, if gross income is large enough (in other words, if $R < q_H I_H + q_L I_L$), the utility level for any type will be positive ($u_i > 0$), and in equilibrium, the level of economic welfare will also be positive (in other words, $W = q_L u_L + (1 - q_L) u_H \left(= \ln\left((1 - q_L) I_H + q_L I_L - R\right)\right) > 0$).

4 Incentives and Penalties

From this section on, we will consider the case of types with imperfect information (in other words, income is imperfectly captured). In particular, given that authorities are not always taking bribes, we shall consider the case in which they have discipline.

In general, if the declared income level is $i = L, H$, and if the probability of a tax investigation of this declared income level is shown by p_i, since it is irrational that a type L taxpayer under this model should make a false claim, the tax investigation should be limited to only low declared income. Hereafter, the probability of investigation (for low declared income taxpayers) is denoted as simply p . In this case, the compatible incentive conditions for type H are as follows. In other words,

$$\ln\left(I_H - T_H\right) \geq p\ln\left(I_H - T_L - F\right) + \left(1-p\right)\ln\left(I_H - T_L\right) \qquad (14)$$

Where $F \geq T_H - T_L$, is the penalty for a false declaration. The left shows the utility level for a type H taxpayer that has made a rational declaration, and the right shows the monitoring risk of probability p of a type H taxpayer's expected utility level in the event of a false declaration.

Solving the above for p gives,

$$p \geq \frac{\ln(I_H - T_L) - \ln(I_H - T_H)}{\ln(I_H - T_L) - \ln(I_H - T_L - F)} \tag{15}$$

Since the right hand side is positive, p must be quite large to satisfy the constraints on incentive compatibility. Here, placing

$$\tilde{p} = \frac{\ln(I_H - T_L) - \ln(I_H - T_H)}{\ln(I_H - T_L) - \ln(I_H - T_L - F)} \tag{16}$$

and calculating the relationship with F gives,

$$\partial\tilde{p} / \partial F = -\frac{\ln(I_H - T_L) - \ln(I_H - T_H)}{\left(\ln(I_H - T_L) - \ln(I_H - T_L - F)\right)^2 (I_H - T_L - F)} < 0 \tag{17}$$

So $\tilde{p}$ is a decreasing function of F.

Regarding p, which satisfies the constraints on incentive compatibility, particularly where $F = T_H - T_L$, an exhaustive survey (i.e. where $p = 1$) where $F > T_H - T_L$ includes a sample survey (i.e. $p \in (0,1]$). This means that in the former case, the penalty for tax evasion is not punitive.

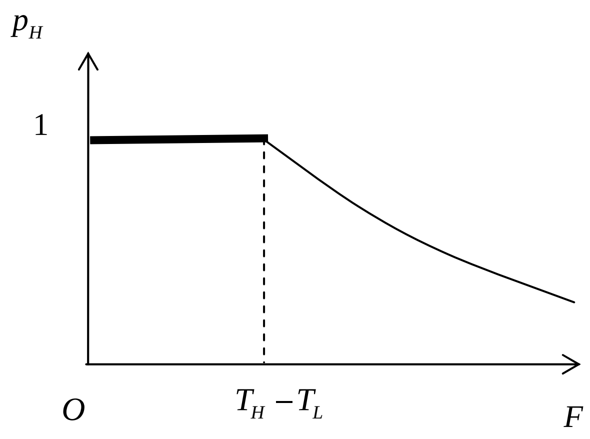

Figure 1

Based on Figure 1, the following lemma holds.

Lemma 1: If $F = T_H - T_L$, then $p = 1$.

Hereafter, we shall analyze the government's decisions based on Lemma 1. The government, in addition to the conventional spending level R, must also raise the cost of conducting tax investigations. For the latter case, since only the type distribution is known at the time of making budget decisions, they must commit to the cost of a full investigation of type H. But in fact, since low income taxpayers only include type L, an investigation cost of $q_L c$ is sufficient. In this paper, for simplicity, to ensure the feasibility of an incentive compatible tax investigation, the probability of type L shall be set at less than 1/2*.

The optimal tax rate is the solution of the following problem. In other words,

$$\underset{\{T_L, T_H\}}{Max}\, W$$
$$s.t. \quad q_L T_L + (1-q_L)T_H = R + (1-q_L)c$$

Here, rewriting the constraining equation as $T_L = \frac{R + (1-q_L)(c - T_H)}{q_L}$, and substituting into the objective function, determining the first level conditions for T_H gives,

$$-q_L \frac{\frac{1-q_L}{q_L}}{I_L - \left(\frac{R + (1-q_L)(c - T_H)}{q_L}\right)} - \frac{1-q_L}{I_H - T_H} = 0 \qquad (18)$$

Solving the above for T_H, where $1 - q_L > 0$, gives

$$T_H^* = R + q_L \Delta I + (1 - q_L)c \qquad (19)$$

Substituting these results into the constraining equation gives,

* In this paper, although an abstraction, where the type L distribution is smaller than 1/2, budget allocation is wasted.

$$T_L^* = R - (1 - q_L)\Delta I + (1 - q_L)c \qquad (20)$$

The above can be summarized in the following form as a proposition. In other words, under the structure of the parameters of Lemma 1,

Proposition 2: The optimal tax rate under asymmetrical information is given as

$$T_H^* = R + q_L \Delta I + (1 - q_L)c \;\; ; \;\; T_L^* = R - (1 - q_L)\Delta I + (1 - q_L)c$$

And since the economic welfare in equilibrium is given by

$$W = \ln\left((1 - q_L) I_H + q_L I_L - R - (1 - q_L) c\right) \qquad (21)$$

where $R + (1 - q_L)c < q_H I_H + q_L I_L$, $W > 0$.

5 Discipline and Corruption

Based on Proposition 2, the amount of tax evaded is given by $T_H^* - T_L^* = \Delta I$. Hereafter, we will consider the conventional case of transfers between parties. In other words, the distribution of ΔI is given exogenously, and the ratio of taxpayers is $\sigma \in (0,1)$. Here, for ΔI, taxpayers shall offer a bribe to investigators of $(1-\sigma)\Delta I$.

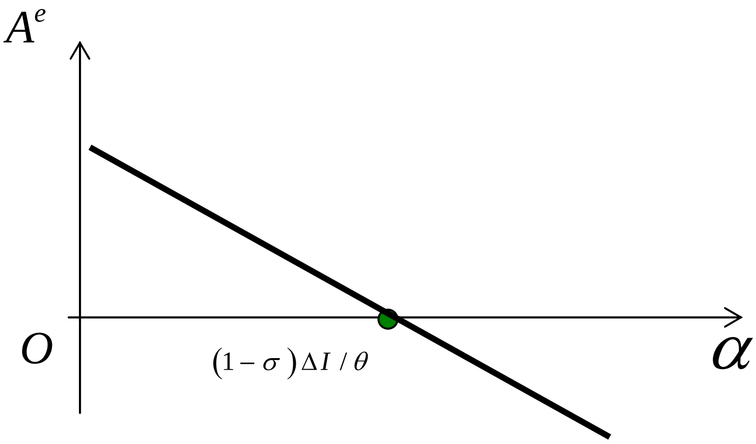

Figure 2

α shows the level of penalties for "corruption charges", and θ represents the likelihood of that corruption being discovered. Where the investigator is a neutral risk, the expected payoff A^e can be shown as

$$A^e = \theta\left((1-\sigma)\Delta I - \alpha\right) + (1-\theta)(1-\sigma)\Delta I \qquad (20)$$

Figure 2 shows that where $\alpha < (1-\theta)\Delta I / \theta$, there is corruption[†].

[†] For distribution rate ΔI, solving for the range of σ given by $\sigma \in (0,1]$ and $A^e(\sigma) \geq 0$, as long as $\Delta I > \theta\alpha$, $\sigma \in \left(0, 1 - \dfrac{\theta\alpha}{\Delta I}\right]$, and thus there is room in this range for negotiation in determining σ. In this paper, this problem

Figure 3 shows the penalties and distribution ratios that fit these conditions. In other words, the possibility (σ,α) lies within the range of I, II in Figure 3, and corruption is established in the region (Region I) below the straight line going down to the right, and no corruption is established in Region II, above the straight line.

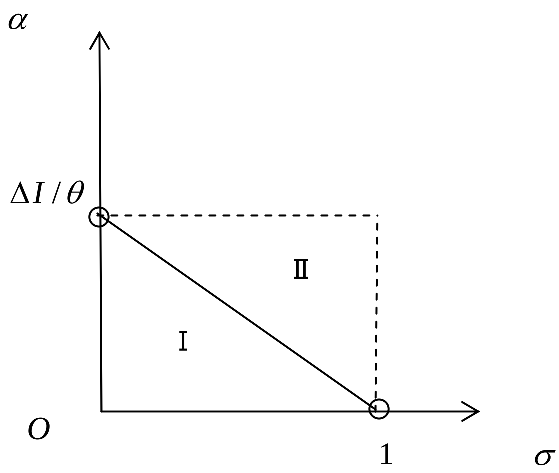

Figure 3

Here we will examine how the economic welfare and financial conditions affect the established parameters for corruption. In doing so, the utility level for type H shall take into consideration the amount of the bribe, given as

$$u'_H = \ln\left(I_H - T_L^* - (1-\sigma)\Delta I\right) \qquad (21)$$

---

is considered in the abstract, as a conventional parameter of the distribution ratio.

The additional burden of type H is established by

$$T_L^* + (1-\sigma)\Delta I < T_H^* \qquad (22)$$

with economic welfare W increasing in equilibrium. In other words, in terms of utilitarian economic welfare, collusion would improve social conditions.

On the other hand, while tax revenues are given as $T_L^* + (1-q_L)\theta\alpha$ in equilibrium, if the above $\alpha < (1-\theta)\Delta I / \theta$ is established, and if tax revenues decrease in equilibrium, even if taking into account the payment of penalties, this will not be sufficient to cover expenditure.

6 Wages as a Strategy to Prevent Corruption

In this paper, the conditions for corruption are the relationship between bribes and penalties, so where $\alpha < (1-\theta)\Delta I / \theta$, in theory, by the government simply providing $s = q_H\left((1-\sigma)(1-\theta)\Delta I / \theta - \alpha\right)$ in compensation to authorities they could prevent corruption. In this case, the issue for government is

$$\underset{\{T_L, T_H\}}{Max} W$$
$$s.t. q_L T_L + (1 - q_L) T_H = R + (1 - q_L) c + s$$

Rewriting the constraining equation as $T_L = \dfrac{R + s + (1 - q_L)(c - T_H)}{q_L}$,

and substituting into the objective function, solving for the first order conditions of T_H, where $1 - q_L > 0$, gives

$$(1 - q_L) \frac{\dfrac{1 - q_L}{q_L}}{I_L - \left(\dfrac{R + (1 - q_L)(c - T_H) + s}{q_L} \right)} - \frac{q_L}{I_H - T_H} = 0 \qquad (23)$$

Solving this for T_H gives

$$T_H^* = R + q_L \Delta I + (1 - q_L) c + s \qquad (24)$$

Then substituting these results into the constraining equation gives

$$T_L^* = R - (1 - q_L) \Delta I + (1 - q_L) c + s \qquad (25)$$

The above results can be summarized as follows as Proposition 3:

Proposition 3: The optimal income tax required to ensure tax revenue R is given by

$$T_H^* = R + q_L \Delta I + (1 - q_L)c + s \ ; \ T_L^* = R - (1 - q_L)\Delta I + (1 - q_L)c + s$$

From Proposition 3, the economic welfare is

$$W^* = \ln\left((1-q_L)I_H + q_L I_L - R - (1-q_L)c - s\right) \qquad (26)$$

The table below summarizes the results of Propositions 2-3

	Compliant	Non-compliant	
		Collusion-free	Collusion-proof
T_H	$R + q_L \Delta I + q_H c$	$R + q_L \Delta I + q_H c$	$R - q_L \Delta I + q_H c + s$
T_L	$R - q_H \Delta I + q_H c$	$R - q_H \Delta I + q_H c$	$R - q_H \Delta I + q_H c + s$
Welfare	W^*	W^{++}	W^+
Finances	Balanced	Deficit	Balanced

,where

$$W^* = \ln\left(q_H I_H + q_L I_L - R - q_H c\right)$$
$$W^{++} = q_H \ln\left(q_H I_H + q_L I_L - R - q_H c + \sigma \Delta I\right) + q_L \ln\left(q_H I_H + q_L I_L - R - q_H c\right)$$
$$W^+ = \ln\left(q_H I_H + q_L I_L - R - q_H c - s\right).$$

Comparisons of welfare under imperfect information are as follows (where economic welfare in the comparison below does not consider the state of tax inspectors). Since the economic welfare for compliant cases is $W^* = \ln\left(q_H I_H + q_L I_L - R - q_H c\right)$, and for non-compliant/collusion-proof cases is $W^+ = \ln\left(q_H I_H + q_L I_L - R - q_H c - s\right)$, the former is more socially desirable than the latter. On the other hand, for non-compliant/collusion-proof cases, as discussed above, the utility level of bribery is better than for the compliant case, meaning that of the three cases this is the most desirable‡.

Thus, under imperfect information, accepting bribery would be the most socially desirable, but this is the only case in which a fiscal deficit occurs.

Proposition 4: For an optimal tax structure with no fiscal deficit, $W^+ < W^*$

‡ This economic welfare of $W^{++} = q_H \ln\left(q_H I_H + q_L I_L - R - q_H c + \sigma\Delta I\right) + q_L \ln\left(q_H I_H + q_L I_L - R - q_H c\right)$ will exceed the economic welfare under perfect information of $q_H \ln\left(q_H I_H + q_L I_L - R\right) + q_L \ln\left(q_H I_H + q_L I_L - R\right)$, where income inequality ΔI is sufficiently large.

7 Conclusions

This paper derived the optimal tax structure for the hierarchy of government-tax agency-taxpayers, and compared economic welfare (ⅰ) in the case of perfect information, (ⅱ) in the case of imperfect information where there are corruption issues, (ⅲ) in the case where there are corruption issues, which are accepted, and (ⅳ) in the case of preventing corruption.

As a result of this analysis, it was found that case ⅲ was the best case. The main policy implications of this paper are that, as is clear from the worsened conditions produced by case ⅳ, it is not necessarily desirable to increase the wages of civil servants as a measure against corruption. In other words, even if it is possible to prevent corruption by improving the allowances paid to civil servants, if these financial resources are obtained by raising the income tax, this will result in a worsening of economic welfare conditions, based on the optimal tax structure for government.

References

Border,K. and J.Sobel,(1987),Samurai accountant: A theory of auditing and plunder,*Review of Economic Stidies*,54,525-540.

Melumad,N.D. and D.Mookherjee,(1989),Delegation as commitment:The case of income tax audits,*RAND Journal of Economics*,20-2 ,139-163.

Mookherjee,D. and I.Png,(1989),Optimal auditing, insurance and redistribution,*The Quarterly Journal of Economics*,104-2,399-415.

Mookherjee,D. and I.Png,(1990),Enforcement costs and the optimal progressivity of income taxes,*Journal of Law, Economics,and Organization*,6-2,411-431.

Myrdal, G., (1968), *Asian Drama: An inquiry into the poverty of nations*, London, Allen Lane the Penguin Press.

Reinganum,J. and L.Wilde.,(1985),Income tax compliance in a principal agent framework, *Journal of Public Economics*,26,1-18.

Sato, H., (2010), Wages as anti-corruption strategy: A note, mimeo. (*Discussion Paper,* Kyushu-Sangyo University, No.46)