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Kleptocracy and corruption

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In this paper, we develop a model that analyzes the competition and strategic interactions between a kleptocratic ruler and his officials in rent seeking. The ruler implements anti-corruption measures, which include wage incentives and monitoring, to discourage his opportunistic officials from seeking bribes to obtain more rent for himself. We show that the ruler pays an efficiency wage to his officials to eliminate corruption if and only if monitoring is relatively effective. We also demonstrate that, in a proprietary state, the ruler always sets an inefficiently high tax rate in order to discourage the officials from demanding bribes. *Journal of Comparative Economics* **34** (1) (2006) 57–74. Lingnan University, Tuen Mun, Hong Kong.

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1. Introduction

Kleptocracy and corruption are long-standing important social, political, and economic phenomena.[1] In the past few decades, these issues have received increasing attention in the social

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[1] Kleptocrat is usually defined as a ruler whose primary goal is personal enrichment (see, e.g., Grossman, 1999 and Rose-Ackerman, 1999). Similar to corruption, kleptocracy refers to the rent-seeking activities of the government. However, although the literature of corruption usually studies low or medium rank government officials, the literature of kleptocracy focuses on sovereign rulers.

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sciences with significant research in many disciplines.[2] In this paper, we extend the existing literature in two dimensions by exploring the combined implications of kleptocracy and corruption. First, we model the conflicts within the ruling class, a topic that has been ignored in the economic literature of kleptocracy. Second, to analyze corruption and corruption deterrence in proprietary states, we examine the competition and strategic interactions between a ruler and his officials in rent-seeking activities. Our results indicate that a kleptocratic ruler implements anti-corruption measures to discourage his opportunistic officials from seeking bribes and, thus, obtain more rent for himself.[3]

In our model, we analyze the roles played by wage incentives and monitoring in corruption deterrence. From the empirical evidence, Palmier (1983) and Lindauer et al. (1988) show that inadequate wages are often an important cause of bureaucratic corruption. Klitgaard (1987) notes that, in ancient China, officials were given an extra allowance called *Yang-Lien*, meaning *nourish incorruptness*. Our model indicates that a ruler pays an efficiency wage to his officials to eliminate corruption if monitoring is relatively effective. Otherwise, the ruler pays only the officials' reservation wage. For both schemes, we demonstrate that, due to competition between the ruler and his officials in rent seeking, the ruler sets an inefficiently high tax rate to discourage the officials from demanding bribes. In particular, even in the absence of corruption in the strategic equilibrium, the ruler sets a tax rate that is higher than the revenue-maximizing rate. The intuition for this surprising result is that a higher tax rate results in lower gains to officials engaging in corruption, or, using the language of industrial organization, the ruler sets a Pareto-inefficient high tax rate to deter entry of his officials into rent-seeking activities.

Buchanan and Lee (1982) note that political decision making processes sometimes generate tax rates that are higher than the rate that maximizes tax revenues. The authors explain this puzzle by arguing that high tax rates are due to politicians having short time horizons. Our paper complements this literature by suggesting that, in a proprietary state, inefficiently high tax rates may result from conflicts within the ruling class, in particular, competition between the ruler and his officials for rents. Jones (1981) describes the relationship between the King and the landlords in France in the Middle Ages as a struggle over taxes and rents. In a classical study of widespread corruption in India in the fourth century B.C., Kangle (1972) notes that corruption of government officials reduced the King's revenues. Our model implies that competition between a ruler and his officials in rent seeking reduces social welfare. In addition, we show that a lower tax rate may be associated with a higher level of corruption in equilibrium and lead to a decrease in social welfare in a proprietary state.

In Section 2, we present the basic analytical framework. Section 3 contains an analysis of a reservation wage scheme. In Section 4, we develop an efficiency wage alternative and investigate the circumstances under which a ruler chooses this scheme over the reservation wage scheme. In Section 5, we summarize the results and draw implications. Most of the mathematical proofs of the propositions and corollaries are collected in Appendix A.

[2] Mills (1986), Grossman (1991, 1999, 2000), Hirshleifer (1991, 1995, 2001), Rose-Ackerman (1999), and Bertocchi and Spagat (2001) are important contributions on kleptocracy. Fiorentini and Zamagni (1999) and Rose-Ackerman (1999) survey the economic literature on corruption and Heidenheimer et al. (1989) survey the literature on corruption from other social sciences.

[3] In the existing literature on corruption, the objectives and constraints of the anti-corruption agents are often not defined explicitly. Consequently, with a few notable exceptions such as Besley and McLaren (1993), Flatters and MacLeod (1995), and Mookherjee and Png (1995), the measures of corruption deterrence are assumed to be exogenous.

2. The basic framework

In our model, we assume a large number of potential firms, each of which is in the territory of a single government official. The number of potential firms and the number of officials are both assumed to be of Lebesgue measure one. The gross profit of a firm, which is denoted by π, is distributed uniformly on the interval [0, 1]. For a firm to operate, permission must be obtained from the official of its jurisdiction. Corruption occurs if an official demands a bribe from the potential firm in his jurisdiction. Our model extends that of Bliss and Di-Tella (1997) by introducing a ruler, i.e., the central government. In our model, a firm must pay a lump-sum tax, t, to the ruler and also obtain permission from the official of its jurisdiction.[4] We assume that the ruler and the officials are risk neutral and infinitely lived and that all officials are identical.

The relationship between the ruler and his officials is analyzed in a principal-agent framework. First, the ruler announces the tax rate and some anti-corruption measures. Then, every official decides whether or not to demand a bribe and the amount of the bribe if demanded, denoted by b. Next, the firms decide whether to operate or not. Hence, the total cost of operation is $t + b$, and a firm's net profit is given by:

$$\pi - t - b. \tag{1}$$

We assume that, in every period, a firm knows the exact value of π but the ruler and the officials know only its distribution.[5] Clearly, a firm will operate if and only if its net profit is non-negative. Thus, the ruler and officials take the probability that a firm will operate as:

$$P(\pi - t - b > 0) = 1 - P(\pi \leqslant t + b) = 1 - t - b. \tag{2}$$

From (2), the greater is t or b, the fewer firms will enter the market. We assume that all firms make non-negative gross profits so that the first-best solution is having all firms enter the market. Thus, taxes and bribes reduce economic efficiency.

In our model, we assume that every official receives a fixed wage, w, from the ruler at the beginning of every period. Inefficiency results from competition between the ruler and the officials over rents in this fixed-wage scheme. Thus, we investigate whether a ruler can increase his net income by choosing compensation schemes than the fixed-wage one. Specifically, a ruler may address this inefficiency by selling an exclusive right to rent seeking to the officials. From every official the ruler would demand an up-front fee, which is equal to the value of this exclusive right in every jurisdiction, and promise that no tax would be imposed. Such a scheme would preclude competition in rent seeking and achieve the first-best solution. However, we exclude this possibility for the following reasons.

First, officials have limited personal wealth and borrowing options so that they may not be able to finance a large up-front fee. In most dictatorships, financial markets are under-developed, property rights are poorly protected, and financial contracts are not enforced by the rule of law. Hence, borrowing is restricted severely, thus making the up-front fee impossible to implement. Second, as a sovereign, the ruler faces a time-consistency problem because he cannot commit himself to pre-announced policies or contracts, as Grossman and Noh (1990), Drazen (2000),

[4] For simplicity, we assume that the operation of a firm is a common knowledge, in particular, the ruler knows that the firm is operating so that it cannot avoid paying the tax.

[5] From this assumption, a firm's gross profits in different periods are completely independent. Alternatively, we could assume that every firm operates only for one period and that the ruler and the officials know only the probability distributions of the gross profits of new firms.

and Grossman (2000) discuss. Hence, even if the officials could pay the ruler the up-front fee, the ruler is tempted to renege on his contract and obtain additional revenue by taxing the firms. Foreseeing this incentive, no official will pay the up-front fee due to the time-consistency problem. Thus, we exclude this impractical scheme from consideration in the model.

Because the wage rate is endogenous in our model, the ruler may use it to discourage the officials from demanding bribes. In addition, the ruler monitors the officials to deter corruption by incurring a cost, denoted $A\theta^2$, where A is some positive coefficient and θ is the probability that a corrupt official is caught, which is a choice variable for the ruler. In this formulation, the higher is the probability that a corrupt official gets caught, the more costly is monitoring. For simplicity, θ is assumed to be independent of whether a potential firm actually operates and the official actually receives the bribe. Moreover, the greater is A, the more costly it is to monitor officials and, hence, the less efficient is the monitoring mechanism.

In the existing literature, the potential cost to an official of engaging in corruption is often dismissal with the resulting loss of future earnings. As an exception, Mookherjee and Png (1995) assume that an official will be subject to a penalty if caught for corruption and that the magnitude of the penalty is proportional to the amount of bribes the official takes, which is consistent with empirical observations. In particular, imposing penalties for corruption is a realistic and strategically relevant option for the optimal design of incentives to deter corruption. In this paper, we assume that, if a corrupt official is caught, he will not only lose his job but also be subject to a penalty. Specifically, the penalty imposed on an official who is caught for corruption is given by αb, where α is a positive parameter.[6]

If an official chooses to take bribes, his expected income in the current period is given by:

$$U^c \equiv w + b(1 - t - b) - \theta\alpha b. \tag{3}$$

Because an official faces the same environment in every period, his strategy is the same in all periods. Given that a corrupt official's probability of not being caught and dismissed in every period is $1 - \theta$, his intertemporal expected income is:

$$\sum_{i=0}^{\infty} \rho^i (1-\theta)^i U^c = \frac{U^c}{1 - \rho(1-\theta)}, \tag{4}$$

where ρ is the time discount factor. On the other hand, if an official chooses not to demand a bribe, his income in the current period is given by:

$$U^u \equiv w. \tag{5}$$

Because a non-corrupt official is never dismissed by the ruler, his intertemporal income is:

$$\sum_{i=0}^{\infty} \rho^i w = \frac{w}{1-\rho}. \tag{6}$$

[6] The penalty is assumed to be independent of whether the official actually receives the bribe. Alternatively, we could assume that, if the bribe is not paid because the firm does not operate, the official has a smaller probability of being detected and the penalty for corruption will be smaller. However, such an assumption will not change any of our results qualitatively. Furthermore, the ruler has an incentive to punish an official who demands a bribe regardless of whether the bribe is actually paid. Even if the official does not receive the bribe, an otherwise profitable firm, which would generate tax revenue for the ruler, may be deterred from operating by the demand of a bribe. Finally, we do not consider the endogenous determination of α and the optimal design of a penalty scheme in a dictatorship in this paper and leave this interesting topic to future research.

Therefore, an official will choose not to engage in corruption if and only if:

$$\frac{w}{1-\rho} \geqslant \frac{U^c}{1-\rho(1-\theta)}. \tag{7}$$

We assume that a ruler's probability of survival in every period is exogenous and constant. Since a ruler faces the same environment in every period, maximizing intertemporal income is equivalent to maximizing net income in every period. The ruler's income comes from tax revenues, which equal:

$$t(1-t-b),$$

in every period. Hence, the ruler's tax revenue is correlated negatively with the amount of bribe demanded by the officials. The ruler incurs three types of cost, namely, the wage paid to his officials, the cost of monitoring officials, and the possible cost of penalizing officials. Examples of the last type of cost are the cost of building prisons and imprisoning corrupt officials. Although the penalties assessed on corrupt officials may be pecuniary penalties, which add to the ruler's income, we assume that the cost of imposing penalties is at least as big as any pecuniary penalties collected so that the ruler's net gain from punishing a corrupt official is negative or zero, denoted ηb, where η is a non-positive parameter so that $\eta \leqslant 0$.[7] Further, we assume that $\alpha > -\eta$ so that the cost imposed on a corrupt official by the ruler is greater than the ruler's own cost of punishing the official.

Since the total number of officials is normalized to be of measure one, the wage cost to the ruler is w and the cost of monitoring is $A\theta^2$. Moreover, because the number of officials caught for corruption is θ, the ruler's total net gain from penalizing the officials is $\theta\eta b$. Thus, in every period, the ruler's net income is given by:

$$V \equiv t(1-t-b) + \theta\eta b - w - A\theta^2. \tag{8}$$

In the remainder of this section, we consider two extreme cases that will be used as benchmarks for the subsequent analysis. In the first case, officials are absolutely loyal to the ruler and not corrupt under any circumstance. Substituting $b = 0$ into (8) and using the first-order condition, we obtain:

$$t = \frac{1}{2} \quad \text{and} \quad \theta = 0.$$

The other extreme is one case of anarchy in that the ruler cannot discipline the officials. However, the ruler still has a first-mover advantage because he announces and collects the tax first. Hence, the ruler sets $\theta = 0$. Treating t as a parameter and using the first-order condition for maximizing (3), we determine the optimal bribe that an official chooses to be:

$$b = \frac{1-t}{2}.$$

Substituting for b and $\theta = 0$ in (8), we obtain:

$$t(1-t-b) - w = \frac{t}{2} - \frac{t^2}{2} - w.$$

[7] This assumption rules out the possibility that the ruler may have an incentive to accuse officials of corruption for the sole purpose of imposing pecuniary penalties on them.

The first-order condition for maximizing the above equation yields:

$$t = \frac{1}{2},$$

and

$$b = \frac{1-t}{2} = \frac{1-\frac{1}{2}}{2} = \frac{1}{4}.$$

We summarize these results in the following lemma.

Lemma 1. *If officials are not corrupt under any circumstance, the ruler chooses*:

$$t = \frac{1}{2} \quad \textit{and} \quad \theta = 0.$$

In the case of anarchy, the strategic equilibrium is:

$$t = \frac{1}{2} \quad \textit{and} \quad b = \frac{1}{4}.$$

Lemma 1 presents two benchmarks that are used for comparisons in the following sections, in which we analyze more realistic interactions between the ruler and his officials in a rent-seeking environment. The formulation in (3) implies that, if an official chooses to be corrupt, his optimal choice of bribe will be independent of the wage rate. Hence, the ruler sets the wage rate at its minimum, namely

$$w = 0.$$

Following Besley and McLaren (1993), we consider this to be the reservation wage. Alternatively, if the wage rate is sufficiently high so that (7) is satisfied, officials will choose not to be corrupt. Following Besley and McLaren (1993), we refer to this as the efficiency wage because it eliminates corruption.

3. The reservation wage scenario

First, for an interior solution to (3), the first-order condition is:

$$1 - t - b - b - \theta\alpha = 0,$$

which implies that:

$$b = \frac{1-\theta\alpha-t}{2}. \tag{9}$$

From (9), the amount of bribe that an official demands will decrease if the probability of being caught or the tax rate increases. In particular, an official will choose not to be corrupt, i.e., $b = 0$, if the right-hand side of (9) is non-positive, i.e.:

$$t \geqslant 1 - \theta\alpha. \tag{10}$$

Consider first the case in which $b > 0$. Substituting $w = 0$ and (9) into (8) and rearranging, the ruler's objective function becomes:

$$t\left(1 - \frac{t+1-\theta\alpha}{2}\right) - A\theta^2 + \eta\frac{\theta(1-\theta\alpha)-\theta t}{2}. \tag{11}$$

The first-order conditions for maximizing (11) are:

$$1 - \frac{2t + 1 - \theta\alpha}{2} - \frac{\eta\theta}{2} = 0,$$

which implies that:

$$2t + (\eta - \alpha)\theta = 1, \tag{12}$$

and

$$\frac{\alpha t}{2} - 2A\theta + \eta\frac{1 - t - 2\alpha\theta}{2} = 0,$$

which implies that:

$$(\eta - \alpha)t + 2(2A + \alpha\eta)\theta = \eta. \tag{13}$$

From (12) and (13), the optimal solutions are:

$$t = \frac{4A + 3\alpha\eta - \eta^2}{8A + 6\alpha\eta - \alpha^2 - \eta^2}, \tag{14}$$

and

$$\theta = \frac{\alpha + \eta}{8A + 6\alpha\eta - \alpha^2 - \eta^2}. \tag{15}$$

To ensure interior solutions, we assume:

$$8A + 6\alpha\eta - \alpha^2 - \eta^2 > 0.$$

Substituting (14) and (15) into (9), we obtain:

$$\begin{aligned} b &= \frac{1 - \frac{\alpha+\eta}{8A+6\alpha\eta-\alpha^2-\eta^2}\alpha - \frac{4A+3\alpha\eta-\eta^2}{8A+6\alpha\eta-\alpha^2-\eta^2}}{2} \\ &= \frac{2A - \alpha^2 + \alpha\eta}{8A + 6\alpha\eta - \alpha^2 - \eta^2}. \end{aligned} \tag{16}$$

Therefore, from (16), $b > 0$ if and only if:

$$A > \frac{\alpha(\alpha - \eta)}{2}.$$

If $A \leqslant \alpha(\alpha - \eta)/2$, the constraint on b is binding so that $b = 0$. Substituting $b = 0$ and $w = 0$ into (11), the ruler's objective function becomes:

$$1 - t - 0 - 0 - A\theta^2 = t(1 - t) - A\theta^2. \tag{17}$$

From (9), $b = 0$ if and only if:

$$\frac{1 - \theta\alpha - t}{2} = 0, \tag{18}$$

which implies that:

$$\theta = \frac{1 - t}{\alpha}. \tag{19}$$

Substituting (19) into (17), the ruler's objective function becomes:

$$t(1-t) - A\left(\frac{1-t}{\alpha}\right)^2. \tag{20}$$

From the first-order condition of maximizing (20), we obtain:

$$t = \frac{2A+\alpha^2}{2(A+\alpha^2)}. \tag{21}$$

Substituting (21) into (19) yields:

$$\theta = \frac{\alpha}{2(A+\alpha^2)}. \tag{22}$$

Using these results, we obtain the following proposition.

Proposition 1. *In the reservation wage scheme, the officials choose to be corrupt if and only if $A > \alpha(\alpha-\eta)/2$, t is always larger than one half, and the tax rate is Pareto inefficient.*

Proof. Appendix A.

The first result implies that the officials' choice of corruption depends on the efficiency of the ruler's monitoring technology and the potential penalty assessed on corruption. In other words, even if officials are paid their reservation wage, corruption can be eliminated completely if the monitoring technology is sufficiently efficient, i.e., A is small, and the potential penalty on corruption is sufficiently large, i.e., α is large. The second result indicates that, due to competition over rents, the ruler sets an inefficiently high tax rate to discourage the officials from demanding bribes. Comparing with Lemma 1, even if no corruption is chosen in the strategic equilibrium, the ruler sets a tax rate that is higher than the revenue-maximizing rate. For example, if $A = \alpha(\alpha-\eta)/2$, $b = 0$. However, from (21), it follows that:

$$t = \frac{2A+\alpha^2}{2(A+\alpha^2)} = \frac{(\alpha(\alpha-\eta)+\alpha^2)}{\alpha(\alpha-\eta)+2\alpha^2} = \frac{2\alpha-\eta}{3\alpha-\eta},$$

which is greater than or equal to $2/3$ because $\eta \leqslant 0$. This tax rate exceeds $1/2$, which is the revenue-maximizing tax rate if officials are not corrupt under any circumstance. The intuition for this result is that a higher tax rate results in lower potential gains to corruption so that the ruler sets an inefficiently high tax rate to deter his officials from engaging in rent-seeking activities.

The third result in Proposition 1 states that the tax rate in the strategic equilibrium is Pareto inefficient. If the bribe demanded by officials is held constant when the tax rate is lowered, a reduction of the tax rate leads to a Pareto improvement for all agents. As an illustration, consider the case in which $A \leqslant \alpha(\alpha-\eta)/2$ so that $b = 0$. If the tax rate is reduced, firms have higher net profits so that more firms will find it profitable to operate. In addition, from Lemma 1, the ruler's total revenue will increase. However, the officials' welfare is not affected. Hence, the tax rate is inefficiently high due to competition between the ruler and the officials over rents. Therefore, Proposition 1 provides an explanation for the phenomenon observed by Buchanan and Lee (1982) that tax rates are sometimes higher than the rate that maximizes tax revenues.

Two corollaries follow from Proposition 1.

Corollary 1.

$$t + b < \frac{3}{4}.$$

Proof. Appendix A.

From (2), the number of profitable firms choosing to operate decreases with $t + b$, which measures the total distortion to the economy. From Lemma 1, $t + b = 3/4$ in the case of anarchy. Hence, Corollary 1 implies that, although the strategic interactions between the ruler and the officials yield inefficient consequences, the ruler's capacity to monitor and punish officials generates an outcome that is better than anarchy. The following corollary discusses the comparative statics for two important parameters, A and α.

Corollary 2. (1) *If* $A > \alpha(\alpha - \eta)/2$, *then* $\partial b/\partial A > 0$, $\partial t/\partial A < 0$, *and* $\partial(t + b)/\partial A > 0$. *If* $A \leqslant \alpha(\alpha - \eta)/2$, *then* $\partial b/\partial A = 0$, $\partial t/\partial A > 0$, *and* $\partial(t + b)/\partial A > 0$.

(2) *If* $A > \alpha(\alpha - \eta)/2$, *then* $\partial b/\partial \alpha < 0$, $\partial t/\partial \alpha > 0$, *and* $\partial(t + b)/\partial \alpha < 0$. *If* $A \leqslant \alpha(\alpha - \eta)/2$, *then* $\partial b/\partial \alpha = 0$, $\partial t/\partial \alpha < 0$, *and* $\partial(t + b)/\partial \alpha < 0$.

Proof. Appendix A.

This corollary implies that bribes increase with monitoring cost, i.e., A, and decrease with penalties, i.e., α, when $A > \alpha(\alpha - \eta)/2$. Intuitively, if monitoring cost increases, the ruler spends less on monitoring so that officials take more bribes. If the penalty assessed on corruption increases, the expected net return from taking bribes decreases so that officials take fewer bribes. Moreover, since t and b are negatively correlated in the ruler's response function, t increases if monitoring cost decreases or if penalties increase.

In addition, Corollary 2 indicates that the total distortion to the economy, measured by $t + b$, increases with monitoring cost and decreases with the penalty on corruption. Intuitively, the intensity of the competition between the ruler and his officials in rent seeking increases with A and decreases with α. In one extreme, if $A \to \infty$ or $\alpha \to 0$, an official's expected loss from engaging in corruption is small. Hence, the interaction approaches anarchy and competition over rents is intense. In the other extreme, if $A \to 0$ or $\alpha \to \infty$, an official's expected loss from engaging in corruption is large. Hence, officials choose not to take bribes so that the ruler and his officials engage in little competition over rents. Therefore, $t + b$ increases with A and decreases with α, because the total distortion to the economy increases with the intensity of the rent-seeking competition.

In the existing literature on kleptocracy, the ruling class is treated as a single decision-making unit; hence, the tax rate is the only measure affecting social welfare. Our results are complementary to the ones in this literature. First, from part (1) of Lemma 1, the comparative static that $\partial(t + b)/\partial A > 0$ and $\partial(t + b)/\partial \alpha < 0$ if $A > \alpha(\alpha - \eta)/2$, taken together with the second result in Proposition 1, imply that competition between the ruler and his officials over rents reduces social welfare. Second, the comparative static results show that the relationship between the tax rate and social welfare may not always be negative. Rather, social welfare decreases with the tax rate if and only if $A \leqslant \alpha(\alpha - \eta)/2$. If $A > \alpha(\alpha - \eta)/2$, the tax rate will decrease as A increases or

α decreases. However, because the bribe demanded by officials will increase by a larger amount in either of these cases, social welfare will actually decrease as the tax rate decreases.[8]

4. The efficiency wage scenario and the ruler's chosen scheme

Suppose that the ruler can choose to set the wage high enough to preclude any official from taking a bribe. Such an efficiency wage must satisfy (7), i.e.:

$$\frac{w}{1-\rho} \geqslant \frac{U^c}{1-\rho(1-\theta)}.$$

Substituting (9) into (3) and rearranging, the corrupt official's expected income in every period is given by:

$$U^c = w + b[1-t-b] - \theta\alpha b = w + \frac{[(1-\theta\alpha)-t]^2}{4}. \tag{23}$$

Hence, the efficiency wage must satisfy the following condition:

$$\frac{w}{1-\rho} \geqslant \frac{1}{1-\rho(1-\theta)}\left\{w + \frac{[(1-\theta\alpha)-t]^2}{4}\right\},$$

which implies that:

$$w \geqslant \frac{(1-\rho)[(1-\theta\alpha)-t]^2}{4\rho\theta}. \tag{24}$$

If (24) is satisfied, no official chooses to be corrupt because the expected loss in future wage is greater than the benefit of corruption. The ruler chooses the minimum wage satisfying (24) so that

$$w = \frac{(1-\rho)[(1-\theta\alpha)-t]^2}{4\rho\theta}. \tag{25}$$

In this case, $b = 0$ and the ruler's objective function is given by:

$$\begin{aligned} &t[1-t-0] - w - A\theta^2 + \eta\theta 0 \\ &\quad = t(1-t) - \frac{(1-\rho)[(1-\theta\alpha)-t]^2}{4\rho\theta} - A\theta^2. \end{aligned} \tag{26}$$

The first-order conditions for maximizing (26) are:

$$1 - 2t + \frac{2(1-\rho)[(1-\theta\alpha)-t]}{4\rho\theta} = 0, \tag{27}$$

and

$$\frac{(1-\rho)(1-\theta\alpha-t)(1+\theta\alpha-t)}{4\rho\theta^2} - 2A\theta = 0. \tag{28}$$

Using these results, we obtain the following proposition.

[8] In reality, taxes are transparent but bribes are usually invisible. Corollary 2 suggests that, if an increase in tax is observed in a proprietary state, social welfare may not necessarily decrease.

Proposition 2. *In the efficiency wage scheme, the tax rate is larger than one half and it is Pareto inefficient.*

Proof. Appendix A.

Proposition 2 shows that, similar to the situation in the reservation wage scheme, the optimal tax rate in the efficiency wage scheme is higher than the tax rate that would apply if officials were not corrupt under any circumstance. Intuitively, the inefficiently high tax rate is caused by competition between the ruler and the officials over rents. Moreover, in this scenario, the ruler has an additional incentive to set a higher tax rate because a higher tax rate results in a lower efficiency wage.[9] Therefore, in the efficiency wage scheme, the trade-off between increasing the cost of wage payment and reducing the tax revenue may lead the ruler to set an even higher tax rate than in the reservation wage scheme. In addition, Proposition 2 states that the high tax rate is Pareto inefficient for the same basic reason as in the reservation wage scheme. From (28), the optimal solution of θ is never zero. Thus, monitoring must be combined with the efficiency wage scheme for the ruler to maximize net income. Hence, an efficiency wage scheme can never replace costly monitoring completely. However, from (25), w and θ are related negatively so that an increase in the efficiency wage saves monitoring costs.

To determine the ruler's best option, let V_R and V_E denote the ruler's expected income in the reservation wage scheme and in the efficiency wage scheme, respectively. Denote the benefit to the ruler of choosing the efficiency wage scheme as $\Delta V \equiv V_E - V_R$. If $\Delta V < 0$, the reservation wage scheme yields higher expected net income for the ruler. The following proposition explores the ruler's best option based on the values of the parameters.

Proposition 3. *First, if $A \leqslant \alpha(\alpha - \eta)/2$, $\Delta V > 0$. Second, if $A > \alpha(\alpha - \eta)/2$, the sign of ΔV is ambiguous. Finally, for a sufficiently large number $\overline{A}$, $\Delta V < 0$ if $A > \overline{A}$.*

Proof. Appendix A.

From Proposition 1, if $A \leqslant \alpha(\alpha - \eta)/2$, officials will not choose to be corrupt in equilibrium in the reservation wage scheme. Thus, the first result in Proposition 3 indicates that, if monitoring is relatively efficient, the ruler can obtain more net income by using both monitoring and wage incentives as anti-corruption measures than by using monitoring alone in the reservation wage scheme. Since officials do not take a bribe in the reservation wage scheme, they are better off in the efficiency wage scheme as well. Moreover, for some parameter configurations, the tax rate is lower in the efficiency wage scheme so that net profits are larger and more firms operate. Therefore, in such a case, the efficiency wage scheme is a strict Pareto improvement over the reservation wage scheme for all agents. This result is consistent with the view that higher wages for officials are cost-effective in Lindauer et al. (1988).

However, the second result in Proposition 3 suggests that, if monitoring is relatively inefficient, i.e. $A > \alpha(\alpha - \eta)/2$, the ruler can obtain more net income with the reservation wage scheme under some parameter configurations, in particular, when the cost of monitoring is sufficiently high. This result explains the absence of an efficiency wage scheme in many developing

[9] The higher is the tax rate, the lower is the optimal bribe demanded by an official so that the official has less incentive to engage in corruption for any given wage rate. Thus, the efficiency wage is a decreasing function of the tax rate.

countries, because the rule of law is not well established and the monitoring mechanism over government officials is often inefficient. Proposition 3 suggests that the efficiency wage scheme is preferable if the monitoring technology is more effective or the penalty for corruption is more severe. This result is consistent with the point made by Shleifer and Vishny (1993) that weak governments unable to control their officials effectively experience high corruption levels. Furthermore, in the reservation wage scheme, Corollary 2 states that $\partial b/\partial A \geqslant 0$ and $\partial b/\partial \alpha \leqslant 0$, which means that corruption is more serious if it is more costly to monitor officials or if the penalty for corruption is less severe.

Our results have implications for the observations of Bardhan (1997) concerning corruption in the post-Communist countries. In Communist period, government officials were under the supervision of the Communist Party, which was effective in monitoring and controlling its members and officials. Moreover, the Communist Party was able to impose heavy penalties on corrupt officials. In terms of our model, A was small and α was large so that corruption was controlled easily. After the demise of Communism, a comprehensive legal system was not established immediately and governments were weak. Therefore, monitoring, convicting, and punishing corrupt officials became more difficult. In our model, A became larger and α became smaller so that corruption became more serious in these countries.

Finally, if the model is modified by assuming that officials are risk averse rather than risk neutral, the efficiency wage scheme is an even more attractive option for both the ruler and his officials. Risk averse officials prefer certain income, i.e., a wage, to uncertain income, i.e., a bribe. Thus, a ruler can pay a smaller efficiency wage to eliminate corruption; hence, he will be more willing to choose the efficiency wage scheme.[10] Moreover, if officials are risk averse, they will choose to take fewer bribes in the reservation wage scheme. In response, the ruler will spend less on anti-corruption measures and, in particular, may impose a lower tax rate. Consequently, firms will have higher net profits and more firms will find it profitable to operate. Therefore, the ruler and firms will be better off if officials are risk averse rather than risk neutral.

5. Conclusion

In this paper, we develop a model that combines kleptocracy and corruption to extend the existing literature by analyzing conflicts within the ruling class and by highlighting the unique features of corruption in proprietary states. In the existing literature on kleptocracy, the ruling class is treated as a single decision-making unit so that tax rate is the only measure that affects social welfare. Our model indicates that competition between the ruler and his officials over rents reduces social welfare. In this paper, the ruler obtains revenues from imposing taxes on the firms operating in the economy. Officials demand bribes that are costly to the ruler because some firms, which otherwise would have been producing profitably and paying taxes, do not enter the market. Therefore, the ruler commits resources to an anti-corruption policy to discourage bribe-taking. The analysis of the competition and strategic interactions between a kleptocratic ruler and his opportunistic officials in rent-seeking activities yields several interesting implications.

First, we find that a ruler will choose to pay his officials an efficiency wage to eliminate corruption if monitoring is relatively effective. Otherwise, the ruler will pay a reservation wage

[10] In our model, the expected penalty increases with the amount of bribes taken by an official. An alternative assumption is that larger bribes are easier to detect. These two assumptions have the same impact if officials are risk neutral. However, if officials are risk averse, the assumption that larger bribes are easier to detect will reduce the incentives to take bribes and make the efficiency wage scheme more likely to be preferred.

to the officials. Under both schemes, we demonstrate that the competition between the ruler and his officials over rents induces the ruler to set an inefficiently high tax rate. Surprisingly, even in the absence of corruption in the strategic equilibrium, the ruler sets a tax rate that is higher than the revenue-maximizing rate. This higher tax rate yields lower potential gains to officials from engaging in corruption so that it discourages them from rent seeking. Moreover, a higher tax rate allows the ruler to pay the officials a lower efficiency wage. However, the higher tax rate is Pareto inefficient because the ruler, the officials, and the general public can all benefit from a lower tax rate. Nevertheless, in a proprietary state, a lower tax rate may be associated with a higher level of corruption and a corresponding reduction in social welfare.

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Appendix A

Proof of Proposition 1. The first result is shown in the text.

With respect to the second result,

$$\text{if } A > \frac{\alpha(\alpha-\eta)}{2}, \qquad t = \frac{4A+3\alpha\eta-\eta^2}{8A+6\alpha\eta-\alpha^2-\eta^2}.$$

Then,

$$t - \frac{1}{2} = \frac{(4A+3\alpha\eta-\eta^2)}{8A+6\alpha\eta-\alpha^2-\eta^2} - \frac{1}{2} = \frac{(\alpha^2-\eta^2)}{8A+6\alpha\eta-\alpha^2-\eta^2} > 0.$$

Therefore, $t > 1/2$. However,

$$\text{if } A \leqslant \frac{\alpha(\alpha-\eta)}{2}, \qquad t = \frac{(2A+\alpha^2)}{2(A+\alpha^2)}.$$

Therefore,

$$t = \frac{(2A+\alpha^2)}{2(A+\alpha^2)} = \frac{1}{2} + \frac{A}{2(A+\alpha^2)} > \frac{1}{2}.$$

For the third result, suppose that the ruler can change the tax rate while other things are held constant. The ruler's objective function is given by:

$$t[1-t-b] - A\theta^2 + \eta\theta b.$$

The first-order condition for maximizing this item yields:

$$t = \frac{1-b}{2}.$$

If $A \leqslant \alpha(\alpha-\eta)/2$, $b = 0$. Holding b constant at zero, the ruler's optimal choice of the tax rate is:

$$t = \frac{1}{2},$$

which is less than the tax rate found above for the strategic equilibrium. Alternatively,

$$\text{if } A > \frac{\alpha(\alpha-\eta)}{2}, \qquad b = \frac{(2A-\alpha^2+\alpha\eta)}{8A+6\alpha\eta-\alpha^2-\eta^2}.$$

Holding b constant, the ruler's optimal choice of the tax rate is:

$$t' \equiv \frac{1-b}{2} = \frac{1-\frac{(2A-\alpha^2+\alpha\eta)}{8A+6\alpha\eta-\alpha^2-\eta^2}}{2} = \frac{(6A-\eta^2+5\alpha\eta)}{2(8A+6\alpha\eta-\alpha^2-\eta^2)}.$$

Comparing this tax rate with the tax rate in (14), denoted by t^o, we compute:

$$\begin{aligned} t' - t^o &= \frac{(6A-\eta^2+5\alpha\eta)}{2(8A+6\alpha\eta-\alpha^2-\eta^2)} - \frac{(4A+3\alpha\eta-\eta^2)}{8A+6\alpha\eta-\alpha^2-\eta^2} \\ &= -\frac{(2A-\eta^2+\alpha\eta)}{2(8A+6\alpha\eta-\alpha^2-\eta^2)}. \end{aligned}$$

Since $A > \alpha(\alpha-\eta)/2$, we have:

$$2A-\eta^2+\alpha\eta > 2\frac{\alpha(\alpha-\eta)}{2} - \eta^2 + \alpha\eta = \alpha^2-\eta^2 > 0.$$

Consequently,

$$t' - t^o < 0 \quad \text{so that} \quad t' < t^o.$$

Moreover, for a lower tax rate, firms will have higher net profits and more firms will find it profitable to operate. Thus, the tax rate is Pareto-inefficient. □

Proof of Corollary 1. If $A > \alpha(\alpha-\eta)/2$,

$$t = \frac{(4A+3\alpha\eta-\eta^2)}{8A+6\alpha\eta-\alpha^2-\eta^2}.$$

Therefore,

$$\begin{aligned} t+b &= \frac{(4A+3\alpha\eta-\eta^2)}{8A+6\alpha\eta-\alpha^2-\eta^2} + \frac{(2A-\alpha^2+\alpha\eta)}{8A+6\alpha\eta-\alpha^2-\eta^2} \\ &= \frac{(6A-\alpha^2-\eta^2+4\alpha\eta)}{8A+6\alpha\eta-\alpha^2-\eta^2}. \end{aligned}$$

Note that:

$$\frac{(6A-\alpha^2-\eta^2+4\alpha\eta)}{8A+6\alpha\eta-\alpha^2-\eta^2} - \frac{3}{4} = -\frac{(\alpha+\eta)^2}{4(8A+6\alpha\eta-\alpha^2-\eta^2)} < 0,$$

which implies

$$t+b < \frac{3}{4}.$$

Moreover, if $A \leqslant \alpha(\alpha-\eta)/2$,

$$t = \frac{(2A+\alpha^2)}{2(A+\alpha^2)} = \left[1 - \frac{\alpha^2}{2(A+\alpha^2)}\right] < \left[1 - \frac{\alpha^2}{2(\frac{\alpha(\alpha-\eta)}{2}+\alpha^2)}\right]$$

$$= \left[1 - \frac{\alpha^2}{3\alpha^2 - \alpha\eta}\right] < \left[1 - \frac{\alpha^2}{4\alpha^2}\right] = \frac{3}{4}. \qquad \square$$

Proof of Corollary 2. If $A > \alpha(\alpha - \eta)/2$,

$$\frac{\partial t}{\partial A} = -\frac{4(\alpha^2 - \eta^2)}{(8A + 6\alpha\eta - \alpha^2 - \eta^2)^2} < 0,$$

$$\frac{\partial b}{\partial A} = \frac{2(3\alpha - \eta)(\alpha + \eta)}{(8A + 6\alpha\eta - \alpha^2 - \eta^2)^2} > 0,$$

and

$$\frac{\partial(t + b)}{\partial A} = \frac{2(\alpha + \eta)^2}{(8A + 6\alpha\eta - \alpha^2 - \eta^2)^2} > 0.$$

If $A \leqslant \alpha(\alpha - \eta)/2$, $b = 0$ so that:

$$\frac{\partial b}{\partial A} = 0.$$

In addition, $t = (2A + \alpha^2)/(2(A + \alpha^2))$ so that:

$$\frac{\partial t}{\partial A} = \frac{\alpha^2}{2(A + \alpha^2)^2} > 0$$

and

$$\frac{\partial(t + b)}{\partial A} = \frac{\partial t}{\partial A} > 0.$$

For the second part, note that $\alpha > -\eta > 0$. If $A > \alpha(\alpha - \eta)/2$,

$$\begin{aligned}\frac{\partial t}{\partial \alpha} &= \frac{[8\alpha A + (3\alpha - 2\eta)\alpha\eta + 3\eta^3]}{(8A + 6\alpha\eta - \alpha^2 - \eta^2)^2} > \frac{[8\alpha\frac{\alpha(\alpha-\eta)}{2} + (3\alpha - 2\eta)\alpha\eta + 3\eta^3]}{(8A + 6\alpha\eta - \alpha^2 - \eta^2)^2} \\ &> \frac{2\alpha(2\alpha^2 + \eta^2)}{(8A + 6\alpha\eta - \alpha^2 - \eta^2)^2} > 0\end{aligned}$$

and

$$\frac{\partial b}{\partial \alpha} = -\frac{[12\alpha A + 4\eta A + (5\alpha - 2\eta)\alpha\eta + \eta^3]}{(8A + 6\alpha\eta - \alpha^2 - \eta^2)^2}.$$

Moreover,

$$\begin{aligned}&12\alpha A + 4\eta A + (5\alpha - 2\eta)\alpha\eta + \eta^3 \\ &\quad > 12\alpha\frac{\alpha(\alpha - \eta)}{2} + 4\eta\frac{\alpha(\alpha - \eta)}{2} + (5\alpha - 2\eta)\alpha\eta + \eta^3 \\ &\quad = \alpha\left(6\alpha^2 + \alpha\eta - 5\eta^2\right) + \eta^3 > \alpha\left(6\alpha^2 + \alpha\eta - 5\eta^2\right) - \alpha\eta^2 \\ &\quad = (6\alpha - 5\eta)(\alpha + \eta) > 0.\end{aligned}$$

Therefore, $\partial b/\partial\alpha < 0$.

Furthermore,

$$\frac{\partial(t + b)}{\partial \alpha} = -\frac{2[2\alpha A + 2\eta A + (\alpha^2 - \eta^2)\eta]}{(8A + 6\alpha\eta - \alpha^2 - \eta^2)^2}.$$

In addition,

$$\begin{aligned}
&2\alpha A + 2\eta A + \left(\alpha^2 - \eta^2\right)\eta \\
&\quad > 2\alpha\frac{\alpha(\alpha-\eta)}{2} + 2\eta\frac{\alpha(\alpha-\eta)}{2} + \left(\alpha^2 - \eta^2\right)\eta \\
&\quad = \left(\alpha^2 - \eta^2\right)(\alpha+\eta) > 0.
\end{aligned}$$

Therefore, $\partial(t+b)/\partial\alpha < 0$.

If $A \leqslant \alpha(\alpha-\eta)/2$, $b = 0$ so that:

$$\frac{\partial b}{\partial\alpha} = 0.$$

In addition,

$$t = \frac{(2A+\alpha^2)}{2(A+\alpha^2)} = \frac{1}{2}\left[1 + \frac{A}{(A+\alpha^2)}\right].$$

Therefore,

$$\frac{\partial t}{\partial\alpha} < 0 \quad \text{and}$$

$$\frac{\partial(t+b)}{\partial\alpha} = \frac{\partial t}{\partial\alpha} < 0. \qquad \square$$

Proof of Proposition 2. From the first-order condition, (27), we get:

$$t = \frac{1}{2}\frac{1 + \frac{2(1-\rho)(1-\theta\alpha)}{4\rho\theta}}{1 + \frac{(1-\rho)}{4\rho\theta}}.$$

Hence, $t > 1/2$ if and only if:

$$\frac{1 + \frac{2(1-\rho)(1-\theta\alpha)}{4\rho\theta}}{1 + \frac{(1-\rho)}{4\rho\theta}} > 1,$$

which implies:

$$1 + \frac{2(1-\rho)(1-\theta\alpha)}{4\rho\theta} > 1 + \frac{(1-\rho)}{4\rho\theta}$$

or

$$\theta\alpha < \frac{1}{2}.$$

Therefore, if $\theta\alpha < 1/2$, $t > 1/2$.

Alternatively, suppose that $\theta \geqslant 1/(2\alpha)$. From (23), the constraint $b \geqslant 0$ is binding if and only if:

$$\frac{(1-\theta\alpha) - t}{2} \leqslant 0.$$

If $\theta \geqslant 1/(2\alpha)$, then the ruler can choose $t = 1/2$ so that:

$$\frac{(1-\theta\alpha) - t}{2} \leqslant \frac{(1-\frac{1}{2}) - \frac{1}{2}}{2} = 0.$$

Therefore, if $\theta \geqslant 1/(2\alpha)$ and $t = 1/2$, $b = 0$ even if the ruler sets $w = 0$. In other words, if the optimal solution of θ satisfies $\theta \geqslant 1/(2\alpha)$, the ruler will pay the officials a reservation wage and officials will not take any bribe. However, if the ruler pays the officials a reservation wage and officials takes no bribe, the optimal solution for θ from (22) is:

$$\theta = \frac{\alpha}{2(A+\alpha^2)} < \frac{\alpha}{2(0+\alpha^2)} = \frac{1}{2\alpha},$$

which results in a contradiction. Thus, the optimal solution of θ must satisfy $\theta < 1/(2\alpha)$. Therefore, $t > 1/2$.

Finally, the proof that the tax rate is Pareto-inefficient is the same as that for Proposition 1. □

Proof of Proposition 3. For the first result, if $A \leqslant \alpha(\alpha - \eta)/2$, $w = 0$ and $b = 0$ are the equilibrium solutions for the reservation wage scheme. Suppose that $w = 0$ and $b = 0$ belong to the feasible set of the efficiency wage scheme so that the reservation wage scheme is a special case of the efficiency wage scheme. If $w = 0$, the optimal solutions from (21) and (22) are:

$$\theta = \frac{\alpha}{2(A+\alpha^2)} \quad \text{and} \quad t = \frac{(2A+\alpha^2)}{2(A+\alpha^2)}.$$

However, substituting these into (28) and noting that $(1 - \theta\alpha) - t = 2b = 0$, we obtain:

$$-\frac{A\alpha}{A+\alpha^2} \neq 0.$$

Namely, the proposed optimal solutions of θ and t cannot satisfy (28), which is a first-order condition. Hence, the ruler never chooses $w = 0$ as an efficiency wage. Consequently, the efficiency wage scheme is strictly preferred to the reservation wage scheme and $\Delta V > 0$.

Turn to the third part of the proposition, i.e., if A is sufficiently large, $\Delta V < 0$. First, for the efficiency wage scheme, if $A \to \infty$, (28) implies that $\theta \to 0$, which in turn implies $w \to \infty$ from (25). Moreover, (8) implies that if $w \to \infty$, the ruler's net income goes to negative infinity. Second, for the reservation wage scheme, if $A \to \infty$, the ruler can choose $\theta = 0$ and $t = 1/2$. Hence, the ruler's net income is computed to be $1/8$, which is positive and therefore higher than the ruler's net income in the efficiency wage scheme. Therefore, for a sufficient large $\overline{A}$, $\Delta V < 0$ for $A > \overline{A}$ so that the ruler chooses the reservation wage scheme over the efficiency wage scheme.

To prove the second part of the proposition. use the result from the first part that $\Delta V > 0$, if $A \leqslant \alpha(\alpha - \eta)/2$. By continuity, if A is in a positive and small neighborhood of $\alpha(\alpha - \eta)/2$, $\Delta V > 0$ for some $A > \alpha(\alpha - \eta)/2$ so that the sign of ΔV is ambiguous. □

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