The larger, the better: Bigger states disincentive corruption

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Abstract

We analyze the agency problem between the government (principal) and a many potential candidates (agents) for public office. We show that, if the dimension of the public service is small, the government has no monetary incentive to get rid of corruption.

Keywords: corruption, principal-agent model, collective sanctions.

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1 Introduction

Corruption is about breaking some fundamental rule of society in exchange for some personal benefit. On one side, there is an individual who is in a position to break the law and bestow some advantage upon some other individual who, on the other side, is prepared to reward the first one with some monetary or real prize. If both parties engage in this exchange, without any coercion, both parties will be better off than the case when no exchange takes place. However, a number of negative externalities may be associated to corruption. This is why it usually has a bad reputation and is severely sanctioned.

This article presents a simple corruption game based on the principal-agent framework[1]. We analyze the agency problem between the government (principal) and a given number of individuals (agents), who are candidates for public office. The highest number of officials for the public position is decided by the law, so the government faces an upper constraint in the agents to be hired. The government confers some discretionary authority to public officials for the administration of a public service, in which they are in direct contact with some citizens. Citizens may be in the position to pay a lump sum to the government (for example, a fee or fine). Agents are of two types, honest and (potentially) dishonest. Honest agents always transfer the fine to the government, whilst dishonest agents may try to extort money from citizens, asking them to pay less than the sum required and retaining the difference. In this paper, we assume that dishonest agents will always decide to bribe whenever they have the chance and no incentive to do otherwise. Appropriate incentives can be provided by the monitoring activity of the government or by offering high (efficiency) wages to public officials.

Our contribution to the literature is to show that, if the dimension (that is, if the highest number of public officials required by the law) of the public service is small, the government has no (monetary) incentive to get rid of corruption. Namely, the

[1]See Aidt (2003) for a review of the principal-agent literature on corruption.

government will always find it profitable to perform the lowest possible monitoring, pay the minimum wage to public officials and let them engage in corruption as a gamble[2]. In contrast, if the dimension of the public service is large, the government will pay higher (efficiency) wages to public official so as to disincentivize corruption.

In our setup, corruption is modelled as a gamble both in the probability of being detected (and punished) and in the likelihood that bribes are offered (that is, when citizens find themselves in the situation of paying the fee and accept the bribe). Stochastic fee payments alter the interplay between the participation and incentive constraints, and have a negative impact on the willingness of (potential) dishonest public officials to accept a job in which they can potentially gain from corruption. In equilibrium, if the wage of public officials is below the reservation level, the participation constraint is binding and the incentive constraint slack, so agents will always extract a bribe if they are given the chance. This leads to the somewhat counterintuitive conclusion that the government can find it profitable to set the wage to the lowest possible level and turn a blind eye to corruption. The overall increase in cost (wages and monitoring costs) necessary to make corruption unattractive may be too much. This conclusion is, in part, similar to that of Besley and McLaren (1993), in which minimum (capitulation) wages rather than efficiency wages can maximize total revenues, but only under some circumstances. The key difference is that in their case this happens when the number of taxpayers liable (that is, with positive income) is small, whereas in our case the government can be tempted to choose minimum wages (and tolerate corruption).

Our results are, instead, different from that derived in the efficient corruption theory, in which corruption can have efficiency enhancing allocative effects, for example, because corrupt individuals can speed up or circumvent complex and burdensome bureaucratic procedures (see Shleifer and Vishny, 1994). On this topic, see also Andvig and Moene (1990), and Kofman and Lawarrée (1996).

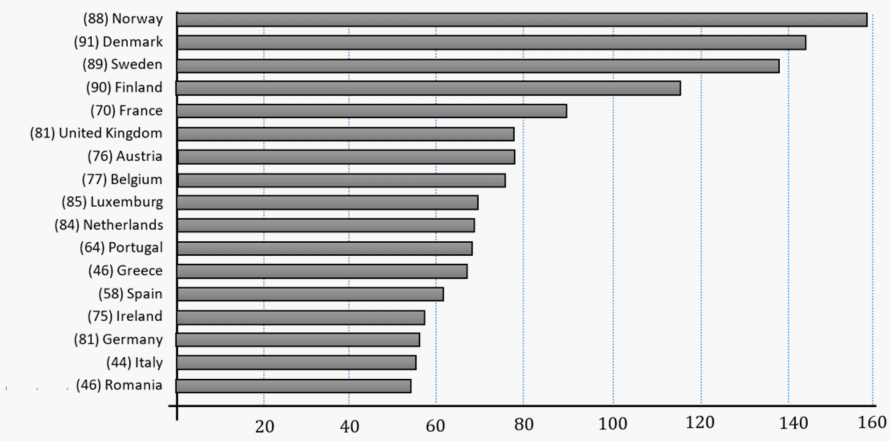
The rest of the paper is as follows. Section 2 builds up the model and derives the results. Section 3 concludes.

[2] On the interpretation of "corruption as a gamble", see Cadot (1987).

Table 1.

Employees in public sector per 1,000 inhabitants (2015). Source: OCDE

The number in parentheses is the Corruption Perception Index (2015). Source: Transparency International



2 The setup

Consider a one-period, risk-neutral economy with a government (principal) and N individuals (agents) who wish to hold a public office. If hired, agents will be in direct contact with a large number, a continuum, of citizens, who may be in a position to pay a fine or fee, F, to the public authority. Agents and citizens are of two types, honest (H) and (potentially) dishonest (D), with the following characteristics:

H agents always transfer F to the government;
D agents may misinform the government and offer a bribe to citizens, asking them to pay less than F, and retaining the difference;
H citizens never accept the bribe;
D citizens always accept the bribe.

To simplify, we assume that each agent exerts costless effort to fine at most one citizen, and that D agents have complete bargaining power over citizens, so the deal is such that the bribe is equal to F. Public officials have a positive reservation wage, w_R, and a positive initial wealth, W. Citizens can afford to pay F.

The government's objective is to maximize expected revenues. There is asymmetric information: agents and citizens know each other's type; the government only knows the probabilities λ and θ that, respectively, an agent and a citizen are honest (and thus the complementary probabilities). We indicate by $\alpha \in (0,1)$ the probability that, within the period analyzed, a citizen is required to pay the fee. The introduction of a stochastic fee payment is a key assumption for our analysis, and the justification is as follows: if α were equal to 0, citizens would never be in the position to pay the fee (this would put into question the rationale for the existence of the public office); if α were equal to 1, the information asymmetry between the government and agents would play no role.

The government is endowed with a technology that can monitor each agent with a (variable) probability $p \in (0,1)$, at a linear cost of c. If corruption is detected, the public official is forced to transfer the fine to the government, must pay a monetary sanction, and lose the job[3]. No penalty is, instead, imposed to citizens. Since the government's wants to maximize expected revenues, it will set the monetary sanction to W, and the probability of detection, p, to the lowest possible level. This will allow the government to tailor the sanction to the wage received by public officials.

In the model, we do not consider a production function of public goods or services, but we implicitly assume that the marginal value of fee resources is higher in the hands of the government than in the hands of corrupt individuals. We also consider no peer monitoring among public officials, and no reporting (whistleblowing) to the authority. We also assume that agents and citizens do not perfectly observe (or are not interested in) the reduction in public revenues, and possibly public goods and services, which derives from the misallocation of resources.

The timing of the game is as follows:

1) nature determines λ, θ, and α;
2) the government chooses the wage, $w \geq 0$, the monitoring activity, p; and the number of public officials to hire:
3) H and D agents decide whether to accept the position or not;

[3]The penalties imposed to corrupt officials are similar to those in the paper by Fan (2006).

4) if D agents are hired and fine a citizen, they decide whether to offer a bribe or not.

For a given w, we will indicate by: $\pi(w)$ the government's expected payoff per public official; $u_H(w)$ the payoff of each H agent; $u_D^B(w)$ and $u_D^{NB}(w)$ the payoff of each D agent when, respectively, a bribe is offered and not.

If we had symmetric information, D agents would never offer a bribe to citizens and the government would not invest in auditing. The first-best solution would be obtained, and the government's expected payoff would be

$$\pi_{FB}(w_R) = \alpha F - w_R. \tag{1}$$

That is, the payoff would be equal to the expected fee payment minus the (reservation) wage paid. Throughout the paper, we will assume that $\alpha F > w_R$, so the first-best payoff in (1) is strictly positive.

The government can choose between two possible strategies to reduce or eliminate corruption: in sub-section 2.1, the government pays the minimum wage to public officials, and tries to discourage corruption through random auditing; in sub-section 2.2, the government introduces efficiency wages in addition to audit control.

2.1 Minimum wage

In this sub-section, we show what happens when the government pays a minimum wage lower than w_R. In this case, H individuals will never accept the job, and the candidate office holders will only be of type D.

Consider the case in which a citizen commits a violation and is liable to pay a fine, F. A (potential) dishonest public official is in charge of collecting the payment. If the citizen is of type H, the agent has no choice but to transfer the fine to the government. If the citizen is of type D, the agent will have to choose whether to offer the bribe or not.

The agent has no incentive to bribe if the expected payoff from corruption is lower than the minimum wage. We initially consider a wage $w = 0$. Hence, the incentive compatibility constraint can be written as

$$u_D^{NB}(0) = W \geq W + (1-p)F - pW = u_D^B(0). \qquad (IC^0)$$

The right-hand side of (IC^0) is the agent's expected payoff from corruption: with probability $1-p$, the agent is not detected and retains the bribe, F, whereas with probability p, is detected and must pay the sanction, W, and transfer F to the government. Note that, in (IC^0), the agent's choice is made after a D citizen is fined, that is if the opportunity to bribe arises. The D agent's incentive constraint is satisfied if

$$p \geq \frac{F}{F+W} \equiv p_{IC}^0. \qquad (2)$$

This means that a large detection probability would be sufficient to prevent corruption in this simple model. However, the participation constraint must also be satisfied, otherwise agents would not have the incentive to accept the job. The agent's participation constraint is

$$u_D^B(0) = W + \alpha(1-\theta)[(1-p)F - pW] \geq W + w_R. \qquad (PC^0)$$

This requires that, in expected terms, before accepting the job, the payoff from bribery must be higher than the reservation wage. That is, the agent knows that, with probability, $\alpha(1-\theta)$, the public office will allow to participate in a lottery in which, with probability $1-p$, obtains F and, with probability p, pays W.

Note that the reason why we set the participation constraint such that bribery must be preferred is that, for each level of the minimum wage below w_R, it would not be possible to induce the truth-telling behavior. In other words, the participation constraint would never be satisfied if, in the left-hand side of (PC^0), we considered the payoff from not bribing, that is the initial wealth plus a minimum wage below w_R.

The participation constraint is satisfied when

$$p \leq \frac{\alpha(1-\theta)F - w_R}{\alpha(1-\theta)(F+W)} \equiv p_{PC}^0. \qquad (3)$$

The threshold p^0_{PC} is positive if

$$\theta \leq \frac{\alpha F - w_R}{\alpha F} \equiv \overline{\theta}. \tag{4}$$

If $\theta > \overline{\theta}$, that is the number of honest citizens is relatively high, the government would never choose the minimum wage policy, as D agents would accept the position only if they are not monitored.

From (2) and (3),

$$p^0_{IC} - p^0_{PC} = \frac{w_R}{\alpha(1-\theta)(F+W)} > 0.$$

Hence, the government cannot set the sanction at the level, p^0_{IC}, such that the incentive constraint, (IC^0), is satisfied. This means that D public officials will always offer a bribe to citizens, if the chance arises. This may partly explain why there are usually institutional constraints to the adoption of large and repressive penalties. See, on this topic, Becker and Stigler (1974), and Laffont and Guessan (1999). A similar argument can be made for the detection probability, because a very high audit control may entail additional agency and monitoring costs. Besides, a higher detection control, for example through improvements in technology, may have perverse effects because it may encourage preemptive corruption, as stressed by Samuel and Lowen (2010).

The expression for the government's expected payoff (per each D public official) can be written as

$$\pi(0) = \alpha[(1-\theta)p(F+W) + \theta F] - pc. \tag{5}$$

The payoff in (5) consists of three terms: the sum $F+W$ transferred by the corrupt public official is caught taking the bribe, which happens with probability $\alpha(1-\theta)p$, that is when the citizen is fined and the agent is audited; the fine F transferred by the honest citizen, with probability $\alpha\theta$; the monitoring cost, c, incurred with probability p.

If

$$\alpha(1-\theta)(F+W) \geq c, \tag{6}$$

that is, the expected transfer from the corrupt agent is larger than the audit cost, the payoff in (5) is increasing in p. Thus, if $\alpha(1-\theta)(F+W) < c$, the easiest way to eliminate corruption would be to eliminate the fee. This would put into question the existence of the public office. Thus, to make the analysis interesting, in what follows we assume that (6) holds. This imples that the detection probability will be set by the government at $p = p^0_{PC}$, which is the least expensive level, and so that (PC^0) is binding. Thus, the incentive constraint, (IC^0), will be slack. In equilibrium, using p^0_{PC}, the government's expected payoff is

$$\pi(0) = \alpha F - w_R - \frac{[\alpha(1-\theta)F - w_R]c}{\alpha(1-\theta)(F+W)} \equiv \pi^*(0). \tag{7}$$

The difference between the government's first-best payoff and the payoff with asymmetric information is positive, and we have the standard result that, under asymmetric information, the principal is not able to obtain the first-best (full-information) payoff. We have that $\partial\pi^*(0)/\partial\theta = cw_R/\alpha(1-\theta)^2(F+W) > 0$, so the government's payoff is increasing in the number of honest citizens.

Each D agent's equilibrium expected payoff is

$$u^{NB}_D(0) = W + \alpha(1-\theta)[(1-p^0_{PC})F - p^0_{PC}W] = W + w_R, \tag{8}$$

which is equal to the reservation level.

Note that, if $w = 0$, bribes are the only source of income for public officials. This would be true for each level of the minimum wage strictly below w_R, so the wage that maximizes the government expected payoff is, indeed, 0. This leads to the following result.

Proposition 1. *If the government adopts a minimum wage policy, public officials will be of type D, and always bribe whenever they have the chance.*

Remark 1. In this section, one of the sources of revenue for the government derives from the sanctions extracted to corrupt individuals. Thus, we do not have the commitment problem that is often present in this type of literature when the government needs to use a monitoring technology (on this topic, see Khalil, 1997).

2.2 Efficiency wage

In this sub-section, we show waht happnes when the government pays a wage equal or higher than w_R. In this case, honest agents will accept the job, and the candidate office holders will be of both type H and D. The wage must be set to a level such that, when a D citizen is fined, the D agent has no incentive to bribe. That is, such that the incentive constraint,

$$u_D^{NB}(w) = W + w \geq W + (1-p)(w+F) - pW = u_D^B(w), \qquad (IC^w)$$

is satisfied. The left-hand side of (IC^w) is the payoff (wealth plus wage) received by the agent when no bribe is offered. The right-hand side is the expected payoff from corruption: with probability $1-p$, the agent is not audited and obtains $w+F$; with probability p, the agent is detected and must pay the sanction W. Note again that the choice between bribery and not is made after a D citizen is fined. The incentive constraint is satisfied when

$$w \geq \left(\frac{1}{p} - 1\right) F - W. \qquad (9)$$

From the binding (IC^w), the lowest (least expensive) efficiency wage is $w = (1/p - 1)\,F - W$.

The participation constraint is

$$u_D^{NB}(w) = W + \left(\frac{1}{p} - 1\right) F - W \geq W + w_R. \qquad (PC_I^w)$$

In this case, the wage can induce the truth-telling behavior. Thus, in the left-hand side of the participation constraint, we can consider the payoff from not bribing. From the binding (PC^w), the lowest (least expensive) audit probability is

$$p = \frac{F}{F + W + w_R} \equiv p_{PC}^w. \qquad (10)$$

Using p_{PC}^w, the equilibrium wage is $w = w_R$, that is, equal to the reservation level.

From (3) and (10),

$$p_{PC}^{w} - p_{PC}^{0} = \frac{\{[1-\alpha(1-\theta)]F + W + w_R\}w_R}{\alpha(1-\theta)(F+W)(F+W+w_R)} > 0,$$

which means that, under the efficiency wage policy, the government is forced to increase the probability of monitoring and use more resources compared to the minimum wage policy. Hence, the expected sanction is higher under the efficiency wage policy, and this is the reason why D individuals choose not to bribe if they are paid efficiency wages.

The expression for the government's expected payoff (per public official) is

$$\pi(w) = \alpha F - w_R - pc. \tag{11}$$

In (11), since efficiency wages can prevent corruption, the government obtains F if a citizen is fined, and incurs the costs for the wage and audit control.

In equilibrium, using p_{PC}^{w}, the expected payoffs are

$$\pi(w) = \alpha F - w_R - \frac{Fc}{F+W+w_R} \equiv \pi^*(w), \tag{12}$$

and

$$u_H(w) = u_D^{NB}(w) = W + w_R. \tag{13}$$

Again, the government cannot achieve the first-best outcome, and agents obtain a payoff equal to the reservation level.

Proposition 2. *If $p = p_{PC}^{w}$, a wage equal to the reservation level is sufficient to prevent corruption.* sola ragione per cgui puo preferire w=0 è guadagnare con W

2.3 Minimum wage vs efficiency wage

In this sub-section, we compare the government's payoff under the two policies analyzed above, to determine the one that alows to obtain the higher expected revenue. Since the expected revenues, $\pi^*(0)$ in () and $\pi^*(w)$ in () are positive, the government can choose between two possible equilibrium configurations:

a) hire $(1-\lambda)N$ agents at the minimum wage of 0. In this case, only D individuals will apply for the position;

b) hire N agents at w_R. The applicants will be both H and D types, and never bribe.

The sign of the difference between the government's expected aggregate revenue under minimum wage and that under efficiency wage, that is of

$$(1-\lambda)N\pi^*(0) - N\pi^*(w), \tag{14}$$

is ambiguous. In particular, the sign of () depends on the proportion, λ, of H types in the population, and is positive if

$$\lambda \leq \frac{c\{[1-\alpha(1-\theta)]F+W+w_R\}w_R}{(F+W+w_R)\{\alpha(1-\theta)[\alpha(F+W)-c]F-[\alpha(1-\theta)(F+W)-c)wr\}} \equiv \widetilde{\lambda}. \tag{15}$$

We can state the following proposition, which summarizes the results of this section.

Proposition 3. *If:*
$\lambda \in (0, \widetilde{\lambda}]$, *corruption will be tolerated*;
$\lambda \in (\widetilde{\lambda}, 1)$, *corruption will be eliminated.*

Therefore, we come to the (expected) conclusion that, if the proportion of honest individuals n the population is above a certain threshold, the government chooses the efficiency wage policy under which no agent will offer bribes. Besides, we obtain the following additional result.

Proposition 4. *The higher the size of the public service, the lower the incentive for the government to hire potentially dishonest public officials.*

3 Conclusion

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