Steal If You Need. Capitulation Wages with Endogenous Monitoring

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Abstract

The importance of high salaries to circumvent bureaucratic corruption has been widely recognized in the policy debate. Yet, there appears to be much reluctance when it comes to the implementation. In this paper, we argue that deterring corruption through wage incentives may become prohibitively expensive that the government finds it optimal to accept higher net revenues at the expense of honesty. Deviating from the existing literature, where monitoring is exogenous, which curtails government's anti-corruption policy options; we set an endogenous monitoring technology that allows us to capture the dual role of auditing, as a complement with and as a substitute for wage incentives to deter bribery. Furthermore, besides the efficiency wage and the outside option, the government could pay a wage below the outside option, which attracts only dishonest agents to public office - capitulation wage. We find that when it is costly to monitor tax inspectors, the government is better-off offering capitulation wages and accepting corruption. When it is optimal to deter bribery, the government can do it either through efficiency wages or monitoring. The role of efficiency wages decreases in societies with higher level of dishonesty.

Keywords: Corruption, Endogenous monitoring, Capitulation wage, Efficiency wage, Carrot & Stick.
JEL codes: D73; H26; J33; J41.

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"I am expected to pay for my petrol when I go for official rounds. I am expected to pay for paper, typing, photocopying, even postage. All of this is official work. It adds up to Rupees 6000 per month. Am I mad to pay it from my pocket? What do they (Islamabad) expect? They know every thing." (Anonymous tax inspector in Pakistan)[1]

1 Introduction

Offering higher public wages has commonly been viewed as an anti-corruption strategy by many academics, policy makers and multilateral development agencies. In their seminal paper, Becker and Stigler (1974) show that raising wages along with non-zero audit probability could be used as a strategy to deter bribery in the public sector. Since then, vast body of literature, both theoretical as well as empirical shows lower public sector wages as one of the main determinants of bribery (Myrdal 1968, Klitgaard 1988, Tanzi 1994, Goel and Nelson 1998, Van Rijckeghem and Weder 2001). Despite the striking implications in policy debates, wage incentive strategy seems not so common when it comes to its implementation. Real wage declines in the public sector have been common in many countries over substantial periods of time. In a sample of twenty-one countries, Haque and Sahay (1996) report that real wages fell at an annual average rate of 1.4 percent. In this theoretical paper, we argue that deterring corruption through wage incentives may become prohibitively expensive that governments find it optimal to accept corruption. Further, we show that there is a trade-off between wage incentives based and monitoring based anticorruption strategies where although the later is expensive but it reduces size of the wage that ensures honesty.

A fact finding task force on reform of tax administration, set up in 2000 by the then president of Pakistan, General Pervaiz Musharaf, conducted a survey on the causes of corruption in tax administration. In this survey, seventy three per cent of the respondents considered poor compensation as a major cause of corruption. However, this is not limited to Pakistan. There have been a number of studies identifying lower wages as one of the major causes of malfeasant usage of public offices.[2] The argument is that less-paid public officials are more inclined to engage in corrupt practices. When the employees are not well paid, they may look for other avenues to generate additional resources and in most of the cases it would be misuse of public offices. For Ukraine, Gorodnichenko and Klara (2007) find that public sector employees receive 24-32% less wages than their private sector counterparts. Yet, workers in both sectors have essentially identical levels of consumer expenditures and asset holdings.

[1] Report of the Task Force on Reform of Tax Administration (2000), Central Board of Revenue, Government of Pakistan

[2] See Myrdal (1968), Klitgaard (1988), Tanzi (1994), Goel and Nelson (1998), Van Rijckeghem and Weder (2001).

Moreover, since lower salaries is a main determinant of corruption in the public sector, the fundamental response to ensure honesty would be to raise the salaries of bureaucrats above what they could get elsewhere i.e. paying them efficiency wages (Becker and Stigler 1974). The economic logic behind efficiency wages stems from the fact that if there is a probability of detection and punishment, higher salaries would imply higher costs of dismissal. In this way, higher salaries can prevent corruption by imposing an opportunity cost to corrupt public officials. Alternatively, there will be positive incentive effects as with higher salaries; competent and honest people would be willing to join public offices (Klitgaard, 1988; Haque and Sahay, 1996).[3]

Recently there have been many attempts to test the efficiency wage argument on real world data. Rauch and Evans (2000) find no evidence of higher wages deterring corruption. Using data from 35 LDC's, they found no clear evidence that competitive salaries have any effect on bureaucrats' performance. In the corruption regressions of Treisman (2000), higher wages have no significant impact on corruption. Di Tella and Ernesto (2003) argue that "one potential explanation for the apparent empirical failure of the Becker-Stigler hypothesis is that these studies include a number of observations drawn from environments where there is no active audit and the probability of being punished for corruption is near zero, or where there is very high audit and the probability of being punished for corruption is near one. Since Becker-Stigler theory predicts that wages should have no effect on corruption in such circumstances, the coefficient on wages in a corruption regression that does not control for audit intensity will tend to zero". They look at the role of wage incentives in the crackdown of corruption in public hospitals of Buenos Aires, Argentina. They find a negative effect of salaries on corruption when audit is expected to be at intermediate level.

In cross-country regressions for low-income countries, Van Rijckeghem and Weder (2001) find a statistically and economically significant effect of the civil services pay on corruption. They find that the relationship between civil-service pay and corruption implies that a rather large increase in wages is required to eradicate corruption solely by raising wages. They report that "a quasi-eradication of corruption is associated with a relative wage of two to eight times the manufacturing wage, not taking into account indirect effect". Thus, empirically, wage incentives reduce corruption in public sector but it raises questions about its cost effectiveness as a policy tool to deter bribery.

In a theory explaining bureaucratic corruption, Besley and McLaren (1993) (hereafter BM) investigate a possible causality from corruption to lower public sector wages. In line with the structure of Becker and Stigler (1974), they show that there can be situations (under parametric conditions) in which governments

[3] There is another view dealing with fairness and receprocity. Their argument is that low paid workers may reciprocate unfair treatment by reducing their productivity, see Skott (2005) for detailed discussion.

may be better-off accepting corruption and offering a wage less than the outside option (capitulation wage). They look at the tax compliance problem where the government optimizes its revenues net of administrative costs. BM were the first to build a theory on governments' reluctance to implement wage incentive policy. They assume exogenous monitoring of tax inspectors where governments can not influence monitoring efforts. Certainly, this restrains governments' anti-corruption instruments. In practice, there are several examples of crackdowns against corruption with massive efforts in auditing. The "mani-pulite" prosecutions in Italy and crackdowns on judicial corruption in Venezuela are few of them.[4] For the United States, Alt and Lassen (2010) argue that the allocation of prosecutorial resources are endogenously determined and have negative impact on corruption. Di Tella and Ernesto (2003) not only report a crackdown on corruption in the public hospitals of the city of Buenos Aires, Argentina during 1996-97 but also could differentiate different intensities at different phases of crackdown.

In this study, we extend the BM analysis of exploring the trade-off between wage incentives based anti-corruption strategy and budgetary balances. The specific type of corruption that we envisage here is the collusion between a tax collector and a tax payer in evading taxes. In this branch of the government, the honesty becomes more pressing as dishonesty would imply fewer revenue collections. We consider problems of both moral hazard and adverse selection: moral hazard arises as bribery can not be observed without costly monitoring, and adverse selection, as not all potential tax inspectors can be identified as being corrupt or honest. The government maximizes net revenue and it offers a wage scheme that generates higher revenues net of administrative costs. It can offer three different wage schemes; a wage that is offered in the private sector (reservation wage), which attracts both corruptible and honest agents to join public offices. It can offer a wage higher than the private wage (efficiency wage), which solves the moral hazard problem, i.e. deters bribery. Or it can offer a wage less than the private wage (capitulation wage), which attracts only dishonest agents in tax offices.

We differ from BM in at least three different ways. First and the most important is that as compared to BM, where audit probability is exogenous, we set a monitoring technology that is endogenous. It depends on two factors with opposing effects; the optimal audit intensity set by the government and a peer-effect of the number of corrupt tax inspectors. We allow the government to optimize a monitoring intensity for every wage scheme.[5] Different wage schemes produce different equilibrium levels of corruption and thus the amount of revenues that the government receives. In this way, shifting from one wage regime to another changes the relative costs and benefits of monitoring and thus its optimal level. Also, in line

[4] See Lui (1986) for several examples of crackdowns in China.

[5] Becker and Stigler (1974) also consider exogenous probability of being caught but they report that it must depend on the amount spent by the state on detection.

with the growing literature on peer-effects (i.e. Lui 1986, Andvig and Moene 1990); we consider that the effectiveness of any monitoring effort should also depend on the environment of corruption in the public offices, where a tax inspector operates. Lui (1986) report that a fundamental observation on corruption is that it becomes very difficult to audit a bureaucrat effectively if many others are also corrupt.

Second, in BM, there is a complete extortion in the sense that if any tax paying household faces a corrupt tax inspector, it will have to pay a bribe. In our model, corruption takes place only when a corruptible tax inspector matches with a corruptible tax payer. For any mismatch, there will be no corruption. Furthermore, we consider the fact that another factor that might influence the tax inspector's decision is the easiness of laundering bribe income. Generally, it can be observed that when there is a probability of getting caught and a penalty associated with it, corrupt tax inspectors may try to remain inconspicuous by altering their patterns of spending and/or by investing their bribe income in a manner different from their legal income. In this way, a costlier laundering would reduce the incentives to be corrupt.

Relaxing the assumptions of exogenous monitoring and complete extortion results in significant qualitative changes in the equilibrium of corruption and the relative performances of different wage regimes. For instance, the wage that deters bribery (efficiency wage) and a wage less than private wage (capitulation wage) would be endogenous. They would depend on the audit intensity set by the government and the chances of matching between corruptible tax payer and corruptible tax inspector. Thus, in our setting, the wage that solves the moral hazard problem is endogenous, and the government, through audit intensity, can affect the size of this wage. This generates a new trade-off where increasing monitoring is costly but it reduces the size of efficiency wage needed to deter bribery. In this way, the introduction of endogenous monitoring adds two additional strategies for deterring bribery. Audit can be a complement to wage incentives (i.e. carrot/stick mix) or an independent instrument as a substitute for wage incentives (sheer stick). This has very important implications for anti-corruption campaigns as without offering wage incentives, the government can still ensure complete honesty by enforcing higher auditing. Both these strategies differ in their implications regarding moral hazard and adverse selection problems: monitoring directly affects the incentives to be corrupt (moral hazard) whereas efficiency wage has an impact on both incentives to be corrupt and selection (adverse selection).

Second, for the equilibrium of corruption, when tax inspectors are paid efficiency wages, in equilibrium all are honest. On the contrary, if they are offered capitulation wages, in equilibrium all tax inspectors are corrupt. The introduction of endogenous monitoring determines the equilibrium of corruption when tax inspectors are offered reservation wages (in BM there is a mixture of both corrupt and honest bureaucrats).

Equilibrium depends on monitoring, which in turn depends on the audit intensity and the proportion of corrupt tax inspectors. When audit intensity is high, in equilibrium all tax inspectors are honest, when it is low, in equilibrium there is a mixture of both corrupt and honest tax inspectors. For the intermediate audit intensities, there are multiple equilibria; the equilibrium depends on the proportion of corrupt tax inspectors (i.e. where they coordinate).

Allowing the honest tax payers/inspectors to refuse bribery implies that corruption takes place only when a corruptible tax inspector matches with a dishonest tax payer. This has very significant implications, especially for the efficiency and the capitulation wage regimes as the size of both wages will now depend on the level of honesty. For the capitulation wage regime, even though in equilibrium all tax inspectors are corrupt, the government can still have tax revenues from honest tax paying households (in BM, the only source of revenues is through successful monitoring). Moreover, the size of efficiency wage increases with dishonesty implying that the results of BM that the efficiency wage generates the highest revenues when the level of dishonesty is high is no longer valid. A higher level of dishonesty would imply higher chances of matching between a corruptible tax payer and a corruptible tax inspector, thus the expected income with corruption would be higher. With higher expected income of corruption, a higher compensation would be required to make corruptible tax inspectors behave honestly.

We find that when it is costly to monitor tax inspectors, the government is better-off offering capitulation wages and accepting corruption. The range where capitulation wage regime dominates the other wage regimes increases with cost of monitoring and tax base, and decreases with the reservation wage (outside option). When it is optimal to deter bribery, the government can do this either through incentive based strategy (carrot/stick mix) or through monitoring. Which of these two is optimal depends on cost of auditing, level of dishonesty, tax base and reservation wage. The role of efficiency wages decreases in societies with higher proportion of dishonest agents. In these societies, the wage incentive schemes become prohibitively expensive and the government would opt monitoring based anti-corruption strategy when auditing is less costly, and a capitulation wage policy when the auditing is more expensive.

The rest of the paper proceeds as follows. In the next section we describe the economy. Section 3 looks at the incentives to be corrupt. Section 4 sets the government's decision problem while section 5 calculates the tax revenues and obtains optimal auditing intensity for each wage regime. In Section 6, there is pair-wise net revenues comparison for different wage regimes. Section 7 examines the comparative statics and section 8 concludes.

2 Description of the Economy

There is a constant population N of infinitely lived, risk-neutral agents. Agents are of two sorts: θN are corruptible and $(1-\theta)N$ are honest. An honest agent regards his integrity as priceless and thus does not offer/take bribe for any material reward. Agents are divided into two groups of citizens – households, of whom there is a fixed measure of n, and to service a population of n potential tax payers, the government requires m tax inspectors (which we normalize to one). Households are differentiated according to differences in their labor endowments that determine their relative incomes and their relative propensities to be taxed. Specifically, we assume that a fraction $\mu \in (0,1)$, of households are endowed with $\varepsilon > 1$ units of labor (high income) and are liable to pay tax τ, while the remaining fraction $(1-\mu)$ are endowed with one unit of labor (low income) and owe no tax. The government knows μ without knowing which household actually owes any tax. Taxes are collected by tax inspectors on behalf of the government. For simplicity, we assume that tax inspectors are exempt from taxes i.e. they are low income type. Each tax inspector has one unit of labor endowment and is responsible for collecting taxes from $\frac{n}{m}$ households. Corruption arises from the incentive of a tax inspector to conspire with a household to conceal information (the household's income) from the government. In doing so, the tax inspector expects to gain from his acceptance of a bribe and the household expects to gain from its evasion of tax. A fraction $\gamma \in (0,1)$ of tax inspectors are corruptible in this way, while the remaining fraction $(1-\gamma)$ are non-corruptible. There are selection effects; γ can be different from θ (the proportion of corruptible agents). γ will be equal to $\theta \in (0,1)$ if tax inspectors are at least offered a wage equal to their outside option (reservation wage) and $\gamma = 1$ if they are offered a wage less than their outside option.[6] Furthermore, a tax inspector who is corruptible may or may not be corrupt, i.e. there are incentive effects. There is a fraction $\lambda \in (0,1)$ of such tax inspectors who will actually be corrupt, while the remaining fraction $(1-\lambda)$ will stay honest.

2.1 Corruption

Corruption takes place when a corruptible high income household conspires with a corruptible tax inspector to declare him as a low income household. For this, a corruptible tax inspector demands b as a bribe to conceal this information from the government. With probability $\theta\mu$, a corruptible tax inspector matches with a corruptible tax payer who owes tax τ. The total expected bribe income of a corrupt tax inspector will be $b\theta\mu n$. Since, corruption is illegal; a tax inspector who is corrupt may try to remain inconspicuous by hiding his illegal income by investing this income differently from legal income and/or by altering his patterns of spending. These activities typically entail costs in one form or another. For

[6] If the government sets public wage below the private wage, no one honest would be prepared to become tax inspector.

purposes of the present analysis, we make a simple assumption that a tax inspector who is corrupt spends a fraction $\beta \in (0, 1)$ of his bribe income to conceal his income. Given this, the total bribe income of corrupt tax inspector is

$$B = (1 - \beta)b\theta\mu n \quad (1)$$

β can be thought as a parameter measuring the institutional quality (i.e. Rule of law). It can be explained as an indicator representing the cost of laundering dirty money (bribe income). The closer the β is to 1, the more efficient are the institutions, and the more costly would be concealing illegal income.

Each corruptible tax inspector faces a probability p of being caught. What determines the chances of being caught is of the central importance here. Contrary to Besley and McLaren (1993) who assume exogenous probability of being caught, we have an endogenous monitoring technology which depends on two factors with opposing effects. First, any probability of being caught must imperatively depend on the government's on-job audit intensity. An intensive auditing would imply higher chances of being detected. Second, tax inspectors usually do not operate on their own but are influenced by their reference groups such as colleagues and friends. It is plausible to imagine that if many of them are corrupt, it is less likely that a corrupt tax inspector will be exposed off. On the contrary, if most of them are honest, it is almost certain that, any one who deviates will immediately be identified. Taking both factors into account, we set a monitoring technology

$$p = \sigma(1 - \alpha\theta\lambda\gamma) \quad (2)$$

where σ is audit intensity set by the government and α is a sensitivity parameter measuring the impact of peer-effects on probability of being caught. In the first part of the paper, we let $\alpha = 0$ and solve the model where probability of being caught is solely determined by the audit intensity set by the government. In the second part, we set $\alpha = 1$ and allow for the impact of peer-effects on probability of being caught. $\theta\lambda\gamma$ is a number of tax inspectors that engage in corruption with a negative sign implying that when many are corrupt, the probability of being caught is lower. This generates a strategic complementarity in decision making of tax inspectors. A higher number of corrupt tax inspectors undermine the capacity of internal investigation units, which increases the expected gains for others. The role of strategic complementarity in monitoring technology (i.e. probability of detection decreases with the fraction of corrupt tax inspector λ) has significant implications for the equilibrium of corruption. The decision of a corruptible tax inspector to be corrupt (honest) will increase (decrease) the incentives for others, which may generate multiple equilibria. We assume that if a conspiracy between a tax inspector and a household is exposed, tax inspector loses all his income (wage plus bribes) and household is forced (legally) to pay back its taxes. Obviously, the optimal policy could include some penalty for tax evading households but that is not the focus here.[7]

2.2 Households

Households receive income I and their utility is a linear function of their expected income, i.e. they are risk neutral. They earn wage w by supplying their labor to private sector. A household with one unit of labor endowment earns a labor income w (private wage) and is exempt from tax. A household with $\varepsilon > 1$ units of labor endowment earns a labor income εw and is liable to pay tax τ. The honest high income households, of whom there is a fraction $(1-\theta)$, do not evade taxes and their income is $\varepsilon w - \tau$. Whereas, the corruptible high income households may or may not conspire with tax inspectors to declare them as low income. If not, then its income is $\varepsilon w - \tau$, and if so, then its income is uncertain and depends on the probability of being caught and the bribe paid to tax inspector. With probability p their conspiracy is exposed and with probability $1-p$, a household and a tax inspector are successful in their conspiracy. Given this, the expected income of a high income household is

$$E(I;b) = \begin{cases} \varepsilon w - \tau & \text{if } b = 0 \\ \varepsilon w - b - p\tau & \text{if } b > 0 \end{cases} \tag{3}$$

where $b > 0$ implies that the household is involved in corruption.

2.3 Tax inspectors

Tax inspectors differ in their behavior in public offices. A fraction $(1-\gamma)$ who are honest, do not demand bribes and earn income w_g by working for the government, where w_g is a wage offered in public sector. While others γ, may or may not be corrupt; if not, their income is w_g, if so, their income is uncertain and depends on the chances of being caught, the bribe they receive and the cost they incur to conceal their bribe income. With probability p, their conspiracy with high income household is exposed and they lose their income (wage plus bribes). Given this, the expected income of a corruptible tax inspector is

$$E(I;b) = \begin{cases} w_g & \text{if } b = 0 \\ (1-p)(w_g + B) & \text{if } b > 0 \end{cases} \tag{4}$$

where B is given by (1). Equation (4) implies a limited liability of tax inspectors i.e. they can only lose what they earn. Introducing any fines would increase the expected loss of being corrupt and thus would reduce the incentives to be corrupt but it would not alter our qualitative results.

[7] Introduction of fines will make corruption more expensive but will not alter our qualitative results.

PART I: without peer-effects

In this part we solve the model with $\alpha = 0$ which implies that probability of being caught is solely determined by the audit intensity set by the government. This allows us to focus only on the endogenous auditing and to analyze the trade-off between auditing and efficiency wages without any peer-effect.

3 Incentives to be corrupt

A dishonest high income household will conspire with a corruptible tax inspector and will offer him bribe if its expected income with bribe is at least equal to its income net of tax paid. From (3), the maximum bribe that a high income household may be willing to offer is

$$b^* = \tau(1 - p) \tag{5}$$

Equation (5) implies that a corruptible household is willing to pay no more than what it expects to save from its tax evasion. Given b^*, a corruptible tax inspector may be corrupt and may exploit his office if doing so earns him higher utility than otherwise. His expected income is given by (4); he would be corrupt only if his expected income with corruption is higher than his income without corruption.

A corruptible tax inspector will only be corrupt if

$$(1 - p)\left[w_g + (1 - \beta)b^*\mu n\theta\right] \geq w_g$$

By substituting in for b^* from equation (5), the incentive compatibility constraint of a tax inspector becomes

$$\frac{(1 - p)^2(1 - \beta)\tau\mu n\theta}{p} \geq w_g \tag{6}$$

The condition in (6) is the incentive compatibility constraint (ICC) for a corruptible tax inspector who decides to be corrupt. A corruptible tax inspector will opt to be corrupt if (6) is satisfied, and if not, he will stay honest. Intuitively, a tax inspector is more likely to be corrupt; the less he expects to lose in his legal income if he is caught and the more he expects to gain in illegal income if he is successful in corruption. By substituting in for $p = \sigma$, we can demarcate different equilibrium conditions as

$$\lambda = \begin{cases} 1 & \forall \ w_g < f(\sigma) \\ 0 & \forall \ w_g \geq f(\sigma) \end{cases} \tag{7}$$

where $f(\sigma) \equiv \frac{(1-\sigma)^2\tau\mu ns}{\sigma}$ and $s = \theta(1 - \beta)$.

The equilibrium condition in (7) highlights the role of wage incentives for the determination of corruption. The intuition behind the above condition is that when public sector wages are higher than the expected gains of corruption, even a potentially corruptible tax inspector would stay honest. On the contrary, when wages are low, every corruptible tax inspector would be corrupt. It is important to note that the threshold of wages that demarcate equilibria in (7) is endogenous and depends on the audit intensity. Thus a wage that ensures no-corruption (efficiency wage) will also be endogenous. A crucial factor for the determination of the level of efficiency wage would be the audit intensity set by the government. Thus, contrary to the previous literature, here, auditing will have a dual role where apart from its direct negative impact on the incentives of corruption, it will also complement with wage incentives.

4 The government's problem

The government collects taxes from high income households by levying lump-sum tax τ. It employs tax inspectors to work on its behalf and pays them a salary w_g. It investigates tax inspectors with intensity σ, which costs it $c\sigma$ of its aggregate tax revenues $\tau\mu n$.[8] This is in line with the deterrence theory that increasing risk of prosecution requires more prosecutorial resources.[9] As in Besley and McLaren (1993), the government maximizes its tax revenues net of administrative costs. Apart from what the government does in their model (i.e. optimal public wage policy), here, not only it chooses an optimal wage policy but it also chooses the optimal audit intensity. Since auditing is costly, the government optimizes it by looking at the additional revenues it fetches and the costs associated with it. The government optimizes audit intensity σ, and offers a wage w_g which yields it higher net revenues. We consider three possible wage strategies for the government. First, it might pay an efficiency wage $w_g = w^e$, which deters bribery and nobody behaves dishonestly. Second, it might pay a reservation wage $w_g = w$ (outside option), which attracts a mixture of honest and dishonest agents. Third, it can pay a capitulation wage $w_g = w^c$, which is below the reservation wage and attracts only corruptible agents.

Corruption takes place when dishonest tax inspector matches with dishonest household who owes tax, τ. With probability $(1-\theta)(1-\lambda\gamma)$, an honest household matches with an honest tax inspector; with probability $(1-\theta)\lambda\gamma$, an honest tax payer encounters a corruptible tax inspector, and with probability $\theta(1-\lambda\gamma)$, a corruptible tax payer meets an honest tax inspector. In all three cases, households declare their true type and submit $\tau\mu n(1-\theta\lambda\gamma)$ taxes to the government. Whereas, with probability $\theta\lambda\gamma$, a corruptible tax payer finds a corruptible tax inspector and they do not submit taxes. The government

[8] A cost function proportional to $\tau\mu n$ helps us to avoid size effects. Further, we choose linear cost function to get analytical solution, our qualitative results will not change by generalizing it to any increasing cost function.

[9] Becker and Stigler (1974) do not explicitly model it but they implicitly assume that probability of being caught is function of the governmental resources spent on detection. Alt and Lassen (2010) find that the allocation of prosecutorial resources is endogenous for the United States.

sets on-job auditing, and with probability p, a conspiracy of a tax inspector with a corrupt household is exposed; household is forced to pay its tax liability and tax inspector loses his wage and bribe income, B. On its expenditure, the government pays a wage w_g and incurs a cost $\sigma c\tau\mu n$ to audit tax inspectors. Given this, net revenues of the government are

$$NR = \tau\mu n(1-\theta\lambda\gamma) + p\tau\mu n\theta\lambda\gamma + \ pB\theta\lambda\gamma - w_g\left(1 - p\theta\lambda\gamma\right) - c\sigma\tau\mu n \tag{8}$$

5 Tax revenues and optimal auditing

The government can offer three different wage schemes: the reservation wage, the efficiency wage or the capitulation wage. Government's decision problem is two dimensional: first, it optimizes the audit intensity for every wage scheme and then it offers a wage scheme that generates higher net revenues. Consider first the optimization problem when the government offers reservation wages i.e. outside option $w_g = w$.

5.1 Reservation wages

When the government offers reservation wages i.e. $w_g = w$, there would be a mixture of both honest and corruptible agents who join tax offices. The proportion of corruptible tax inspectors γ is equal to the proportion of corruptible agents in the society, $\gamma = \theta$. Tax offices comprise the pool of corruptible and honest tax inspectors and from (6) the incentives to be corrupt would solely be determined by the monitoring technology. Since, incentives to be corrupt depend on monitoring; the government can eliminate corruption by tightening the audit up to a level where expected gains of corruption fall short of its losses. We call it a "sheer stick" strategy where the government offers a reservation wage but controls corruption by tightening the audit. From the ICC in (6), the audit intensity that ensures all corruptible tax inspectors stay honest is $\sigma^* \equiv \frac{2s+x-\sqrt{4sx+x^2}}{2s}$, where $x = \frac{w}{\tau\mu n}$ is a ratio of wage bill to tax base. The threshold σ^* sets the expected gains of corruption equal to the reservation wage, $f(\sigma) = w$. Thus, for any audit intensity greater or equal to σ^*, every corruptible tax inspector will stay honest and for any audit intensity less than σ^*, every corruptible tax inspector will be corrupt.

Given this, when the government offers reservation wages, there can be two different equilibria demarcated by the audit intensity

$$\lambda = \begin{cases} 1 & \forall\ \sigma < \sigma^* \\ 0 & \forall\ \sigma \geq \sigma^* \end{cases} \tag{9}$$

Proposition 1 $\forall\ \sigma < \sigma^*$, *there is a unique equilibrium such that all corruptible tax inspectors are corrupt, and* $\forall\ \sigma \geq \sigma^*$, *there is a unique equilibrium such that all corruptible tax inspectors stay honest.*

Since incentives to be corrupt $f(\sigma) \equiv \frac{(1-\sigma)^2 \tau\mu n s}{\sigma}$ decreases with audit intensity σ, for any audit intensity less than σ^*, expected gains of corruption always exceeds its expected losses, the ICC will always be satisfied and in equilibrium all corruptible tax inspectors will be corrupt. While for any audit intensity greater or equal to σ^*, the ICC is never satisfied and in equilibrium all corruptible tax inspectors will stay honest.

Proposition 1. implies that when government offers reservation wages, there can be two different equilibria demarcated by the audit intensity. Thus, net revenues of the government will be different in two equilibria. In the following, we study in detail the two sub cases of equilibria given in (9) and the corresponding tax revenues.

Consider first the case where the government offers reservation wages and the audit intensity is low such that in equilibrium all corruptible tax inspectors are corrupt.

5.1.1 Reservation wages with low audit

When audit intensity is low i.e. $\sigma < \sigma^*$, the ICC is always satisfied. In equilibrium all corruptible tax inspectors are corrupt. In this case, government's net revenues in (8) are

$$NR^L = \tau\mu n(1-\theta^2) + p\tau\mu n\theta^2 + p(1-\beta)(1-p)\tau\mu n\theta^3 - w(1-p\theta^2) - c\sigma\tau\mu n$$

By substituting in for p we get

$$NR^L = \tau\mu n(1-\theta^2) + \sigma\tau\mu n\theta^2 + \sigma(1-\sigma)\tau\mu n\theta^2 s - w(1-\sigma\theta^2) - c\sigma\tau\mu n$$

The government maximizes NR^L with respect to audit intensity. The first order conditions yield

$$FOC \qquad \tau\mu n\theta^2 + \tau\mu n\theta^2 s - 2\sigma\tau\mu n\theta^2 s + w\theta^2 - c\tau\mu n = 0$$

Increasing audit intensity has both positive and negative effects on net revenues. All positive effects arise from the fact that higher intensity increases the probability of being caught. With higher probability of being caught, corruptible households will be more inclined toward paying their taxes. There are also negative effects as increasing audit increases the cost of audit. Second, there is also an indirect effect as higher audit implies lower probability of success, which implies lower expected bribes ($b = \tau(1-p)$) and thus the lower amount of bribe income confiscated by the government.

The audit intensity that maximizes NR^L is

$$\sigma^L = \frac{\theta^2(1+s+x)-c}{2\theta^2 s}$$

The first and obvious implication of the optimal audit σ^L is that it decreases with cost of auditing and is eventually equal to zero for $c = c_l \equiv \theta^2(1+s+x)$. When cost of auditing is less than c_l, it is always optimal to audit, while for any cost greater than or equal to c_l, it would be optimal not to audit tax inspectors (i.e. $\sigma^L = 0$).

By substituting in for σ^L, the corresponding net revenues are

$$NR^L = \begin{cases} \tau\mu n\left(d - x + \frac{(\theta^2(1+s+x)-c)^2}{4\theta^2 s}\right) & \text{for } c < c_l \\ \tau\mu n\,(d-x) & \text{for } c \geq c_l \end{cases} \tag{10}$$

where $d = 1-\theta^2$. Given the optimal audit intensity, we can now deduce a condition such that there exists an equilibrium where all corruptible tax inspectors are corrupt. From Proposition 1, the equilibrium where all corruptible tax inspectors are corrupt exists when the audit intensity is lower than the threshold σ^*. Since σ^L decreases with c, there exists a $c^* \equiv \theta^2(1-s+\sqrt{4sx+x^2})$ such that $\sigma^L = \sigma^*$. $\forall c > c^*$, $\sigma^L < \sigma^*$ and there exists an equilibrium where all corruptible tax inspectors are corrupt.

5.1.2 Reservation wages with high audit

Consider now the case where the government offers reservation wages and monitor tax inspectors with high audit. When the government puts higher audit, precisely when $\sigma \geq \sigma^*$, the ICC is never satisfied. In equilibrium all tax inspectors are honest and the government receives all tax revenues.

The corresponding net revenues with high audit are

$$NR^H = \tau\mu n\,(1 - x - c\sigma^*) \tag{11}$$

5.2 Efficiency wages

To find the efficiency wage, we employ the standard technique of equating tax inspector's expected income when he is corrupt with the income when he is honest. From equilibrium condition in (7), the wage that deters bribery is $f(\sigma)$

$$w^e = \frac{(1-\sigma)^2\,(1-\beta)\tau\mu n\theta}{\sigma}$$

Given this we define efficiency wage as a maximum of reservation wage and $f(\sigma)$, $w^e = \max\{w, f(\sigma)\}$. This implies that the efficiency wage is at least equal to the outside option. The efficiency wage is endogenous and it depends on the model parameters especially on the optimal audit intensity set by the government. The comparative statics of efficiency wage can be obtained by differentiating it with respect to different parameters. First, for quite natural reasons, higher the audit intensity is, lower will be the efficiency wage. It is important to note that if there is no auditing ($\sigma = 0$), there exists no finite wage that makes tax inspector behave honestly. Intuitively, when the government does not audit, the probability of being caught is zero, and the expected gains of corruption will always be greater than the expected losses. On the contrary, a higher auditing implies higher probability of being caught and thus a lower expected income of corruption. With lower expected income of corruption, a smaller compensation would be required to make corruptible tax inspectors behave honestly. In this way, auditing complements with wage incentives; i.e. the higher the auditing is, the lower will be the required compensation to ensure honesty.

Further, the probability of a matching of corruptible tax inspector with a corruptible tax payer increases the size of efficiency wage. Higher chances of matching with dishonest tax payer increase expected bribe income, thus higher compensation would be required to make them honest. Thus, efficiency wage will be more expensive in societies with higher proportion of corruptible agents. On the other hand, cost of laundering bribe income β reduces the efficiency wage. With better rule of law, tax inspectors would spend a higher share of its income to remain inconspicuous implying that lower compensation would be required to make them honest.

When the government pays efficiency wages, $\gamma = \theta$ and in equilibrium all tax inspectors will be honest, $\lambda = 0$. In this case, the government receives all tax revenues $\tau \mu n$. The government's net revenues with efficiency wages are

$$NR^e = \tau \mu n - w^e - c\sigma\tau\mu n$$

By substituting in for w^e

$$NR^e = \tau \mu n - \frac{(1-\sigma)^2 \tau \mu n s}{\sigma} - c\sigma\tau\mu n \tag{12}$$

The first order conditions yield

$$FOC \quad \frac{\tau \mu n s}{\sigma^2} - \tau \mu n s - c\tau\mu n = 0$$

Increasing audit intensity increases the probability of being caught which reduces the efficiency wage, thus, it increases the net revenues. On the other hand, increasing auditing requires higher resources for auditing, which implies higher costs, thus, it decreases the net revenues.

The optimal audit intensity that maximizes NR^e is

$$\sigma^e = \frac{\sqrt{s}}{\sqrt{s+c}}$$

Since efficiency wage is $w^e = \max\{w, f(\sigma)\}$; given the $f(\sigma)$, we know that for $\sigma = \sigma^*$, $w = f(\sigma)$ and for any $\sigma < \sigma^*$, $f(\sigma) > w$. Given the optimal audit σ^e, we can deduce a precise condition which demarcates w and $f(\sigma)$ in terms of size. Since σ^e decreases with c and σ^* does not depend on c, there exists a $c^{**} \equiv \left(\frac{4s^3}{(2s+x-\sqrt{4sx+x^2})^2} - s\right)$ such that for $c = c^{**}$, $\sigma^e = \sigma^*$ and for any $c > c^{**}$, $\sigma^e < \sigma^*$ implying that $f(\sigma) > w$.

Given this, the corresponding net revenues with efficiency wage are

$$NR^e = \begin{cases} \tau\mu n\left(1 + 2s - 2\sqrt{s}\sqrt{s+c}\right) & \text{for } c \geq c^{**} \\ \tau\mu n\left(1 - x - c\sigma^*\right) & \text{for } c < c^{**} \end{cases} \tag{13}$$

5.3 Capitulation wages

The third wage regime occurs when the government offers a wage that is lower than the reservation wage. This is a situation when the government gives up against corruption and does not try to deter bribery. Capitulation wage is a minimum wage at which the expected income of a corruptible tax inspector is equal to his outside option, $(1-p)(w^c + B) = w$. This gives a capitulation wage

$$w^c = \frac{w}{1-\sigma} - (1-\sigma)(1-\beta)\tau\mu n\theta$$

By looking at the comparative statics; capitulation wage increases with audit intensity and if there is no audit, it is equal to reservation wage less of bribe income. An intensive audit implies a lower expected bribe income implying a lower capitulation wage. With the same reasoning, capitulation wage will be higher with higher β. Furthermore, the capitulation wage decreases with probability to meet corruptible tax payer, which implies that the role of capitulation wages increases in societies with higher proportion of corruptible agents.[10]

With capitulation wages, there are only corruptible tax agents who accept to work in tax offices, i.e. $\gamma = 1$. Contrary to BM where in capitulation wage regime, the only source of revenues is a tax recovered through successful monitoring, here, apart from the successful monitoring, the honest tax

[10] By looking at the capitulation wage, one can see that it may be negative (when the bribe income is higher than the legal income, w). The special case of negative wages can be thought as a sister concept of "tax farming" in ancient Rome. In ancient Rome, tax farmers were often utilized to collect provincial taxes. Tax farmers paid in advance for the right to collect taxes in particular area. In fact, tax farming was quite profitable, tax farmers used to collect more than what they paid to the government and it became a major investment vehicle for wealthy and influential citizens (Levi 1988).

paying households would refuse paying bribes to corrupt tax inspectors and they would submit their true taxes.

Given this, the government's net revenues with capitulation wages are

$$NR^c = \tau\mu n(1-\theta) + p\tau\mu n\theta + p(1-\beta)(1-p)\tau\mu n\theta^2 - w^c(1-p\theta) - c\sigma\tau\mu n$$

By substituting in for w^c and p,

$$NR^c = \tau\mu n(1-\theta) + \sigma\tau\mu n\theta - \tau\mu ns(1-\sigma) - \frac{w(1-\sigma\theta)}{1-\sigma} - c\sigma\tau\mu n$$

The first order conditions yield

$$FOC \qquad \tau\mu n\theta - \tau\mu ns - \frac{w(1-\theta)}{(1-\sigma)^2} - c\tau\mu n = 0$$

Increasing audit increases the probability of getting caught, which increases the tax revenues. On the other hand, more intensive auditing requires more resources that increases the cost and reduces the net revenues. Furthermore, an increase in audit lowers the probability of success, which results in lower expected income of bribes. Since, the capitulation wage decreases with expected bribes; a lower expected bribe income implies a higher capitulation wage to be paid. The optimal audit intensity that maximizes NR^c is

$$\sigma^c = 1 - \sqrt{\frac{ax}{\beta\theta - c}}$$

where $a = 1-\theta$. The optimal audit intensity σ^c decreases with c, and there exists $c^c \equiv \beta\theta - ax$ such that for cost of audit greater than c^c, it is optimal not to audit.

Given this, the maximum net revenues of the government with capitulation wages are

$$NR^c = \begin{cases} \tau\mu n(1 - x\theta - c - 2\sqrt{ax}\sqrt{\beta\theta - c}) & \text{for } c < c^c \\ \tau\mu n\,(1 - x - \beta\theta) & \text{for } c \geq c^c \end{cases} \tag{14}$$

6 Net revenues comparisons

Having found the optimal audit intensities and the net tax revenues for different wage schemes, the next task remains to look at the relative performance of each wage regime in terms of revenues generation. We do so through pair-wise comparison of the capitulation wage with other wage regimes, by looking at the decision point where the government is indifferent between capitulation wage and other wage regimes. Capitulation wage in (14) generates two different levels of net revenues i.e. when it is optimal to audit and when it is optimal not to audit. Consider first the case when it is optimal to audit (i.e. $\sigma^c > 0$).

Since all tax inspectors are corruptible, the audit will not have any effect on tax compliances as the only tax payers are the honest households. The only positive effect on revenues will come through an increase in the amount of fines collected from the corrupt tax inspectors who are caught. Generally speaking, the central idea behind any auditing effort is to increase the tax compliances and it can never be just collecting fines. Without loss of generality, we can assume that when the government offers capitulation wages, it knows that only corruptible agents will be tax inspectors and putting any auditing will not increase tax compliances, it decides not to audit. Even when it is optimal to audit, reservation wage with high audit intensity always generates more revenues than the capitulation wages.

Lemma 1. *Reservation wage with high audit always dominates capitulation wage for any* $c < c^c$.

Proof. see Appendix 1-A. ■

This has very intuitive implication; when it is less costly to audit, the government is always better-off putting high audit. However, this might not be the case when the cost is higher, precisely when $c \geq c^c$. In the remaining of this paper, the corresponding revenues with capitulation wages are those where it is optimal not to audit i.e. $\sigma^c = 0$.

In the following we see when will it be optimal for the government to accept corruption and do not deter bribery.

6.1 Capitulation vs Efficiency

By comparing (13) and (14), we get a threshold of c such that both wage regimes generate equal revenues. First, we compare when $w^e = \frac{(1-\sigma)^2 \tau\mu n s}{\sigma}$; capitulation wages yield higher net revenues than efficiency wages for any $c > \widehat{c} \equiv \left(\frac{(2s+x+\beta\theta)^2 - 4s^2}{4s}\right)$. The $\widehat{c}$ demarcates the region where capitulation wages dominate efficiency wages in terms of revenues generation. The comparative statics can be obtained by differentiating $\widehat{c}$ with respect to x. The lower the x is, the lower is $\widehat{c}$ and the greater will be the region where capitulation wages dominate the efficiency wages. The relationship between $\widehat{c}$ and x can better be understood by decomposing $x = \frac{w}{\tau\mu n}$; it increases with the reservation wage and decreases with the tax rate. The impact of the reservation wage on capitulation and efficiency wage regimes is very straightforward; the reservation wage has no effect on efficiency wage regime and it has a negative impact on net revenues in capitulation wage regimes. Since capitulation wage $w^c = \frac{w}{1-\sigma} - (1-\sigma)\tau\mu n s$ increases with w; the higher reservation wage would imply higher capitulation wage and lower net revenues.

Whereas, the tax rate affects both wage regimes through its direct and indirect channels. The direct effect arises as an increase in tax rate increases the total volume of tax and the indirect effect takes place through its effect on wages (both on efficiency and on capitulation). The increase in tax rate has positive direct effect on revenues with capitulation wages as an increase in tax rate increases the tax volume. Whereas, for the efficiency wages; it has a positive (increase in tax volume) and a negative (increase in total cost of auditing) effect on the net revenues. The direct positive effect (increase in tax volume) is greater for the efficiency wages as compared to the capitulation wages as in the later only honest households pay taxes. On the contrary, the indirect effect of increase in tax rate has a negative effect on efficiency wage regime and a positive effect on capitulation wage regime. The higher tax rate implies a higher expected bribe ($b = \tau(1-p)$) that has opposing effects on two wage equations. For the efficiency wage, the higher the expected bribe is, the higher will be the efficiency wage thus the higher will be the wage bill, and the lower will be the net revenues. Whereas, for the capitulation wage, higher expected bribes imply lower capitulation wage (lower wage bill) and thus the higher net revenues. By taking into account the implications of both w and τ, the lower the x (lower $w$or/and higher τ) is, the greater would be the role of capitulation wages.

Consider now the case when the efficiency wage is equal to reservation wage. This is similar to offering the reservation wage with high audit intensity (sheer stick). Capitulation wages will yield higher net revenues than the efficiency wages for any $c > c_h \equiv \frac{2s\beta\theta}{2s+x-\sqrt{4sx+x^2}}$. The threshold c_h increases with x implying that lower the x is, the larger will be the region where capitulation wages dominate the efficiency wages. A decrease in x (decrease in w or/and increase in τ) increases net revenues with capitulation wages. Since capitulation wage decreases with w, any decrease in w reduces the wage bill and increases the net revenues. Whereas an increase in tax rate always increases tax volume and the net revenues. For the efficiency wages, any decrease in w increases the net revenues by directly reducing the wage bill. While it has also an opposite indirect impact as the lower w implies a higher audit intensity $\sigma^* \equiv \frac{2s+x-\sqrt{4sx+x^2}}{2s}$, thus lower net revenues. For changes in tax rate, there are both positive and negative effects on net revenues with efficiency wages. The higher the tax rate is, the higher will be the tax volume but also the higher will be the cost. The indirect effect comes through the audit intensity σ^*; since σ^* decreases with x, the higher the tax rate is, the higher will be the audit intensity, thus the lower will be the tax revenues.

Proposition 2 *There exists* $\widehat{x} \equiv -2s + \sqrt{4s^2 + \beta^2\theta^2}$ *such that* $\forall x \leq \widehat{x}$, *capitulation wages generate higher revenues than efficiency wages* $\forall c > c_h$, *and* $\forall x > \widehat{x}$, *capitulation wages generate higher revenues than efficiency wages* $\forall c > \widehat{c}$.

Proof. see Appendix 1-B. ■

The immediate implication of Proposition 2 is that not only there is interplay between the honest and the corrupt equilibrium but also there is interplay between the policies that achieve the honest equilibrium. The government can deter corruption by two different policy instruments. The honest equilibrium can be achieved either by wage incentives (carrot/stick mix strategy) i.e. the government pays wage $w^e = \frac{(1-\sigma)^2 \tau \mu n s}{\sigma}$ with some audit, or by the sheer stick strategy where it pays outside option but puts tighter audit which forces all corruptible tax inspectors to behave honestly. What distinguishes one policy option from the other in terms of revenue generations is the level of x. For any $x < \widehat{x}$, the government always generates higher revenues by sheer stick strategy than the wage incentives strategy. Between sheer stick and the capitulation wages, which one generates higher revenues depends on the cost of audit. For any cost less than c_h, sheer stick always generates higher revenues than the capitulation wages, and it is optimal (in terms of higher revenues) for the government to deter corruption. While for any cost greater than c_h, it is optimal for the government to give up against corruption and offer the capitulation wages. On the other hand, when $x > \widehat{x}$, the government will generate higher revenues with wage incentives than with the sheer stick. In comparison with capitulation wages, the government will go for the corruption deterrence for any cost of audit less than $\widehat{c}$, and it will give up against corruption if the cost is greater than the threshold $\widehat{c}$.

Furthermore, it is important to note that the threshold $\widehat{x}$ that demarcates sheer stick strategy from wage incentives increases with the proportion of corruptible agents, θ. This implies that the role of sheer stick strategy is greater in highly corruptible societies than in less corruptible societies. Whereas, the role of incentives based strategies would be greater in less corruptible societies than in highly corruptible societies.

6.2 Capitulation vs Reservation

Consider first the case of reservation wages with low audit where in equilibrium all corruptible tax inspectors are corrupt.

6.2.1 Low audit

From (10), for $\forall c \geq c_l$, it is optimal not to audit, i.e. $\sigma^L = 0$. Consider first the case when there is no auditing with both reservation and capitulation wages. The capitulation wage always yields higher net revenues than the reservation wages for any $\theta > \beta$. Whereas in the case when with reservation wages, it is optimal to audit i.e. $\sigma^L > 0$, there exists a threshold $\widetilde{c} \equiv \theta^2(1 + s + x - 2\sqrt{(1-\beta)(\theta-\beta)})$ such that capitulation and reservation wages yield equal net revenues. And for any $c > \widetilde{c}$, capitulation wages generate more net revenues than reservation wages.

Proposition 3 *For $\sigma^L = 0$, capitulation wages yield higher net revenues than reservation wages for any*

$\theta > \beta$. For $\sigma^L > 0$, there exists $\widetilde{x} \equiv \frac{\left(s-\sqrt{(1-\beta)(\theta-\beta)}\right)^2}{\sqrt{(1-\beta)(\theta-\beta)}}$ such that for any $x > \widetilde{x}$, capitulation wages always yield higher net revenues. And for any $x < \widetilde{x}$, capitulation wages yield higher net revenues for $\forall c > \widetilde{c}$, whereas reservation wages yield higher net revenues for $\forall c < \widetilde{c}$.

Proof. see Appendix 1-C. ■

When it is costly to audit tax inspectors such that it becomes optimal for the government not to audit, the capitulation wage regime generates more revenues than the reservation wages if the proportion of corruptible agents θ is greater than the cost of concealing bribe income β. In countries with endemic corruption, this condition seems satisfied. Since, corruption takes place by a matching of the corruptible households with the corruptible tax inspectors, the higher θ implies higher chances of matching, thus the higher corruption. In other words, corruption is more likely feature of the societies with higher θ. On the other hand, it should be easier to conceal bribe income when there is a wide-spread corruption. Thus higher θ is associated with lower β and vice-versa.

In the case when $\sigma^L > 0$, which wage regime generates higher revenues crucially depends on the reservation wage and tax base. Capitulation wage regime generates higher revenues for any $x > \widetilde{x}$. When x is less than $\widetilde{x}$, reservation wages with low audit will generate higher revenues than capitulation wages for any cost less than $\widetilde{c}$. The threshold $\widetilde{c}$ increases with x, implying that lower the x is, the lower will be $\widetilde{c}$, and the greater will be the region where capitulation wages generate higher revenues than the reservation wage.

6.2.2 High audit

When the government offers reservation wages and puts high audit, it is the same case when $w^e = w$ (sheer stick). For any $c > c_h$, capitulation wages would yield higher net revenues than the reservation wages with high audit.

7 Comparative statics

In the previous section we saw that depending on the cost of auditing and the ratio of wage bill to tax base, there are configurations where the government is better-off accepting corruption at the expense of higher net revenues. In this section, we put all results together and see when it is optimal for the government to prefer one wage regime over the others. There can be three possible scenarios with respect to corruption. If the efficiency wages generate higher revenues than other wage regimes, the government will offer efficiency wages and in equilibrium there is no corruption. On the other hand, if capitulation wages generate higher revenues, the government gives up against corruption, and in equilibrium all tax inspectors are corrupt. The third scenario is when the government generates higher revenues with reservation wages and there is a mixture of both corruptible and honest tax inspectors. Before going into a detailed comparison, we assume that $\theta > \beta$. This implies that when it is costly to audit such that $\sigma^L = 0$, the government is always better-off offering the capitulation wages than the reservation wages with low audit.

For revenues generation, which wage regime yields higher tax revenues crucially depends on the cost of audit c, the ratio of wage bill to tax base x and the proportion of corruptible agents θ. Consider first the situation when x is greater than the threshold $\widehat{x}$.

Proposition 4 *For* $1 \geq x > \widehat{x}$*;*

- *reservation wages with low audit are always dominated by other wage regimes.*
- $\forall c \in (0, c^{**})$*, reservation wages with high audit yield higher net revenues than other wage regimes.*
- $\forall c \in (c^{**}, \widehat{c})$*, efficiency wages yield higher net revenues than other wage regimes.*
- $\forall c > \widehat{c}$*, capitulation wages yield higher net revenues than other wage regimes.*

Proof. see Appendix 1-D. ■

This result has significant implications for the public policy. When reservation wage is higher or/and tax base is lower, the government is better-off by either completely eliminating corruption or not at all. There is no role for a policy that results in mixture of corruptible and honest tax inspectors in the tax offices. Thus, in the situation when x is high, the government would not offer reservation wages with low audit intensity. Moreover, whether it is better for the government to eliminate corruption or to give up against depends on the cost of auditing. When the cost of auditing is less than or equal to $\widehat{c}$, the government will eliminate corruption and when the cost of auditing is greater than $\widehat{c}$, the government will be better-off giving up against corruption. For eliminating corruption, the government has two policy options; sheer stick and wage incentives (carrot/stick mix). When the cost is lower than or equal to c^{**}, the government would be better-off offering the sheer stick strategy and for any cost of audit $c \in (c^{**}, \widehat{c})$, the wage incentives would be the dominant strategy. Thus for low cost of auditing; reservation wages with high audit, for the intermediate cost of auditing; efficiency wages and for the high cost of auditing; capitulation wages would be the dominant wage strategy.

Consider now the situation when x is smaller than the threshold $\widehat{x}$.

Proposition 5 *For $x \in (0, \widehat{x})$;*

- *reservation wages with low audit are always dominated by other wage regimes.*
- *efficiency wages are dominated by other wage regimes.*
- $\forall c \in (0, c_h)$*, reservation wages with high audit yield higher net revenues than other wage regimes.*
- $\forall c > c_h$*, capitulation wages yield higher net revenues than other wage regimes.*

Proof. see Appendix 1-B. ■

Contrary to the case when x is high, for a lower x, efficiency wages are either dominated by the sheer stick strategy or by capitulation wages. From the policy perspective, when the reservation wage (outside option) is low or/and tax base is high, the government generates higher revenues by offering the reservation wage with high audit when auditing is less costly, and by offering capitulation wages when auditing is more costly.

A lower x means a lower w or/and higher τ for a given population of taxable households μn. Consider first the impact of reservation wage; the reservation wage has no effect on revenues with efficiency wages, while it has positive effect on revenues with capitulation wages. The lower the reservation wage is, the lower will be the capitulation wage, and thus the lower will be the wage bill. For the reservation wage with high audit, there are two opposite effects; there is a direct positive effect as the lower the reservation wage is, the lower will be the wage bill thus the higher will be the net revenues. And there is an indirect negative effect as the lower the reservation is, the lower will be the x, the higher will be the audit intensity $\sigma^* = \frac{2s+x-\sqrt{4sx+x^2}}{2s}$, the higher will be the total cost of auditing ($c\sigma^*$), and thus, the lower will be the net revenues. Overall for reservation wages with high audit, the direct effect dominates the indirect one such that lower reservation wage is associated with higher revenues.

On the other hand, the tax rate has both direct and indirect effects for all three wage regimes. Both effects are positive for the capitulation wages and the reservation wages with high audit. Whereas for the efficiency wages, the direct effect is positive and the indirect effect is negative. Increasing tax rate increases the overall tax revenues for all wage regimes (direct effect). For capitulation wages, the higher the tax rate is, the lower will be the capitulation wage, and the higher will be net revenues (indirect effect). Similarly, for reservation wages with high audit when the tax rate is higher $\sigma^* = \frac{2s+x-\sqrt{4sx+x^2}}{2s}$ is lower, thus the total cost of audit ($c\sigma^*$) will be lower and net revenues will be higher. While for efficiency wages, this indirect channel has negative effect on the net revenues. The higher tax rate implies a higher efficiency wage, higher wage bill and thus lower net revenues.

Which of these two scenarios is more likely depends on the level of dishonesty, i.e. proportion of the corruptible agents, θ. The threshold $\widehat{x} \equiv \theta[-2(1-\beta)+\sqrt{4(1-\beta)^2+\beta^2}]$ that demarcates these two scenarios increases with θ. Thus higher the dishonesty is, the higher will be the $\widehat{x}$, and more likely would be the scenario where the efficiency wage strategy is dominated by other wages. This implies that the role of efficiency wages decreases in societies where the proportion of corruptible agents is higher. In these societies, wage incentive schemes would be very expensive and the government would opt either a sheer stick policy when the monitoring is less expensive or a capitulation wage policy when the monitoring is expensive.

PART II: with peer-effects

In this section we allow peer-effects affecting the probability of being caught (i.e. $\alpha = 1$), which implies that the effectiveness of any audit would now depend on the number of corrupt tax inspectors or on corruption itself. Thus, probability of being caught is $p = \sigma(1-\theta\lambda\gamma)$ and there is a strategic complementarity in the decision making of tax inspectors. Given this, the ICC in (6) will now become

$$\frac{(1-\sigma(1-\theta\lambda\gamma))^2\tau\mu ns}{\sigma(1-\theta\lambda\gamma)} \geq w_g \qquad (6-a)$$

The strategic complementarity in the decision making of corruptible tax inspectors determines the equilibrium level of corruption. Given the wage, w_g and the audit intensity σ, the incentive compatibility constraint in $(6-a)$ is a function of the proportion of corruptible tax inspectors who opt to be corrupt, λ. Given this, one can deduce a fraction $\lambda \in (0,1)$ of dishonest tax inspectors who are corrupt. Consider a $\lambda \in (0,1)$ for a given w_g and σ, such that $(6-a)$ is either satisfied with inequality or is not satisfied at all. Both of these situations can not be an equilibrium: in the first case, some of the corruptible tax inspectors choose not to be corrupt when it pays them to be corrupt, as a result λ would rise until $\lambda = 1$. In the second case, some of the corruptible tax inspectors opt to be corrupt while it does not pay them to be corrupt, as a result λ would decline until $\lambda = 0$. Thus, there can only be two equilibria where either all corruptible tax inspectors are corrupt or all of them stay honest.

Having said this, we can define two thresholds from the ICC in $(6-a)$ as a function of the audit intensity σ, $f(\lambda;\sigma)$. Consider first, if all tax inspectors were honest, then $\lambda = 0$ and the left hand side of $(6-a)$ is $f(0;\sigma)$, which represents the expected gains of corruption given that all other tax inspectors were honest. When $f(0;\sigma) > w_g$, the agent will be corrupt even if no one else is corrupt. Consider now if all tax inspectors were corrupt, $\lambda = 1$ and the left hand side of $(6-a)$ is $f(1;\sigma)$, which represents the expected gains of corruption given that all corruptible tax inspectors were corrupt. Given this, we can demarcate different equilibrium conditions as

$$\lambda = \begin{cases} 1 & \forall \; w_g < f(0;\sigma) \equiv \frac{(1-\sigma)^2 \tau \mu n s}{\sigma} \\ 0 & \forall \; w_g \geq f(1;\sigma) \equiv \frac{(1-\sigma d)^2 \tau \mu n s}{\sigma d} \\ 0 \text{ or } 1 & \forall \; f(1;\sigma) > w_g \geq f(0;\sigma) \end{cases} \qquad (7-a)$$

As it was the case with without peer-effects, the equilibrium condition in $(7-a)$ depends on the monitoring technology, which is endogenous. There are two main differences between (7) and $(7-a)$: first, because of strategic complementarity, there are multiple equilibria when public sector wages are at intermediate levels. Second, the size of wage that ensures honesty is bigger than the one without peer-effects (i.e. $f(1;\sigma) \geq f(\sigma)$) . In this way, introduction of peer-effects would make wage incentive based strategy more expensive.

The government problem is same as in (8). The equilibria of corruption when the government offers reservation wages will now depend on the audit intensity as well as on the strategic complementarity. From the ICC in $(6-a)$, the audit intensity that ensures that in equilibrium all corruptible tax inspectors stay honest is $\overline{\sigma} = \sigma^* \left(\frac{1}{d}\right) \equiv \frac{2s+x-\sqrt{4sx+x^2}}{2sd}$. The threshold $\overline{\sigma}$ sets the expected gains of corruption (given that every corruptible tax inspector is corrupt) equal to the reservation wage, $f(1;\sigma) = w$. Thus, for any audit intensity greater or equal to $\overline{\sigma}$, every corruptible tax inspector will stay honest irrespective of whether others are corrupt or honest. Similarly, there is a lower bound of audit intensity $\sigma^* \equiv \frac{2s+x-\sqrt{4sx+x^2}}{2s}$ (by setting $f(0;\sigma) = w$), such that any intensity less than this, the ICC is always satisfied and in equilibrium all corruptible tax inspectors will be corrupt.

Given this, when the government offers reservation wages, there can be three different equilibria demarcated by the audit intensity

$$\lambda = \begin{cases} 1 & \forall \; \sigma < \sigma^* \equiv \frac{2s+x-\sqrt{4sx+x^2}}{2s} \\ 0 & \forall \; \sigma \geq \overline{\sigma} \equiv \frac{2s+x-\sqrt{4sx+x^2}}{2sd} \\ 0 \text{ or } 1 & \text{if } \overline{\sigma} > \sigma \geq \sigma^* \end{cases} \qquad (9-a)$$

Proposition 6 *$\forall \; \sigma < \sigma^*$, there is a unique equilibrium such that all corruptible tax inspectors are corrupt, $\forall \; \sigma \geq \overline{\sigma}$, there is a unique equilibrium such that all corruptible tax inspectors stay honest. And for $\overline{\sigma} > \sigma \geq \sigma^*$, there are multiple equilibria.*

Note that the condition for the equilibrium in which all corruptible tax inspectors are corrupt is same as without peer-effects in (9). Strategic complementarity has two effects on the equilibrium of corruption: first, the size of audit intensity that ensures all tax inspectors behave honestly is bigger (i.e. $\overline{\sigma} > \sigma^*$).

Second, for the intermediate audit intensities, there are multiple equilibria. There can be an equilibrium where all corruptible tax inspectors stay honest or an equilibrium where all corruptible tax inspectors are corrupt. Which of these two equilibria occurs depends on the coordination of corruptible tax inspectors.

When the government offers reservation wages, there can be three different equilibria of corruption implying three different amounts of the tax revenues. The government optimizes its revenues in each of the three cases and sets the audit intensity that maximizes net revenues. Consider first the case when the government offers reservation wages with low audit such that in equilibrium all corruptible tax inspectors are corrupt. The optimal audit intensity that maximizes net revenues is $\sigma^L = \frac{d\theta^2(1+s+x)-c}{2d^2\theta^2 s}$, and the corresponding revenues are

$$NR^L = \begin{cases} \tau\mu n\left(d - x + \frac{(d\theta^2(1+s+x)-c)^2}{4d^2\theta^2 s}\right) & \text{for } c < c_l' \\ \tau\mu n\,(d-x) & \text{for } c \geq c_l' \end{cases} \qquad (10-a)$$

where $c_l' = (1-\theta^2)c_l$.[11] And the equilibrium where all corruptible tax inspectors are corrupt exists for any $c \geq c^{*\prime} \equiv (1-\theta^2)c^*$.

In the case when the government offers reservation wages and sets a high audit intensity such that in equilibrium all corruptible tax inspectors behave honestly, the corresponding net revenues are

$$NR^H = \tau\mu n\,(1 - x - c\overline{\sigma}) \qquad (11-a)$$

Since the size of audit intensity that ensures honest equilibrium is now bigger (as compared to without peer-effects), net revenues in $(11-a)$ are less than without peer-effects in (11).

Consider now the case when audit is at intermediate level, then, from Proposition 6, there are multiple equilibria. Strategic complementarity implies that there can be two equilibria where either all corruptible tax inspectors are corrupt or all stay honest. The equilibrium depends on the coordination of corruptible tax inspectors. They may coordinate on "corrupt" ($\lambda = 1$) or on "honest" ($\lambda = 0$) equilibrium. If they coordinate on honest equilibrium, there will be no matching with corruptible households and they submit all taxes. When they coordinate on corrupt equilibrium, they conspire with corruptible tax payers and they do not submit taxes. We suppose that the government assigns an ex-ante probability $q \in (0,1)$ that corruptible tax inspectors will coordinate on honest equilibrium and they will submit all tax receipts.[12]

[11] Also note that σ^L can be maximum where probability of being caught is equal to one, $p = 1$. Thus the optimal σ^L is between zero and $\sigma^L_{\max} = \frac{1}{d}$.

[12] This probability depicts the relative optimism of the government regarding corruption outcome. More optimist governments put higher probability to be in the honest equilibrium. Government's optimism can be driven by the intrinsic characteristics of the society i.e. their culture and norms. What makes the government more optimistic can be an important issue to be explored but that is not the focus here.

Given this, net revenues of the government are

$$NR^I = q(\tau\mu n - w - c\sigma\tau\mu n) + (1-q)NR^L$$

By substituting in for p,

$$NR^I = q(\tau\mu n - w - c\sigma\tau\mu n) + (1-q)(\tau\mu n d + \sigma\tau\mu n d\theta^2 + \sigma(1-\sigma d)\tau\mu n d\theta^2 s - w(1-\sigma d\theta^2) - c\sigma\tau\mu n)$$

The first order conditions yield

$$FOC \qquad -qc\sigma\mu n + (1-q)(\tau\mu n\theta^2 d + \tau\mu n d\theta^2 s - 2\sigma\tau\mu n d^2\theta^2 s + wd\theta^2 - c\tau\mu n\,) = 0$$

The audit intensity that maximizes NR^I is

$$\sigma^I = \frac{d\theta^2(1-q)(1+s+x) - c}{2(1-q)d^2\theta^2 s}$$

Optimal audit intensity decreases with the cost of auditing and is equal to zero when $c = (1-q)c_l'$.

For the analytical tractability of our results, we consider two extreme cases i.e. either $q = 0$ or $q = 1$. Consider first the case when a probability that corruptible tax inspectors coordinate on honest equilibrium is zero. This is a "pessimist" scenario in which the government considers that if it announces intermediate audit intensity, all corruptible tax inspectors will be corrupt. The optimal audit intensity will be $\sigma^I = \sigma_L \equiv \frac{d\theta^2(1+s+x)-c}{2s\theta^2 d^2}$. From the equilibrium in Proposition 6, for reservation wages with intermediate audit to be an equilibrium, audit intensity should at least be equal to σ^*. The optimal σ^I decreases with c and is equal to σ^* when $c = c^{*'}$. Given this, the government will announce optimal σ^I for any $c \leq c^{*'}$, and σ^* for any $c > c^{*'}$. The corresponding net revenues are

$$NR^I = \begin{cases} \tau\mu n\left(d - x + \frac{(d\theta^2(1+s+x)-c)^2}{4s\theta^2 d^2}\right) & \text{for } c \leq c^{*'} \\ \tau\mu n\left(d - x + \sigma^*(d\theta^2(1+s+x) - c) - \sigma^{*2} d^2\theta^2 s\right) & \text{for } c > c^{*'} \end{cases} \tag{15}$$

It is important to note that for any cost of audit less than $c^{*\prime}$, net revenues with intermediate audit are equal to net revenues with low audit, and for any $c > c^{*'}$, reservation wages with low audit always generates higher revenues than the intermediate audit. Since in equilibrium, all corruptible tax inspectors are corrupt, reservation wages with low audit fetches same revenues as reservation wages with intermediate audit but with smaller audit intensity so the costs. Thus, net revenues with low audit will always be greater than the net revenues with intermediate audit.

Consider now the "optimist" scenario in which if the government announces intermediate audit, all corruptible tax inspectors will be honest ($q = 1$). If this is the case, the government will always announce the lower bound σ^* and the net revenues will be

$$NR^I = \tau\mu n\,(1 - x - c\sigma^*) \tag{16}$$

When all tax inspectors coordinate on the honest equilibrium, there exists a threshold $c^I \equiv \frac{2s\beta\theta}{2s+x-\sqrt{4sx+x^2}}$ such that $NR^I = NR^c$ and $\forall c > c^I$, the capitulation wage regime generates more revenues than the reservation with intermediate audit.

From equilibrium condition in $(7-a)$, the wage that deters bribery is $f(1;\sigma)$

$$w^e = \frac{(1-\sigma d)^2\,\tau\mu n s}{\sigma d}$$

Since with peer-effects, probability of being caught is smaller, the size of efficiency wage is bigger than the one without peer-effects. With given efficiency wage, the audit intensity that maximizes NR^e is $\sigma^e = \frac{\sqrt{s}}{\sqrt{d(sd+c)}}$. Since efficiency wage is $w^e = \max\{w, f(1;\sigma)\}$, for $\sigma = \overline{\sigma}$, $w = f(1;\sigma)$ and for any $\sigma < \overline{\sigma}$, $f(\sigma) > w$. Given the optimal audit σ^e, we can deduce a precise condition which demarcates w and $f(1;\sigma)$ in terms of magnitude. Since σ^e decreases with c and $\overline{\sigma}$ does not depend on c, there exists a $c^{**\prime} \equiv (1-\theta^2)c^{**}$ such that for $c = c^{**\prime}$, $\sigma^e = \overline{\sigma}$ and for any c greater than c^{**}, $\sigma^e < \overline{\sigma}$ implying that $f(1;\sigma) > w$.

Given this, the corresponding net revenues with efficiency wages are

$$NR^e = \begin{cases} \tau\mu n\left(1+2s-\frac{2\sqrt{s}\sqrt{sd+c}}{\sqrt{d}}\right) & \text{for } c \geq c^{**\prime} \\ \tau\mu n\left(1-x-c\overline{\sigma}\right) & \text{for } c < c^{**\prime} \end{cases} \qquad (13-a)$$

Since the size of the efficiency wage is now bigger, net revenues with efficiency wages are lower than without peer-effects in (13).

The capitulation wage is $w^c = \frac{w}{1-\sigma a} - (1-\sigma a)\tau\mu n s$, which is smaller than the one without peer-effects. The optimal audit intensity that maximizes NR^c is $\sigma^c = \frac{1}{a} - \sqrt{\frac{x}{\beta\theta a - c}}$. The optimal audit intensity σ^c decreases with c, and there exists $c^{c\prime} \equiv (1-\theta)c^c$ such that for any cost of audit greater than $c^{c\prime}$, it is optimal not to audit. Given this, the maximum net revenues of the government with capitulation wages are

$$NR^c = \begin{cases} \tau\mu n(1-x\theta-\frac{c}{a}-2\sqrt{x}\sqrt{\beta\theta a-c}) & \text{for } c < c^{c\prime} \\ \tau\mu n\left(1-x-\beta\theta\right) & \text{for } c \geq c^{c\prime} \end{cases} \qquad (14-a)$$

Given the net revenues for each wage scheme, we can now compare different wage schemes for both pessimist ($q = 0$) and optimist ($q = 1$) scenarios. While doing so we maintain our assumption that $\theta > \beta$ and Lemma 1. Consider first a pessimist scenario where $q = 0$; our results in Proposition 4 and 5 are reproduced. The only difference is that the sizes of thresholds of c that demarcate different wage regimes are now smaller. In Proposition 4 (for $1 \geq x > \widehat{x}$), the region where capitulation wages dominate other wage regimes will be bigger (i.e. now we have a threshold $\widehat{c}' = (1-\theta^2)\widehat{c} < \widehat{c}$). The region where reservation wages with high audit dominate other wage regimes will be smaller (i.e. now we have $c^{**\prime} = (1-\theta^2)c^{**} < c^{**}$). Whereas, the region where efficiency wages dominate other wage regimes remains same as in Proposition 4. Similarly in Proposition 5 (for $\widehat{x} \geq x \geq 0$), our results are reproduced whereas now, we will have $c'_h = (1-\theta^2)c_h < c_h$. The region where capitulation wages dominate other wage regimes will be larger and the region where reservation wages with high audit dominate other wage regimes will be smaller.

In an optimist scenario where the probability that all corruptible tax inspectors coordinate on honest equilibrium is one ($q = 1$), the reservation wages with intermediate audit always generates higher revenues than the reservation wages with high audit. Note that net revenues of reservation wages with intermediate audit in (16) are same as the net revenues with high audit without peer-effects in (11). By comparing capitulation wage with other wage regimes; it generates higher revenues than the reservation wages with intermediate audit for any cost of audit greater than c_h, and higher than the efficiency wages for any cost of audit greater than $\widehat{c}'$. Whereas, there exists a threshold $\overline{c}$ such that $NR^I = NR^e$, and for any $c < \overline{c}$, $NR^I > NR^e$. Furthermore, by comparing $\widehat{c}'$ and c_h, there exists a threshold $\overline{x} > \widehat{x}$ such that for any x greater than $\overline{x}$, $\widehat{c}'$ is greater than c_h.

As it was the case without peer-effects, there are two scenarios depending on the size of x. When x is low, the efficiency wage is always dominated by other wage regimes. Since now, the threshold that demarcates these two situations is $\overline{x}$ which is greater than the $\widehat{x}$; the region where efficiency wage is always dominated by other wage regimes will now be bigger. This is quite intuitive as peer-effects undermine the efficiency of the auditing, thus, the magnitude of impact of auditing on efficiency wage will be smaller and the efficiency wage will be relatively (as compared to no peer-effects) more expensive. By combining all results in the optimist scenario when $x \in (0, \overline{x})$, reservation wages with intermediate audit and capitulation wages dominate all other wage regimes. When auditing is less costly (i.e. $c < c_h$), the government would be better-off offering reservation wages with intermediate audit and when auditing is costly (i.e. $c \geq c_h$), the government would give up against corruption and will offer capitulation wages. When $1 \geq x > \overline{x}$, reservation wages with intermediate audit, efficiency wages and capitulation wages dominate other wage regimes. For any cost of audit less than $\widehat{c}'$, the government is better-off eliminating corruption. When the cost is small i.e. $c \in (0, \overline{c})$, the government is better-off announcing the reservation wage with intermediate audit. While for the cost $c \in (\overline{c}, \widehat{c}')$, the wage incentives (efficiency wage) will be a dominant strategy in terms of revenues generation. As in the case of $q = 0$, for any cost of audit greater than the threshold $\widehat{c}'$, the government will have higher revenues by giving up against corruption.

Introduction of peer-effects has not only implications for the equilibrium of corruption but it also affects the relative performances of the different wage schemes. First, when tax inspectors are offered outside option, there can be multiple equilibria when the audit intensity is in intermediate levels. Second, since peer-effects undermine the effectiveness of auditing, the size of both the audit intensity and the efficiency wage that ensure honest equilibrium will be bigger, whereas the capitulation wage will be smaller. Thus, the range of parameters where capitulation wages dominate other wage regimes will be larger. This holds even when with reservation wages and intermediate audit, corruptible tax inspectors coordinate on honest equilibrium.

8 Conclusion

We evaluate the common conviction prevailing among many economists that efficiency wage can be used as an incentive device to eliminate malfeasance in the government and its cost-effectiveness. Our focus remains on one branch of the government, i.e. tax department, which may comprise corruptible tax inspectors who cause tax compliance problems. We explore for a budget balancing government that when it will launch anti-corruption strategy and would it be cost effective to offer wage incentives to combat corruption. Apart from the efficiency wage, we add reservation wage (outside option) and the capitulation wage (a wage less than outside option) in the basket of wage strategies for the government. We have an endogenous monitoring technology, which depends on the government's audit intensity and the number of corrupt tax inspectors. Furthermore, we add the role of rule of law through the cost of laundering bribe income.

Endogenous monitoring technology implies that the equilibrium level of corruption not only depends on the public remuneration scheme but also on the level of audit intensity and the number of other corrupt tax inspectors. For the wage incentives to be a viable anti-corruption strategy, it must be accompanied by a non-zero audit intensity. When the government offers efficiency wages and capitulation wages, there is a unique equilibrium where all tax inspectors stay honest and all are corrupt, respectively. For the reservation wages, the equilibrium depends on the monitoring technology. For a higher audit intensity, all tax inspectors stay honest, and for a lower audit intensity, all corruptible tax inspectors are corrupt. For the intermediate levels of audit intensity, there are multiple equilibria. Corruptible tax inspectors will be corrupt or will stay honest depending on the proportion of corrupt tax inspectors.

Since audit is costly and the effectiveness of monitoring depends on the number of other corrupt tax inspectors, there are situations where the government is eventually better-off (in terms of revenues) giving up against corruption. The government prefers capitulation wage over efficiency wage when the cost of audit is high, the tax rate is high, the proportion of corruptible agents is high and the outside option is low. By giving up against corruption, the government saves revenues from two fronts. First, it offers a wage less than the outside option, which reduces the wage bill. Second, since at this wage, only corruptible agents join tax offices, the government has no incentive to audit them; hence it saves its cost of monitoring.

Capitulation wage regimes depicts the real world phenomenon of those countries that offer public sector wages lower than the private sector but are supplemented by bribery. For example, Gorodnichenko and Klara (2007) find evidence that in Ukraine, public sector employees receive 24-32 percent less wages than their private sector counter parts. Yet, workers in both sectors have essentially identical level of consumer expenditures and asset holdings.

Another important aspect of our analysis is the choice of anticorruption tool. If it is optimal (in terms of net revenues) for the government to deter bribery, it can be achieved either through wage incentives with non-zero audit (carrot-stick mix) or through offering outside option but with tighter monitoring (sheer stick). The government is better-off adopting incentive based anti-corruption campaign (carrot-stick mix) when the cost of audit is intermediate, the tax rate is low, the reservation is high and the proportion of dishonest agents is not so high. In the case, when it is less costly to audit, the tax rate is intermediate or high, the reservation is low, the government is better-off offering tax inspectors a wage equal to private sector and launch massive audit.

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