Motivation, Expertise, and Bureaucratic Embezzlement: Is there a Link?*

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Abstract

A benevolent government employs officials to provide public services which can be procured at a high or a low price. While a low priced service is necessarily bad, a high priced service can be either good or bad. Actual procurement price is private information but the quality of the service is observable. Officials can either be experts or naïve as well as socially motivated or potentially corruptible. These types are private information. While embezzlement cannot be detected physically, opinions for or against a suspect can be formed by using aggregate information. We show that embezzlement increases with the size of the potentially corruptible officials up to a point, after which it disappears; it may rise if social motivation rises; and the impact of expertise on incidence of embezzlement is ambiguous.

Keywords: Embezzlement, Corruptible, Social Motivation, Expertise, Bureaucracy.

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1 Introduction

This paper asks three questions on 'petty' corruption[1] that have not been directly addressed in the theoretical or empirical literature. (i) Is the incidence of corruption necessarily higher in societies where a high proportion of bureaucratic officials are potentially corrupt (i.e. corruptible)? (ii) Should we expect greater or less corruption when those who care about the society care even more? (iii) Do the average education and skill of a society have an impact on the extent of corruption?[2]

The literature on corruption focuses on ways in which petty corruption can be reduced or eliminated.[3] While the empirical relationship between higher wage of public officials and reduction of corruption is inconclusive at best (Rauch and Evans (2000), Treisman (2000)), theoretical investigations suggest that payment of higher wages may have to coexist with an effective (and hence costly) monitoring process (Besley and McLaren (1993)), or that the rewards and the penalties have to be quite large for them to have the desired effect (Mookerjee and Png (1995)). Our focus is on the developing world where corruption is rife and budgetary (and political) constraints might make it difficult for governments to pursue such incentive based anti-corruption strategies.

Hence, we start from the premise that, on account of factors such as jurisdictional or political problems and fiscal constraints, the measures discussed above are difficult to implement optimally. In other words, we study a scenario of a failed mechanism that

[1]Petty corruption is generally defined as circumstances where public officials misuse their office for private gains. See Rose-Ackerman (1999) for a discussion and distinction with 'grand' corruption.

[2]In an article entitled 'Eight Questions about Corruption', Svensson (2005) reports some related questions about corruption in the public sphere, like what are the common characteristics of highly corrupt countries, do higher remuneration packages reduce corruption, and why most recent fights against corruption have failed. An extensive bibliography on corruption can also be found in that survey article.

[3]For an extended discussion on these issues, see Bardhan (1997) and Aidt (2003). Also see Becker and Stigler (1974), Acemoglu and Verdier (2000) and Shleifer and Vishny (1993) for other aspects of the problem.

is otherwise designed with the objective to curb embezzlement (which, in this paper, is the way petty corruption manifests itself). We also note that a fundamental property of embezzlement is that it is almost impossible to detect. This scenario fits in well with the stylized facts about developing countries where the incidence of corruption is higher (Bardhan (1997)). We develop a simple framework where government officials supply public services. The government is benevolent, but resource constrained. Each official is employed to provide a public service which can be procured at a high or a low price. While a low priced service is necessarily of low quality, a high priced service can be either of high or low quality, a phenomenon often witnessed in developing economies. The government does not observe the price at which the service is actually procured by the official (since for example, receipts can be faked), but the true type of the service becomes common knowledge in the future. Officials can either be experts (who can identify the true quality of the service at the time it is procured) or naïve (who cannot). Also, each official can be either socially motivated (and care about the service he actually provides) or not (and therefore corruptible). These types are private information, with a common prior. While embezzlement cannot be detected physically, opinions for or against a suspect can be formed using aggregate information and individual performances.

We then demonstrate the following. First, embezzlement, surprisingly, does not exist in highly corruptible bureaucracies. As the number of corruptible public officials increases, which in turn implies that the proportion of the socially motivated ones falls, embezzlement increases up to a point, and then it disappears. This result stands clearly against the grain of conventional wisdom. Second, and more interestingly, an increase in the degree of social motivation of the existing motivated public officials may increase embezzlement, particularly when the social value of the service is high. These two results put together is novel and questions the conventional wisdom stimulated by the sociological literature (Akers *et al.* (1979); Akers (1998); Miller *et al.* (2001)) where it is argued that social norm-building campaigns would reduce the incidence of corruption. Of course, we also show that when the social value of the service is low, motivation is indeed a good thing.

We also argue that the effect of average expertise of the bureaucracy on the incidence

of embezzlement is ambiguous. This issue has been discussed by policymakers who argue that embezzlement is lower in contexts where appointment and promotion of bureaucrats is meritocratic (Tanzi (2000)) so that incentives from performing well outweighs the strength of the evil's eye.

These results bear an important implication for law enforcement, whenever crime cannot be physically detected,[4] and, in our model, it unfolds in the following manner. A benevolent government, while unable to detect embezzlement, forms a Bayesian belief of an official's act being corrupt, conditional on three observables: the proportion of officials who are corruptible, or are experts, and their aggregate behaviour. So long as this belief is low, a corruptible official foresees a chance to get away with a corrupt act, and hence any change in these observables that reduces this belief would enhance embezzlement.

An interesting feature of this Bayesian belief is that an increase in the number of corruptible officials increases it directly, thereby making it more difficult for corrupt officials to hide behind an excuse that their service is of low quality not because they were corrupt but because they were naïve and unlucky while procuring the service. Analogously, a rise in expertise should have a similar impact as this reduces the *a priori* probability of an official being naïve. However, a rise in expertise also reduces the chances of a motivated naïve official to be cheated in the product market where the service is procured. This may then lead to more motivated naïve officials to enter the high priced market, paving the way for the corruptible to ride on the excuse of ignorance. Hence it may provide room for further embezzlement, rendering the total effect unclear.[5]

The impact of social motivation in our model is subtle. When the social value of the service is high, a rise in motivation pushes motivated officials to take more personal risk to serve the society. In the process, the motivated naïve officials buy more at the high

[4]See Polinsky and Shavell (2005) for a survey of the literature on law enforcement in the public sphere.

[5]Tirole (1996) demonstrates that corruption can be self-sustaining in a model where an individual's actions are determined by the reputation of the group he belongs to. In our model, an individual's membership of a group is private information, though his actions may get disciplined by group behaviour that is observed by the government.

price market so that more of them get cheated. This gives the corruptible the room to embezzle and claim naïveté. Hence, the corruptible indulge in embezzlement even more. However, when the social value is small, this rise in social motivation has the reverse impact by forcing the motivated naïve officials to avoid taking risk.

We should also note that while our results are interesting, it is well known in the economics literature that in a second-best world, more of a 'good thing' is not necessarily overall welfare improving. In this paper we show how this unfurls in a model of embezzlement with incomplete information, where the 'good thing' is the supply of social motivation.

The remainder of the paper is structured as follows. In section 2 we describe the details of the model. We state our main results in section 3. Section 4 concludes the paper with some discussions. The proof of our main result is provided in an appendix.

2 The Model

A large bureaucracy consists of a continuum of government officials. Each official supplies a unit of a public service, which is available from an exogenously given group of suppliers, and at two prices, p and 1, with $p > 1$. If the service is purchased at the *low price* 1, then it is certain to be of *low quality* that gives a value 1 to the society (so that the net value to the society is 0). If it is purchased at the *high price* p, then it gives a value 1 if it is still of a low quality, but v if it is of a *high quality*, with $v > p$. An official is endowed by the government with some funds, and once he procures the service, the official is asked to report the price at which the procurement is made, since the true price of procurement is not observed by the government.[6]

A fraction σ of these officials are *experts* while the remaining fraction $1-\sigma$ are *naïve*. Expert officials can tell apart the quality of the service with certainty at the time of

[6]This environment can be motivated by many real life scenarios where an official is exclusively responsible for a well defined 'part' of an operation. For example, a public official may be entrusted to build and maintain a certain stretch of roadway within his jurisdiction, or provide clean drinking water to local residents. If potholes appear in that stretch of roadway or the drinking water is found to be contaminated, then the government can hold that official responsible.

purchase, while naïve officials cannot make any such distinction. For a naïve official, let λ be the probability that a high priced service is of low quality. Existence of suppliers of low quality services in the high priced market is a common feature of an underdeveloped economy; however it is reasonable to assume that if their clients are government officials, they could face punishment, so that λ should decrease in σ. Hence, we set $\lambda = \delta(1-\sigma)$, where $0 < \delta < 1$ reflects the success of a low quality supplier in the high priced market.[7]

Further, a fraction α of the officials is *corruptible* and are uniformly distributed across expertise, while the rest of the officials are *socially motivated*. Socially motivated officials are intrinsically 'honest' and report the true price at which the service is purchased and derive utility from the value of the service (net of price) and the remuneration package that comes with this job. We let $\theta \in [0, 1]$ denote the degree of this social motivation. The corruptible officials do not care about the value of the service they provide or its price, but are interested only in the remuneration they receive. However, if given an opportunity, they would procure the low quality service at the low price, report having procured the service at the high price, and embezzle the difference of the two prices, $p - 1$. In our model, this embezzlement is the embodiment of petty corruption. While the identity of an official in terms of his expertise and social motivation is private information, α and σ are common knowledge.

The quality of a service becomes public knowledge once it is procured. If it is of high quality, the official earns a monetary reward of $w > 0$, while if it is of low quality, then he is denied this reward. A low quality service against a reported high price can be the result of one of the following two possibilities: either a naïve official has procured at the high price but got cheated by an unscrupulous supplier, or that a corruptible official has misreported the actual procurement price and embezzled the difference. Since the government has no technology to physically detect embezzlement, the official incurs a

[7]Our results, including those on the effects of σ, will hold for any λ that is decreasing in σ.

punishment cost of $-K$ with probability μ,[8] where

$\mu = Pr$[embezzlement by official|low quality service was procured with high reported price].

Table 1 summarizes the payoff of each type of official under each action they take. The payoff of a motivated expert from procuring at the low price is simply 0 since in that case the social return is 0 while his wage is denied as the service is of low quality with certainty. On the other hand, his payoff from procuring at the high price is $\theta(v-p)+w$ since being an expert he makes sure that the high priced service is of high quality, thereby ensuring a social payoff of $\theta(v-p)$ and the wage w. The payoff of a motivated naïve official from procuring at the low price is also 0. However his payoff on the other hand from procuring at the high price is obtained as follows: with probability $1-\lambda$ he buys the high quality service and thus receives his social payoff of $\theta(v-p)$ and retains w, while with probability λ he gets cheated by the supplier of the service so that his social payoff is $\theta(1-p)$ and loses w; moreover, he is also punished with probability μ of an amount $-K$ and pays for the perceived embezzled amount of $p-1$. We now move to corruptible officials. A corruptible expert ensures that the service is of high quality while procuring at the high price and so earns w; if he embezzles then he receives a payoff of $(1-\mu)(p-1)-\mu K$, as with probability $1-\mu$ he is let off and therefore enjoys the embezzlement of $p-1$ while with probability μ he has to give up this embezzlement and incur the punishment disutility of $-K$. On the other hand his payoff from procuring at the low price and not indulging in embezzlement is 0 as he is denied the wage w. The payoffs to a corruptible naïve official is identical to that of his expert counterpart whenever he procures at the low price. However when he procures at the high price, his payoff is $(1-\lambda)w-\lambda\mu K$.

We employ the notion of Perfect Bayesian Equilibrium, which we call *Equilibrium with Consistent Beliefs* (ECB): a pair (s,μ) of pure strategy profile s used by the officials

[8]For simplicity of our analysis we assume that μ is not affected by the true state of each case of a low quality service. One may think that this makes the government an inefficient office of investigation and judgment. We wish to highlight here the fact that all our results hold good if we instead assumed that this μ is larger for those officials who actually commit the crime. Also note that if punishment was contingent on μ being higher than some exogenously given threshold, then our results will be reinforced.

Type of Official	**Payoffs from purchasing at the High Price**	**Payoffs from purchasing at the Low Price**	
Motivated Expert	$\theta(v-p)+w$	0	
Corruptible Expert	w	*Not Embezzle*	*Embezzle*
		0	$(1-\mu)(p-1)-\mu K$
Motivated Naive	$(1-\lambda)[\theta(v-p)+w]+\lambda[(1-\mu)\theta(1-p)+\mu((1+\theta)(1-p)-K)]$	0	
Corruptible Naive	$(1-\lambda)w-\lambda\mu K$	*Not Embezzle*	*Embezzle*
		0	$(1-\mu)(p-1)-\mu K$

Table 1: Expected Payoffs of officials.

and the probability of punishment μ is an ECB if (i) given μ, s is a Nash equilibrium of the game played amongst the officials and (ii) given s, whenever possible, μ is Bayesian consistent with s. In what follows we shall give a complete characterization of the set of ECB.

3 Equilibrium Corruption

We begin with some observations. With $w > 0$ it follows that in any equilibrium, the motivated experts always buy at the high price. Observe that if a corruptible expert official buys at the low price and reports the price truthfully, he earns 0 which is strictly less than w, which he can guarantee by buying the good at the high price. Hence, if he does not buy the good at the high price, he must embezzle. Also, if a corruptible expert official is not corrupt, it must be that $(1-\mu)(p-1)-\mu K < 0$, from which it would follow that $w > max\{0,(1-\mu)(p-1)-\mu K\}$, so that it is optimal for him to buy at the high price and, as an expert, ensure a high quality service. This establishes that if a corruptible expert official buys at a low price, he must embezzle while if he is not corrupt, then he must provide a high quality service. Now pick any arbitrary $0 < \mu < 1$ and suppose that a corruptible expert embezzles. Individual rationality of the corrupt expert would require $(1-\mu)(p-1)-\mu K > w > 0$. But since $w > (1-\lambda)w-\lambda\mu K$, it would then follow that a corruptible naïve official must also find it optimal to be corrupt. Finally, since each type of official faces the same incentives, in every equilibrium, all officials who have the same 'identity' must take identical actions.

We now state our main result.

Proposition 1. *Consider the bureaucratic environment described above. Then the following is true:*

1. *For very high and very low values of p, there is no embezzlement in equilibrium;*

2. *For intermediate values of p, embezzlement exists in equilibrium. In particular, starting from a low proportion α of corruptible officials, as α increases, embezzlement typically increases up to a point after which a rise in α leads to complete absence of embezzlement. Moreover,*

   (a) *An increase in the degree of social motivation θ can only enhance the possibility of embezzlement only if the value of the public good v is high; otherwise*

   (b) *An increase in θ can only reduce this possibility.*

The proof can be seen diagrammatically from Figure 1 (the formal proof is moved to an Appendix).[9] For an equilibrium with embezzlement to exist, it must be that the motivated naïve officials procure at the high price. This follows from the fact discussed above that if corruptible experts indulge in embezzlement, their naïve counterparts do so as well. Hence, if the motivated naïve officials do not buy at p, it would then be that $\mu = 1$. In that case it is easy to see from the payoff table that no corruptible official will find it beneficial to embezzle. Given this, consider the function $H(\alpha; \sigma, \theta)$ which is the locus of points in the (α, p)- plane along which these officials are indifferent between procuring at the high and the low price. Below that locus, they strictly prefer the high price since, *ceteris paribus*, p is lower so that the social value of the service is higher. The H schedule is negatively sloped because if p decreases, an official will continue to be indifferent between the high and low price only if μ increases. Since μ increases with

[9]Note that this result holds even if the proportion of experts in the population is zero, that is, in other words, we can assume that in our model expertise has no role to play in that all officials are equally skilled and each official faces some probability of being cheated in the high price market so that $\lambda = \delta$ in our specifications. Nevertheless we study the general model with $\sigma > 0$ in order to derive some observations on the role of expertise.

α, a property of a Bayesian update, maintaining indifference requires a rise in α. Now consider the corruptible expert officials. $G(\alpha;\sigma)$ is the locus of points along which these officials are indifferent between procuring at the high price and being corrupt (recall that whenever they procure at the low price, they embezzle). Embezzlement is the preferred option above this curve, since *ceteris paribus* an increase in p makes embezzlement more lucrative. It is upward sloping because in order to preserve the indifference, a rise in p has to be matched by a rise in μ (caused by a rise in α). Finally, consider the corruptible naïve officials. The locus of points along which they are indifferent between procuring at the high price and embezzlement is $B(\alpha;\sigma)$ which lies strictly below G since if a corruptible expert indulges in embezzlement, then his naïve counterpart must do so as well (while the reverse implication is not universally true).

The shaded area in Figure 1, denoted $\bar{p}a\hat{p}$, is where all corruptible are corrupt (the case of full embezzlement), while the shaded region $\hat{p}ab\hat{p}'$ is where only the corruptible naïve are corrupt (the case for partial embezzlement). As depicted in the figure, fix some intermediate value of $p = p^*$ and suppose α is close to zero. Then in equilibrium there is embezzlement by all corruptible officials. As α rises, this equilibrium is sustained and therefore by virtue of this rise in α, size of embezzlement rises as well until we move to the right of the G schedule after which only the corruptible naïve embezzle. Hence aggregate embezzlement falls, though it does not disappear. As α rises further, so that we move to the right of the B schedule, embezzlement disappears completely.

Regarding the impact of an increase in motivation, note that the indifference loci G and B are not affected by a change in θ since θ does not affect the payoff of corruptible officials. However, since θ affects the payoff of the motivated naïve officials, it leads to a shift of the H schedule. A higher θ essentially makes the payoff of these officials more responsive to the social service they render. This has two opposing effects: on the one hand, if they are successful in the high price market this would increase their utility, while if they are cheated, their disutility from being unable to serve the society increases as well. The net effect therefore crucially depends upon whether v is high or low. When v is high, they are willing to remain in the high priced market with an even higher μ so that α can now be larger. Hence, an increase in θ shifts the H schedule

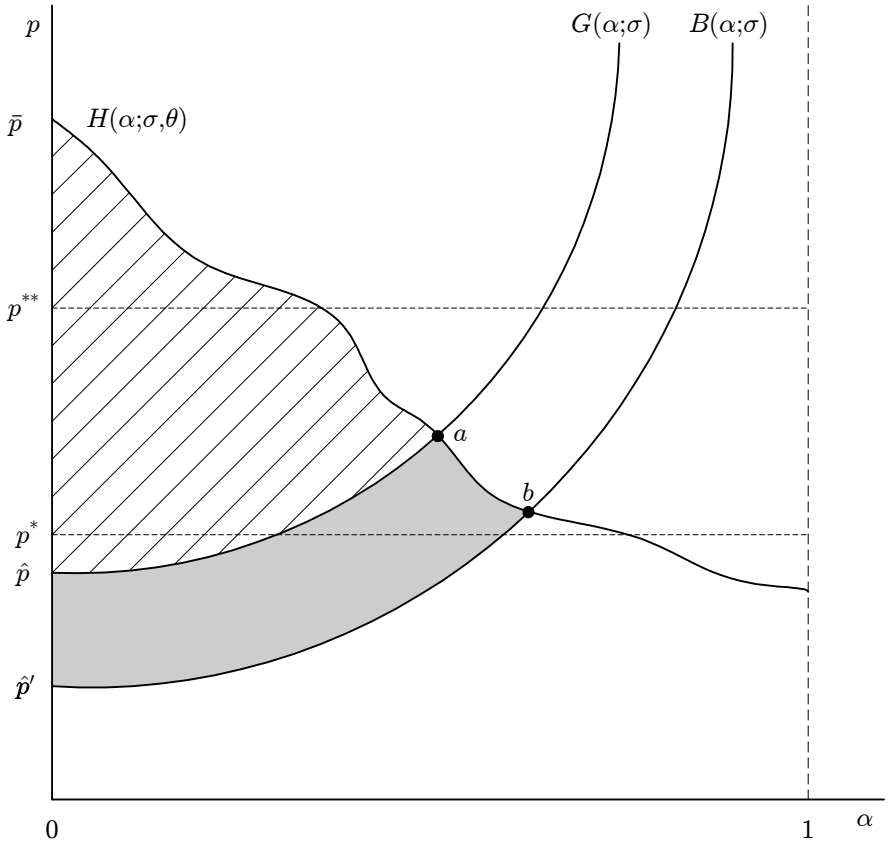

Figure 1: The zone $\bar{p}a\hat{p}$ is full embezzlement; the zone $\hat{p}ab\hat{p}'$ is partial embezzlement.

rightwards. On the other hand, when v is low, they need a lower μ to remain indifferent, thus shifting the H schedule leftwards. So, suppose v is large so that the H schedule shifts rightwards. In that case if p is small (like p^*), then it has no impact; if on the other hand p is large (say equal to p^{**}), then equilibrium with embezzlement is sustained for a higher value of α, and this is what we mean by saying that an increase in motivation increases embezzlement. The implications for the case when v is small so that the H schedule shifts leftwards are opposite, and is now easy to see.

We end this section with a brief discussion on the effect of expertise on embezzlement.

As σ rises, the G and B schedules both shift leftwards. To see this note that[10]

$$\frac{dG}{d\sigma} = \frac{K+w}{(1-\mu)^2}\frac{d\mu}{d\sigma} > 0,$$

since $\frac{d\mu}{d\sigma} > 0$. Similarly,

$$\frac{dB}{d\sigma} = (1-\lambda)\frac{K+w}{(1-\mu)^2}\frac{d\mu}{d\sigma} - \frac{w+\mu K}{1-\mu}\frac{d\lambda}{d\sigma} > 0,$$

since again $\frac{d\mu}{d\sigma} > 0$ and $\frac{d\lambda}{d\sigma} < 0$. However, the impact of a higher expertise on the indifference schedule H of the motivated naïve officials is ambiguous. This is because a higher expertise directly reduces $\lambda = \delta(1-\sigma)$, the probability of being cheated in the high price market, making participation in the high priced market more attractive. On the other hand, it increases the probability of being punished given that the quality of the procured service turns out to be low. Hence the net shift of the H schedule as σ rises is unclear. If the former impact outweighs the latter so that the H schedule shifts rightwards, then for higher values of p (like p^{**}), an increase in σ may in fact sustain an equilibrium with corruption for even higher values of α. However, if p is low and embezzlement exists in equilibrium, then a rise in σ unambiguously reduces embezzlement since, as can be seen clearly from Figure 1, the H schedule is not binding while the G and B schedules bind when p is lower than the value at which the two schedules H and G intersect.

4 Conclusion

Despite the existence of mechanisms that can potentially eliminate corruption, this phenomenon continues to thrive, particularly in developing countries, with often staggering loss of resources and efficiency. This paper sheds some light on possible circumstances for such failure. In a model where a bureaucracy consists of experts as well as naïve officials (who could be socially motivated or corruptible), our results have the following implications. First, only if a bureaucracy is highly corruptible (or equivalently devoid

[10]See Appendix for the exact form of the μ function depending upon whether embezzlement if full or partial.

of officials who care for the society), the existence of a benevolent government with an otherwise constrained punishment mechanism as outlined in the paper can reduce embezzlement when this is costly to monitor. Second, an increase in the social motivation of the officials might actually increase the incidence of embezzlement. Finally, the impact of the expertise of the officials is ambiguous: it reduces embezzlement unambiguously only when the price at which services are procured is not too high, and otherwise may even increase embezzlement. Consequently, while meritocracy may become an effective policy instrument to tackle embezzlement, one needs to be careful.

In the context of budgetary and political constraints that, in a developing world, typically render the design of optimal mechanisms infeasible, our model has implications for the incentive-based literature. Although a large increase in wages will go a long way towards eradicating embezzlement in our model, this is not feasible since the country is poor and the bureaucracy is large. Hence, incentives have to be marginal, and if the government wants to pay its officials a small premium over the market-determined wage, this would encourage motivated naive officials even more to purchase the service at a high price, thereby encouraging the corruptible officials to indulge in embezzlement since, after all, the wage premium is small. Another established channel to fight embezzlement is to impose a high punishment. Even if this is politically feasible, high punishments would force the motivated naïve officials to avoid the high price market, as now the penalty from buying a low quality service by mistake is unsustainable. This in turn may lead to low average quality of public services, so long as the proportion of motivated naive officials is large in the population, and the probability of being cheated in the high price market is still large enough.

Our model abstracts from two important aspects. First, we do not address the case where officials can 'help each other' in determining the quality of their individual services. For example, a motivated naïve official may meet with his expert counterpart and reduce the bite of incomplete information. However, as long as such cooperation is not full, our results will hold qualitatively. Second, it could be that the motivated officials care for aggregate embezzlement rather than only about the quality of their individual services. If motivated officials internalize the negative welfare impact they

create by virtue of their 'self-centred' social motivation, our results may not hold in general. These and other related questions are in our agenda for future research.

A Appendix

Proof of Proposition 1 The motivated naïve buy at p if and only if

$$p \leq H(\alpha;\sigma,\theta) = \frac{(1-\lambda)(\theta v + w) + \lambda + \lambda\mu(1-K)}{\theta + \lambda\mu}.$$

The corruptible experts are corrupt if and only if

$$p \geq G(\alpha;\sigma) = 1 + \frac{w + \mu K}{1-\mu},$$

while the corruptible naïve are corrupt if and only if

$$p \geq B(\alpha;\sigma) = 1 + (1-\lambda)\frac{w + \mu K}{1-\mu}.$$

Observe that $G(\alpha;\sigma) > B(\alpha;\sigma)$ for all α and parallel in the (p,α) plane, since λ is independent of p and α. In case where all corruptible are corrupt, we have

$$\mu = \frac{\alpha}{\alpha + \delta(1-\sigma)^2(1-\alpha)},$$

while in the case where only the naïve are corrupt, we have

$$\mu = \frac{\alpha}{\alpha + \delta(1-\sigma)(1-\alpha)}.$$

In both cases, we have $\frac{d\mu}{d\alpha} > 0$. Now,

$$H_\alpha = \frac{\lambda(1-K) - (1-\lambda)\lambda(\theta v + w) - \lambda^2}{(1+\lambda\mu)^2}\frac{d\mu}{d\alpha} < 0,$$

since the largest value of H_α is at $K = 0$, where $H_\alpha < 0$. Also note that

$$H(0;\sigma,\theta) = \frac{(1-\lambda)(\theta v + w) + \lambda}{\theta},$$

and

$$H(1;\sigma,\theta) = \frac{(1-\lambda)(\theta v + w) + \lambda(2-K)}{\theta + \lambda}.$$

Now,

$$G_\alpha = \frac{K+w}{(1-\mu)^2}\frac{d\mu}{d\alpha} > 0,$$

and $G(0,\sigma) = 1+w$ while $G(1,\sigma) = +\infty$. One can check that $G_{\alpha\alpha} > 0$. So for existence of equilibrium with full embezzlement, it is necessary and sufficient that $H(0;\sigma,\theta) > G(0,\sigma)$ a condition that is satisfied for v large enough. Since B is parallel to G, for existence of equilibrium with partial embezzlement, it is necessary and sufficient that $H(0;\sigma,\theta) > B(0,\sigma)$, a condition that is again satisfied for v large enough. Thus we have shown that for very high and very low values of p, there is no embezzlement in equilibrium, and for intermediate values of p, embezzlement exists in equilibrium if and only if the proportion of corruptible officials is not too high. The proof of the proposition is completed by noting that

$$H_\theta = \frac{(1-\lambda)(\lambda\mu v - w) - \lambda[1+\mu(1-K)]}{(\theta+\lambda\mu)^2},$$

so that for v large enough, we have $H_\theta > 0$, and that $G(.)$ and $B(.)$ are independent of θ.

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