The Pitfalls of a Partially Honest Bureaucracy: Bribery, Inefficiency, and Bureaucratic Delay

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Abstract

We analyze a situation where bureaucrats award a scarce asset to agents who differ in terms of their productive utilization of the asset. In a one-period setting of our model, or one in which agents have no choice over which bureaucrat to approach, perfect efficiency results in the allocation of the asset, or permits to obtain it. In a two-period setting in which permits are awarded over time and agents can re-apply to a different bureaucrat in the second period, efficiency need not result. Assets are allocated efficiently (i.e. to the most productive agents) when all bureaucrats are honest, or when all of them are dishonest. However, efficiency is not achieved in a wide range of cases where the bureaucracy is partially honest. In fact, total surplus is a non-monotonic function of the fraction of bureaucrats that are honest. The equilibrium inefficiency takes the form of allocating the asset to less productive applicants, as well as delaying its allocation to the more productive candidates. Thus bureaucratic delay can be a strategic maneuver to increase income from bribery.

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1 Introduction

Corruption and delays in the performance of official tasks are commonly taken to be the two most prevalent vices of bureaucracy in developing economies. In many such economies, business ventures may require numerous official sanctions and permits to operate (see De Soto 1989, Shleifer 1997, and Berkowitz and Li 2000, among many others, for examples). Government officials may also control the distribution of scarce resources, often at subsidized prices. Bureaucratic decisions, and the timeliness of such decisions, can, therefore, influence the profitability of many productive activities.

Consider the time-honored example (also modeled in this paper) of bureaucrats granting licenses that are essential for some surplus generating activity. If bureaucrats are not sufficiently monitored, their discretionary power in awarding licenses gives them the opportunity to extract rents by charging bribes. In this case, potential bribe income, rather than the official criteria for obtaining a license (merit or otherwise), decides the allocation of licenses, and inefficiency may result. This inefficiency may take the form of licenses being granted to the wrong recipients, or needless delay for the right recipients in obtaining the license. In particular, bureaucrats may create red tape and unnecessary delays if such tactics positively affect the magnitude of their bribes. Thus the possibility arises that bribery and bureaucratic delays may be strategically interrelated.

It has been argued, however, that allocation of goods or services by bribery contains certain efficiency properties. In the context of obtaining a contract or production license, for example, the most productive applicant is supposed to place the greatest value on a license, and is thus expected to pay the highest bribe. In the context of obtaining a bureaucratic service, the one with the highest value on time will be willing to pay most to move ahead in the queue. In these examples, allowing bribery guarantees efficient allocation, across people and across time.[1]

[1] For more sophisticated arguments along these lines, see Lien 1990 and Lui 1985. (Clark and Riis 2000,

These arguments on the efficiency of bribery are commonly made in a static setting. In contrast, we examine a very simple dynamic bribery model, in which the distribution of licenses is a time-consuming activity, taking place over two periods. Further, applicants are allowed to re-apply for the license in the second period to a new bureaucrat, if denied one in the first period (possibly because unwilling to pay a high enough bribe). We find that in this setting, the efficiency of bribery is far from a foregone conclusion, even though in the one-period version of our model it is. An applicant who is both more productive and who also has a higher waiting cost, may not be able to secure a license in the first period. The reason is that once the ability to reapply in a subsequent period is introduced, productive candidates need not be the ones willing to pay most for the license. As we demonstrate, they may assess higher chances of a profitable reapplication, even at the cost of delay and uncertainty in acquiring a license.

Surprisingly, we find that social efficiency is a non-monotonic function of the fraction of bureaucrats who are opportunistic, i.e. maximize their returns from bribery. In particular, if all bureaucrats are opportunistic, or if all are honest, perfect efficiency results. In the former case, reapplication is pointless for all candidates, since there is no chance of finding an honest bureaucrat; hence, the productive candidates are willing to pay the highest bribes. In the latter case, all bureaucrats, by assumption, perform the duty of awarding licenses to the most deserving applicants. When there is a mix of honest and opportunistic bureaucrats, however, inefficiency can result.

Paradoxically, then, an increase in the fraction of honest bureaucrats can actually lower efficiency. It should be stressed that these results are different from the arguments of Leff (1964) and Huntington (1968), among others, who have argued that honest officials enforcing absurd regulations can lead to inefficiency. In our model, the honest officials award their licenses to the most productive applicants in a timely manner, by assumption.

however, show some fragility in the results of the former model.) Of course, in the context of credit market imperfections, these efficiency properties may not hold either, an issue we discuss later in the paper.

The equilibrium inefficiency in our model can take the form of awarding licenses to the less productive candidates; it can also take the form of delaying licenses to the productive candidates. Thus we rationalize the equilibrium occurrence of inefficient bureaucratic delays. We are not the first to do so. In Banerjee (1997) red tape (including bureaucratic delay) is an efficient mechanism designed to separate out the more productive applicants when the fact that potential applicants are credit-constrained makes monetary mechanisms, such as bribery, unable to do so. In our approach, bureaucrats have the ability to recognize the more productive applicants, so screening is not an issue. Delay arises because productive candidates may have increasing willingness to pay bribes over time as their re-application options are exhausted. This makes bureaucratic delay a potentially strategic choice that leads to higher bribe incomes for bureaucrats but contributes to overall inefficiency.

One final surprising implication of the model is that inefficiency results from the availability of greater opportunities to entrepreneurs to choose among bureaucrats, and in particular, to leave a bureaucrat who has attempted to charge a bribe in search of an honest one. Elsewhere in the literature ability to choose is typically regarded as enhancing efficiency (see Shleifer and Vishny 1993 and Rose-Ackerman 78, for example). In contrast, in the present paper, perfect efficiency results if entrepreneurs have only one choice.

These results suggest that the efficiency of bribery is far from robust in a dynamic setting. Further, it may depend in a non-monotonic way on the degree of honesty of the bureaucracy. The basic model is outlined in section 2. The equilibrium is characterized and proved unique in section 3. Efficiency as a function of the level of honesty in the bureaucracy is solved for in section 4. Discussion and conclusions are provided in section 5.

2 The Model

There are N 'officials' or 'bureaucrats', each endowed with L 'licenses' or 'permits'. These officials are delegated the power to grant the licenses to deserving applicants. Once granted,

the permit enables a person possessing entrepreneurial skills to engage in some productive venture. There are $M > N$ potential 'applicants', heterogeneous in terms of their productivity (or entrepreneurial ability). Specifically, we assume that an applicant, if granted a license, can generate a net present value V_1 from her venture if she is of the 'productive' type (type one), and $V_2 \in (0, V_1)$ if she is of the 'unproductive' type (type two). A fraction $\mu \in (0, 1)$ of the total population of applicants M, are productive. Applicants apply costlessly for licenses, and maximize expected net present value.

Officials are given the task of giving licenses only to productive applicants, in as timely a manner as possible. A fraction $\nu \in (0, 1)$ of them are 'honest' and do just that. The rest, are 'dishonest' or 'corrupt', and thus maximize personal gain from bribery.

It is assumed that an official to whom an application is submitted can, costlessly and instantaneously, identify the type of the applicant. However, the process of awarding licenses is otherwise time-consuming (due to formalities and red-tape), so much so that any official can award at most T licenses in a single period. We assume that all bureaucrats are given exactly two periods to complete their task of distributing the permits and that $T \in (L/2, L)$. In words, one period is insufficient ($T < L$), but two periods are more than sufficient ($2T > L$), to award all licenses. Since two periods are more than enough, an official who gives away all L licenses has some discretion over the timing of his license distribution. We assume that payoffs in period 2 are discounted at rate $\delta \in (0, 1)$.

An official's type, honest or dishonest, is private information. We assume that an applicant can approach at most one official per period, whom she chooses at random. For simplicity, we further assume that a candidate who approaches a certain official in the first period is unable to identify him in the second period. Thus if choosing an official to whom to apply in the second period, a candidate will again randomly choose from all officials.[2] We

[2]In other words, the candidate samples with replacement. The more realistic case of sampling without replacement (at least after having encountered the 'wrong' kind of bureaucrat) complicates the analysis without changing results, given that N is thought of as large.

also assume that the act of soliciting a bribe is not observed by a third party. The result of these assumptions is that candidates do not know whether any given official is honest or corrupt, neither in the first nor second period; they only know the fraction of honest officials, ν.[3]

Applicants thus select randomly from among all officials in each period. Thinking of M as large, we assume that the same number of each type of applicants approaches each official in each period. Since the process of application is costless, all M applicants decide to attempt acquiring licenses in period 1. Therefore, each official receives M/N applications of which $\mu M/N$ are of the productive type. We assume that

$$\mu M/N \geq 2T, \tag{A1}$$

which implies that there are more productive applicants than there are licenses, since $2T > L$. It actually goes further than this, ensuring that officials always have at least T productive candidates approaching them in both periods. This will allow officials maximum discretion over the timing of their license distribution.[4] We also assume that

$$(1-\mu)M/N \geq T. \tag{A2}$$

That is, there are at least as many unproductive applicants as there are permits that can be given out in period 1. This will allow officials maximum discretion over the recipients of their license distribution, at least in period 1.[5]

[3]We do not explore communication among candidates about first-period application experiences. It is not clear that communication would be effective, since it would be cheap talk and everyone would have an incentive to divert other candidates to the dishonest officials, as will be clear later. Further, it is realistic to rule out communication when entrepreneurial candidates make up a small percentage of the total population, and thus potentially never meet each other in daily interaction.

[4]The assumption $\mu M/N \geq L + \nu(2T - L)$ suffices for the equilibria we derive later. However, since crucial results involve comparative statics on ν, we make the stronger assumption, which is equivalent to the weaker one with ν substituted in at its supremum value, one.

[5]We do not need to worry about period 2 in the case of unproductive candidates. As will be shown later,

Under assumption A1, it is clear that an honest official will award all T licenses in period 1 to productive applicants. He will clearly give out the maximum of T licenses, and all these will go to productive applicants, since $T < \mu M/N$, the number of productive applicants he receives. The action of the dishonest official, however, is determined so as to maximize total payoffs he gets from take-it-or-leave-it offers to the applicants. He may find it profitable to award some number of permits less than T in period 1, or award permits to less productive applicants, or both, depending on the willingness to pay of the various candidates in each period. Thus, both bureaucratic delay and allocative inefficiencies may arise from the strategic behavior of corrupt officials in our model. Let G_{ij}^t denote the number of licenses given to type i applicants by the dishonest bureaucrat j in period t, for $i, t \in \{1, 2\}$ and $j \in \mathcal{D}$, where $\mathcal{D}$ is the set of all dishonest bureaucrats.

For convenience of exposition, we define

$$1 + \kappa \equiv \frac{\mu M}{NL}, \tag{1}$$

$$\tau \equiv \frac{T}{L}, \tag{2}$$

$$\alpha \equiv \frac{V_2}{V_1}, \tag{3}$$

and

$$g_{ij}^t \equiv \frac{G_{ij}^t}{L}. \tag{4}$$

Since $T \in (L/2, L)$ we have that $\tau \in (1/2, 1)$. Assumption A1 implies that $\kappa \geq 2\tau - 1 > 0$. Finally, $V_2 \in (0, V_1)$ implies that $\alpha \in (0, 1)$.

We note here that if the time horizon were one period, or equivalently, if each entrepreneur could only receive a permit from a specific bureaucrat assigned to him, then the maximum

it would never be optimal to distribute a license to an unproductive candidate in period 2 regardless of how many there were.

bribe the productive candidate would be willing to pay would be V_1, and the less productive applicants V_2. Clearly all dishonest bureaucrats in this case would also award all licenses to productive candidates, and efficiency would result.

3 Equilibrium in the Two-Period Game

An equilibrium in this context involves honest officials awarding licenses to productive applicants in as timely a manner as possible; dishonest officials maximizing bribery revenue, given the actions of all other officials and applicants; and applicants maximizing expected revenue given the actions of officials and other applicants.

As noted, an honest official awards all T permits to type 1 applicants in period 1. A dishonest official j will distribute G^1_{ij} licenses to type i applicants in the same period. The total number of type 1 applicants who are without permits at the beginning of period 2, call it P_2, is then

$$P_2 = \mu M - [\nu NT + \sum_{j \in \mathcal{D}} G^1_{1j}] = NL[1 + \kappa - \nu\tau - \sum_{j \in \mathcal{D}} \frac{g^1_{1j}}{N}], \tag{5}$$

where the second expression just rewrites the first using equations 1-4. Let p_2 denote the number of type 1 applicants in period 2 *per official*. Further, let

$$\overline{g}^1_{1\cdot} \equiv \sum_{j \in \mathcal{D}} g^1_{1j}/[(1-\nu)N] \tag{6}$$

be the average number of licenses granted per dishonest official to productive candidates in period 1.[6] Then p_2 can be expressed, using equations 5 and 6, as

$$p_2 = P_2/N = L[1 + \kappa - \nu\tau - (1-\nu)\overline{g}^1_{1\cdot}] = L[1 + \kappa - \tau + (1-\nu)(\tau - \overline{g}^1_{1\cdot})]. \tag{7}$$

Note that $G^1_{1j} \leq T$, so $g^1_{1j} \leq \tau$ and $\overline{g}^1_{1\cdot} \leq \tau$ (using equations 2 and 4). Thus p_2 is bounded below at $L(1 + \kappa - \tau)$. This would result if all officials gave out the maximum

[6] It is the total number of licenses granted by dishonest officials to productive candidates in period 1, divided by the total number of dishonest officials, $(1-\nu)N$.

number of licenses in the first period to type 1 applicants. Note also that in period 2 honest bureaucrats have $L - T = L(1 - \tau)$ licenses left to grant. Since $\kappa > 0$, by assumption A1, honest bureaucrats have more productive applicants in period 2 (at least $L(1 + \kappa - \tau)$) than they have remaining licenses ($L(1 - \tau)$). Clearly they will give all their remaining licenses in period 2 to productive applicants. Thus the behavior of honest bureaucrats is perfectly clear: they give T licenses to productive candidates in period 1, and $L - T$ licenses to productive candidates in period 2.[7]

We now turn to the behavior of a dishonest bureaucrat, who maximizes revenues, first in period 2. Since this is the final date, a take-it-or-leave-it offer of a permit will be accepted as long as the price to a candidate of type i is no greater than V_i. Thus the official can win V_1 from a productive candidate and V_2 from an unproductive candidate in period 2. For period 1 bribes, first note that an unproductive candidate will always get a payoff of zero in period 2. If she meets an honest official, she gets no license, since he gives all of his to productive candidates; if she meets a dishonest official, she loses all her surplus V_2 in the form of a bribe. Thus the waiting option of an unproductive candidate in period 1 is worth zero. It follows that even in period 1, a dishonest official will be able to extract the full amount V_2 from an unproductive candidate. This is not true of productive candidates in period 1: since they have some probability of meeting an honest official next period, who will give his remaining licenses to productive candidates for free, their waiting option has positive value. Thus a dishonest bureaucrat will not be able to extract all of V_1 from a productive candidate in the first period.

What is the value for a productive candidate of waiting until period 2 to get a license?

[7] We have assumed that honest bureaucrats do the efficient thing with their own licenses. One may imagine a case, however, where an honest bureaucrat who is aiming to maximize efficiency of all license distribution, not just his own, might sacrifice some efficiency in his own action if this somehow gave other officials greater incentives toward the efficient action. This is never the case in our model, as will be clear later.

She can only get a positive payoff if she meets an honest official in period 2, which happens with probability ν. Even if this occurs, the honest official may not have enough licenses for her. He has $L - T = L(1-\tau)$ licenses, while there are p_2 productive agents applying to him, where p_2 comes from equation 7. Thus the productive candidate's probability of getting a license conditional on meeting an honest bureaucrat in period 2, call it $\phi(\overline{g}^1_{1\cdot})$, is

$$\phi(\overline{g}^1_{1\cdot}) = \frac{L(1-\tau)}{p_2} = \frac{1-\tau}{1+\kappa-\tau+(1-\nu)(\tau-\overline{g}^1_{1\cdot})}. \tag{8}$$

Note that $\phi(\overline{g}^1_{1\cdot})$ is strictly increasing in $\overline{g}^1_{1\cdot}$. Further, $\overline{g}^1_{1\cdot} \leq \tau$ as noted above, and thus $\phi(\overline{g}^1_{1\cdot})$ is bounded above at $(1-\tau)/(1+\kappa-\tau)$.

Clearly, the value for a productive candidate of waiting for period two is $\delta\nu[\phi(\overline{g}^1_{1\cdot})]V_1$. This is the discounted value of meeting an honest official and getting a permit worth V_1 from him. The maximum bribe that can be extracted from a productive agent in period 1 is thus $V_1 - \delta\nu[\phi(\overline{g}^1_{1\cdot})]V_1$, or $\gamma(\overline{g}^1_{1\cdot})V_1$, where

$$\gamma(\overline{g}^1_{1\cdot}) \equiv 1 - \delta\nu[\phi(\overline{g}^1_{1\cdot})] \in (0,1). \tag{9}$$

Since $\phi(\overline{g}^1_{1\cdot})$ is strictly increasing in $\overline{g}^1_{1\cdot}$, $\gamma(\overline{g}^1_{1\cdot})$ is strictly decreasing in $\overline{g}^1_{1\cdot}$. The intuition is that the greater the number of licenses going to productive candidates from dishonest officials in period 1, the smaller the remaining number of productive candidates that honest bureaucrats will be unable to service in period 2; this raises productive candidates' waiting option value and lowers their willingness to pay in period 1. In summary, a dishonest bureaucrat in period 1 can earn $\gamma(\overline{g}^1_{1\cdot})V_1$ from a productive candidate and $\alpha V_1 = V_2$ from an unproductive candidate. In period 2 he can earn δV_1 from a productive candidate and $\delta\alpha V_1$ from an unproductive candidate. Recalling equation 4, the dishonest bureaucrat's payoff, call it Π, can be written

$$\Pi = LV_1[\gamma(\overline{g}^1_{1\cdot})g^1_{1j} + \alpha g^1_{2j} + \delta g^2_{1j} + \alpha\delta g^2_{2j}]. \tag{10}$$

We now prove a lemma that simplifies analysis of dishonest officials' behavior.

Lemma 1. *Under assumptions A1 and A2, dishonest official j will set $g^1_{1j} + g^1_{2j} + g^2_{1j} = 1$.*

Proof. Recall that $G^1_{1j} + G^1_{2j} + G^2_{1j} + G^2_{2j} \leq L$, that is, an official can grant no more than L total licenses. Using equation 4, this constraint can be rewritten in the form $g^1_{1j} + g^1_{2j} + g^2_{1j} + g^2_{2j} \leq 1$. We must show that a dishonest bureaucrat will set $g^2_{2j} = 0$, and that the constraint binds.

Since α and δ are both strictly less than one, and thus $\delta\alpha < \delta, \alpha$, it is clear from examination of the dishonest official's payoff 10 that he will set $g^2_{2j} = 0$ if there are enough productive candidates in period 2 and unproductive candidates in period 1 to exhaust his supply of L licenses. In period 1, $(1-\mu)M/N$ unproductive candidates approach him; assumption A2 gives that $(1-\mu)M/N \geq T$. In period 2, $p_2 = L[1+\kappa-\tau+(1-\nu)(\tau-\overline{g}^1_{1\cdot})]$ productive candidates approach him. Note that assumption A1 implies $\kappa \geq 2\tau - 1$, using equations 1 and 2, and thus $1+\kappa-\tau \geq \tau$. Further, we know from the discussion following equation 7 that $p_2 \geq L(1+\kappa-\tau)$. Combining these gives that

$$p_2 \geq L\tau = T. \tag{11}$$

In summary, at least T unproductive applicants approach him in period 1, and at least T productive applicants approach him in period 2. Thus he can sell all his L licenses for more than an unproductive applicant in period 2 would pay, so he must set $g^2_{2j} = 0$.

To show the constraint binds in any optimal plan, assume the opposite: g^1_{1j}, g^1_{2j}, and g^2_{1j} are optimal and $g^1_{1j} + g^1_{2j} + g^2_{1j} < 1$. This implies that either $g^1_{1j} + g^1_{2j} < \tau$ or $g^2_{1j} < 1-\tau$, or both. Take the latter case, which is equivalent to $G^2_{1j} < L - T$. We know (see preceding paragraph) that at least $L - T$ productive agents apply to agent j, and also that he has at least $L - T$ licenses left, since he could give out at most T in period 1. It is thus clear from the official's payoff 10 that the official could raise g^2_{1j} without changing any other term of his payoff, and thus strictly increase his payoff. The former case is equivalent to $G^1_{1j} + G^1_{2j} < T$. Again, we know that at least T unproductive agents apply to him and so he can raise g^1_{2j} without changing any other term in his payoff, thereby increasing it. We

have reached a contradiction, and thus the constraint must bind, that is, $g^1_{1j}+g^1_{2j}+g^2_{1j}=1$. ■

Lemma 1 establishes that no licenses will be awarded to unproductive candidates in period 2, since there are always enough candidates willing to buy them at a higher price. It also shows that no licenses are wasted, for largely the same reasons.

Utilizing lemma 1, we can write

$$g^2_{1j} = 1 - g^1_{1j} - g^1_{2j}. \tag{12}$$

Further, both $(G^1_{1j}+G^1_{2j})$ and G^2_{1j} are constrained to be less than T. We can use equations 2, 4, and 12 to combine these two constraints into one: $1-\tau \leq g^1_{1j}+g^1_{2j} \leq \tau$. It is also the case that G^t_{ij} is constrained to be no greater than the per-official supply of type-i candidates in period t. As discussed in the proof of lemma 1 and earlier, assumptions A1 and A2 ensure that at least T applicants of each type approach each official in period 1. Further, the period-2 constraint is that $G^2_{1j} \leq p_2$, where p_2 is the number of type-1 applicants per official in period 2, expressed in equation 7. But equation 11 from the proof of lemma 1 shows that $p_2 \geq T$. Thus these constraints add nothing, since there are always enough candidates in each period of the necessary type to exhaust all T licenses. Combining these facts, the dishonest bureaucrat's program can be re-written as

$$\max_{g^1_{1j}\geq 0,\, g^1_{2j}\geq 0} \Pi = LV_1[\gamma(\overline{g}^1_{1\cdot})g^1_{1j} + \alpha g^1_{2j} + \delta(1 - g^1_{1j} - g^1_{2j})] \tag{13}$$

subject to

$$1-\tau \leq g^1_{1j} + g^1_{2j} \leq \tau. \tag{14}$$

A solution to this program clearly exists, since the maximand is continuous in both choice variables (see equations 6, 8, and 9) and the choice set is compact. The analysis of this program would be completely linear were it not for the dependence of γ on $\overline{g}^1_{1\cdot}$, which in turn depends on g^1_{1j}. The remaining linearity, however, tends to push solutions to corners.

Take for example the case where $\alpha < \delta$. It is clear that the solution takes the form

$$\begin{array}{lll} g^1_{1j} = 0, & g^1_{2j} = 1-\tau, & if\ \gamma(\overline{g}^1_{1\cdot}) < \alpha < \delta \\ g^1_{1j} \in [0, 1-\tau], & g^1_{2j} = 1-\tau-g^1_{1j}, & if\ \gamma(\overline{g}^1_{1\cdot}) = \alpha < \delta \\ g^1_{1j} = 1-\tau, & g^1_{2j} = 0, & if\ \alpha < \gamma(\overline{g}^1_{1\cdot}) < \delta \\ g^1_{1j} \in [1-\tau, \tau], & g^1_{2j} = 0, & if\ \alpha < \gamma(\overline{g}^1_{1\cdot}) = \delta \\ g^1_{1j} = \tau, & g^1_{2j} = 0, & if\ \alpha < \delta < \gamma(\overline{g}^1_{1\cdot})\ . \end{array} \tag{15}$$

The first three lines involve setting $(g^1_{1j} + g^1_{2j})$ at their lower bound $1-\tau$, reserving τ for productive applicants in period 2, since δ is the largest payoff. The $1-\tau$ are divided in period 1 according to how α compares to $\gamma(\overline{g}^1_{1\cdot})$; if they are equal, any division is optimal. The last two lines involve setting g^1_{2j} to zero and awarding all licenses to productive applicants, with the timing depending on how δ compares to $\gamma(\overline{g}^1_{1\cdot})$; if they are equal, any timing is optimal.

It is already evident how both strategic delay and allocative inefficiency may arise in equilibrium. For example, assume for the moment that $\gamma(0) < \alpha < \delta$.[8] In this case the return to licensing productive candidates in period 2 is highest, so $(g^1_{1j} + g^1_{2j})$ will be set as low as possible, $1-\tau$. In period 1, the return to unproductive candidates is higher than the return to productive candidates, so no licenses are put into g^1_{1j}. That is, $g^1_{1j} = 0$ (and since j is arbitrary, $\overline{g}^1_{1\cdot} = 0$), $g^1_{2j} = 1-\tau$, and $g^2_{1j} = \tau$ give the optimal strategy. But this involves awarding some licenses to unproductive candidates ($g^1_{2j} > 0$), as well as delaying licenses to productive candidates ($g^2_{1j} > 1-\tau$).

Clearly, if $\alpha > \delta$, no strategic delay would arise in equilibrium. An official would rather give out T licenses to unproductive candidates in period 1 than delay licenses to productive candidates in period 2. Consequently, we focus on the case in which $\delta > \alpha$ in this paper.[9]

Note that for a given bureaucrat j, the solution to the maximization problem of 13 and 14 need not be unique. For example, if the solution involves $\gamma(\overline{g}^1_{1\cdot}) = \alpha < \delta$, then we know

[8] Conditions under which this holds will be established later.

[9] The other case is available from the authors upon request. The analysis is almost identical and adds no new insight to this case.

$g^1_{1j} + g^1_{2j} = 1 - \tau$, but we may know nothing further about g^1_{1j} and g^1_{2j} individually.

This non-uniqueness of the individual bureaucrat's solution is not problematic for the following reason. Note that since the behavior of honest bureaucrats and the maximizing behavior of entrepreneurial applicants are incorporated into the program, the equilibrium is characterized fully by the collection of solutions to the dishonest bureaucrat's maximization problem, one for each $j \in \mathcal{D}$. Of course, these solutions are tied together by the relationship of equation 6, reproduced here:

$$\overline{g}^1_{1\cdot} \equiv \sum_{j \in \mathcal{D}} g^1_{1j}/[(1-\nu)N].$$

Thus the equilibrium is summed up by a set $\{(g^1_{1j}, g^1_{2j}) : j \in \mathcal{D}\}$, such that for each $j \in \mathcal{D}$, (g^1_{1j}, g^1_{2j}) solves the above maximization problem, taking as given all others' actions, and such that $\overline{g}^1_{1\cdot}$ satisfies equation 6. We next show that even though a given bureaucrat's solution (g^1_{1j}, g^1_{2j}) may not be unique, $\overline{g}^1_{1\cdot}$ and analogously-defined $\overline{g}^1_{2\cdot}$ and $\overline{g}^2_{1\cdot}$ are.

Proposition 1. *Under assumptions A1 and A2 and for $\alpha < \delta$, all equilibria involve unique values for $\overline{g}^1_{1\cdot}$, $\overline{g}^1_{2\cdot}$, and $\overline{g}^2_{1\cdot}$.*

Proof. Assume the opposite, that is $\overline{g}^a_1$ and $\overline{g}^b_1 > \overline{g}^a_1$ are both equilibrium outcomes for $\overline{g}^1_{1\cdot}$. We know then that $\gamma(\overline{g}^a_1) > \gamma(\overline{g}^b_1)$, since γ is strictly decreasing in $\overline{g}^1_{1\cdot}$. Call these γ_a and γ_b, respectively.

Note from equations 15 that the optimal g^1_{1j} is weakly increasing in γ, in the sense that if $\gamma_a > \gamma_b$, then the optimal g^1_{1j} for γ_a is at least as great as the optimal g^1_{1j} for γ_b. Since this is true for all j, it must be true that $\overline{g}^a_1 \geq \overline{g}^b_1$. This is a contradiction, and thus there can only be one equilibrium value for $\overline{g}^1_{1\cdot}$.

Take the equilibrium value for $\overline{g}^1_{1\cdot}$ as given, and let $\gamma^* = \gamma(\overline{g}^1_{1\cdot})$. Consider two cases. First, if $\alpha \neq \gamma^*$, then by equations 15, g^1_{2j} is strictly pinned down for each bureaucrat j (at 0 if $\alpha < \gamma^*$ and at $1-\tau$ if $\alpha > \gamma^*$). Clearly $\overline{g}^1_{2\cdot}$ must also be. Second, if $\alpha = \gamma^*$, then g^1_{2j} is not pinned down for any bureaucrat, but the sum $(g^1_{1j} + g^1_{2j})$ is pinned down at $1-\tau$ for every bureaucrat. Thus $\overline{g}^1_{1\cdot} + \overline{g}^1_{2\cdot} = 1-\tau$, so $\overline{g}^1_{2\cdot}$ is pinned down at $1 - \tau - \overline{g}^1_{1\cdot}$.

We have shown that $\overline{g}^1_{1.}$ and $\overline{g}^1_{2.}$ are uniquely pinned down in equilibrium. Since equation 12 holds for each bureaucrat j, clearly $\overline{g}^2_{1.}$ is pinned down at $1 - \overline{g}^1_{1.} - \overline{g}^1_{2.}$. ■

Proposition 1 establishes that the equilibrium is unique if we restrict attention to aggregate variables. An immediate corollary is that there exists a unique symmetric equilibrium in which $g^t_{ij} = \overline{g}^t_{i.}$ (where existence relies on convexity of the optimal choice sets). It will therefore be without loss of generality (again, from the standpoint of aggregates) that we restrict attention to symmetric equilibria in following sections.

For clarity, we define the following equilibrium quantities. Let M be the amount of misallocation, that is, the total number of licenses awarded to unproductive candidates. Then

$$M = (1 - \nu)NL\overline{g}^1_{2.}; \tag{16}$$

this is the total number of licenses in the hands of dishonest bureaucrats, $(1 - \nu)NL$, times the average fraction each one gives to unproductive candidates (which can occur only in period 1). Let D be the total number of licenses delayed, that is, given *late* to productive candidates, above and beyond the amount necessary. In particular, even honest officials cannot service all productive candidates in period 1, and so give out a fraction $1 - \tau$ of their licenses to them in period 2. So only the fraction in excess of $1 - \tau$ counts in the quantity D:

$$D = (1 - \nu)NL[\overline{g}^2_{1.} - (1 - \tau)] = (1 - \nu)NL[\tau - \overline{g}^1_{1.} - \overline{g}^1_{2.}], \tag{17}$$

where the second equality uses equation 12. Quantities M and D represent the two types of efficiency losses in the model.

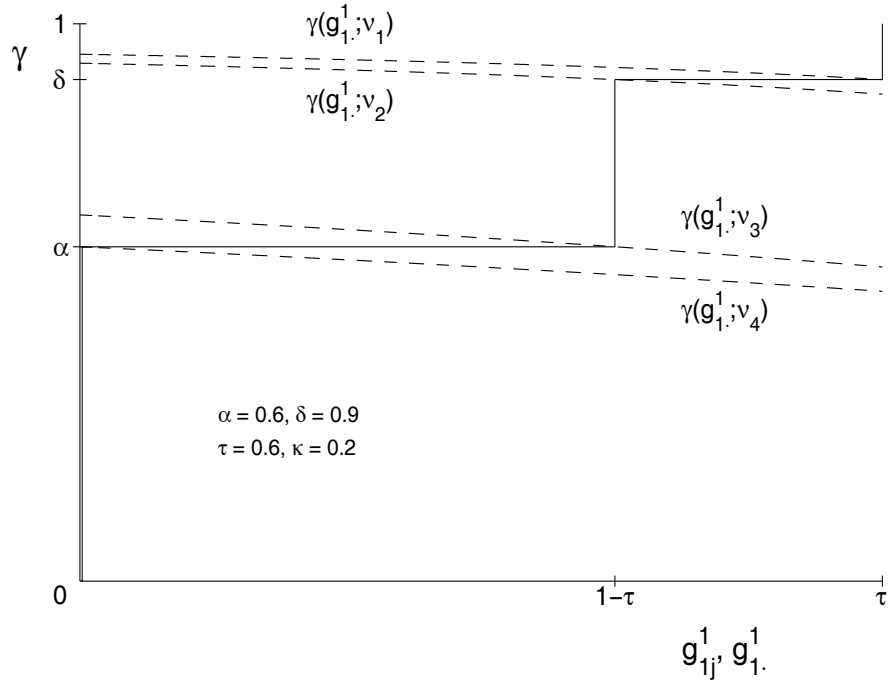

Figure 1: Determination of equilibrium.

4 Effects of Honest Agents

In this section we trace the effects of ν, the fraction of honest officials, on the amount of license misallocation M and strategic delay D. We continue to assume $\alpha < \delta$. The basic result is a non-monotonic (in fact, W-shaped) relationship of efficiency with the percent of honest agents, ν. To see the non-monotonicity, consider the extreme cases. If $\nu = 0$, every official is corrupt; a productive applicant derives no value from waiting, since he can never meet an honest official, and so will pay the full amount V_1 even in period 1 (i.e. $\gamma = 1$); and so all officials give all their licenses to productive candidates, τ percent in period 1, $1 - \tau$ percent in period 2. If $\nu = 1$, all officials are honest and the exact same behavior results. For intermediate values of ν, however, corrupt bureaucrats find it optimal to pass by productive candidates in period 1 since they are not willing to pay the full amount V_1.

The problem is illustrated graphically in Figure 1. The increasing step function (technically, correspondence) represents the γ required to make a given g^1_{1j} optimal; it is merely

the inverse of the solution of equations 15. Specifically, setting $g^1_{1j} = 0$ is justified as an optimal choice by any $\gamma \leq \alpha$. Similarly, setting $g^1_{1j} = 1 - \tau$ is optimal when $\alpha \leq \gamma \leq \delta$, and setting $g^1_{1j} = \tau$ is optimal when $\delta \leq \gamma$. These cases make up the vertical pieces of the step function. For $g^1_{1j} \in (0, 1-\tau)$, we know that a dishonest official must be indifferent between productive and unproductive applicants in period 1, and thus γ must equal α. Similarly, for $g^1_{1j} \in (1-\tau, \tau)$, a dishonest official must be indifferent between productive applicants in periods 1 and 2, respectively, and thus γ must equal δ. These cases make up the horizontal pieces of the step function.

The decreasing dashed lines represent the function $\gamma(\overline{g}^1_{1\cdot})$ for four different values of the parameter ν, which are discussed below. The function $\gamma(\overline{g}^1_{1\cdot})$ is strictly decreasing in $\overline{g}^1_{1\cdot}$, as is evident from equations 8 and 9 and the discussion following. Thus there is exactly one intersection of a given dashed line with the step function. This of course represents the unique symmetric equilibrium, in which $g^1_{1j} = \overline{g}^1_{1\cdot}$.

It is also evident from inspection of equations 8 and 9 that $\gamma(\overline{g}^1_{1\cdot})$ depends on ν, and is in fact strictly decreasing in ν for a given $\overline{g}^1_{1\cdot}$. Thus Figure 1 corresponds to $\nu_1 < \nu_2 < \nu_3 < \nu_4$; the higher ν, the lower the $\gamma(\overline{g}^1_{1\cdot}; \nu)$ curve. More specifically, the values for ν are chosen to put the intersections at the corners of the step function. In particular, ν_1 is defined to set $\gamma(\tau; \nu_1)$ equal to δ. Then using equations 8 and 9,

$$\nu_1 = \frac{1 - \tau + \kappa}{1 - \tau} \frac{1 - \delta}{\delta}. \tag{18}$$

By construction, for $\nu < \nu_1$, $\gamma(\tau; \nu) > \delta$ and the equilibrium involves $\overline{g}^1_{1\cdot} = \tau$ and $\overline{g}^1_{2\cdot} = 0$ (see equation 15). Next, ν_2 is defined to set $\gamma(1 - \tau; \nu_2) = \delta$ and ν_3 is defined to set $\gamma(1 - \tau; \nu_3) = \alpha$. This gives that

$$\nu_2 = \frac{\tau + \kappa}{\frac{\delta}{1-\delta}(1 - \tau) + 2\tau - 1} \tag{19}$$

and

$$\nu_3 = \frac{\tau + \kappa}{\frac{\delta}{1-\alpha}(1 - \tau) + 2\tau - 1}. \tag{20}$$

Clearly for $\nu \in (\nu_2, \nu_3)$, $\alpha < \gamma(1-\tau;\nu) < \delta$ and the equilibrium involves $\overline{g}^1_{1.} = 1-\tau$ and $\overline{g}^1_{2.} = 0$. Finally, ν_4 is defined to set $\gamma(0;\nu_4) = \alpha$:

$$\nu_4 = \frac{1+\kappa}{\frac{\delta}{1-\alpha}(1-\tau)+\tau}. \tag{21}$$

For $\nu > \nu_4$, $\gamma(0;\nu) < \alpha$ and the equilibrium involves $\overline{g}^1_{1.} = 0$ and $\overline{g}^1_{2.} = 1-\tau$. In the current discussion, we are assuming that $0 < \nu_1 < \nu_2 < \nu_3 < \nu_4 < 1$; this will be shown in proposition 2.

These intervals for ν, namely $(0, \nu_1)$, (ν_2, ν_3), and $(\nu_4, 1)$, involve the intersections through the vertical segments of the step function in Figure 1. The remaining intervals, $[\nu_1, \nu_2]$ and $[\nu_3, \nu_4]$, involve intersections through the horizontal segments. For $\nu \in [\nu_1, \nu_2]$, Figure 1 makes clear that in equilibrium $\gamma(\overline{g}^1_{1.};\nu) = \delta$. Using this fact in equations 8 and 9, we can solve for $\overline{g}^1_{1.}$ as a function of ν:

$$\overline{g}^1_{1.}(\nu) = \tau - \frac{\delta(1-\tau)}{1-\delta}\frac{\nu-\nu_1}{1-\nu}, \quad \nu \in [\nu_1, \nu_2]. \tag{22}$$

It can be checked that this expression ranges from τ to $1-\tau$ as ν increases from ν_1 to ν_2. Since $\gamma = \delta > \alpha$, we know $\overline{g}^1_{2.} = 0$. For $\nu \in [\nu_3, \nu_4]$, Figure 1 makes clear that in equilibrium $\gamma(\overline{g}^1_{1.};\nu) = \alpha$. Again, we can use equations 8 and 9 to solve for $\overline{g}^1_{1.}$:

$$\overline{g}^1_{1.}(\nu) = 1-\tau-[\frac{\delta(1-\tau)}{1-\alpha}+2\tau-1]\frac{\nu-\nu_3}{1-\nu}, \quad \nu \in [\nu_3, \nu_4]. \tag{23}$$

It can be checked that this expression ranges from $1-\tau$ to 0 as ν increases from ν_3 to ν_4. Since $\alpha = \gamma < \delta$, we know that each bureaucrat gives out exactly the fraction $1-\tau$ of his licenses in period 1, and so $\overline{g}^1_{2.} = 1-\tau-\overline{g}^1_{2.}$.

We can summarize how $\overline{g}^1_{1.}$ and $\overline{g}^1_{2.}$ vary with ν as follows:

$$\begin{array}{lll}
\overline{g}^1_{1.} = \tau, & \overline{g}^1_{2.} = 0, & if\ \nu \in [0, \nu_1] \\
\overline{g}^1_{1.} = \tau - \frac{\delta(1-\tau)}{1-\delta}\frac{\nu-\nu_1}{1-\nu} & \overline{g}^1_{2.} = 0, & if\ \nu \in [\nu_1, \nu_2] \\
\overline{g}^1_{1.} = 1-\tau, & \overline{g}^1_{2.} = 0, & if\ \nu \in [\nu_2, \nu_3] \\
\overline{g}^1_{1.} = 1-\tau-[\frac{\delta(1-\tau)}{1-\alpha}+2\tau-1]\frac{\nu-\nu_3}{1-\nu}, & \overline{g}^1_{2.} = 1-\tau-g^1_{1j}, & if\ \nu \in [\nu_3, \nu_4] \\
\overline{g}^1_{1.} = 0, & \overline{g}^1_{2.} = 1-\tau, & if\ \nu \in [\nu_4, 1]\ .
\end{array} \tag{24}$$

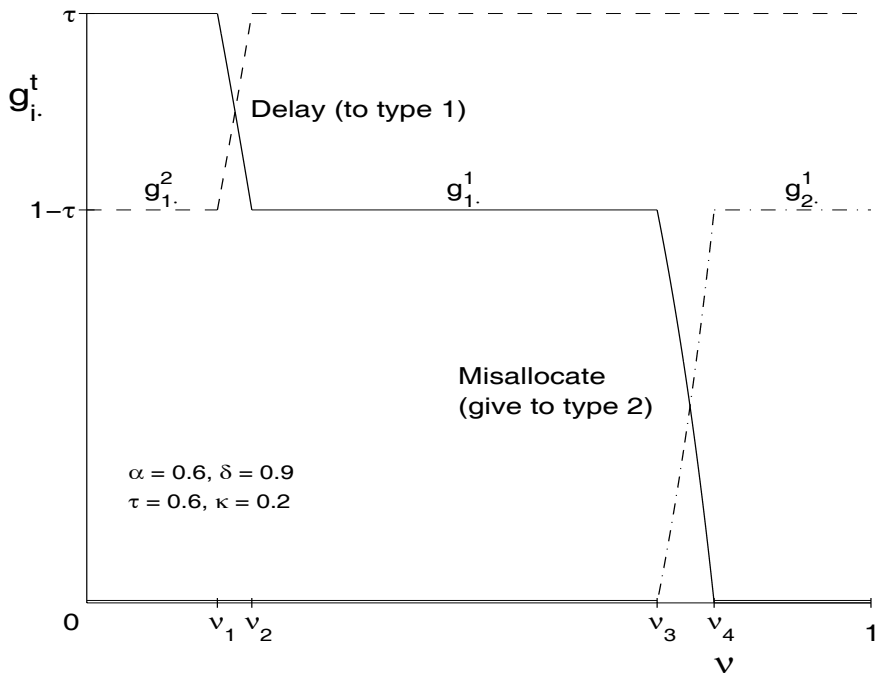

Figure 2: The effect of ν on corrupt officials' license allocation.

The effect of ν is expressed graphically in Figure 2. It is clear that for moderate values of ν, productive candidates may experience significant delay. For ν higher still, they experience outright denial as licenses are allocated to unproductive candidates.

Our ultimate goal is to look at total inefficiency resulting from dishonest bureaucrats. To do so, we use the equilibrium values of 24 to calculate total misallocation of licenses M and strategic delay D, from equations 16 and 17, respectively.

$$M = \begin{cases} 0, & if\ \nu \in [0, \nu_3] \\ (\nu - \nu_3)NL[\frac{\delta(1-\tau)}{1-\alpha} + 2\tau - 1], & if\ \nu \in [\nu_3, \nu_4] \\ (1-\nu)NL(1-\tau), & if\ \nu \in [\nu_4, 1]\ . \end{cases} \tag{25}$$

$$D = \begin{cases} 0, & if\ \nu \in [0, \nu_1] \\ (\nu - \nu_1)NL\frac{\delta(1-\tau)}{1-\delta}, & if\ \nu \in [\nu_1, \nu_2] \\ (1-\nu)NL(2\tau - 1), & if\ \nu \in [\nu_2, 1]\ . \end{cases} \tag{26}$$

Note that both M and D each consist of three linear pieces: the first flat, the second and third forming an inverted V. Total inefficiency, call it Λ for loss, is a weighted sum of M and D.[10] For each license delayed, the payoff in total surplus is reduced by V_1 and increased by δV_1, for a net gain of $(\delta - 1)V_1 < 0$. Similarly, for each license misallocated, the net gain to total surplus is $(\alpha - 1)V_1 < 0$. Thus

$$\Lambda = V_1[D(\delta - 1) + M(\alpha - 1)]. \tag{27}$$

Using this expression and equations 25 and 26, we see that

$$\Lambda = \begin{cases} 0, & \nu \in [0, \nu_1] \\ -V_1 NL(\nu - \nu_1)\delta(1-\tau), & \nu \in [\nu_1, \nu_2] \\ -V_1 NL(1-\nu)(1-\delta)(2\tau - 1), & \nu \in [\nu_2, \nu_3] \\ -V_1 NL\{(1-\nu)(1-\delta)(2\tau-1) + (\nu - \nu_3)[\delta(1-\tau) + (1-\alpha)(2\tau - 1)]\}, & \nu \in [\nu_3, \nu_4] \\ -V_1 NL(1-\nu)[(1-\delta)(2\tau-1) + (1-\alpha)(1-\tau)], & \nu \in [\nu_4, 1]\ . \end{cases} \tag{28}$$

From equation 28, one can see that total surplus is piecewise linear and essentially W-shaped as a function of the percent of honest officials, ν. The one qualification is the flat segment that makes up the first linear segment. By inspection, the second and fourth segments are decreasing in ν,[11] while the third and fifth segments are increasing in ν. The fifth segment reaches zero exactly as ν reaches one. Total surplus is pictured in Figure 3 as a percent of first-best surplus, which equals $V_1[NT + \delta N(L - T)] = V_1 NL[\tau + \delta(1 - \tau)]$.

We have argued that total efficiency is a W-shaped function of ν, the fraction of honest people. It remains to provide conditions ensuring that indeed $0 < \nu_1 < \nu_2 < \nu_3 < \nu_4 < 1$, which has been assumed thus far.

[10] We will think of Λ as negative if there is a loss in efficiency.

[11] For $\nu \in [\nu_3, \nu_4]$, one can calculate the slope on ν to be $-V_1 NL[\delta(1-\tau) + (\delta - \alpha)(2\tau - 1)]$. This is strictly negative since $\alpha < \delta$ and $\tau \in (1/2, 1)$.

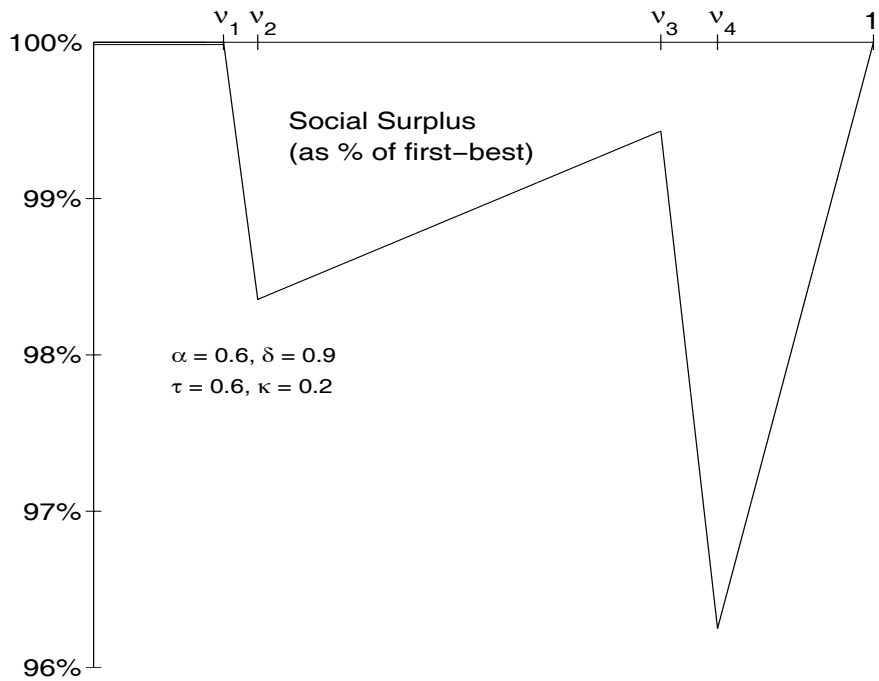

Figure 3: Efficiency as a function of ν.

Proposition 2. *Under assumptions A1 and A2 and for $\alpha < \delta$, the condition*

$$\delta > (1 - \tau + \kappa) \max\{\frac{1-\alpha}{1-\tau}, \frac{1}{2(1-\tau)+\kappa}\}$$

guarantees that

- *For $\nu \in (\nu_1, 1)$, strategic delay occurs in equilibrium, that is, $\overline{g}^2_{1\cdot} > 1 - \tau$;*
- *For $\nu \in (\nu_3, 1)$, misallocation of licenses occurs in equilibrium, that is, $\overline{g}^1_{2\cdot} > 0$; and*
- *Total surplus is W-shaped in ν, reaching local minima at $\nu = \nu_2$ and $\nu = \nu_4$, and attaining the first best only for $\nu \in [0, \nu_1]$ or $\nu = 1$.*

Proof. The preceding text establishes each of these facts, under the assumption that $0 < \nu_1 < \nu_2 < \nu_3 < \nu_4 < 1$, which we here show. Recall that $\delta \in (0, 1)$, $\tau \in (1/2, 1)$, and $\alpha \in (0, \delta)$ by assumption. Further, assumption A1 implies that $\kappa \geq 2\tau - 1$ and is thus strictly positive.

Given these facts, inspection of equation 18 reveals that $\nu_1 > 0$. Comparison of equations 19 and 20 reveals that $\nu_2 < \nu_3$, since $\alpha < \delta$. Comparison of equations 20 and 21 reveals that $\nu_3 < \nu_4$ as long as $\nu_4 < 1$. To see this, let $\nu_4 \equiv x/y$, and note that $\nu_3 = (x-z)/(y-z)$, where $z = 1-\tau > 0$. Subtracting a positive constant from both numerator and denominator of any fraction less than one reduces the amount, as long as both numerator and denominator remain positive, which is true here.

It remains only to show that $\nu_1 < \nu_2$ and $\nu_4 < 1$. Using equations 18 and 19, one can show that

$$\delta > \frac{1-\tau+\kappa}{2(1-\tau)+\kappa}$$

is necessary and sufficient for $\nu_1 < \nu_2$. (It is also necessary and sufficient for both $\nu_1 < 1$ and $\nu_2 < 1$.) Further, using equation 21, one can show that

$$\delta > \frac{(1-\tau+\kappa)(1-\alpha)}{1-\tau}$$

is necessary and sufficient for $\nu_4 < 1$. (It is also necessary and sufficient for both $\nu_3 < 1$ and $\nu_4 < 1$.) Evidently these two conditions are enough for the result. Note that they can be satisfied. For example, any combination of parameters satisfying the restrictions mentioned earlier in the proof in addition to $\alpha = \tau$ and $\kappa = 2\tau - 1$ satisfy these conditions. ■

5 Conclusion, Discussion, and Future Extensions

The previous sections analyzed a model where the possibility of finding an honest bureaucrat upon reapplication limits the bribe that the productive agent is willing to pay. Under certain conditions this maximum bribe can be lower than the surplus of the less productive agent. This can result in the less productive types outbidding the more productive ones in the first period, and securing licenses from dishonest officials.

Another consequence of a sufficient number of productive agents searching for licenses in the second period, rather than paying a bribe in the first, was that corrupt officials could find it profitable to distribute fewer licenses in period 1. Such strategic delays in the distribution of licenses was driven by the possibility of capturing a higher bribe from productive re-applicants. Thus, the presence of some honest bureaucrats led to both allocation inefficiency and bureaucratic delays. Clearly, these two effects are interrelated in our analysis, both following from the negative externality generated by the existence of honest officials. In this sense, our paper demonstrates that the twin features of misallocation of opportunities and bureaucratic inefficiency can have a common cause, and their frequently observed co-existence is not one of pure coincidence.

Till now, the analysis was conducted with the assumption that all potential applicants have the ability to pay bribes (up to V_1 at least). With this assumption, the equilibrium outcome when all bureaucrats are honest turned out to be identical with the equilibrium when all bureaucrats are dishonest. In the former situation, officials awarded all licenses to the most productive type as part of performance of their duty. In the latter case, bribery ensured allocation efficiency, as the type that generated the greatest surplus from each license paid the highest bribe.

If complete honesty among all bureaucrats is as efficient as total dishonesty, it may be argued that the government should not spend any resources on costly corruption deterring activity, but should rather encourage bureaucrats to behave as revenue farmers who are unrestricted in their attempt to maximize earnings from the sale of licenses. Such a conclusion, however, overlooks what frequently may be an important justification for awarding licenses at below their "market price" to the most productive applicants, rather than using price as a screening device for achieving allocation efficiency. In an economy where income is distributed unequally, and credit markets are imperfect, a proportion of all types, including the most productive ones, may lack the adequate resources to pay for the bribe that the official

demands. Consequently, a less productive but wealthy agent may outbid a more productive but poor one, and revenue farming may lead to inefficient allocation of resources.

To illustrate, assume the following simple distribution of initial wealth: a proportion λ of all agents in our model (types 1 and 2) possesses $w > V_1$, while all others have zero wealth. Imperfections in the credit market imply that no one is willing to lend money to the agents for the purpose of bribing bureaucrats. While, as before, we maintain the assumption $1 + \kappa > 2\tau$, we now assume that

$$1 > \lambda(1 + \kappa) > \tau, \tag{A3}$$

which implies that $L > \lambda\mu M/N > T$. Thus, while the total number of licenses possessed by each bureaucrat is strictly greater than the number of wealthy type 1 agents per official, the latter number is greater that the maximum number of licenses each bureaucrat is able to allocate within a single period.

Consider, under such circumstances, the outcome when all officials are corrupt. Then, $\nu = 0$, and from equation 9, it is evident that $\gamma = 1$. It is easy to see that, given assumption A3, each official will receive enough applications from the wealthy type 1 agents to be able to charge the bribe V_1 for all T licenses in period 1. Thus, in equilibrium, NT licenses awarded to type 1 agents in period 1. In period 2, there are $L[\lambda(1 + \kappa) - \tau]$ wealthy type 1 agents per official, where $L[\lambda(1+\kappa)-\tau]$ is strictly less than $L - T$. Consequently, of the remaining licenses, officials award $L[\lambda(1+\kappa)-\tau]$ licenses to type 1 applicants for the bribe V_1, and the remainder, i.e. $L[1 - \lambda(1 + \kappa)]$ licenses to wealthy type 2 agents in exchange for the bribe V_2. This outcome is dominated by the equilibrium with all honest officials, when only type 1 agents are awarded all the L licenses by each bureaucrat over the two periods.

It would be instructive to extend the analysis with limited wealth effects to cases where $\nu \in (0, 1)$. We leave this to a future extension. For the present, we make the observation that if a fully opportunistic bureaucracy is not as desirable as a fully honest bureaucracy, it may be socially efficient to invest in corruption-controlling activities. But if the non-monotonic

relationship between the proportion of honest officials and efficiency continues to hold in this limited wealth case as well, the results may lead to a sort of bimodality in implementation of optimal anti-corruption policies. We conjecture that countries with very small differences in their costs of making an official behave honestly rather than opportunistically may make very different choices regarding how much to invest in an honest bureaucracy. Countries with unit costs above some cutoff will make little investment and allow or even encourage corruption as the norm, while those below the cutoff will expend resources to obtain a relatively, or completely, clean bureaucracy.

References

[1] Abhijit Banerjee. A theory of misgovernance. *Quarterly Journal of Economics*, 112(4):1289–1332, November 1997.

[2] Daniel Berkowitz and Wei Li. Tax rights in transition economies: A tragedy of the commons? *Journal of Public Economics*, 76(3):369–397, June 2000.

[3] Derek J. Clark and Christian Riis. Allocation efficiency in a competitive bribery game. *Journal of Economic Behavior and Organization*, 42(1):109–124, May 2000.

[4] Hernando de Soto. *The Other Path.* Harper and Row, New York, 1989.

[5] Samuel P. Huntington. *Political Order in Changing Societies.* Yale University Press, New Haven, CT, 1968.

[6] Nathaniel Leff. Economic development through bureaucratic corruption. *American Behavioral Scientist*, pages 8–14, 1964.

[7] Da Hsiang Donald Lien. Corruption and allocation efficiency. *Journal of Development Economics*, 33(1):153–164, July 1990.

[8] Francis T. Lui. An equilibrium queuing model of bribery. *Journal of Political Economy*, 93(4):760–781, August 1985.

[9] Susan Rose-Ackerman. *Corruption: A Study in Political Economy*. Academic Press, New York, 1978.

[10] Andrei Shleifer. Government in transition. *European Economic Review*, 41(3-5):385–410, April 1997.

[11] Andrei Shleifer and Robert W. Vishny. Corruption. *Quarterly Journal of Economics*, 108(3):599–617, August 1993.