Competition in Bureaucracy and Corruption*

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Work in progress, comments are welcome

Abstract

This paper studies the consequences of introducing competition between bureaucrats. Bureaucrats are supposed to grant licences to firms that satisfy certain requirements. Firms have to invest into satisfying these requirements. Some bureaucrats are corrupt, that is, they give the licence to any firm in exchange for a bribe. Some firms prefer to buy the licence rather than to invest and satisfy the requirements imposing negative externalities on the society. It is found that the competition regime creates more incentives for firms to invest which is beneficial for the welfare, however, if firms' behavior does not change, the competition regime decreases the welfare. Additional results on dynamic entry to the bureaucracy and the effect of punishments are given.

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1 Introduction

Corruption is an important problem in many countries, only few countries in the world can be characterized as corruption free. In a cross-country analysis, Mauro (1995) shows

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that corruption hampers investment and growth. While almost thirty years ago Susan Rose-Ackerman (1978) wrote her famous book on the economic analysis of corruption, the literature on corruption is still quite limited, for its complicated nature and a lack of reliable data. There are many case studies and anecdotal evidence of corruption and sometimes policies aimed at fighting corruption. It is not clear how much of this experience can be generalized to other places and periods; a theoretical analysis of institutional responses to corruption is particularly scarce.[1] This paper makes a step in this direction.

I study how introducing competition between bureaucrats affects corruption. This kind of institutional response to the corruption problem was first suggested in Rose-Ackerman (1978) and then discussed in Schleifer and Vishny (1993).[2] In the same way as competition among firms reduces prices of the goods they sell, competition among bureaucrats reduces prices they charge for their services, i.e. bribes. Shleifer and Vishny (1993) say (p. 607):

> "A citizen can obtain a U.S. passport without paying a bribe. The likely reason for this is that if an official asks him for a bribe, he will go to another window or another city. Because collusion between several agents is difficult, bribe competition between the providers will drive the level of bribes down to zero."

It seems very intuitive that if there are several bureaucrats that provide some service they cannot extort the same bribes as when there is only one such bureaucrat.[3] However, it does not mean that the costs of corruption for the society decrease, that is, the welfare increases.

[1] One reason for this is that many people agree with "moralists" or "fatalists", as Bardhan (1997) calls them. The former ones think it is all about social values and norms; the latter ones attribute it to being in a "bad" equilibrium in a multiple-equilibria world. In either case, not much can be done about corruption.

[2] While it is beyond the scope of the paper, note that comparing the costs of different anti-corruption instruments the competitive bureaucracy (creating overlapping jurisdictions, allowing citizens/firms to choose where or to whom to apply for a service) seems to be much cheaper than many others such as increasing bureaucrats' salaries, tighter monitoring of their performance, better enforcement of anti-corruption laws.

[3] This would not be true if the bureaucrats can coordinate on their bribe policy. Assuming that bureaucrats are numerous enough, we rule out this possibility throughout the paper.

To make the point clear, let us define two types of corruption (which are close to those introduced by Schleifer and Vishny (1993); thus, I keep their names). If a bureaucrat asks a bribe for a legal service, or action, this is corruption *without theft*. This is the case, for example, when a firm with a clean technology (a *qualified* firm) is extorted a bribe by a bureaucrat for the certification that the technology is indeed clean. The second type is corruption *with theft*: the bureaucrat asks money for performing an illegal action, or service. This is the case when a polluting firm (an *unqualified* firm) "buys" a certificate from a bureaucrat. Another example would be a tax inspector that lets a firm to save on taxes in exchange for a bribe. The crucial difference between the two types is that corruption with theft imposes a negative externality on the rest of the society in the form of pollution, unpaid taxes, etc. In fact, a bureaucrat and a firm collude against the government (society); they "steal" from it. Corruption without theft is more innocuous as the bribes paid are simply transfers from the firms to the bureaucrats.

Introducing competition is good under corruption without theft since its only effect is to reduce the level of corrupt payments. It is less so when corruption is with theft because by reducing the level of payments it allows more unqualified firms to buy the bureaucrats' service (e.g. certificate) imposing bigger negative externalities on the rest of the society. This observation has been made by Rose-Ackerman (1978,1999) and Schleifer and Vishny (1993).

This paper studies the point that has been missing in the literature: how does competition affect the firms' *incentives* to become qualified? In our model, all the firms are initially unqualified and they might undertake some investment to become qualified. In most of the paper we consider that the firms are identical, that is, they have the same investment costs. There are honest bureaucrats that give licences only to qualified firms (and without a bribe) and dishonest ones that give licences to any firm in exchange for a bribe. We study and compare two regimes: monopoly and competition. Under monopoly regime, the firm cannot choose the bureaucrat it applies while under competition regime the firm can reapply to another bureaucrat in the next period. Reapplication is costly as the future is discounted. As the firms are identical, in any given equilibrium they all take the same decision, they are either all qualified, and the corruption is without theft, or they are all unqualified, and the corruption is with theft. Their decision is, by definition, endogenous and this is one of the main distinctive features of this paper.

First, we analyze which regime, monopoly or competition, results in a higher welfare when firms take the same decision in both regimes. Bribes indeed fall under competition regime as the literature predicts. If the corruption mode is with theft (the firms are unqualified in the equilibrium), then, again confirming the literature, the competition regime performs worse than the monopoly mode. There are two reasons for this result. The first reason is the easy one, spelled out in the literature: unqualified firms produce more on average as they continue to reapply until they meet a dishonest bureaucrat, thus, the negative externality is bigger. The second reason is the outcome of the *endogenous* qualification: under monopoly regime the firms in districts where the bureaucrat is honest have to invest to become qualified and obtain the licence. The production takes place in the second period at the latest, i.e., earlier on average than under competition regime and the welfare is higher. Note that we include only real variables in the welfare function, that is, production, costs and externalities, and do not include bribes. While there are sound reasons to consider bribes bad per se, the literature often focuses on some real impacts of corruption and not on the size of the bribes. See, for example, Bliss and Di Tella (1997) and Acemoglu and Verdier (2000).

Second, we investigate in which regime firms are more likely to invest and become qualified. We find that in the competition regime firms have more incentives to invest. In this regime a qualified firm gains more than an unqualified firm as compared to the monopoly regime. Consider a firm that meets a dishonest bureaucrat. Under monopoly regime the bureaucrat will ask for the same bribe from a qualified and unqualified firm as its outside option (not dealing with this bureaucrat) is zero in both cases. Under competition regime a qualified firm has a higher outside option as it may reapply and possibly meet an honest official, thus, a qualified firm will end up paying a lower bribe than an unqualified one. Consider now a firm that meets an honest official. A qualified firm obtains its licence without any bribe under both regimes. An unqualified firm cannot get the licence. Under monopoly regime it will invest and obtain the licence in the next period. Under competition regime, however, the firm has to reapply to a randomly chosen bureaucrat, i.e., it does not know if he will be honest or not. Whether the firm invests or not in the next period, it will still obtain less than an investing firm under monopoly regime. Hence, in both cases, when meeting an honest bureaucrat and a dishonest one, the difference in profits between a qualified firm and unqualified firm is higher under

competition regime. The latter one is more conducive to investment.

When firms are heterogenous, introduction of competition among bureaucrats has two opposing effects: the positive one is that some firms that were previously unqualified invest and become qualified, the negative one is that the firms that are still unqualified produce less (later) and impose higher externalities. The total effect is thus ambiguous, it depends, in particular, on how many firms change their behavior. However, if there are a lot of very inefficient firms, that is, firms with investment costs higher than their profits which will never invest, the negative effect becomes dominant and the introduction of competition is not beneficial.

If agents can choose whether they become entrepreneurs or bureaucrats, the number of honest bureaucrats is endogenous. We investigate which regime leads to a higher share of honest bureaucrats. We find that there is a unique stable equilibrium in which firms do not invest. Under both regimes, for low values of the bureaucrats' bargaining power the equilibrium share is one while for high ones it is zero. There is an intermediate range in which the share of honest bureaucrats is between zero and one and decreasing in the bargaining power. In general there is no clear cut answer which regime results in a higher share of honest bureaucrats in the equilibrium. However, there is a range of bargaining power when it is unambiguously the competition regime. There is also a unique stable equilibrium in which there is no dishonest bureaucrats and firms invest. It seems that this equilibrium is more likely to emerge under competition regime as well.

The literature on the effects of competitive bureaucracy is small. We already mentioned Rose-Ackerman (1978, 1999) and Shleifer and Vishny (1993). We are not aware of any other paper that studies or at least discusses the issue. The papers that look at corruption and competition study, in fact, the effect of competition in the regulated market and not in the bureaucracy (the most cited are arguably Ades and Di Tella (1999) and Laffont and N'Guessan (1999)). From the modelling point of view, the bargaining process is quite similar to the one of Cadot (1987). The important difference is that he gives the bureaucrat full bargaining power while we consider a more general case when bureaucrat's bargaining power can be anything. Acemoglu and Verdier (2000) study a model in which firms decide on their behavior, there is, as we call it, endogenous qualification. In their model, firms may be inspected by a bureaucrat with a certain probability, once a firm is inspected it has to deal with a given bureaucrat. Thus, they have the monopoly regime;

it is quite difficult to think about the competition regime there. They have a general equilibrium model in agents choose whether to become entrepreneurs or bureaucrats as in our dynamic analysis. Their model is much richer in that the government decides on the number and salary of bureaucrats and on the taxes/subsidies on the firms affecting the gain from the corrupt transactions.

The rest of the paper is organized as follows. The model is introduced in Section 2 and the equilibrium outcomes are found for both monopoly and competition regimes. Section 3 compares the two regimes and Proposition 3 presents the two main results discussed above. Section 4 contains extensions of the basic model of Section 2. Heterogenous firms are considered in Section 4.1; arbitrary bargaining power in the bargaining of a firm and corrupt bureaucrat is studied in Section 4.2. In Section 4.3 we put the model into a dynamic framework: we analyze the equilibrium when agents can choose decide whether they become entrepreneurs or bureaucrats.Section 4.4 introduces punishments for giving and accepting bribes *...to be done.....*Section 5 concludes.

2 The model

There is an industry in which production process involves negative externalities in terms of pollution, hygienic risk, etc. There are identical firms that can invest a certain amount c to improve the production process, for example, they can recycle their wastes or switch to a better technology.[4] If a firm produces without investing it imposes a negative externality of size lc, $l > 1$, on the rest of the society. This industry is regulated in the following way: there are bureaucrats that grant licences to the firms. We say that a firm is *qualified* (for the licence) if it has invested into a better technology, otherwise, it is *unqualified*. Denote with superscripts q and u the variables relevant for qualified and unqualified firms, respectively. Only after obtaining the licence a firm can produce and earn profits $v > c$.[5,6]

The bureaucrats are supposed to grant licences if and only if the firm applying for the licence is qualified. A share h of bureaucrats do precisely this, they are *honest*. Moreover, they do not ask for bribes. The remaining bureaucrats, of share $1-h$, are *dishonest*: they

[4] We consider heterogenous firms in Section 4.1.

[5] We analyze inefficient firms with $c > v$ in Section 4.1.

[6] In fact, it is the ratio $\frac{c}{v}$ that matters.

give a licence in exchange for a bribe irrespectively of the firm's qualification. There is a unit mass of bureaucrats.

We study two regimes of the bureaucracy: monopoly and competition. Under monopoly regime, each firm can apply for a licence only to a certain bureaucrat, for example, the firms are in different districts and there is a single bureaucrat in each district. Under competition regime, each firm chooses randomly the bureaucrat to apply. The firms do not know the honesty of a given bureaucrat until they apply. In both regimes, a firm that faces a dishonest official bargains about bribe b. The bargaining ends with no delay and the two parties split equally the surplus from the relationship.[7] Denote with subscripts m and c the variables relevant for monopoly and competition regimes, respectively.

The timing of the game is the following. In the beginning of each period the firm decides whether to invest into a better technology or not. Then, it applies to a bureaucrat. If the licence is granted, the firm produces, earns v and quits the game. Otherwise, the firm enters the next period. Under monopoly regime the firm always reapplies to the same bureaucrat. Under competition regime, the firm cannot reapply to the same bureaucrat, it has to apply to different bureaucrats. Since there is a continuum of them, in every period the firm meets a honest bureaucrat with probability h. There is a common discount factor δ.[8]

In the welfare calculation we do not include bribes, they are considered as pure transfers. There many reasons to believe that bribes do enter (negatively) the welfare function. For instance, part of the bribes may be wasted because of the secret and non-enforceable nature of these contracts, as it is often assumed in the hierarchical (principal-supervisor-agent) models of collusion (e.g. Laffont and N'Guessan (1999);[9] higher bribes and/or higher prevalence of corruption create tolerance to the corruption in the society which makes anti-corruption policies less effective. However, it is important to disentangle the

[7] In Section 4.3 we show that the results of this Section and Section 3 (in particular, Proposition 3) do not depend qualitatively on the distribution of the surplus, i.e., on the bargaining power of the two parties.

[8] The profit v is treated as if it occurs only in the period when production takes place. It can be also interpreted as a discounted stream of all future profits, that is, once a firm gets the licence it produces for all future periods. Then, its per period value will be $(1-\delta)v$. The same applies to the externality lc.

[9] It was first shown in Laffont and Tirole (1991) in the framework of interest-group politics and then developed for different setups in the subsequent literature.

two issues, welfare and amount of bribes, aiming to understand the exact effects of introducing competitive bureaucracy.

Let us now consider the two regimes in more detail.

2.1 Monopoly regime

Under monopoly regime, the firm cannot switch to another bureaucrat. The surplus of their relationship is firm's profits v *independently* of whether the firm is qualified or not. Then, any firm facing a dishonest official will have to pay half of its profits as a bribe to obtain the licence

$$b_m^q = b_m^u = b_m = \frac{v}{2}.$$

Consider the firm's decision to improve its technology. When the firm improves it, it will obtain the licence in the same period from any bureaucrat; but it will have to pay the bribe b_m if the bureaucrat is dishonest:

$$\Pi_m^q = hv + (1-h)\frac{v}{2} - c. \tag{1}$$

If the firm decides not to improve, it will still obtain the licence from a dishonest bureaucrat in exchange for a bribe. If the bureaucrat is honest, the firm will have to invest in the next period:

$$\Pi_m^u = \delta h(v-c) + (1-h)\frac{v}{2}. \tag{2}$$

Comparing (1) and (2) we see that there is a threshold level of investment costs c_m^*

$$c_m^* = \frac{(1-\delta)\,h}{1-\delta h}v \tag{3}$$

such that the firms improves its technology if and only if its costs are lower than c_m^*. It increases in h from 0 to v as we would expect: when more bureaucrats become honest, chances to "buy" the licence decrease while chances to get the licence without a bribe increase so that the investment into a better technology is justified for higher costs. It decreases with the discount factor δ as the cost of delay which occurs when an unqualified firm meets an honest bureaucrat become smaller.

Once we know if the firm invests or not, we can easily compute the welfare. We consider bribes as pure transfers, they do not enter into welfare calculation. Proposition 1 summarizes the main results of this Section.

Proposition 1 *Under monopoly regime, there exists the threshold* $c_m^* \in [0, v]$ *given by (3) such that if the investment costs* c *are lower than* c_m^* *the firm invests and the resulting welfare is*

$$W_m^q = v - c. \tag{4}$$

If the investment costs c *are higher than* c_m^* *the firm does not invest and the resulting welfare is*

$$W_m^u = \delta h(v - c) + (1 - h)(v - lc). \tag{5}$$

2.2 Competition regime

Under competition regime the analysis becomes more complicated. When bargaining with a dishonest bureaucrat, a firm has now an outside option which is to wait until the next period and to apply to another bureaucrat. A qualified firm will obtain the licence for free if the bureaucrat is honest while an unqualified firm cannot do it unless it invests in the next period which is costly. Thus, the outside option of the firm in the bargaining in any period is higher for a firm that is qualified in this period. Unlike the monopoly regime, the equilibrium bribes paid by a qualified and unqualified firm will be different.

Let us focus on the stationary solution, i.e., when the bribes b_c^q and b_c^u do not depend on the period. Lemma 1 makes an observation that simplifies the further analysis.

Lemma 1 *The firm invests only in the first period, if at all.*

Proof. Consider an unqualified firm that does not obtain the licence in the current period. In the beginning of the next period it will face exactly the same problem when deciding whether to invest or not as in the current period because of the stationarity of the problem. Then, if it is optimal not to invest in the current period, it will be optimal not to invest in any future period. ■

Let us first derive the expected profits of the firm that decides to invest in the first period. It will always obtain the licence but if the bureaucrat is dishonest, it will have to pay the bribe b_c^q:

$$\Pi_c^q = hv + (1-h)(v - b_c^q) - c.$$

The bribe is determined through a bargaining process. The value of the relationship between the firm and dishonest bureaucrat is $v - \delta(\Pi_c^q + c)$ as the firm may leave the bureaucrat and reapply in which case it will earn $\delta\left[hv + (1-h)(v - b_c^q)\right]$. The equilibrium bribe splits this value equally, that is,

$$b_c^q = v - \delta(\Pi_c^q + c) - b_c^q.$$

It equals

$$b_c^q = \frac{1-\delta}{2-\delta+\delta h} v. \tag{6}$$

Note that b_c^q is decreasing in the share of honest bureaucrats h and in the discount factor δ because both of them increase the firm's outside option. In particular, a higher h means higher chances to obtain the licence without a bribe.

The qualified firm expected profits are

$$\Pi_c^q = \frac{1+h}{2-\delta+\delta h} v - c. \tag{7}$$

Let us now turn the firm that decides not to invest. It can get the licence only from a dishonest bureaucrat; if it meets an honest one, it has to reapply in the next period. Its expected profits are

$$\Pi_c^u = \delta h \Pi_c^u + (1-h)(v - b_c^u).$$

The equal split condition

$$b_c^u = v - \delta \Pi_c^u - b_c^u$$

yields the equilibrium bribe b_c^u

$$b_c^u = \frac{1-\delta}{2-\delta-\delta h} v. \tag{8}$$

The most important thing to note is that $b_c^u > b_c^q$, given by (6), as the consequence of a lower outside option of the unqualified firm. The bribe b_c^u is decreasing in the discount factor δ as it it the case of the bribe for qualified firms. However, it increases with the share of honest bureaucrats h since a higher h decreases the firm's chances to meet a dishonest bureaucrat, the only source of the licence for an unqualified firm. We also obtain that the competition regime reduces the size of the bribes in the equilibrium:

$$b_c^q < b_c^u < b_m. \tag{9}$$

The unqualified firm profits are

$$\Pi_c^u = \frac{1-h}{2-\delta-\delta h} v. \tag{10}$$

The comparison of (7) and (10) yields the threshold level of costs c_c^* above which the firm does not invest

$$c_c^* = \frac{4(1-\delta)h}{(2-\delta)^2 - \delta^2 h^2} v. \tag{11}$$

It increases with h from 0 to v as c_m^* does: when h is higher, it pays more to be qualified and it pays less to be unqualified. It decreases with the discount factor δ since though a higher δ benefits both the qualified firm and the unqualified, the impact on the latter one is bigger than on the former one.

We can write Proposition 2 summarizing the results of this Section.

Proposition 2 *Under competition regime, there exists the threshold $c_c^* \in [0, v]$ given by (11) such that if the investment costs c are lower than c_c^* the firm invests and the resulting welfare is*

$$W_c^q = v - c. \tag{12}$$

If the investment costs c are higher than c_c^* the firm does not invest and the resulting welfare is

$$W_c^u = \frac{1-h}{1-\delta h}(v - lc). \tag{13}$$

The expression for W_c^u may need some comment. When the firm is not qualified, it can obtain the licence only if it meets a dishonest bureaucrat. This event occurs with probability $1-h$ in the first period, with probability $h(1-h)$ in the second period, with probability $h^2(1-h)$ in the third period, etc. The expected social value of production is $(v-lc)(1-h)(1+\delta h+\delta^2 h^2+...)$ which gives (13).

3 Comparison of the two regimes

The comparison of the monopoly and competition regimes proceeds in two steps. First, we find out which regime is better if the firm behavior is the same in the two regimes. That is, we compare the welfare of the two regimes if the firm invests and if it does not. Second, we find out which regime gives more *incentives* for firms to invest into a better technology, that is, we compare the thresholds c_m^* and c_c^*. Proposition 3 makes the formal comparison.

Proposition 3 *If the firm's decision to invest is the same under the two regimes, the monopoly regime is (weakly) better, that is,* $W_m^u > W_c^u$ *and* $W_m^q = W_c^q$.

The firm has more incentives to invest under the competition regime, that is, $c_c^* > c_m^*$.

Proof. Direct comparison shows that $W_m^q = W_c^q$ and $c_c^* > c_m^*$. To show that $W_m^u > W_c^u$ notice that W_c^u decreases with l faster than W_m^u. Showing that $W_m^u > W_c^u$ when $l = 1$ completes the proof. ■

Let us explain the intuition of these results. Start with the simplest one, the one showing that if the firm invests, the welfare is the same, $W_m^q = W_c^q$. If the firm is qualified, it will get the licence from any bureaucrat under any regime. The only difference is the bribe it will have to pay. As the bribes do not affect the welfare, the welfare is the same under both regimes.

If the firm does not invest, the monopoly regime turns out to be better, $W_m^u > W_c^u$. The first reason is that the expected discounted profits of the firm are higher. Under monopoly regime, the firm obtains the licence either in the first period if the bureaucrat

is dishonest or in the second one if he is honest. Under competition regime, it can be in the first period with the same probability $1-h$, or in the second with probability $h(1-h)$, or in the third one, etc. Thus, under monopoly regime the licence is obtained earlier on average, and so the discounted expected profits are higher.

If the externality is relatively small, that is, l is close to 1, the production of any firm (qualified or not) results in a welfare gain of $v-c$. Under monopoly regime it happens earlier on average, therefore, the welfare is higher. If the externality is big, that is, l is much higher than 1, the monopoly regime is better for a second reason. The unqualified firm obtains the licence only if it meets a dishonest bureaucrat in the first period, i.e., the expected social loss is $(1-h)lc$. Under competition regime, the unqualified firm reapplies for the licence until it meets a dishonest bureaucrat, i.e., the expected social loss is $\frac{1-h}{1-\delta h}lc$. In other words, under competition regime the unqualified firm meets a dishonest bureaucrat more often, and thus, the expected negative externality is bigger.

Now, why does the competition regime provide more incentives for the investment? First, consider the case when the firm applies to a dishonest bureaucrat. It has to pay the same bribe $b_m^q = b_m^u = \frac{v}{2}$ under monopoly regime independently of whether it is qualified or not. Under competition regime, a qualified firm has a higher outside option than an unqualified one. Bargaining over the bribe the qualified firm ends up paying a smaller bribe, $b_c^q < b_c^u$, as we noticed comparing (6) and (8). Thus, the difference in profits between a qualified firm and unqualified firm is higher under competition regime.

Second, consider the case when the bureaucrat is honest. A qualified firm obtains v in both regimes. Under monopoly regime an unqualified firm will invest and obtain the licence in the second period, earning $\delta(v-c)$. Under competition regime, the firm reapplies earning $\delta\Pi_c^q$ if it invests or $\delta\Pi_c^u$ if it does not. The next period bureaucrat is drawn randomly from the population, thus, $\Pi_c^q < v-c$. For $c = c_m^*$ or below, $\Pi_c^u < v-c$ as well. Again, the difference in profits between a qualified firm and unqualified firm is higher under competition regime. Note that the assumption that the firm cannot reapply to the same bureaucrat under competition regime is crucial here.

The comparison of the welfare confirms the earlier literature: both Rose-Ackerman (1978,1999) and Schleifer and Vishny (1993) argue that the competition regime is not so good when the firms are unqualified as there are more licences issued illegally imposing higher social costs. We obtain this effect when the externality is important enough (i.e.,

l is much higher than 1). However, we find another reason: under competition regime there is more delay on average as firms keep reapplying for the licence until they meet a corrupt bureaucrat. Even when there is no externality ($l = 1$) the monopoly regime outperforms the competition one. They also argue that competition is good when the firms are qualified as it reduces the bribe level. We do have this feature in our model (see (9)) but since bribes do not enter the welfare function we do not observe this effect in Proposition 3.

4 Extensions

4.1 Heterogenous firms and inefficient firms

In the analysis before the firms were identical, that is, they all had the same investment costs c, and the production was efficient if the firm has invested, that is, $v - c > 0$. We relax these assumptions in this Section.

Suppose that the firms are heterogenous. A firm i has investment costs c_i which is distributed on $[c_L, c_H]$, $c_H > v$, according to a cumulative distribution function F. Firms are therefore different and there are *inefficient* firms with $c_i > v$ that never invest.

Given a certain share of honest bureaucrats h, the thresholds of investment c_m^* and c_c^* are still (3) and (11), respectively. Every firm compares its costs c_i with the threshold of the appropriate regime and invests if and only if its costs are lower than the threshold. In the market both qualified and unqualified firms coexist. In the language of Schleifer and Vishny (1993) there is corruption with theft and without theft at the same time. The welfare in a regime $j = m, c$ is

$$W_j = F(c_j^*)W_j^q + \left[1 - F(c_j^*)\right] W_j^u.$$

The difference in welfare $\Delta W = W_c - W_m$ equals

$$\Delta W = \left[F(c_c^*) - F(c_m^*)\right](W^q - W_m^u) - \left[1 - F(c_c^*)\right](W_m^u - W_c^u), \tag{14}$$

where $W^q = W_m^q = W_c^q, W_m^u, W_c^u$ are given by (4), (12), (5), (13), respectively.

From Proposition 3, $c_c^* > c_m^*$ and $W_m^u > W_c^u$; by an easy inspection $W^q > W_m^u$. Then, the first term in (14) is positive and the second term is negative. Introducing competition

has two opposing effects: the first, positive, one is that more firms invest into a better technology; the second, negative, effect is that the firms that still do not invest decrease the welfare. The total effect is therefore ambiguous.

Suppose that there are more firms that have costs c_i. This is good for the competition regime as compared to the monopoly regime if $c_c^* < c_i < c_m^*$ and bad if $c_i > c_c^*$. As the thresholds c_c^* and c_m^* depend on the share of honest bureaucrats h, it can be good for some h and bad for others. However, if these firms are inefficient, $c_i > v$, they never invest and so they are always bad for the competition regime. Proposition 4 makes a formal statement. For the sake of exposition it assumes a uniform distribution but nothing qualitatively depends on this assumption.

Proposition 4 *Assume $c_i \rightsquigarrow U[0, c_H]$. For any positive share of dishonest bureaucrats, $h < 1$, there exists c_H high enough so that the monopoly regime is better than the competition regime.*

Proof. Rewrite (14) as

$$\Delta W = \frac{1}{c_H}\{[c_c^* - c_m^*]\,(W^q - W_m^u) - [c_H - c_c^*]\,(W_m^u - W_c^u)\}.$$

Given any $h < 1$ the expression in brackets is a decreasing linear function of c_H (for $h = 1$ $W_m^u = W_c^u$). The difference in welfare ΔW is negative if and only if

$$c_H > \frac{[c_c^* - c_m^*]\,(W^q - W_m^u) + c_c^*\,(W_m^u - W_c^u)}{W_m^u - W_c^u}.$$

■

4.2 Arbitrary bargaining power

Until now we have assumed that the corrupt bureaucrat and the firm split equally the surplus of their relationship, that is, they have equal bargaining power. The distribution of bargaining power affects, obviously, bribes and the profits of the firm. Therefore, it will change the incentives of the firm to invest. In this Section we show that Proposition 3 that compares the two regimes holds for any distribution of bargaining power. Denote the bargaining power of the bureaucrat σ, i.e., the bureaucrat obtains share σ of the surplus.

Proposition 5 *Proposition 3 holds for any positive bargaining power of the bureaucrat $\sigma > 0$. That is, if the firm's decision to invest is the same under the two regimes, the monopoly regime is (weakly) better, that is, $W_m^u > W_c^u$ and $W_m^q = W_c^q$. The firm has more incentives to invest under the competition regime, $c_c^* > c_m^*$. Moreover, the difference $c_c^* - c_m^*$ is increasing in σ.*

Proof. The distribution of bargaining power σ affects the bribes. However, it does not affect the welfare if the firm's decision to invest is unchanged. So, $W_m^q, W_c^q, W_m^u, W_c^u$ are still given by (4), (12), (5), (13), respectively.

To prove that $c_c^* > c_m^*$ we have to compute them explicitly (we give here intermediate calculations as we will need them later in Section 4.3). Under monopoly regime, (1) and (2) become

$$\Pi_m^q = hv + (1-h)(1-\sigma)v - c \text{ and} \tag{15}$$

$$\Pi_m^u = \delta h(v-c) + (1-h)(1-\sigma)v. \tag{16}$$

The threshold c_m^* does not depend on σ and is given by (3).

Under competition regime, bribes (6) and (8) become

$$b_c^q = \frac{1-\delta}{1-\delta\sigma(1-h)}\sigma v \text{ and} \tag{17}$$

$$b_c^u = \frac{1-\delta}{1-\delta\sigma-\delta h(1-\sigma)}\sigma v. \tag{18}$$

The profits (7) and (10) are now

$$\Pi_c^q = \frac{1-\sigma+\sigma h}{1-\delta\sigma(1-h)}v - c \text{ and} \tag{19}$$

$$\Pi_c^u = \frac{(1-\sigma)(1-h)}{1-\delta\sigma-\delta h(1-\sigma)}v. \tag{20}$$

The threshold c_c^* given before by (11) is now

$$c_c^* = \frac{(1-\delta)h}{(1-\delta\sigma(1-h))(1-\delta\sigma-\delta h(1-\sigma))}v. \tag{21}$$

The difference $c_c^* - c_m^*$ is positive

$$c_c^* - c_m^* = \frac{\sigma\delta h(1-\delta)(1-h)(2-\delta h-\sigma\delta+\sigma\delta h)}{(1-\sigma\delta+\sigma\delta h)(1-\sigma\delta-\delta h+\sigma\delta h)(1-\delta h)}v > 0. \tag{22}$$

Noting that c_c^* is increasing in σ finishes the proof. ■

In the literature the usual case is when the bureaucrat has full bargaining power, that is, $\sigma = 1$ (e.g. Cadot (1987) and Banerjee (1997)). It is therefore a nice feature of our model that it incorporates this case. However, an intermediate bargaining power, first, is more realistic, second, allows us to analyze how changes in both firm's and bureaucrat's outside options affect the equilibrium level of bribes and the welfare by changing the firm's investment decision. Indeed, if the bureaucrat appropriates the whole surplus of the relationship a change in his outside option, for example, a higher punishment, does not influence the bribe unless the punishment is so high that he stops accepting bribes. See Section 4.4 in which we introduce a punishment for an illegal licence for both the firm and the bureaucrat.

4.3 Dynamics

Let us now turn to a dynamic, or long-term, perspective similar to Acemoglu and Verdier (2000). Agents in the economy can choose whether they become entrepreneurs or bureaucrats. All agents have the same entrepreneurial talent, that is, they all have the same investment cost c if they choose to become entrepreneurs. However, some agents are honest while others are dishonest and they turn, if the wish, into bureaucrats of the respective type.[10]

We make a simplifying assumption that bureaucrats do not receive any salary.[11] Honest agents do not receive any income if they become entrepreneurs. As we need some of them still entering the bureaucracy, we assume that there are some honest "enthusiasts" or "patriots" that always want to become entrepreneurs. Dishonest agents will

[10] In Acemoglu and Verdier (2000) the agents do not know whether they will be honest or dishonest bureaucrats. They claim that this assumption does not affect the general insights of their model.

[11] Introducing a salary would require taxes on the firms to balance the government budget as in Acemglu and Verdier (2000). The government then has an instrument that changes the relative income of bureaucrats and entrepreneurs and therefore influences the agents' decision about their career. We leave this for future research.

derive their income from bribes. Choosing their career they compare their expected bribe income and their expected profits if they become entrepreneurs.

We also assume that the number of both entrepreneurs and bureaucrats is of unit mass each.[12] If dishonest agents find it worthwhile to become bureaucrats they enter into bureaucracy until either all bureaucrats are dishonest or their share is such that the dishonest bureaucrats' expected income equals entrepreneurs' profits. A dynamic equilibrium is thus characterized only by the share of honest bureaucrats.

Denote the expected bribe income B and the expected firm profits Π. As we are interested in how they depend on the share of honest bureaucrats h we write $B(h)$ and $\Pi(h)$. As in Section 4.2 we conduct the analysis for any bargaining power σ.

Definition 1 *A dynamic equilibrium is characterized by the share of the honest bureaucrats h^{eq} such that $h^{eq} = 0$ if and only if $B(0) \geq \Pi(0)$; $0 < h^{eq} < 1$ if only if $B(h) = \Pi(h)$ and $h^{eq} = 1$ if and only if $B(1) \leq \Pi(1)$.*

In each of the two regimes we now need to find how the bribe income and profits depend on h. This is done in Lemmas 2 and 3 for the monopoly and competition regimes, respectively.

Lemma 2 *Under monopoly regime, the bribe income is constant*

$$B_m = \sigma v.$$

If $h < h_m^*$

$$h_m^* = \frac{c}{(1-\delta)v + \delta c}, \tag{23}$$

the profits are Π_m^u given by (16) and decreasing in h. If $h > h_m^*$ the profits are Π_m^q given by (15) and are increasing in h.

Proof. Any firm pays the bribe $b_m = \sigma v$ if it meets a dishonest bureaucrat. As there is unit mass of both firms and bureaucrats, the dishonest bureaucrat bribe income is $\sigma\nu$. Putting $c = c_m^*$ in (3) we find the threshold level h_m^* such that the firms invest if and only if $h > h_m^*$. Differentiating relevant profits with respect to h gives the result. ■

[12] This can be another instrument of the government as in Acemoglu and Verdier (2000). We plan to investigate it in the future.

Lemma 3 *Under the competition regime, if $h < h_c^*$ implicitly given by (21) at $c_c^* = c$, the bribe income is*[13]

$$B_c^u = \frac{1}{1-\delta h} b_c^u,$$

where b_c^u is given by (18), and increasing in h. The profits are Π_c^u given by (20) and decreasing in h.

If $h > h_c^*$ the bribe income is

$$B_c^q = b_c^q,$$

where b_c^q is given by (17), and decreasing in h. The profits are Π_c^q given by (19) and increasing in h.

Proof. Putting $c = c_c^*$ in (21) we find the threshold level h_c^* such that the firms invest if and only if $h > h_m^*$. Differentiating relevant profits with respect to h gives the result. The bribe income is the expected discounted bribe of the firm divided by the the number of dishonest bureaucrats $1-h$. When the firm is qualified, the expected bribe is $(1-h)b_c^q$. When the firm is unqualified the expected bribe is $\frac{1-h}{1-\delta h} b_c^u$. ■

In both regimes if the firms choose not to invest, the bribe income is increasing (or constant) in h and the profits are decreasing in h. Consider an equilibrium with an intermediate $h^{eq} \in (0,1)$ (if it exists). In such an equilibrium bribe income equals the profits. If there are more dishonest agents that enter into bureaucracy, the share of honest bureaucrats falls. The bribe income falls and the firms' profits increase. Dishonest agents will not enter anymore and honest "enthusiasts" will eventually move the share of honest bureaucrats back to h^{eq} in future periods. Thus, this equilibrium is *stable*. Moreover, it is unique. If the firms decide to invest, the opposite is true and the equilibrium (if it exists) is unstable and unique.

There might a stable equilibrium $h^{eq} = 0$. In this case the firms do not invest so an increase in h decreases the profits and increases (or keeps constant) the bribe income.

[13] $h_c^* = \frac{1}{2}\frac{1}{c\delta^2\sigma(1-\sigma)}(\delta c(1-\sigma\delta)(2\sigma-1) - \nu(1-\delta) + \sqrt{2v\delta c - 4vc\sigma\delta + 4vc\sigma^2\delta^2 + 2v\delta^2 c\sigma - 4v\delta^3 c\sigma^2 + v^2 + c^2\delta^4\sigma^2 - 2c\delta^2 v - 2c^2\delta^3\sigma + 2v\delta^3 c\sigma + c^2\delta^2 + v^2\delta^2 - 2v^2\delta}).$

Thus, this equilibrium is stable. Similarly, there is stable equilibrium $h^{eq} = 1$ in which the firms invest. This is summarized in next Lemma.

Lemma 4 *Under any regime, there is at most one stable equilibrium in which $h^{eq} \geq 0$ if firms do not invest. There is at most one unstable equilibrium in which $0 < h^{eq} < 1$ and one stable in which $h^{eq} = 1$ if firms invest.*

Call an equilibrium in which firms invest *investment equilibrium* and the one in which the firms do not invest *non-investment equilibrium.*

In what follows we focus only on the stable equilibria. In Proposition 6 find the equilibrium share of honest bureaucrats in each regime.

Proposition 6 *Under monopoly regime, if $\delta\frac{c}{\nu} + 1 - \delta < \frac{1}{2}$ a non-investment equilibrium exists if and only if $\sigma > \delta\frac{c}{\nu} + 1 - \delta$. The equilibrium share of honest bureaucrats $h_m^{eq} = 0$.*

If $\delta\frac{c}{\nu} + 1 - \delta \geq \frac{1}{2}$, the non-investment equilibrium exists if and only if $\sigma > \sigma_m^*$. The equilibrium share of honest bureaucrats h_m^{eq}

$$h_m^{eq} = \begin{cases} h_m^{eq\_i}, & \text{if } \sigma_m^* < \sigma \leq \frac{1}{2}, \\ 0, & \text{if } \sigma > \frac{1}{2}, \end{cases}$$

where

$$h_m^{eq\_i} = \frac{1 - 2\sigma}{(1-\sigma)v - \delta(v-c)}$$

and σ_m^* is such that $\frac{1-2\sigma_m^*}{(1-\sigma_m^*)v-\delta(v-c)} = h_m^*$ in (23).[14]

The investment equilibrium with exists $h_m^{eq} = 1$ exists whenever the non-investment equilibrium does not exist and/or $\sigma < 1 - \frac{c}{\nu}$.

Under competition regime, the non-investment equilibrium exists if and only if $\sigma > \sigma_c^*$. The share of honest bureaucrats in this equilibrium h_c^{eq} is

$$h_c^{eq} = \begin{cases} h_c^{eq\_i}, & \text{if } \sigma_c^* < \sigma \leq \frac{1}{2-\delta}, \\ 0, & \text{if } \sigma > \frac{1}{2-\delta}, \end{cases}$$

[14]

$$\sigma_m^* = \frac{(\nu - c)(\nu - \nu\delta + c\delta)}{\nu(2\nu - 2\nu\delta + 2c\delta - c)}.$$

where $h_c^{eq\_i}$ *is such that* $\Pi_c^u(h_c^{eq\_i}) = B_c^u(h_c^{eq\_i})$ *and* σ_c^* *is such that* $h_c^{eq\_i} = h_c^*$ *defined in Lemma 3.*[15]

The investment equilibrium exists whenever the non-investment equilibrium does not exist and/or $\sigma < \frac{1-c/\nu}{1-\delta}$.

Both $h_m^{eq\_i}$ *and* $h_c^{eq\_i}$ *decrease in* σ.

Focusing on the non-investment equilibrium (and saying that $h^{eq} = 1$ when it does not exist) we see that under both regimes the equilibrium share of honest officials decreases with the bureaucrats' bargaining power. For low bargaining power it equals one, that is, no dishonest agents become bureaucrats. When it is high, the equilibrium share of honest bureaucrats is zero. For intermediate bargaining power it equals h^{eq_i} which is between zero and one, and decreases with the bargaining power. See Fig. 1 for a possible behavior of h^{eq} (when $\delta\frac{c}{\nu} + 1 - \delta \geq \frac{1}{2}$).

In Figure 1 both h_m^{eq} and h_c^{eq} equal one for low values of bargaining power. At $\sigma = \sigma_c^*$ h_c^{eq} falls until $h_c^{eq\_i}$ while h_m^{eq} is still one. At $\sigma = \sigma_m^*$ h_m^{eq} also falls until $h_m^{eq\_i}$ but it is still higher than $h_c^{eq\_i}$. Then, at $\sigma = \underline{\sigma}$ h_m^{eq} and h_c^{eq} intersect and h_c^{eq} becomes higher than h_m^{eq}. At $\sigma = \frac{1}{2-\delta}$ they both become zero. Thus, for $\sigma \in (\sigma_c^*, \underline{\sigma})$ the monopoly regime results in a higher equilibrium share of honest bureaucrats while for $\sigma \in (\underline{\sigma}, \frac{1}{2-\delta})$ it is the competition regime.

The situation depicted in Figure 1 does not hold always. In particular, $h_c^{eq\_i}$ and $h_m^{eq\_i}$ may not intersect. In this case, the competition regime results in a higher share of honest bureaucrats for any bargaining power. This is likely to be the case if the investment costs c are low. This is because with lower c the two thresholds σ_m^* and σ_c^* increase so that the intersection of $h_c^{eq\_i}$ and $h_m^{eq\_i}$ happens to the left from them when it is irrelevant as both h_c^{eq} and h_m^{eq} are one in that interval. Next Proposition which is a simple corollary of Proposition 6 presents the only result that always holds.

Proposition 7 *For* $\sigma \in [\underline{\sigma}, \frac{1}{2-\delta})$ *the competition regime results in a strictly higher equilibrium share of honest bureaucrats, that is, in this interval* $h_c^{eq} = h_c^{eq\_i} > 0 = h_m^{eq}$.

[15] $$h_c^{eq\_i} = \frac{1}{2}\frac{(1+\delta)(1-\sigma) - \sqrt{\delta^2 - 2\delta - 6\sigma\delta^2 + 8\sigma\delta + 1 - 2\sigma + 5\sigma^2\delta^2 - 6\sigma^2\delta + \sigma^2}}{\delta(1-\sigma)}.$$
It is always smaller than $\frac{1}{2-\delta}$.

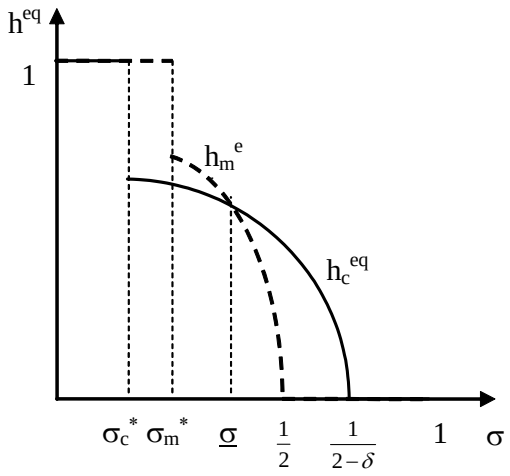

Figure 1: The equilibrium shares of honest bureaucrats h_m^{eq} when $\delta\frac{c}{\nu}+1-\delta \geq \frac{1}{2}$ (dashed line) and h_c^{eq} (solid line).

Let us now turn to the investment equilibrium. Under monopoly regime it exists if $\sigma < 1-\frac{c}{\nu}$ while under competition regime it exists for a larger interval $\sigma < \frac{1-c/\nu}{1-\delta}$. Thus, we may think that this equilibrium is more likely to emerge under competition regime.

4.4 Punishments

.....to be done.....

5 Conclusion

This paper studied the effects of the competitive bureaucracy. It confirmed the intuition of informal discussions in the literature that it is good (neutral) when corrupt transactions are only about redistributing surplus and bad when they impose negative externalities on the rest of the society. The new finding of the paper is that the competitive bureaucracy creates more incentives for the firms to invest into eliminating these negative externalities.

It may seem that the competitive bureaucracy is an arrangement rarely seen in the

real world. However, firms usually can re-register in another region if they are unhappy with the bureaucracy of their current region. Even if in a given region there is only one bureaucrat firms can choose the bureaucrat by choosing the region.

We made two crucial assumptions that may need some justification. First, firms do not know whether the bureaucrat they apply to is corrupt or not. In many cases it is known whether a bureaucrat is corrupt or not. However, if the licence is not to be obtained too often, then the firms are always "new" in the market. Also, if punishment is quite probable, the corrupt transactions will be kept secret. Moreover, if firms compete in the same market they will be reluctant to share this information as it benefits the competitors.

The second assumption is that under competition regime they reapply to a randomly chosen bureaucrat. This is the case when a firm applies not to a specific bureaucrat but to a department that assigns it randomly to some bureaucrat. For example, reapplying for visa and repassing the interview you cannot be sure to meet the same interviewer as the first time. It may also be a deliberate policy not to assign the same bureaucrat in order not to create familiar relations between the firm and the bureaucrat. In fact, analysis of such a policy may be an interesting extension for future research.

Enriching the dynamic analysis à la Acemoglu and Verdier (2000) seems to be promising. The government may introduce a price of the licence and it may impose a fine on unqualified applicants. The size of bureaucracy can be also changed, and salaries paid to bureaucrats. We plan to investigate these extensions in the nearest future.

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