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Corruption, Exogenous Changes in Incentives and Deterrence

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Abstract

In this article we apply and extend the model elaborated by Acemoglu and Verdier in their seminal paper (2000), to examine how the economy represented in their theoretical framework responds to an exogenous change in the agent's incentive. In particular, we focus on the consequences of a famous sentence of the Italian Supreme Court in plenary session, no. 500 of 1999, in which a revolutionary interpretation of civil liability rules is introduced, allowing private agents of our economy to appear before the court to demand reimbursement for the damages suffered as a consequence of illicit behavior of the public administration. This is one of the few cases in which the judex substantially makes law in a system of civil law, and the modi modification in incentive whether or not to be corrupted comes from an authority that is not part of the game (the jurisdictional power). Basing our affirmations on the model, we can say that corruption may have declined in Italy since the year 2000, as a result of a change in the incentives for both private agents and bureaucrats.

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by

Giuseppe Di Vita[1]

In this article we apply and extend the model elaborated by Acemoglu and Verdier in their seminal paper (2000), to examine how the economy represented in their theoretical framework responds to an exogenous change in the agent's incentive. In particular, we focus on the consequences of a famous sentence of the Italian Supreme Court in plenary session, no. 500 of 1999, in which a revolutionary interpretation of civil liability rules is introduced, allowing private agents of our economy to appear before the court to demand reimbursement for the damages suffered as a consequence of illicit behavior of the public administration. This is one of the few cases in which the judex substantially makes law in a system of civil law, and the modification in incentive whether or not to be corrupted comes from an authority that is not part of the game (the jurisdictional power). Basing our affirmations on the model, we can say that corruption may have declined in Italy since the year 2000, as a result of a change in the incentives for both private agents and bureaucrats.

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1   Introduction

This paper comes in the wake of the literature assuming the existence of a trade-off between government failures and market failures; before the seminal paper by Acemoglu and Verdier (2000) this topic had rarely been formalized (see also Shi and Temzelides, 2004). The problem of the choice between two alternatives, market failure and government failure, has given rise to considerable efforts from scholars. In particular, some people see corruption as an inevitable consequence of the government's attempts to change the market allocation of resources (Rose-Ackerman, 1978).[2] We agree with this view, but the real problem is understanding the effects of corruption on the market allocation of resources.

There are at least two streams in economic literature concerning the effects of corruption on welfare and the growth of the economy. The first is based on the studies of Leff (1964) and Huntington (1968), which emphasize the role of bribes in simplifying exchanges in the economy and the relationships with bureaucrats, that are prepared to reduce *red tape* for a sum of money. The second assumes that "legality" is a public good encouraging the achievement of maximum welfare and maximum growth rate of the economy (Shleifer and Vishny, 1993).[3] Applied research shows unequivocally that the effects of corruption on economic growth are negative (Anoruo and Braha, 2005, Dreher and Herzfeld, 2005, Mauro, 1995, Mo, 2001, Pellegrini and Gerlagh, 2004, Wei, 2001).[4] In economic literature there is no previous research to show how an exogenous change of incentive for players, coming from jurisdictional power, modifies the results of the game. In particular, some research exists on the issue of corruption in Italy, but not in the same terms as this study. Del Monte and Papagni (2001), for example, focus on the problem of corruption in public spending in Italy.

The main motivation in writing this paper is that, as a result of a recent decision of the Italian Supreme Court (*Corte di Cassazione*), the responsibilities of both the public administration as a whole and bureaucrats in particular have increased. We assume that this modification in the liability rules in Italy has altered incentives in the corruption market. The interesting issue is that this has occurred as a result of a decision made by an institution that is not part of the game; in a way, the sentence of the Italian Supreme Court is one of the few examples where jurisdictional power makes law in a civil law system.

The questions we have in mind in writing this paper are: has the decision no. 500, 1999, of the Italian Supreme Court reduced the incentives for bureaucrats

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[2]On this issue Acemoglu and Verdier affirm "... *corruption is often unavoidable because governments distort the allocation of resources, and corruption is the way that the market bypasses the regulations ...* " (Acemoglu and Verdier, 2000, p. 196).

[3]In general, for a survey of the economic theory of corruption, see Rose-Ackerman (1999), while for a review of empirical literature on this issue see Dreher and Herfeld (2005).

[4]Starting from the results of the empiric literature supporting the hypothesis that corruption is a burden on economic growth, we can argue that corrupted economies are inefficient. A typical example could be the Latin American countries where there are high levels of both corruption and bureaucratic inefficiency. From a rhetorical point of view we can just say that if the public sector is efficient there will be less incentive to corrupt someone (Clerico, 1996, p. 67).

to be corrupted and corruption as a whole? Has the willingness of entrepreneurs to pay bribes been reduced as a result of this sentence? Are decisions concerning technology, talent allocation and the government budget modified as an effect of the modification in incentives?

Following Acemoglu and Verdier's paper we expect the phenomenon of corruption to decrease in Italy as a result of the change in incentives for civil servants to take bribes. In other words, the exacerbation of the liability rule for public administration reduces both the willingness of entrepreneurs to pay bribes and the propensity of bureaucrats to accept them. This implies that more firms will choose good technology, more agents will decide to become entrepreneurs and, finally, the government budget may be reduced as a direct consequence of the lower burden of civil servants.

In this paper we assume that the sentence no. 500, 1999 of the Italian Supreme Court in plenary session (Corte di Cassazione, 1999) may be assimilated to an exogenous event that changes the incentives among the agents considered in the theoretical model we are considering.

The mechanism of exogenous change of incentive highlighted here is absolutely new because the modification in the behavior of all the agents involved in this game derives from an institution that does not take part in it (juridical power). This happens as a result of the 'creative' decision of the Italian Supreme Court in a legal system of civil law.

To the purposes of this article we use Acemoglu and Verdier's model (2000) instead of that of Shi and Temzelides (2004, p. 874); the former is simpler and fits better with the limited aims of our research, while the latter is based on a non standard assumption concerning the role of bureaucracy, that is considered as a non monopolistic supplier of some public good, but concurs with private agents. In this manner Shi and Temzelides (2004) render endogenous the trading patterns between bureaucrats and private agents. The analysis is really interesting to design further actions of political economy, to introduce into private economy close substitutes of public goods, in order to render the market more competitive and reduce corruption; this theoretical framework is not suitable, however, to describe the present situation in Italy, where there is no competition in most of the public services.

Acemoglu and Verdier (2000, p. 196) found that the number of bureaucrats, and their salaries, must be high if their activity is difficult to monitor. Indeed they showed that the relationship between per capita income and degree of government presence is difficult to monitor. In general we consider that in a regime of corruption the prices of public products will be higher than where illegal action does not exist, thus creating a source of market failure.[5] All scholars agree that in cases of costly or imperfect monitoring of the activity of bureaucrats, an 'efficiency wage' is necessary to avoid or limit corruption (Acemoglu and Verdier, 2000, Stiglitz, 2000).

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[5]Del Monte and Papagni (2001) affirm: " ... *A government official controls the offer of a service against private demand. He or she has some discretionary power on the offer and can restrict it in several ways (e.g. denying permission or delaying its release). Bribes are the extra-price charged by bureaucrats to private customers, and arise like rents ... ".*

In general, the fairness of public administration, together with its efficiency, could be considered as a pure public good (Ellickson, 1973), but this is not true in cases where the private agent demands permission for something (to build a house, for example). In the latter hypothesis we are probably dealing with a case where the public good may be *factor augmenting* or *firm augmenting* (Del Monte and Papagni, 2001 and Cellini, 2004). This happens because in the first case we have generalized spill-overs, while in the second there is just one agent that will benefit by the activity of bureaucracy. This explains why private agents are prepared to pay bribes.

The definition of corruption we have in mind is quite simple: an exchange of money, or an *attempt* to perform such, between a private agent and a bureaucrat, in order to obtain some public product or service. By this definition it is irrelevant who starts the bargaining to conclude the corruption contract, and just illegal payments or attempts at such can create corruption.

Departing from the common assumption for which the discretional power of the bureaucrat is the main reason for corruption, we argue that also the imperfect monitoring of civil service activities and the existence of monopolistic power leave room for bribes and other illegal activities.

The theoretical framework used here is a general equilibrium model, that is microfounded by using a multiple stage game. Acemoglu and Verdier (2000) emphasize the opportunity cost by using people in bureaucracy that otherwise could be productive in the private sector.

In particular, we refer to the model described in Section III of the Acemoglu and Verdier paper, in which heterogeneity among bureaucrats is allowed (p. 204). For the limited purposes of this paper we assume that the market failure we wish to correct is relevant enough to justify the opportunity cost paid by the economy to employ a part of its agents on inspecting entrepreneurs.

To our aims it is worth mentioning that Acemoglu and Verdier affirm: " ... *We also do not allow complaints by entrepreneurs. Such complaints could change the bargaining game between bureaucrats and entrepreneurs in the corruption stage, and would imply that bureaucrats would be able to extract less from entrepreneurs with good technology without changing the essence of our results ...* ". In this paper we account for the hypothesis in which private agents may make some complaints to ask for compensation for damages, thus introducing a little change in the theoretical framework. We confine ourselves to considering how the change in incentive influences corruption and the effects on the economy, without taking into account the problem of a non-monotonic relationship between the optimal degree of government intervention and the per capita income level, an issue well developed in Acemoglu and Verdier's paper (2000).

We account for exogenous changes in some variables only, as a consequence of sentence no. 500, 1999 passed by the Italian *Corte di Cassazione*. In particular, it is assumed that the sentence of the Italian Supreme Court have filled a cause of market failure, represented by an imperfect specification of property rights (Tietenberg, 1992) and especially of the awarding of damages. Before this decision the public administration could cause some harm to a private agent without

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having to repay in full the owner of the good, such that bureaucracy had no incentives to stop illicit behavior and violation of the law.

By means of the theoretical framework that we use here, we may affirm that as a result of sentence no. 500, 1999 corruption in Italy would decline if the economy really worked as in the model, but we also say that as the incentive changes allow a reduction in the salary for civil servants, more agents will decide to become entrepreneurs and more information about the behavior of the public employer will be available for public administration.

The paper is organized as follows. After this introduction, in the second Section we outline the Italian legal system to make clear the problem we are handling. In Section three, we report Acemoglu-Verdier's model in brief, to render this article more easy to read. In Section four, we show how the outcomes of the model change as a result of an exogenous shock represented by sentence no. 500, 1999 by the Italian Supreme Court. Final remarks conclude the paper.

2 Historical and Juridical Background in Italy

In Italy there is a system of *civil law* for which the judex are committed to the law and can only interpret and apply it without making new rules.

The Italian Constitution, in paragraph 24, makes a distinction between two individual juridical situations: the *diritto soggettivo* and the *interesse legittimo*. The first is a right fully protected by the legal system. The second is strictly connected to the administrative provision of a civil servant and can be active against the public administration, and until the end of the last century was not fully protected by the Italian civil code. The main distinction between these two individual situations is that in the second the agent cannot usually make any claim for damages suffered. The *interesse legittimo* is an individual situation that a private agent usually has against some public office, that may lead to the annulment of an administrative provision or the recognition of some right. This distinction is typical of the Italian legal system and does not find its counterparts in the legal systems of other countries.[6] Even among Italian scholars of public law, there is no agreement about the autonomous theoretical relevance of the *interesse legittimo* (Scoca, 1988).

In particular, before the leading decision of the Italian Supreme Court in Plenary session, no. 500, 1999, it was possible to ask for compensation for damages only in cases of the violation of a right, but not for cases in which the private agent suffered an illicit harm caused by bureaucracy. This is the individual situation that we call *interesse legittimo*, with the exception of competition for public supply of products, because the possibility to engage in lawsuit against the public administration was introduced in Italy by the Law no. 142 of 19 February 1992, under the pressure of the European Community. Think, for example, of the case of a private agent who makes an instance to a public office to obtain the authorization to build a house. If the agent does not get any answer after the time fixed by the law, she or he should begin a proceeding against the

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[6]Only the Spanish Constitution considers the *interesse legittimo* in paragraph 24.

public administration to establish her or his own right to build the house, but cannot ask for any compensation for damages, because the individual situation is qualifiable as 'interesse legittimo' only and not as a right. Before the historic decision of the Italian Supreme Court no. 500, 1999, that extended the regime of full protection even in cases of individual situations that are configured as *interesse legittimo,* there was more room for corruption. The reasons are simple. With regard to the relationships between the government and its bureaucrats, if there is no possibility to go behind the court to safeguard the individual juridical position it is more difficult for the principal (public administration) to know about the misdeeds of public servants, because no legal act will be notified to the authorities. The possibility for the principal to discover that its bureaucrats are asking for bribes consists uniquely in the costly effort of monitoring the activities of civil servants. On the other hand, the risk for the bureaucrat is restricted to the possibility of losing his job, but there is no additional civil liability. From the point of view of the relationship between private agents and civil servants, if the first cannot demand a refund of the damages she or he has suffered, the agent has to corrupt a civil servant if he or she wishes to obtain something from the public administration. Under this condition bureaucrats have an enormous bargaining power against private agents in the bribes market.

The historic decision of the *Corte di Cassazione* changed the application of general liability rules in the Italian legal system, so that now also *interessi legittimi* have full protection. This leads to a change in incentives and information among the parts involved in the three-agent multiple-stage game described here, because the possibility for private agents to appear before the court to demand damages suffered is an additional indication for the public authority that something is not working very well with its employees. This increases the probability that the corrupted civil servant will be detected and fired. If the public administration has to pay for the damages claimed by the private agent, and may ask the bureaucrat to refund the sum, this decision greatly widens the liability area of civil servants. This mechanism must necessarily make the bureaucrat less prepared to take bribes for fear of losing his or her job.

The possibility for a private agent to take legal steps against the public administration in cases of violation of *interesse legittimo* could have reduced the willingness to pay bribes to obtain concessions or accelerate the procedure for obtaining them, thus increasing the opportunity cost of using a criminal behavior to corrupt bureaucrats.

It is worth mentioning that the sentence of the *Corte di Cassazione* does not change the area of criminal responsibility for private agents and bureaucrats; from the point of view of criminal law nothing has changed. The mechanism by means of which a civil servant could be made to pay the damages caused during his activity is as follows. The private agent proceeds against the public administration in which the bureaucrat is engaged. In the hypothesis that a public authority is condemned to refund the damages suffered by a private agent as a direct consequence of the illicit behavior of its public servant, there are two possibilities. The public administration may either sue for damages in a criminal prosecution against its bureaucrat or inform the *Corte dei Conti* (The Italian

Court of Auditors)[7] to proceed for inland revenue damages. This is the so-called "double track system": obviously this implies that the corrupted bureaucrat will never be convicted to pay more than all the damages created against the public administration (Longavita, 2004). The justification for treasury damages in Italy is gross negligence or fraudulent behavior by the bureaucrat.

The economic mechanism we suppose to work depends in a crucial way on the probability that the guilty will be discovered and punished. If the changes in incentive introduced by decision no. 500/1999 really work we must surely observe a reduction in corruption cases in Italy, beginning from 2000.

3 The Acemoglu-Verdier model

First of all we report three essential assumptions constituting the basis of the theoretical model employed in this paper: "*1. Government intervention requires the use of agents ("bureaucrats" for short) to collect information, make decisions, and implement policies; 2. These bureaucrats are self-interested, and by virtue of their superior information, hard to monitor perfectly; 3. There is some heterogeneity among bureaucrats.*" (Acemoglu and Verdier, 2000, p. 194). Their significance is straightforward, and well illustrated in Acemoglu and Verdier's paper (2000). In what follows it will become clear why we highlight those conditions.

3.1 The Basic Model

To make this work easy to read, we now report in synthesis the basic structure of Acemoglu-Verdier's model (2000).[8] For the sake of simplicity we also use the same notation for variables. A static economy is presented, consisting of a continuum of risk-neutral agents with mass one. Initially it is assumed that all the agents are homogeneous. They can choose to become entrepreneurs, or if there is a government they can become government employees (bureaucrats). Those who decide to be entrepreneurs may choose to implement a "bad" technology or a "good" one; both generate the same amount of output y, but the clean technology has a cost e, where $0 < e < y$, while the "bad" technology is costless. The so-called "good" technology ensures a positive externality. Let n be the mass of entrepreneurs in the economy considered, and $x \leq n$ be the mass of entrepreneurs choosing the good technology.

We assume that there is a positive non-pecuniary effect on the payoff of all agents equal to βx, where $\beta > e$ (i.e. the positive externality more than offsets the private cost of implementing the "good" technology). Under those

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[7]The *Corte dei Conti* is a special jurisdictional authority that judifies in cases of treasury damages.

[8]From the point of view of the author of this paper it can be easy to refer simply to the model of Acemoglu and Verdier (2000), thus we report their model just to render as straightforward as possible the reading of this paper, but without the intention of appropriating to ourselves the paternity of the original contribution.

conditions maximum taxes are independent of technology choices, but do not in outcomes. The payoffs for both activities are

$$(1) \qquad \begin{aligned} \pi_g &= y + \beta \cdot x - e \\ \pi_b &= y + \beta \cdot x \end{aligned} \quad .$$

where π_g is the profit of entrepreneurs that employ the 'good' technology and π_g is the revenue of the firms that use the 'bad' technology. To the purposes of this paper we may ignore the *Laissez-Faire* equilibrium (Acemoglu and Verdier, 2000, p. 197) to deal with the case of optimal regulation without corruption. We have just to report that under the stipulated assumptions all the firms will choose the 'bad' technology (i.e. $n = 1$ and $x = 0$), generating a negative externality, such as to create room for the economic policy to increase welfare.

3.2 Optimal Regulation Without Corruption

It is assumed in the paper that the government's objective function is only to maximize social welfare, and to this aim it attempts to regulate the choice of entrepreneurs concerning the technology to implement. The crucial assumption is that the technology choice is not publicly observable, so that the government has to employ some agents as bureaucrats to inspect firms. Indeed, it is considered that each bureaucrat may inspect just one entrepreneur. In the simplest version of the model it is assumed that there is no corruption and bureaucrats always report truthfully. Under those conditions, there will be a fraction of agents that will be bureaucrats, randomly controlling the technology implemented by firms, the opportunity cost of subtracting agents from the private sector of the economy is low, and there will be limited liability and constraints. The Government budget constraint determines the subsidies that can be given in favor of those entrepreneurs who implement the "good" technology.

In this multiple-stage game we assume to have three different kinds of players. The public administration and the private agents, that may choose, in the presence of public intervention, to be entrepreneurs or become bureaucrats. τ represents the tax that an entrepreneur should pay if a "bad" technology is implemented, while s is the subsidy that a firm receives for using the good technology. w is the wage received by bureaucrats. The probability that an entrepreneur may be inspected is $p(n) = \{(1 - n/n), 1\}$ which is the fraction of bureaucrats $(1 - n)$ divided by the fraction of entrepreneurs n. The timing of events is the same as in Acemoglu and Verdier model's (2000, p. 198). The government wishes to maximize the net surplus SS

$$(2) \qquad SS = n \cdot y + (\beta - e)\, x,$$

by choosing n, x, w, τ and s, under four constraints.

First, there is a *limited liability constraint* for which the government cannot tax more than the revenue of the firm

$$(3) \qquad \tau \le y.$$

Second, the payoff of entrepreneurs is the same regardless of the technology they choose. The expected payoffs are: $\pi_g = y + \beta \cdot x - e + p(n) \cdot s$ for good

technology, and $\pi_b = y + \beta \cdot x - p(n) \cdot \tau$ for bad technology. The authors of the paper we are referring affirm that the number of entrepreneurs should be $n \geq 1/2$. The reason is that for $n < 1/2$ we find that the probability of an inspection is greater than 1, and this does not make sense (i.e. $p(n)$ for $n < 1/2$ is $p(n = .4) = (1 - .4)/.4 = 1.5$). This implies that $n \geq 1/2$.

Making equal $\pi_g = \pi_b$ after simplification and dividing both members by $p(n)$, we obtain

$$(4) \qquad \tau + s \geq \frac{n}{1-n} \cdot e,$$

that we denominate *technology constraint* (i.e. $\pi_g \geq \pi_b$). This constraint ensures that all the agents choose the good technology.

The government cannot commit its citizens to becoming bureaucrats; in this way the rational agents, that are all risk-neutral, choose to be civil servants if their payoff is greater than or at the least equal to the entrepreneurs', $w + \beta \cdot x \geq \pi_g$, or

$$(5) \qquad w \geq y - e + \frac{1-n}{n} \cdot s.$$

This result comes from substituting by π_g and simplifying. This is the so-called *talent allocation constraint.*

The last constraint is related to the balance in the public sector. The government has to pay salaries to $(1-n) \cdot w$ for $n \geq 1/2$ and it distributes subsidies equal to $(1-n) \cdot x/n \cdot s$. On the other hand the government also collects taxes equal to $(1-n) \cdot (1 - x/n) \cdot \tau$. The *government budget constraint* is

$$(6) \qquad \left(1 - \frac{x}{n}\right)\tau \geq w + \frac{x}{n} \cdot s.$$

This result comes from considering that the government expenses are $(1-n) \cdot w + (1-n) \cdot x/n \cdot s$ and the revenues are $(1-n) \cdot (1 - x/n) \cdot \tau$. Dividing both members by $(1 - n)$, the result proves to hold. We can see that equation (3) should hold as an equality, otherwise, τ and n could be increased without violating (4), (5), or (6). The technology choice has to hold as an equality for the same reason. In this way, after some algebra, by using (3) and (4) and substituting in (5), we get a simplified form of the allocation of talent:

$$(5') \qquad w \geq y - \frac{1-n}{n} \cdot y, \text{ for } n \geq 1/2.$$

If this inequality did not hold, the public-sector wage rate would be too low to attract agents, and we would have $n = 1$. Finally, rearranging (6) and using (4), we get a simplified form of government budget constraint:

$$(6') \qquad y \geq w + x/(1-n) \cdot e.$$

Combining $(5')$ and $(6')$, and noting that x, the mass of entrepreneurs choosing the good technology, cannot be greater than n, we obtain the constraint set of the government as

$$(7) \qquad x \leq \min \left\{ \frac{(1-n)^2 \cdot y}{n \cdot e}, n \right\}.$$

Letting $x = \left[(1-n)^2 \cdot y \right] / n \cdot e$ and multiplying both members for n and after some little algebra we find

$$(8) \qquad \hat{n} = \frac{\sqrt{Y}}{\sqrt{e} + \sqrt{Y}}.$$

It is worth reporting that for $x = 0$ and $n = 1$ the social surplus is $SS_{ng} = y$. Instead, for $\hat{n}$ between $\frac{1}{2}$ and 1, $SS_g = (y + \beta - e) \cdot \left(\sqrt{y} / \left(\sqrt{e} + \sqrt{y} \right) \right)$, such that without corruption and if

$$(9) \qquad \beta > \sqrt{y \cdot e} + e,$$

is satisfied, the optimal allocation of resources has $n = x = \hat{n}$ given by (8). Otherwise, the optimal allocation is the *laissez-faire*. If the SS_g prevails we obtain that the majority of entrepreneurs will employ the 'good' technology, but the intervention of the policy maker is justifiable, in terms of β, only if the market failure is strong enough compared to y. This is because the market intervention of the social planner withdraws some agents from the private sector of the economy (see Acemoglu and Verdier, 2000, p. 199 for more details).

3.3   Optimal Regulation with Corruption

In this section we modify the previous theoretical framework to allow for the corruptibility of civil servants. A bureaucrat may use the information advantage she or he has over her or his principal (the government), and thus create room for bribes, by reporting untruthfully. The maximum "surplus" that a bureaucrat can extract is $s + \tau$. We assume that in both cases the bureaucrat can get a proportion $0 < \sigma \leq 1$ of this amount as a bribe. The probability for a bureaucrat to be caught is q.[9] If the bureaucrat is caught taking bribes he loses all his income.

Note that $(1-q)$ is a measure of the informational advantage of bureaucrats, where for $q = 0$ corrupted bureaucrats are never caught and for $q = 1$ corrupted bureaucrats will immediately be detected.

Because all bureaucrats are homogenous, there will be an unique condition determining whether it pays to be corrupt. If honest, a bureaucrat obtains w. If corrupt, he loses everything with probability q, and with probability $1 - q$, he receives both the wage and a bribe $b = \sigma \cdot (\tau + s)$. The corruption constraint is therefore:

$$(10) \qquad w \geq \frac{1-q}{q} \cdot \sigma \cdot (\tau + s) = \frac{1-q}{q} \cdot \frac{n}{1-n} \cdot \sigma \cdot e,$$

if it is violated, all the bureaucrats become corrupt. In this case, all the entrepreneurs receive $\sigma \cdot (\tau + s)$, regardless of the technology choice made by

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[9] See footnote number 6 on page 200 of Acemoglu and Verdier's paper (2000), in which the exogenous nature of **q** is highlighted.

entrepreneurs, such that the government intervention is unequivocally wasteful. It is worth noting that there is an inverse relationship between w and q ($\partial w/\partial q < 0$). This means that it is possible to reduce the salary paid to bureaucrats without increasing the corruption phenomena, thereby releasing resources for alternative use.

If (10) holds, there will be no corruption. Thus using (10) and the government budget constraint in its simplified form we get the corruption constraint

$$(11) \qquad x \leq \frac{y}{e} - \left(\frac{y}{e} + \frac{1-q}{q} \cdot \sigma \right) \cdot n.$$

Acemoglu and Verdier (2000) show that if (11) is more restrictive than (7), to prevent corruption it will be necessary to pay the bureaucrats a wage higher than its present level to attract agents towards bureaucracy, in other words a *rent*. The best intervention policy may take one of these three forms:

(i)   (11) is less restrictive than (7), such that $n = x = \hat{n} > \frac{1}{2}$ as in (8);

(ii)   (7) is less restrictive than (11), so $n = x = n_c > \frac{1}{2}$ where n_c is given by imposing $n = x$ in (7);

$$(12) \qquad n_c \equiv \frac{y}{y + e + \dfrac{1-q}{q} \cdot \sigma \cdot e}.$$

(iii) $n = \frac{1}{2}$ and x is chosen so as to balance (11), thus

$$(13) \qquad x = \max \left\{ \frac{1}{2} \left(\frac{y}{e} - \frac{1-q}{q} \cdot \sigma \right) ; 0 \right\}.$$

In hypothesis (iii) the government revenues decrease a little in order to subsidize the firms that implement the 'good' technology, so that the only way to raise the revenues is for some entrepreneurs to choose the bad technology and pay $\tau = y$.

3.4   Heterogeneity and Equilibrium Corruption

Now it is assumed that after an agent becomes a bureaucrat he will discover whether or not to take bribes. He or she knows that before deciding to become a civil servant, we have a case of adverse selection (Besley and McLaren, 1993). The dishonest bureaucrats that are able to take bribes will be discovered with probability $\hat{q} \geq 0$, while those that are honest or not particularly proficient at corruption will be caught with probability $q > \hat{q}$. The crucial point in this version of the model is that there is some heterogeneity among bureaucrats in the propensity to take bribes. The probability that an agent will be prepared to take bribes is m. Now the timing of events is:

1.   The government announces the public wage w, the tax τ, the subsidy s, and the maximum number of bureaucrats it will hire $(1 - n)$.

2.   The agents choose their professions. If there are more applicants to the government sector than $1 - n$, then $1 - n$ of them are chosen randomly and the remainder enter in the private sector.

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3.   Those who enter the private sector choose a technology. Their choice of technology is at this stage non observable by any other agent.

3.1   Each bureaucrat discovers if she or he is good at taking bribes or not, and then decides to whether to demand a bribe.

4.   Each bureaucrat randomly inspects one entrepreneur and discovers whether she or he has chosen the good or the bad technology.

5.   Each bureaucrat first decides whether to make a "collusion" offer to the entrepreneur with whom he is matched. If he decides not to demand bribes, he makes a truthful report, and the game ends are in the section I. In case the bureaucrat demands a bribe then his report depends on the entrepreneur's response. If the entrepreneur accept this offer and pay the bribe, then, exactly at the same time, the bureaucrats makes the agreed report. If the entrepreneur rejects the collusion offer, the bureaucrats reports the project to be bad.

6.   The bureaucrats' report are inspected and those that made a false report are caught with probability $\hat{q}$.

In cases with heterogeneity in the propensity to accept bribes among bureaucrats there are three different possible solutions.

First, there is no government regulation (i.e. *Laissez Fair* equilibrium) $n = 1$ and $x = 0$.

Second, there is no corruption and the solution in the previous section in Acemoglu and Verdier's paper applies, with $\hat{q}$ that substitutes q (and $n = x \geq 1/2$ or $n = 1/2$ and $x < 1/2$, in this case $w \geq (1 - \hat{q}) \cdot \sigma \cdot (\tau + s)/\hat{q}$, so neither "honest" nor "dishonest" bureaucrats accept bribes). The social surplus of this allocation is SS_{nc} (see Proposition 2, in Acemoglu and Verdier's model).

Third, there is the possibility of intervention with partial corruption, that is the topic of this section. In this allocation there are enough sufficient rents so that the 'honest bureaucrats' do not become corrupted, but a fraction m will accept bribes (the 'dishonest'). Under this new assumption the *technology choice constraint* is

$$(14) \qquad \tau + s \geq \frac{n}{1 - n} \cdot \frac{1}{1 - m} e.$$

What is changed here with respect to Sections I and II is that the entrepreneur will be inspected and receive subsidy with probability $(1 - n) \cdot (1 - m)/n$. Even in this hypothesis, if an entrepreneur and a civil servant are discovered to exchange money for a public service in an illicit way, the revenue of the private agent will be confiscated regardless of the technology choice.

The *corruption constraint* now is

$$(15) \qquad w \geq \frac{1 - q}{q} \cdot \sigma \cdot (\tau + s) \geq \frac{1 - q}{q} \cdot \frac{n}{1 - n} \cdot \frac{\sigma}{1 - m} \cdot e.$$

While the *budget constraint* with partial corruption is different as well, because some civil servants are caught to taking bribes and their returns are confiscated:

$$(16) \qquad (1 - n) \cdot w + (1 - n)(1 - m) \cdot \frac{x}{n} \cdot s + (1 - n) \cdot m (1 - \hat{q}) \cdot s$$

$$\leq (1-n) \cdot m \cdot \hat{q} \, (w+\tau) + (1-n) \cdot (1-m) \cdot \left(1 - \frac{x}{n}\right) \cdot \tau.$$

As in the previous versions of the model, the bureaucrat earns w, the honest fraction $1-m$ pay out a subsidy x/n, and the dishonest civil servants, except the fraction $\hat{q}$ that are caught, pay a subsidy with probability 1 (if the technology is bad, he claims it is good and takes the subsidy). The wage of corrupted bureaucrats will be not paid for the proportion $\hat{q}$ of $(1-n) \cdot m$ that will be caught, and full taxes will be collected from the entrepreneurs involved in criminal exchanges with civil servants. Finally, the $(1-n) \cdot (1-m)$ honest bureaucrats detect entrepreneurs with bad technology with probability $1 - x/n$.

Under an assumption of partial corruption, the *talent constraint* is

$$(17) \qquad (1-m) \cdot w + m \cdot (1-\hat{q}) \cdot [w + \sigma \cdot (\tau + s)]$$
$$\geq y - \frac{1-n}{n} \cdot \tau + \frac{1-n}{n} \cdot m \cdot (1-\hat{q}) \cdot (1-\sigma) \cdot (\tau + s).$$

It is different from (5) for two reasons. The agents understand that if they decide to be employed in government service, with probability m they will be good at taking bribes, and thus make more than w. They also realize that if they become entrepreneurs, they will have to deal with corrupt bureaucrats (this is the third term of the right-side of (17)). Now assuming $\sigma = 1$, and combining from (15), (16) and (17), we may define the constraint set for partial corruption constraints

$$(18) \qquad x \leq \min \left\{ n; (1-n) \cdot y - n \cdot \left[\frac{m}{1-m} \cdot (1-\hat{q}) + \frac{1-q}{q} \cdot \frac{1-m \cdot \hat{q}}{1-m} \cdot \right]; \right.$$
$$\left. \frac{(1-n)^2 \cdot y}{n \cdot e} \right\},$$

and $n \geq \frac{1}{2}$. Reporting Acemoglu and Verdier's results, we may observe that (18), has three terms. The first require nothing other than $x \leq n$. The second affirms that the $1-m$ bureaucrats who are honest do not accept bribes. Finally, the last ensures that agents are willing to apply to bureaucracy. Let $A \equiv A(\hat{q}, m, q) \equiv m/(1-m) \cdot (1-\hat{q}) + (1-q)/q \cdot 1/(1-m) \cdot (1-m \cdot \hat{q})$. The main results of the model with partial corruption are summarized in Proposition 3 of Acemoglu and Verdier's paper (2000).

4 Application of the Theoretical Framework to Study the Effects of Sentence no. 500 / 1999 of the Italian Supreme Court on Corruption

After reporting the basic framework which we use in this paper, it is possible to start to show how it is useful to explain what is happening in Italy since the revolutionary sentence no. 500 / 1999 of the Italian Supreme Court, with regard to corruption.

4.1   The example

First of all we have to say that in their paper Acemoglu and Verdier supply, as an example, the negative externality of pollution and the regulation of public authorities in the choice of firms whether or not to adopt the clean technology (for the same example see Shi and Temzelides, 2004, p. 874). Here we refer to a different case regarding the edification activity that the people can make by respecting the planning legislation (i.e. 'good technology' in our example), thus creating a non-pecuniary positive externality, or by violating the town planning scheme (i.e. 'bad technology' in our application), in the attempt to maximize private profit to the detriment of social welfare, thus creating a negative externality. In the first case, the positive effect is a good organization of the territory, with nice houses, wide streets and space for people to meet. In the second case we have the opposite. Without some public intervention all the building firms will choose the bad technology as in the typical situation of 'prisoner dilemma', with the consequent creation of negative externality. This could be a nice example of market failure, with the risk, in the presence of public intervention, of obtaining a worse situation that, as in Acemoglu and Verdier's model, may leave room for corruption. In our paper the bureaucrats' inspection is necessary to see if entrepreneurs are building according to the planning legislation, or if they are employing a 'bad technology', thus creating a negative externality. For the purpose of our research it is not important to know whether the entrepreneurs have regular planning permission or if they got this licence in a regime of silence-approval. In the first case the inspection of bureaucrats is preventive: this means that before the concession of planning permission it is impossible for entrepreneurs to start construction. In the latter hypothesis the checking by bureaucrats could be both preventive and successive, to verify if the private agent spoke the truth in the statement of conformity of the building to the town planning scheme.

4.2   The Variable of the Game Changed as a Result of Sentence no. 500 / 1999 of the Italian Supreme Court

In section two we have described why we assume that the incentive for players in the game described in Acemoglu and Verdier's model has been changed as a result of the decision of the *Corte di Cassazione* we are examining in this article. Now we will explain in more detail which parameters have been changed by sentence no. 500 / 1999. They are: σ the proportion of 'surplus', $(s + \tau)$, that the bureaucrats may ask for bribes; q the probability that a corrupted bureaucrat will get caught; $\hat{q}$ the probability that a "dishonest" bureaucrat, that is good at taking bribes, will get caught (with $\hat{q} \geq 0$); finally m is the fraction of civil servants who are prepared to exchange public goods for money (note that $\hat{q}$ and m only regard the version of the model with partial corruption).

In our application, before the change of incentives for the players in the game, the bureaucrat might delay the release of planning permission without having to fear some legal action from the entrepreneurs, thus she or he could

exert a strong bargaining power in demanding bribes and in the amount of surplus she or he might extract. On the other hand, the private agent could not file a lawsuit against the public administration, because of the imperfect specification of the property rights (could not claim for damages), thus his bargaining power was lower and she or he probably preferred to pay some money to obtain the public authorization he needed or wait for an indefinite period of time. After the seminal sentence we are considering, the entrepreneur to whom a bureaucrat denies or delays without reason the release of some public permission or authorization, may proceed against the public administration to ask for a refund of the damages she or he has suffered, as well as the release of the administrative provision she or he originally requested. As we have seen, if the public administration loses its case to an entrepreneur suing for violation of *interessi legittimi*, it may recover the amount of money paid from the bureaucrat, on condition that the latter has gross responsibility or has used a fraudulent behavior. This means that, in the bribe market, the bargaining power of the civil servant is reduced and private agents will be less willing to make illicit payments to obtain some public good or service (i.e. $\sigma \downarrow$).

After sentence no. 500 / 1999 of the Italian *Corte di Cassazione* the likelihood that a corrupt bureaucrat will be caught has increased; this happens essentially because in attempts to corrupt, if the entrepreneur decides to sue the public administration where the corrupt bureaucrat is employed, demanding a refund of the damage he or she has suffered as a result of delay or illicit denial of some public authorization or permission, the public administration may discover, by means of the service of the statement of claim, that something does not work very well. In other words the service of petition by entrepreneurs increases the information available to the public administration about the behavior of employees (i.e. $q \uparrow$). Obviously, this does not mean that each lawsuit for violation of *interessi legittimi* hides an attempt to corruption by the civil servant, but it is a signal that there is some problem. Note that in Italy in the last five years, since sentence no. 500 / 1999, lawsuits against the public administration for violation of *interessi legittimi* have grown exponentially (Presidenti T.A.R. Relazioni Inaugurali Anno Giudiziario, 2005).

Finally, the fraction of civil servants who are prepared to exchange public goods for money has become lower, because the full protection of the juridical situation of *interesse legittimo* legitimates entrepreneurs to file a lawsuit against the public administration, since the historic sentence no. 500 /1999 of the Italian Supreme Court has increased the liability rule for civil servants. This means that the corrupted bureaucrat, apart from losing his job (as in Acemoglu and Verdier's model), might be also condemned to refund the public administration for damages through violation of *interessi legittimi* (i.e. $m \downarrow$).

After the description of the variable that we assume changed and the description of the directions in which we assume they work, we may apply Acemoglu and Verdier's model to the problem we are handling.

4.3   The Application of the Model

To the aims of this paper we may distinguish two different kinds of relationship. The first is between bureaucrats and entrepreneurs. In the absence of an efficiency wage and without corruption, the inefficiency of the public administration constitutes a negative externality for entrepreneurs. In the absence of an efficiency wage, but with corruption, there is room for bribing. In particular, the greater the magnitude of the deal involved, the greater will be the willingness of entrepreneurs to pay bribes (in particular in the area of private and public building, as in the case of sentence no. 500 / 1999). Here we are dealing with a case of strategic interdependence between these two players. This effect is captured by σ. The second relationship is between the public administration and the bureaucrat (principal- agent theory), where the sentence has increased both the information about the behavior of civil servants and the liability rule for bureaucrats. These effects are expressed by q and m respectively. It is worth noting that even in the version of the model which allows for partial corruption, the final effects on m of the increased liability rule for bureaucrats, as a consequence of sentence no. 500 / 1999, is in the direction of reducing its value, because for civil servants that are prepared to take bribes they see the opportunity cost of being corrupted as higher than before, such that the final effect is that m decreases. In what follows we just refer to the versions of the model which allow for corruption.

4.3.1   Homogeneity among bureaucrats

Here we apply Acemoglu and Verdier's model as shown in subsection 3.3 of this paper. Under *ceteris paribus* conditions, we can do some simple exercises of comparative statics. We start taking into account the effects of a reduction of σ. Given that $\partial w/\partial \sigma > 0$, we may affirm that a decrease in σ implies a fall in the corruption constraint in (10). This means that the wage level w to avoid corruption will be lower if the power of bureaucrats in demanding bribes is reduced. Accounting for the number of entrepreneurs choosing the 'good' technology as in (11) and taking the partial derivative of x with respect to σ ($\partial x/\partial \sigma < 0$), we can see that decreasing the amount of 'surplus' the bureaucrat may extract in the form of bribes, the number of entrepreneurs implementing the 'good' technology increases. Even the overall number of private agents that decide to become entrepreneurs n_c , under the assumption of public intervention in the economy and corruption, rises if the power of civil servants to ask for bribes is reduced. In fact, taking the first partial derivative of n_c with respect to σ, in (12) we get $\partial n_c/\partial \sigma < 0$. In the same manner we may proceed to study the effects of an increase in the probability for bureaucrats to be caught. From (10) it is immediately clear that $\partial w/\partial q < 0$; this means that if it is easier to detect corrupt bureaucrats, the public authority will see its corruption constraint reduced. We may also consider the effects of a reduction in q with respect to x ($\partial x/\partial q > 0$). When q increases this implies that more entrepreneurs will choose the good technology. Finally, using (12), for $\partial n_c/\partial q > 0$, if it is easier

for corrupt bureaucrats to be caught, this implies that more private agents will choose to be entrepreneurs and fewer will be bureaucrats.

4.3.2 Heterogeneity among bureaucrats

Now we make use of the theoretical framework outlined in subsection 3.4. We start by analyzing the effects of a change in the amount of bribes that the dishonest bureaucrat may extract from surplus. From (15), that describes the partial corruption constraint, and knowing $\partial w/\partial \sigma > 0$, it is possible to affirm that, as in the version of the model previously presented, if σ decreases this implies that the rent for public bureaucrats to avoid the corruption phenomenon will also diminish. With regard to the *talent allocation constraint* represented in (17) we know that $\partial x/\partial \sigma > 0$ such that if the fraction of surplus, $(\tau + s)$, that the civil servant may extract is reduced, this implies that more private agents will decide to become entreprenuers also in this version of the model.

Because the effects of an increase in q are the same as in the previous subsection, here we investigate just how a rise in $\hat{q}$ will change the result of the model. To investigate how a change in the probability that a 'dishonest' public servant will be caught taking bribes will alter the number of entrepreneurs that will implement the 'good' technology, we can start from (16); for $\partial x/\partial \hat{q} > 0$, we may conclude that an increase of $\hat{q}$ determines that more and more entrepreneurs will employ the 'good' technology. Equation (17) is useful to study how the talent allocation constraint is affected by a change in $\hat{q}$, By taking the implicit partial derivative of mass of entrepreneurs choosing the 'good' technology with respect to $\hat{q}$ ($\partial n/\partial \hat{q} > 0$).

By using (14) and taking the partial derivative of surplus, $\tau + s$, with respect to m ($\partial (\tau + s)/\partial m > 0$) we can see that a fall in the probability that the bureaucrats are prepared to take bribes increases the surplus. Equation (15) is informative about the effects of a change in m with respect to the corruption constraint. In this case there is a positive relationship between those two variables ($\partial w/\partial m > 0$). Thus a decrease in the capability or propensity of dishonest bureaucrats in taking bribes also decrease the so called 'corruption constraint' represented by w.

Regarding the effects on x, and seeing from (16) that $\partial x/\partial m < 0$, we may affirm that a reduction in the probability that a bureaucrat is prepared to take bribes raises the number of entrepreneurs that will choose the 'good' technology.

5   Final Remarks

We agree with Acemoglu and Verdier's conclusions for which the partial corruption equilibrium is better than the case in which corruption is not allowed for; in our application we confirm the main result of the theoretical framework, for which an increase of information to the government about the behavior of its bureaucrats, a decrease in bargaining power of bureaucrats in asking for bribes, and a reduction of the propensity of civil servants to be 'dishonest', may reduce:

a) the number of agents withdrawing from the private sector; b) the efficiency wages paid to bureaucrats; c) the overall corruption phenomenon.

Thus it is confirmed that the choice is not between the *laissez fair* equilibrium with market failures and policy intervention with government failure, but in which cases the benefit of economic policy more than outweighed the damage of public intervention.

We think that it may be interesting to study the possibility of differentiating taxes for private agents as a function of the delay in the answer from the public administration. A more rapid answer from the public administration could imply higher taxes for private agents. In other words, this seems to be an application of the efficiency wage theory from the point of view of bureaucrats, and a mechanism of revealed preferences from the standpoint of the private agent.

The conclusions of the paper are perfectly consistent with Italian legislation in the area of wage payment to bureaucrats. We have seen that to avoid or limit corruption we have to pay a *rent* to civil servants, or, in other words, we have to pay them following the efficiency wage criteria. A similar system of labor remuneration was implemented in Italy In the 'nineties, but probably some more effort is necessary (Petretto, 1998).

From the point of view of welfare, the first-best is equilibrium with the intervention of the state and no corruption. If we extend the model to account for the possibility that civil servants take bribes, the partial corruption equilibrium is better than the full corruption equilibrium. In other words, if the illicit behavior of government employees is not so consistent, it is not worth spending so many resources on eliminating this phenomenon.

Corruption is seen as an unavoidable evil related to the intervention of the state in the economy to correct the causes of market failure, but these negative effects are acceptable if they are more than outweighed by the positive ones.

The crucial point in the real function of the mechanism we have outlined in this model is the effectiveness of the checks by the *Corte dei Conti* and the extension of the liability rule for public servants.

In terms of political economic measures we can imagine rendering competitive the market of inspection of some public good, assuming that the market may supply strict substitutes of public goods (Shi and Temzelides, 2004). In other words we are in front of a dichotomous choice. To maintain monopolistic power in the supply of a public product, thus trusting in the power of public intervention in the economy and accepting some level of corruption as an inevitable by-product of public regulation, as in Acemoglu and Verdier (2000). Or we may imagine creating some products that are close or perfect substitutes of that provided by public administration, thus avoiding the problem related to public intervention failure and stimulating competition in the supply of public services (Shi and Temzelides, 2004). Another measure to limit corruption is to reduce the monopolistic power of each bureaucrat, to provide for a substitute decision from another authority. Regarding the corruption phenomenon as a whole, using the indicators of Transparency International, we may affirm that corruption has declined in Italian starting from 2000, but to prove that

this result is a direct consequence of the mechanism outlined in this paper it is necessary to do some more research.

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