

# The social cost of non-compliance and the optimal punishment of corruption. Can European policy measures be helpful?<sup>1</sup>

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## Abstract

In this paper corruption is analysed in a model in which private compliance costs are explicitly introduced as well as asymmetry of information between government and private agents in a Principal–Agent model of costly regulation. Conditions leading to efficient anti corruption measures are derived and compared with those obtained by previous literature. An explicit analysis of the efficiency cost of corruption is also presented. European legislation is examined and evaluated according to the model’s results. The potential effects of European norms are discussed in the perspective that corruption is a great obstacle to an efficient management of the public sector that negatively affects the role of institutions in each country.

**Keywords:** Regulation; Compliance Costs; Corruption; Efficient Penalties; European Anticorruption Measures.

“My remaining two months in office [as Governor of Arkansas] were tough on my staff. They needed to find jobs. *The usual route out of politics is through one of the big companies that do a lot of business with state government*, but we had angered all of them.” B. Clinton, *My life*, Vintage Books, N.Y., 2005, Vol. I, page 373 (emphasis added).

“Bribes are paid for two reasons – to obtain government benefits and to avoid costs”, S. Rose–Ackerman (1996)

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## 1. Introduction

In any civil society, economic and social activities should generally conform to some legally determined standards of conduct intended to promote efficiency, safety, order or some other public goals. The legislative sphere (government) sets these standards and, in an idyllic world, private individuals/firms comply with the rules. However, compliance often requires costly and burdensome activities on the part of privates (e.g. applying for a complicated licence; submitting a detailed environmental-impact study when planning a construction investment; paying high fees for a licence, not to mention taxes). Since some private agents may fall short of ethical civil conscience, complete and spontaneous compliance should not be always assumed. Hence, independent administrative structures (bureaucracy) are in charge of the control and the evaluation of the extent to which private activities conform to prescribed rules. This activity mostly consists in *i*) the discovery of illegal conducts that undermine the social benefits of regulation and *ii*) the application of law-determined fines to non-complying subjects. Yet, since the circumvention of the rules might be vastly beneficial for successful private agents, the potential benefit of avoiding compliance provides incentives for potential corruption activities. Indeed, even bureaucrats may fall short of the above-mentioned civil virtues and could accept/solicit bribes for not monitoring/imposing the application of the law up to the full consequences. In turn, this creates the need to adopt anti-corruption measures on the part of governments. So, all over the world, governments, officials and private agents engage in a sort of perverse triangular liaison in which the government sets the rules, privates often try to circumvent them and public officials chase and eventually fine the circumventing privates who, in turn, may resort to bribing to avoid punishment and forced compliance. Corruption is the dark side of the above triangular liaison and generally moves a huge amount of resources whose exact volume is, not surprisingly, virtually unknown because even indirect indicators of corruption could be misleading or ambiguous (a low arrest rate for bribery may signal either low corruption or widespread corruption). Still, the forms, causes and damages of corruption, as well as remedies, are the subject of great discussions and speculation in contemporary societies. Hence, corruption is the source of an increasing concern for national governments and international organizations and generates intense political and academic debates.

At the European level, corruption continues to be a cause of concern, as it is globally<sup>3</sup>. Although the nature and extent of corruption vary, it most probably exists in all Member States and causes serious economic, social, and political harm. International instruments and EU anti-corruption legislation are already in place but implementation remains insufficient. The Commission calls on EU Member States to ensure that they fully transpose all relevant legal instruments into their legislation and effectively enforce the anticorruption measures through the detection and prosecution of corruption offences as well as by a systematic record of accomplishment of deterrent penalties and asset recovery. To that end, the Commission has set up the EU Anti-Corruption Report to assess periodically Member States' efforts, starting in 2013. In parallel, the EU

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<sup>3</sup> The process of enlargement of the EU has been a key vehicle for major anti-corruption reforms in the candidate countries and potential candidates. The 2005 negotiating frameworks for Croatia and Turkey introduced a specific chapter covering a range of rules of law issues, including judicial reform and the fight against corruption. The renewed consensus on enlargement, endorsed on 14 and 15 December 2006, has further strengthened the focus on the rule of law.

participates in the Council of Europe Group of State against Corruption (GRECO). The EU will also continue to address corruption through all relevant EU policies – internal as well as external. The most sensible areas include: *i*) corruption in the sphere of judicial and police cooperation; *ii*) modernised EU rules on confiscation of criminal assets; *iii*) revision of EU public procurement legislation; *iv*) improvement of EU crime statistics; *v*) enhancement of an anti-fraud policy to protect EU financial interests; *vi*) stronger use of conditionality in EU cooperation and development policies. At the same time, private-public dialogue at EU level on how to prevent corruption within the business sector will be further developed with the support of the Commission. It is therefore clear that EU perceives corruption as a great obstacle to an efficient management of the economy – of the public sector in particular – directly affecting the role of institutions in each country as well as the policy instruments to be used for any recovery path towards overall efficiency and more balanced budget policies. Although the total economic costs of corruption in Europe cannot be easily calculated, it is estimated that 120 billion Euros per year, or approximately 1% of the EU GDP, is lost because of corruption<sup>4</sup> and that a good 5% of the EU citizens pay a bribe annually. Outside Europe, corruption might well amount to 5% of GDP at world level and one study suggests that corruption may add as much as 20-25% to the total cost of public procurement contracts<sup>5</sup>.

Economic theory initially saw corruption as “oil in the wheels” of economic systems and as a form of self-defence of markets against burdensome and noxious public regulation. Then, Myrdal (1968), Rose-Ackerman (1975, 1978) and a subsequent literature showed that corruption is “sand in the wheels” of the economic mechanism and many empirical works revealed the damages of corruption to GDP, GDP growth, investment and overall public budget policy. Yet, existing economic theory analyses corruption/bribing decisions as a two-party utility maximization choice under uncertainty and generally does not consider the government as an active party. Models generally assume that the pay-off of a corrupted transaction is ex-ante known to equally informed parties who try to reach a Nash equilibrium deal about the extent of corruption and bribing. The properties of these equilibriums are analysed to derive policy indications for measures (concavity of the penalty function, differences in the fines charged to corrupted parties, properties of the wage structure of public officers, etc.) apt to discourage such transactions. Hence, the main concern of the literature seems to regard the equilibrium relationship between briber and bribee given the probabilities of being discovered and the penalties structure. Yet, no general analysis of corruption has been undertaken with the purpose of deriving anti-corruption measures from the maximization of a properly defined social welfare function in which the well-being of the main actors (government, officers and privates) are included, compliance decisions are related to government regulation and the existence of asymmetric information on compliance costs between government and agents is properly taken into account. This paper intends to contribute to the current debate by proposing that kind of analysis. We present a simple but general model of optimal regulation activity generating compliance costs to private subjects who, under the hypothesis of

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<sup>4</sup> The cited figure is based on estimates by specialised institutions and bodies, such as the International Chamber of Commerce, Transparency International, UN Global Compact, World Economic Forum, Clean Business is Good Business.

<sup>5</sup> Data are obtained from [www.transparency.org/policy\\_research/surveys\\_indices/gcb](http://www.transparency.org/policy_research/surveys_indices/gcb) and [www.nispa.org/files/conferences/2008/papers/200804200047500.Medina\\_exclusion.pdf](http://www.nispa.org/files/conferences/2008/papers/200804200047500.Medina_exclusion.pdf).

asymmetric information with the government, may resort to bribing public officers in order to reduce the “burden of regulation”. Under reasonable assumptions on compliance costs, we derive *i*) the conditions for efficient costly regulation; *ii*) the implications of regulation on compliance and compliance costs and consequently on the privates’ decisions on the extent of their compliance and *iii*) the properties of the fine structure for corrupted privates and officers consistent with the above optimal conditions. We show that, since regulation may induce private costly compliance as well as social benefits, Governments, in order to induce the most efficient pro compliance behaviour and reduce corruption to a minimum level, should make the efficient fines conditional on the effects of regulation on compliance costs and on privates’ reaction to regulation. The second purpose of the paper is to discuss the main EU policy measures against corruption in the lights of the above results. We try to evaluate the potential effectiveness of these recommended measures as instruments able to curtail corrupted transaction in European economies. The potential effects of European norms are discussed in the perspective that corruption is a great obstacle to an efficient management of the public sector that negatively affects the role of institutions in each country as well as their budget policy.

The paper is organized as follows. Section 2 contains a short review of the economists’ view of corruption and stresses differences in the approaches and in model building as well as in policy indications. In sections headed 3 we present our model of optimal regulation in the presence of compliance costs (observable by the government, section 3.1 and non observable, section 3.2) and the results emerging when the model encompass the idea that bribing generates a specific distorsive cost likewise an indirect tax (section 3.3). In section 3.4 we discuss our results and compare them with those obtained by the previous literature. In sections headed 4, some of the main EU anti-corruption policy issues are evaluated in the lights of results obtained mainly in sections 3.2 and 3.3. A brief section 5 concludes.

## **2. Corruption: definitions, causes and consequences**

Economic analysis has investigated corruption at both theoretical and empirical level. Starting with the seminal works of Rose-Ackerman (1975; 1978) a growing body of literature has studied corruption decisions as the result of optimal individual choices under uncertainty in the framework of crime, agency and rent-seeking theories. Public procurement and tax evasion have been the most natural initial case studies. Researchers have derived conditions for “optimal” bribe and penalty functions for private agents and public officers who may mutually gain from corrupt transactions. They have stressed the role of market competition among suppliers to the public sector in determining both corruption opportunities and rent appropriation and have also derived efficiency wage formulas designed to curb officers’ corruption by increasing the opportunity cost of risky corrupt activities. The conditions for efficient law enforcement, such as the judiciary activities and efficient penalty structure, have been extensively studied, too.

A second strand of literature has developed mainly after the publication of the indexes of (perceived) corruption from some international institutions. The publication of these indexes, such as the various versions of Transparency International Index, Corruption Perception Index and Word Bank Index, has lead economists to investigate what factors have a significant statistical influence on cross–countries differences in corruption. The fundamental legal structure of a country (e.g. civil vs. common law structure) as well as

the strength of its political and administrative decentralization or the time length of its democratic organization seem to affect the probability that individuals of that country can be exposed to corrupted activities (La Porta et al, 1998; Treisman, 2000). The abundance/scarcity of raw materials (Ades et al, 1999) and the gender distribution of parliamentary seats and senior bureaucratic positions (Swamy et al., 2001) are other factors making corruption more/less likely.

Lawyers approach to the analysis of corruption can be understood from the very definition of corruption adopted by the Global Programme against Corruption run by the United Nations. Corruption is any “abuse of power for private gain”, which therefore covers corruption in both public and private sectors. Lawyers stress the need of monitoring and supervising the officers’ activity and to improve the enforcement of the law.

In spite of the fact that corruption is a many-faceted phenomenon for which a precise and comprehensive characterisation is difficult to formulate, yet during the last 40 years economists have attempted to offer a number of definitions of corruption to be used in the economic analysis of the illicit trade associated to the relationship between (corrupted) officials and (corrupting) privates. In the first of the two seminal papers quoted above, Rose-Ackerman (1975) deals with the relationship between market structure and the incidence of corrupt dealings in government contracting process. She defines the essential aspect of a corrupt behaviour as an illegal or unauthorized transfer of money or an in-kind substitute in favour of a person in a position of power acting as an agent for another individual or organization. The purpose of the bribe is to induce that person to place his/her own interests ahead of the objectives of the organization for which he/she works. Framing the concept of corruption in property rights terms, Shleifer and Vishny (1993) define government corruption as the sale by government officials of government property for personal gain, i.e. transforming illegally public into private property. Polisky and Shavell (2001) distinguish between two different kind of corrupting phenomena, namely the acceptance of a payment by an official in return for not reporting a violation and the threatening of an innocent individual in order to extort some money from him. In all these cases, as stressed by Rose-Ackerman (2006), corruption represents the illicit use of willingness to pay as a decision making criterion on the part of a private individual who makes a payment to a public official in return for actions that are against the interests of his/her principals. Hence, corruption occurs when the private search for economic advantages clashes with law and norms that condemn such behaviour (Rose-Ackerman and Søreide, 2011) and consists in acts in which the power of a public office is used for personal gain in a manner that contravenes the *rules of the game* (Jain, 2001).

Corruption has been seen for long time as an efficiency-enhancing practice that permits the market to defend itself from pre-existing burdensome government failures such as excess taxations or queues for services of various sorts (Lui, 1985). Consequently, bribes were considered as useful side-payments that improved bargaining outcomes and promoted overall efficiency. It was the progressive assimilation of the work of Myrdal (1968) what made clear to many that corruption ought to be seen as sand and not oil in the gears of economic systems because corruption negatively affects both GDP and GDP growth (Mauro, 1995; Brunetti et al, 1998); it deteriorates the investment climate and tends to reduce both domestic and foreign investment – perhaps with a few recent exemption (Helmy, 2013) – and ultimately distorts public expenditure decisions (Mauro, 1998). Moreover, interest rates are badly prejudiced by corruption in loans

operations and countries perceived as more corrupt pay a higher risk premium when issuing bonds (Ciocchini et al, 2003) or encounter more difficulties when they introduce fiscal stimulus packages aimed at targeting future budget consolidations (Arin et al, 2011). There is also evidence (Lambsdorff, 2006) that bureaucratic corruption leads to misallocation of resources and reduces productivity and service quality, diminishes expenditure in education and distorts private sector activities by giving rise to shadow economy and tax evasion. Although appealing on intuitive grounds, the hypothesis that there is a negative effect of corruption on equality in resource distribution does not pass robust causal relationship statistical tests (Gupta et al, 2002).

Causes of corruption are the subject of both theoretical and empirical research. Although many causes of corruption seems to be also consequences of corruption to such an extent that feedback loops may obscure the true causal relationship, still a list of possible critical conditions making corruption more likely can be compiled following Lambsdorff (2006). The list includes the size of the public sector, the quality of regulation, the degree of economic completion; the structure of government; the amount of decentralization; the impact of culture; the prevailing values and gender of the agents involved; the characters of some invariant features of a country, such as geography and history.

Lastly, we may recall that suggestions of anti-corruption reforms have emerged alongside the discussion of corruption causes. Accordingly, some suggested that the public sector should be downsized and privatization of SOEs further accomplished. Other researches stress that regulation of economic activity and particularly public utilities should be simplified and made less discretionary. For others, officials' salaries should increase because low salaries force public servants to supplement their income illicitly whereas high salaries are a premium that is lost if a public servant is caught and fired. Press freedom and independence are also indicated as forces conducive to a better anti-corruption environment. The judiciary, however, has received a special analytical attention only quite recently. Judiciary may deter corruption since the quality of the judiciary can make easier and quicker the repression of corruption. However, the judiciary sector too is open to bribery. Data discussed by Rose-Ackerman et al. (2012) show that judiciary, the only service having a *pure public good* nature among those they analysed, is the only sector in which corruption is higher in high income countries than in low income ones, as if a sort of Wagner Law for corruption was affecting the judiciary activity as countries become richer. In the same paper Rose-Ackerman et al. (2012) also discuss the potential effectiveness of other measures designed to deter malfeasances such as: *i*) external monitoring and punishment; *ii*) transparency and bottom-up accountability initiatives; *iii*) civil service reforms (wage restructuring, personnel rotation and recruitment practices based on merit); *iv*) competitive service delivery, particularly for substitute services; *v*) international efforts to coordinated transnational anti-corruption activities; *vi*) reinforcement of legal services with the institution of National Courts and International Forums. Other policy measures, derived from the application of the tools of New Institutional Economics to the issue of corruption, are discussed by Lambsdorff (2002; 2007) who maintains that fighting corruption should focus less on individual moral attitudes or penalties and more on methods to destabilise corrupt relationships. The role of institutions and particularly the

voting rules<sup>6</sup> are also addressed explicitly or implicitly as sectors in which reforms might be introduced to reduce corruption (Potter et al., 2011).

### 3. A model of compliance and corruption

Balancing uncertain gains and costs – given penalties – of two parties contemplating a corrupted bargaining has been the focus of the existing theoretical literature on corruption, which has progressively adapted this approach to the study of the different contexts in which corruption may emerge. Framing their researches into this analytical structure, many authors have discussed the properties the penalties should possess for effectively restrain the parties of a potential corrupted transaction to conclude the illicit deal. The main concern of the literature seems to regard the equilibrium relationship between briber and bribee given the probabilities of being discovered and the above mentioned penalties structure. Yet, as stressed in section 1, no general analysis of corruption has been undertaken with the purpose of deriving anti-corruption measures from the maximization of a properly defined social welfare function in which the well-being of the main actors (government, officers and privates) are included, compliance decisions are related to government regulation and compliance cost and the existence of asymmetric information on compliance costs between government and agents is properly taken into account. To conduct this kind of analysis we construct a model by assuming that regulation is costly for private subjects and that in-compliance (when undiscovered) brings about a pay-off given by compliance cost avoidance. Since this provides the basis for a corruption bargaining we trust that using avoided costs as a measure of the gains pursued by a potential bribee allows to devise a sufficiently general analytical framework which may accommodate many of the specific cases of corruption discussed in the literature. Then, using the model discussed in this and in the following sections, we derive optimal punishment structure from a Principal-Agent scheme of the relationship between government and privates. Participation and incentive compatibility constraints are obtained from Nash equilibrium conditions emerging from the briber-bribee bargaining and then incorporated into the government maximization problem. The basic structure of the model is given by the following hypotheses.

#### *H1 Government*

The government sets some standards of conduct to be observed by firms or households operating in a society when they want to implement a project. Call these standards  $X$  and assume they can be cardinally measured (e.g. the number of pollution reducing filters in a production). Then the government invest resources to regulate privates' behaviour by monitoring their compliance. Call these norms *regulation* and suppose they can be expressed as a variable  $r$  measurable in monetary terms. Assume the government invests the quantity  $r \geq 0$  of resources in regulation activities and obtains from this activity a return given by a function  $V(r)$  which we assume to be continuously increasing and strictly concave in  $r$ .  $V(r)$  is twice differentiable on  $[0, +\infty)$  and satisfies the Inada conditions,  $V'(0) = +\infty$  and  $\lim_{r \rightarrow \infty} V'(r) = 0$ . Then, the benefit from standards and regulation-monitoring is  $V(r)X$  which is the gain of implementing  $X$  through  $r$ .

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<sup>6</sup> Specifically, the dimension of the voting districts seems to affect opportunities of corruption. Person et al. (2011) argue on empirical grounds that larger voting districts are associated with less corruption.

Regulation is costly for the Government. We assume that there are two types of costs. Implementation costs of the measures are expenditures necessary to prevent the damage (e.g. pollution) from non-compliance, call them  $D(r)$ , and assume  $D(\cdot)$  is a continuously increasing convex function. A second source of costs is given by the opportunity costs of  $r$  itself. Total preventing damage cost evaluated at required full compliance would be  $D(r)X$ . Hence, this means that if the government does not invest in regulation/monitoring, people would not comply and society would suffer a loss given by the forgone benefit of  $X$ . Hence, the government net utility function at full compliance is:

$$V = (V(r) - D(r))X - r$$

where the last term indicates the opportunity cost of the resources used in the regulation process.

### *H2 Privates*

Private subjects may either completely comply, partially comply or not comply at all. Hence, we define non-compliance as a continuous function  $x(r) \in [0, X]$ . Then,  $[X - x(r)]$  is compliance. Since  $x(r)$  is the private's reaction to regulation we do not say a priori whether it is monotonously increasing or decreasing in  $r$ . Hence,  $dx/dr$  is the slope of a reaction function to regulation. When it is positive, private's react to regulation by reducing compliance and when it is negative, they increase compliance. Following Mookherjee et al. (1997), we assume that compliance is costly and in order to simplify things we suppose that each private has no other costs but pure compliance costs. Call  $C$  the cost per unit of compliance (the cost of each filter).  $C$  is assumed to be a random variable realized only after that the government has fixed the norms of conduct. We assume there exists a common knowledge probability distribution  $F(C)$  having a density  $f(C)$  over a strictly positive support  $[\underline{C}, \bar{C}]$ . We assume that  $h(C) = f(C)/[1 - F(C)]$  is non-decreasing in  $C$ <sup>7</sup>. Note that  $\underline{C} > 0$  implies that compliance can never be costless. When private's do not comply and are discovered they will be sentenced to pay a fine whose structure will be specified below. The private's utility under full observability (or full compliance) is therefore

$$U_p = \bar{U} - E[C]X$$

where  $\bar{U}$  is the value of the regulated project for the private's (the flow of profits of the potentially polluting firm). The latter is supposed to be a constant and therefore the gain from non-compliance is the expected cost saving deriving from complete non-compliance or partial compliance. With asymmetric information, we will adapt this function to incorporate fines for non-compliance as well as the probability of being discovered.

### *H3 Officers*

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<sup>7</sup> Call  $S(C) = [1 - F(C)]$ . Then a non-decreasing hazard rate implies that  $S(C+z)/S(C)$  is non-decreasing in  $C$  for any non-negative  $z$ . The higher the cost the higher the probability that your costs will further increase, and vice versa.



The government delegates an agency, the bureaucrats, to monitor privates' compliance. To simplify things assume that bureaucracy's activity has no operating costs but officers' salary  $w$ . Hence, assuming that the working effort is costless, the utility of the officers under full observability is simply their salary  $w(r)$  which is a continuously increasing and differentiable function of  $r$ :

$$U_B = w(r)$$

Yet, in an asymmetric information context non-complying privates may try to bribe officials, i.e. they may try to persuade them to misreport about non-compliance with the direct consequence that the fine will be greatly reduced or entirely waived. We will call  $f_P$  and  $f_B$  the fines for privates and officers if they are discovered giving and accepting a bribe. Hence,  $U_B$  will be modified to account for bribes, penalties and probability of discovering when asymmetric information is introduced.

#### *H4 Allocative efficiency*

Finally, corruption will be assumed to be socially costly in terms of allocation of resources. This cost will be treated, in a way that will be discussed below and following an idea of Rose–Ackerman et al. (2012, 6), as a debt-weight loss provoked by a distortive tax which produces an extra *marginal costs of public funds*. Therefore, in this paper the total social damage induced by non-compliance and corruption behaviour will be higher than the direct damage from non-compliance (however defined) because bribes will not be treated as pure lump-sum inter-individual transfers.

Given H1 – H4 the problem of the government is to determine the optimal  $r$  under different assumptions about the distribution of information between government, officers and privates taking into account that, when there is asymmetry of information, corruption may lead private subjects to choose a non-complying behaviour supported by a bribing strategy

### **3.1 A benchmark case: full observability of compliance costs**

We first derive optimal  $r$  under the assumption that realized private costs are ex-post perfectly observable and consequently that there cannot be bribes (and fines) because the government can perfectly monitor individuals' and officers' behaviour. For simplicity, let us start by setting damage and salaries as constants. The objective function of the government is to maximize welfare at full compliance

$$\text{Max}_r (V(r) - \bar{D})X + \bar{U} - E[C]X - r - \bar{w}$$

As one can see the above is a social welfare function similar to the one used by Polinsky et al. (2001, 7) where the government (or *the public*) gain is given by  $V(r) - r$  and the damage plays the same role of their variable  $h$ , “the harm from committing the act”. In our case the act is the decision of not complying. Since compliance is assumed to be costly and costs are ex-ante unknown, uncertainty enters the model through the gain

privates obtain from their acts, as in Polinsky et al. (2001), i.e. through cost avoidance. The government, however, has no moralistic views about compliance and requires compliance when the latter is “efficient” from a cost perspective. Hence, considering  $E[C]$  we say that efficiency conditions (i.e. an efficient level of regulation) imply (adapting from Shavell, 1980), that it would be preferable to have compliance (state 1) if  $V(r) - \bar{D} \geq C$ , i.e. when net social wellbeing is greater than or equal to the full compliance cost, and non compliance (state 2) should be seen as efficient when the opposite condition is realized, i.e. when  $V(r) - \bar{D} < C$ . We can evaluate  $F[C]$  at the cut-off value of  $C$  to define the expected value of social wellbeing conditional on costs being lower than the cut-off level. This is simply the government net welfare times the probability of having a cost realization at or below the cut-off level. Accordingly, the probability  $F[V(r) - \bar{D}]$  is the probability of state 1 whereas the probability of state 2 is  $[1 - F(V(r) - \bar{D})]$ . Then a pure benevolent *welfare* maximizing government calculates the optimal  $r$  by maximizing the net benefit of regulation as follows:

$$\text{Max}_r \left[ \underbrace{F(V(r) - \bar{D})}_{\text{Pr. of State 1}} \right] \left[ \underbrace{(V(r) - \bar{D})X}_{\text{Social benefit of regulation net of damage}} \right] + \bar{U} - \underbrace{E[C|C \leq V(r) - \bar{D}]X}_{\text{Expected privates' cost of full compliance conditional on State 1}} +$$

$$- \underbrace{r - \bar{w}}_{\text{Government expenditure}}$$

To simplify notations, we shall put  $[V(r) - \bar{D}] = \tilde{C}$  from now on. Notice, that this way of treating in compliance is consistent with the view that in compliance (and later, corruption) is a “damage” (damage for society and a gain for non complying privates). Hence, we incorporate in the analysis the Myrdal’s (1968) view of corruption as sand – and not oil – in the machine. However, the definition of state1 as a target state of the benevolent government incorporates the idea that the government ought to avoid for efficiency reasons an excess level of regulation that might generate a total social cost higher than total benefit. Beyond this level of costs, compliance produces a private sacrifice higher that public benefit and that state of the world does not represent an efficient outcome. Then, the government tries to induce, by regulation, a compliance limited by that level of costs.

Given the above specifications, the optimal  $r$  solves

$$\text{Max}_r W = F[\tilde{C}][V(r) - \bar{D}]X + \bar{U} - X \int_{\underline{C}}^{\tilde{C}} Cf(C)dC - r - \bar{w} \quad (1)$$

$$\text{s.t. } F[\tilde{C}]U|_{x=0} \geq 0$$

The participation constraint requires that in State 1 full compliance does not exhaust the private’s utility. It can be easily shown that in State 1 the participation constraint is always satisfied. Maximization of problem (1) gives an optimal regulatory policy when

$$f(\tilde{C})\tilde{C}'_r[V(r) - \bar{D}]X + XF(\tilde{C})V'_r - X\tilde{C}'_r\tilde{C}f(\tilde{C}) - 1 = 0$$

i.e. when  $X \partial V / \partial r = 1 / F[V(r) - \bar{D}]$  since  $[V(r) - \bar{D}] = \tilde{C}$ . This implies  $X \frac{\partial V}{\partial r} > 1$  for any  $C < \tilde{C}$ . This gives for  $C < \tilde{C}$ , a strictly positive value of  $r$  that maximized the government return.

Implicit in the result there is the indication that there exists a *tolerance* level of non-compliance determined by the cost level, which induces a value of  $r$  smaller than the value obtainable with costless or certain compliance. To see this, contrast the above result with that emerging from a situation in which there is a cost level known ex-ante, namely with the condition determining the optimal value of  $r$  that results from  $\text{Max}_r [(V(r) - \bar{D})X - CX - r - \bar{w}]$ . In this case, the optimal  $r$  is obtained when  $X dV(r)/dr = 1$  at the maximized level of welfare. When compliance costs are uncertain, the government invests less resources in regulation than with certain compliance costs. This accords with intuition. In view of the fact that non-compliance is “socially” efficient for high realization of  $C$  and that monitoring is costly, the value of  $r$  can be set at levels below the value chosen if correct compliance were certain at a predetermined level of compliance costs. Yet, to the above result, we can also give another interpretation. Since costs are unknown in advance, the government may think it better to optimally “over-insure” against the risk of imposing an excess compliance cost to privates in the worst state of the world when compliance costs are higher than public compliance benefits.

### 3.1.1 Regulation when damage and salary depend on $r$

Under realized costs observability and no bribes, the underinvestment result is not necessarily obtained when  $D$  and  $w$  vary with  $r$ . Consider some possibilities.

*i)* Assume that  $D = \bar{D} - \psi(r)$  where  $\psi(\cdot)$  is a continuous increasing function (the damage can be reduced by  $r$ ) and that wages are fixed. In this case, the cut-off value of  $C$  would be  $\tilde{C} = [(V(r) - \bar{D} + \psi(r))]$  and problem (1) would rewrite as

$$\text{Max}_r F[\tilde{C}] [(V(r) - \bar{D} + \psi(r))X] + \bar{U} - X \int_{\underline{C}}^{\tilde{C}} Cf(C) dC - r - \bar{w} \quad (2)$$

$$\text{s.t. } F[\tilde{C}] U|_{x=0} \geq 0$$

yielding  $\frac{\partial V}{\partial r} = \left( \frac{1}{XF[(V(r) - \bar{D} + \psi(r))]} - d\psi/dr \right)$ . Also in this case the resulting  $r^*$  is

lower than with certainty since in the latter case the optimal  $r$  would be obtained from the condition  $\partial V / \partial r = (1/X - d\psi/dr)$  but it is higher than the previous (constant damage) case since  $d\psi/dr > 0$ . Hence, when the damage can be decreased by regulation the “over-insurance” (or the under-investment) result is reduced because investment in regulation accomplishes two mutually consistent effects of social welfare. This means that if the damage is reduced by regulation the government is more inclined to take the risk of imposing an excess compliance cost to privates in the worst state of the world (when compliance costs are higher than public compliance benefits) because the net gain of regulation is higher for any value of  $C$ .

ii) Assume now that  $D = \bar{D} + \psi(r)$  and  $w = w(r)$ . This means that if the government wants to increase regulation, bureaucracy must receive higher wages (see H3). Problem (1) rewrites as

$$\begin{aligned} \text{Max}_r F[\tilde{C}][&(V(r) - \bar{D} + \psi(r))X] + \bar{U} - X \int_{\underline{C}}^{\tilde{C}} Cf(C)dC - r - w(r) \\ \text{s.t. } F[\tilde{C}]U|_{x=0} &\geq 0 \end{aligned} \quad (3)$$

yielding an optimal  $r^*$  satisfying  $\frac{\partial V}{\partial r} = \left( \frac{1 + dw/dr}{XF[(V(r) - \bar{D} + \psi(r))]} - d\psi/dr \right)$ . This means

that the optimal investment is obtained when the expected marginal government benefit of  $r$  equals the marginal government expenditure in wages. Under cost uncertainty, however, the optimal  $r$  would be once again smaller than with certainty for in the latter case we have  $\partial V / \partial r = (1 + dw/dr) / X - d\psi/dr$  and the “over-insurance” (underinvestment) would be higher than with fixed salary. Wages increasing with  $r$  induce the government to reduce investment in regulation in order to reduce the risk of imposing an excess compliance cost to privates in the worst state of the world. However, the above f.o.c. implies that at the optimum there is a relation between  $V'$  and  $w'$  that can be exploited to investigate the property of the efficient salary structure. Let for simplicity  $\psi' = 0$  in the last f.o.c. and solve for  $w'$ . Then, integrate between 0 and  $r^*$  to obtain

$$\int_0^{r^*} dw(r) = \int_{r_0}^{r^*} [X(dV/dr)F[\tilde{C}] - 1]dr$$

where  $r^*$  is the optimal level of  $r$ . We get the salary structure resulting from optimal regulation as follows:

$$\begin{aligned} w(r^*) &= \underline{w} + \int_0^{r^*} (XdV/drF[\tilde{C}] - 1)dr \\ &= \underline{w} + [XF[\tilde{C}]\int_0^{r^*} dV(r)] - r^* \end{aligned} \quad (4)$$

where  $\underline{w}$  is the fixed level of the salary when  $r = 0$ . Then, the optimal salary structure is the sum of two components. One is certain and represents the fixed minimum part of the salary. The uncertain component is given by the difference between a quota of the value of the total marginal government's gain at full compliance generated by investing up to  $r^*$  and the investment opportunity cost of regulation. Then, under (ex-post) cost observability, the above salary structure links salary to expected net performance (increase in  $V$ ) as if salaries were directly dependent of the expected benefits of the investment in regulation. Then, even when costs are ex-ante uncertain, a (sub) optimal level of regulation is obtained when compliance costs can be ex-post observed by both government and officers. Officers' activity can be rewarded in a way that ensures they receive a fair share – given by  $F[\tilde{C}]$ , i.e. by the probability of state 1 – of the government benefit from investment in regulation. However, cost observability implies that incompliance and bribing are impossible. Then, the above results should be contrasted with that emerging from a situation in which cost observability in any state

of the world is restricted to officers only, so that an efficient penalty structure should be designed to help achieving a policy of determining the optimal  $r$  that induces compliance without bribing.

### 3.2 Compliance and corruption without observability

When the government cannot observe costs, pure regulation/monitoring does not lead to efficient outcomes, the probabilities of state 1 and state 2 cannot be defined and, consequently, the optimal  $r$  cannot be derived from the maximization of the benefit of regulation in which a tolerance level of incompliance is defined by efficiency cost conditions. Moreover, recall that under cost observability the very role of bureaucracy may even look somehow superfluous. Officers are simply the *longa manus* of the government. To give bureaucracy an active and autonomous role, we now assume that compliance costs can be observed only by bureaucracy but not by the government. The latter, fearing that privates and officers may collude can impose pre-determined fines to non complying privates (upon bureaucracy's report) and to officers when they are discovered to be corrupt, i.e. when they misreport. Hence, the government must determine its optimal measures taking into account not only compliance costs uncertainty but also that privates and officers may bargaining over the officers' reports, i.e. over the gain generated by avoiding the compliance costs required by regulation. As a result the government must first understand how a Nash equilibrium between privates and officers can be characterized (i.e. what the best decisions about a bribe can be) and then incorporate the results into his maximization problem regarding optimal policy in order to obtain simultaneously conditions for an optimal  $r$  and for the fines.

We start with the private-officers bargain problem. Assume that  $\Theta$  is the probability that a corrupted transaction is discovered when a bribe  $b$  changes hands. If an officer is discovered he/she is not fired from the office but his salary is reduced by the amount given by a lump-sum payment  $b < f_B < w$ . This means that the bribe is confiscated and the officer pays a positive penalty on top of the bribe confiscation. As a result his expected utility is modified as follows

$$E[U_B] = (1 - \Theta)[w + b] + \Theta[w + b - f_B]$$

with a *status quo* (no bargaining) utility of  $w$ .

If the private is discovered he/she is compelled to fully comply (then, his/her total cost will be  $C[X - x(r)] + Cx(r) = CX$ ), and is fined with a penalty  $f_P$  per unit of incompliance evaluated at  $C$ . Then, since the gain of a private is given by the monetary value of his/her regulated activity  $\bar{U}$  (e.g. an house he/she builds) *plus* the avoided compliance costs (e.g. the unpaid fees)<sup>8</sup> net of the bribe, we have, assuming that  $CX + b + f_P < \bar{U}$ ,

$$E[U_p] = (1 - \Theta)[\bar{U} - C(X - x(r)) - b] + \Theta[\bar{U} - C(X - x(r)) - b - Cx(r)f_P]$$

with a *status quo* (no bargaining and no incompliance) utility of  $\bar{U} - CX$  (the gain net of total compliance cost).  $X$  is total required compliance and  $x$  is incompliance. The latter

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<sup>8</sup> We assume that the lump-sum penalty is smaller than  $\bar{U}$  which implies that the government cannot confiscate entirely the gain of the private (an house built "illegally" cannot be demolished).

is assumed to depend on  $r$  in two possible different ways:  $x'(r) > 0$  (burdensome regulation) or  $x'(r) < 0$  (simplifying regulation) and it is observed by both parties (see H2). This allows for bribing over partial compliance. A Nash solution (see Ades et al. 1997) is obtained from

$$MAX_b (E[U_B] - w)(E[U_P] - \bar{U} + CX)$$

yielding

$$b^*(C, x(r)) = \frac{1}{2} \left[ Cx(r) + \frac{\Theta}{1-\Theta} (f_B - Cx(r)f_P) \right] \quad (5)$$

which has a simple interpretation<sup>9</sup>:  $P$  and  $B$  share the expected surplus given by the sum of the net expected gain of the briber ( $Cx(r)$  is the amount of avoided compliance costs, ranging from 0 to  $CX$ ) and the expected penalty (reduction in utility) of the bribee. Since  $\partial b / \partial x \geq 0$  for  $f_P \leq (1-\Theta)/\Theta$ ,  $b_{f_P} < 0$  and  $b_{f_B} > 0$ , by implicit differentiation we can see that  $df_P/dx > 0$  and  $d^2f_P/dx^2 < 0$  (concavity of the privates' penalty),  $df_B/dx < 0$  and  $df_P/df_B > 0$ .

Equation (5) tell us that the condition for  $b > 0$ , i.e. the condition for corruption in the society, requires

$$\left[ Cx(r) + \frac{\Theta}{1-\Theta} (f_B - Cx(r)f_P) \right] > 0 \quad \text{for } 0 \leq x(r) \leq X$$

Call  $C_I$  the value of  $C$  that satisfies the above equation as an equality given the parameters. Then  $F[C]$  evaluated at any  $C < C_I$  gives the probability of the realization of the compliance costs that makes corruption equal zero<sup>10</sup>. We use it<sup>11</sup> in the following modified version of Problem 1. The government assumes that when costs are in the interval  $[\underline{C}, C_I]$  there is no bribe, given  $\Theta$ ,  $f_P$  and  $f_B$ . Therefore, the problem is to issue the efficient amount of regulation and determine the optimal fine functions that induce the required compliance when unobservable expected costs are assumed to be greater than  $C_I$  and bribes are therefore possible. Using the above utility function of the privates the government calculates, for  $C > C_I$ , by the Envelope Theorem,

$$\frac{dU_P^*}{dC} = -X + x(r) - \Theta x(r)f_P$$

<sup>9</sup>  $b$  has a lower bound of zero for  $x = 0$  ( $\Theta=0$ ), and an upper bound of  $CX + (\theta/1-\theta)[f_B - CXf_P]$  for  $x = X$ .

<sup>10</sup> Making  $f_B$  dependent on  $w$  (i.e.  $f_B = \gamma w$ , with  $0 < \gamma < 1$ ) penalizes seniority with respect to the case of a lump-sum fine, provided that salary increases with years in office. The effect is to increase the threshold value of  $C_I$  discussed in the text for high rank officials thereby making corruption less likely for these kind of officers: a result that is generally claimed in the literature for high wage officers.

<sup>11</sup> Reference to the stake of corruption to define a probability of corruption in the model is used also in Auriol et al (2011, 218) to compare the probability of corruption in alternative ownership regimes after SOEs privatization.

and solves, under the assumption that  $x$  can be observed but its corresponding costs are not, the welfare maximization problem under the above incentive compatibility constraint for the privates<sup>12</sup>

$$\text{Max}_r \int_{C_1}^{\bar{C}} [V(r) - D - w(r)] f(C) dC \quad \text{s.t.} \quad \left[ \frac{dU_p^*}{dC} = 0 \right] \quad \forall C > C_1$$

which requires, for a multiplier  $\mu > 0$ ,

$$\text{Max}_r H = [V(r) - D - w(r)] f(C) - \mu [-X + x(r) - \Theta x(r) f_p] \quad \forall C > C_1$$

with the following f.o.c.

$$\begin{aligned} \frac{\partial H}{\partial r} &= [V' - w'] f(C) - \mu x' + \Theta \mu x' f_p = 0 \\ -\frac{\partial H}{\partial V} &= \dot{\mu} = -f(C) \end{aligned}$$

The last condition gives, upon integration between  $C_1$  and  $\bar{C}$ ,  $\mu = -[1 - F(C_1)]$  for any  $C_1 < \bar{C}$  and therefore, by substitution, the optimal fine per unit of incompliance (index  $I$  dropped) is

$$f_p = \frac{1}{\Theta} \left( 1 + (V' - w') \frac{dr}{dx} \frac{f(C)}{[1 - F(C)]} \right) \quad \forall C > C_1 \quad (6)$$

where  $dr/dx = (dx/dr)^{-1}$ . Then, the optimal fine *per unit* of incompliance has two components: a fix part plus or minus the gain/loss generated by the sign of the reciprocal of  $dx/dr$  (marginal incompliance). When  $dx/dr = 0$  privates do not modify their decision on incompliance whatever the regulation policy and the fine is a constant. We call this situation neutral reaction to regulation. When  $dx/dr > 0$  an increase in  $r$  induces more incompliance on the part of privates (adverse reaction to regulation) and therefore the fine has to include the gain potentially generated by an efficient choice of  $r$  (i.e.  $V' - w'$ ) that is forgone because of the privates' reaction. Privates should be punished by including in the fine the foregone welfare increase. When  $dx/dr < 0$  (accommodating reaction to regulation) an increase in  $r$  implies that privates progressively reduce incompliance as if compliance were complementary to regulation and therefore their perspective fine can be reduced: they should benefit from their virtuous behaviour. For  $dx/dr < 0$  the penalty becomes a subsidy when

$$\left[ \frac{f(C)(V' - w')}{[1 - F(C)]} < \Theta \frac{dx}{dr} \right]$$

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<sup>12</sup> It can be shown that participation constraint is satisfied. Moreover, linearity of the utility function implies that  $\text{sign}[\partial E[U_p]/\partial C] = \text{sign}[\partial^2 E[U_p]/\partial C \partial x(r)]$  which guaranties single-crossing.

Notice the role played by the hazard rate of the distribution in the above result: it makes the realization of the positive welfare gain ( $V' - w'$ ) more or less likely in terms of the conditional density of non complying behaviour at costs  $C > C_1$  given that privates have complied (see eq. 5) at costs at or below  $C_1$ .

Since (5) is valid for any value of  $C > C_1$  we can substitute (5) into (6) to obtain, for any value of the unknown costs, the penalty for the officer for any  $C > C_1$  consistent with  $b > 0$ :

$$f_B = Cx(r) \left[ 1 + \frac{f(C)}{[1-F(C)]} \frac{dr}{dx} \left( \frac{V' - w'}{\Theta} \right) \right] \quad (7)$$

As one can verify, substituting (6) and (7) into (5) leads, other things being equal, to a zero bribe payment for any value of  $C > C_1$ . Moreover, notice that the penalty for  $B$  is always positive if  $dx/dr > 0$  i.e. when privates increase incompliance and negative when

$$\left[ \frac{f(C)(V' - w')}{[1-F(C)]} < \Theta \frac{dx}{dr} \right]$$

for  $dx/dr < 0$  i.e. when privates reduce incompliance. Notice once again the role of the hazard rate of  $F(C)$  which is analogous with respect to the case of  $f_P$ .

When the government's policy induces compliance,  $f_P$  reduces in (6). Privates may appropriate part the results of their reaction to regulation. Then, although no specific conclusion for the value of penalty of the officers can be drawn, still we can say that their penalty should be smaller than  $f_P$  and should have the same property of  $f_P$  with respect to the sign of  $dr/dx$ .

### 3.3 Corruption and the allocative cost of bribes

Rose–Ackerman et al. (2012, 6) suggested that bribes, like a distortive tax, are not simple inter-individual lump-sum transfers. On the contrary, they affect allocative efficiency as if, in our interpretation, something similar to the *marginal costs of public funds* were attached to a bribe as it is to any indirect tax. As such, bribes produce a reduction of welfare that should be related to  $dx/dr$  and as such charged to corrupted parties. We show that this is indeed the case.

Assume the shadow cost of bribery is defined in terms of bureaucracy salary so that that  $D(b) = \bar{D} + \lambda w(r)b$  with  $dD/dr = \lambda w' b > 0$ . Substituting for  $D$  in the  $H$  function above and maximizing it under the same incentive compatibility constraint gives the gain from regulation reduced by  $\lambda$  (the shadow cost of corruption) times the amount of the total bribe. Solving the modified problem we obtain

$$f_P = \frac{1}{\Theta} + \frac{f(C)}{[1-F(C)]} \left[ \frac{dr}{dx} \frac{(V' - w')(1 + \lambda b)}{\Theta} \right] \quad \forall C > C_1$$

which means that the distortionary cost of corruption must have an increasing effect on the fine (the numerator of the term in braces is higher) that must affect  $f_P$  through  $dr/dx$  and the hazard rate. Once again, the reaction to regulation can be *accommodating* or



*adverse* in terms of enhancing compliance and, under the hypothesis that bribes induce a distortion in the allocation of resources ( $\lambda > 0$ ), the effect of  $\lambda b$  on  $f_p$  depends upon the effect of regulation on noncompliance and the hazard rate, i.e. upon how likelihood is that  $C > C_1$  (greater potential gain from corruption). Hence, the resulting higher value of  $\lambda b$  which reduces the net marginal gain of regulation must be paid by privates according to the value of  $dr/dx$ .

### 3.4 Discussion and relations with the literature

Reference to compliance costs and government regulation has permitted to present a somewhat general framework for compliance and corruption analysis. The existing literature, on the contrary, discusses separate and specific cases of corruption decisions (procurement, police abuse, taxes, ecc.). Still, the results obtained in the previous sections can be related to the existing literature. First, notice that in our setting above, investment in  $r$  is an investment in “enforcing by monitoring” i.e. an activity that, likewise in Mookherjee et al. (1992), the regulator implements by committing resources *before* receiving information about the offence, if any. This should not be confused with the activity of enforcement by investigation. If in (4)  $w$  is interpreted as the ongoing salary prevailing in the economy, the payment structure represents a variant of those efficiency wage payments discussed by Ades et al. (1997, 504), among others. Assume, as an example, that  $D$  is the loss from fees unpaid to the government for some private activity (social contributions, in the reported example of Ades et al (1997)), the last part of (4) incorporates in the officers’ salary part of the fees collected by the activity of the bureau whereas the second component of the salary is the marginal gain generated by their activity. Under symmetric information on compliance costs and results of the bureaucratic monitoring activity, which implies that bribes are not possible, officers can be made residual claimants of the results of their work. Concavity of the fine function parallels Rose–Ackerman (1975, 193) result that concavity is “consistent with a sanctioning strategy under which the penalty upon conviction is solely a function of the size of the bribe paid and the probability of conviction is a concave function of the firms’ revenues”. In our model regulation/monitoring implies to enforce efficient compliance – or discovery of ex-post non compliance – requires, absent bribes, concavity in  $r$  and  $D$ . As for our result when bribing is possible, we stress that Mookherjee et al (1995) obtain a result similar to that shown by our equation (6) and (7), i.e. that it should be punished more the bribe giver than the receiver, and Lambsdorff (2007) suggests this measure should be adopted when the receiver fails to reciprocate after taking the bribe.

As for the fines of public officers, we have followed the literature and supposed that the officers are not fired and that the penalty per unit of noncompliance is flat. Analogously we have supposed that the private, upon discovery, is not entirely deprived from the results of his non complying action. We have assumed that he/she is forced to fully comply and fined with a flat rate penalty. Even with this simplifying assumptions, however, the model permits to conclude that a permanent reduction of the salary or a fine increasing with the wage would make corruption less likely, at least for high rank officials (see footnote 9). This accords with results on efficiency wages obtained by previous literature. Indeed, also in our case the smaller the advantage from curbing corruption the lower the incentive part of the wage to be paid to officers. Still, we have

shown that the probability of being discovered is not the exclusive factor that affects corruption decisions, even when moral costs are not taken into account.

We found that simplification of privates' compliance activities affects the critical value of  $C$  and reduces both incompliance and bribes, not to mention the allocative cost of corruption. A similar result was obtained empirically only for utilities operating in developing countries by Seim et al. (2009) and more recently by Johnson et al. (2013) for regulatory regimes in some US states but no previous theoretical work has analysed a model build on this idea. We provide a general framework in which compliance costs could be associated to the income level of bribers and bribees (through officers' wage and, indirectly, through the monetary value of the regulated action of the privates) in order to incorporate agents' income level into the model. We have shown that fines should be independent of such variables and this makes anti-corruption measures seemingly neutral in distributional terms.

The allocative cost of corruption (opportunity costs of the bribes) is reflected in the fines' formulas and this characterizes our results with respect to other models in which efficiency requires some equilibrium level of corruption.

Our main result is that compliance might not always be the most efficient choice from a social point of view and therefore that there can exist an equilibrium level of corruption. However, we innovate with respect to the literature by endogenizing this level of tolerance to the regulatory choices of the government. Still, bribing is socially costly in efficiency terms even when full compliance would be inefficient. With too high compliance costs there are two cumulative sources of inefficiency: excess costly compliance for which the government might be responsible and bribing which might be considered as a privates reaction to high compliance costs. If excess of regulation is bad, corruption makes its consequences worse. Likewise previous studies, we show that, given compliance costs (the value at stake, in our model), corruption depends upon the probability of been caught and therefore all that increases this probability reduces bribes and fines. For instance, assume that the probability of discovery a corrupted agreement depends upon the monitoring activity of the government which is a random variable with  $F(z) = 1 - \exp[-\lambda z]^N$  where  $z > 0$  and  $N > 0$  are, respectively, a measure of the government's monitoring activity and the number of persons (officials or members of the public) somehow involved in the process or with a knowledge of it, then the expression for  $\Theta/(1-\Theta)$  can be substituted by  $f(z)/[1-F(z)] = \lambda N(\lambda z)^{N-1}$  which is increasing in  $z$  and  $N$ . Given the monitoring activity, increasing the number of people with knowledge of the existence of a potential corrupt transaction (i.e. imposing transparency and bottom-up accountability to the process) decreases the probability of bribing and increases the possibility of discovering (e.g. trough *whistleblowing*).

In all, our results show that, given the equilibrium level of corruption, fines can be positive or negative according to the sign of  $dx/dr$  if the reduction of that level is pursued by public policy. This implies that also in corruption policy incentive compatibility requires the adoption of carrot-stick measures whereas stick alone might be even counterproductive. In the following sections the above results will be used to evaluate some aspects of the structure of the EU anti corruption policy.

#### **4. EU measures against corruption and how effective they can be**

Over the last decade, some efforts have been made at international, EU and national level to reduce corruption. At EU level, the anti-corruption legal framework has

developed by the adoption of legislation on corruption in the private sector (Council Framework Decision 2003/568/JHA on combating corruption in the private sector (OJ L 192, 31.7.2003, p. 54) and the accession of the EU to the United Nations Convention against Corruption (UNCAC) (Council Decision 2008/801/EC (OJ L 287, 29.10.2008, p. 1).

The Treaty on the Functioning of the European Union recognises that corruption is a serious crime with a cross-border dimension which Member States are not fully equipped to tackle on their own<sup>13</sup>.

However, the implementation of the anti-corruption legal framework remains uneven among EU Member States and unsatisfactory overall. The EU anti-corruption legislation is not transposed in all Member States. The Commission does not have the power to bring legal proceedings against Member States for failure to transpose measures adopted under the Third Pillar of the Treaty, prior to the entry into force of the TFEU. Such proceedings will be possible from 1 December 2014, pursuant to Article 10 of Protocol No 36 on Transitional Provisions of the Treaty of Lisbon.

To date there is no mechanism in place monitoring the existence, and assessing the effectiveness, of anti-corruption policies at EU and Member State level in a coherent cross-cutting manner. At international level, the main existing monitoring and evaluation mechanisms are the Council of Europe Group of States against Corruption (GRECO), the OECD Working Group on Bribery, and the review mechanism of the UN Convention against Corruption (UNCAC). Framework Decision 2003/568/JHA on combating corruption in the private sector<sup>14</sup>, adopted in July 2003, aims to criminalise both active and passive bribery, establishing more detailed rules on the liability of legal persons and deterrent sanctions. In addition to stronger monitoring and implementation of existing legal instruments, anti-corruption considerations should, as part of a comprehensive approach, be integrated into all relevant EU policies – internal as well as external. A stronger focus should be put on the following policy areas.

In what follows we evaluate some of the most important EU policy steps against corruption on the basis of our previous results.

#### **4.1 Law enforcement, judicial and police cooperation within the EU**

Member States should take all necessary steps to ensure the effective detection, prosecution and a stable track record of dissuasive penalties and recovery of criminally acquired assets in corruption cases. In this context, judicial and police cooperation between EU Member States, financial investigations, training of law enforcement personnel, and the protection of whistleblowers is of particular importance. In section 3.2 above the probability of detection is exogenous to individual behaviour but measures can be designed to take advantage from any “false move” of privates and officerces. For this reason greater transparency and the envolvment of many actors in each activity increases the probability that the treat of whistleblowing (possibly anonimous) might reduce corruption. Consistently to this hypothesis, under its 2010-2014 strategy, Europol is committed to providing increased support for law enforcement

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<sup>13</sup> Article 83(1) of the Treaty on the Functioning of the European Union lists corruption among those crimes for which directives providing minimum rules on definition of criminal offences and sanctions may be established, since corruption often has implications across, and beyond, internal EU borders. Bribery across borders, but also other forms of corruption, such as corruption in the judiciary, may affect competition and investment flows.

<sup>14</sup> OJ L 192, 31.7.2003, p. 54.

operations and function as the EU criminal information hub and EU centre for law enforcement expertise. The Commission urges Europol to step up its efforts to combat corruption as a facilitator for organised crime activity.

Since 2004, Eurojust has been involved in a slightly increasing number of corruption cases. Although in 2010 these cases represented only 2% of its total workload, the growing number of Member States involved attests to an increasing need for judicial cooperation in corruption cases with a cross-border dimension. The Commission urges Eurojust to strengthen its efforts to facilitate the exchange of information among Member States' authorities on corruption cases with cross-border implications.

The Commission<sup>15</sup> have pointed to delays in the efforts by many Member States to adopt measures regarding confiscation of the proceeds of crime. The third Anti-Money Laundering Directive<sup>16</sup> lists corruption as one of the predicate offences for money laundering. Evaluations conducted by the OECD's Working Group on Bribery suggest that very few foreign bribery cases are detected through the national anti-money laundering systems. The Commission stresses the need for further cooperation between the Financial Intelligence Units<sup>17</sup>, specialized anti-corruption agencies and law enforcement bodies in Member States. Member States should ensure that financial investigations are pursued effectively and consistently in corruption cases and that any potential link with organized crime and money laundering is always considered.

The protection of whistleblowers against retaliation is a key element of anti-corruption policies. The relevant legal framework in the EU is uneven, creating difficulties in handling cases with a cross-border dimension.

The Commission will support the development of targeted training programmes on corruption for law enforcement agencies through the European Police College (CEPOL). Those programmes should cover specific aspects of handling corruption cases with cross-border implications, for example, the gathering and exchanging of evidence, the link with financial investigations, and the link with investigations of organised crime offences.

## **4.2 Public procurement**

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<sup>15</sup> Report from the Commission to the European Parliament and to the Council based on Article 8 of the Council Decision 2007/845/JHA of 6 December 2007 concerning cooperation between Asset Recovery Offices of the Member States in the field of tracing and identification of proceeds from, or other property related to crime (COM(2011) 176 final); Report from the Commission to the European Parliament and the Council based on Article 22 of the Council Framework Decision 2006/783/JHA of 6 October 2006 on the application of the principle of mutual recognition to confiscation orders (COM(2010) 428); Report from the Commission pursuant to Article 6 of the Council Framework Decision 2005/212/JHA of 24 February 2005 on confiscation of crime related proceeds, instrumentalities and property (COM(2007) 805 final); Report from the Commission based on Article 14 of the Council Framework Decision 2003/577/JHA of 22 July 2003 on the execution in the European Union of orders freezing property or evidence (COM(2008) 885 final).

<sup>16</sup> Directive 2005/60/EC (OJ L 309, 25.11.2005, p. 15).

<sup>17</sup> According to Article 21(2)(b) of Directive 2005/60/EC of the European Parliament and of the Council of 26 October 2005 on the prevention of the use of the financial system for the purpose of money laundering and terrorist financing, the "FIU shall be established as a central national unit. It shall be responsible for receiving (and to the extent permitted, requesting), analyzing and disseminating to the competent authorities, disclosures of information which concern potential money laundering, potential terrorist financing or are required by national legislation or regulation. It shall be provided with adequate resources in order to fulfill its tasks".

Public expenditure on works, goods and services accounts for roughly 19% of EU GDP (2009). Almost a fifth of this expenditure falls within the scope of the EU Directives on public procurement (i.e. approx. €420 billion, or 3.6% of EU GDP). According to EU (2011), the most common corruption scenarios that might occur in the public procurement procedures are the so-called "kickback" (i.e. payment of a bribe as a reward for the official who influenced the procurement process), manipulation of tender documents to favour a specific bidder, and the use of front/intermediary companies to cover the illegal activities of the corrupt official.

The current EU legal framework on public procurement<sup>18</sup> does not include specific provisions on prevention and sanctioning of conflicts of interest, and comprises only few specific rules on sanctioning favoritism and corruption. In January 2011, the Commission launched a consultation<sup>19</sup> on the modernisation of EU public procurement policy. It raises the question whether a common definition of conflict of interest and possible safeguards against such situations are needed at EU level, including the publication of concluded contracts to enhance transparency, the extension of exclusion grounds and 'self-cleaning' measures. Many of the above steps should be welcomed on the basis of our results. Still, more incisive measures should be adopted to reduce compliance costs, particularly about the participation to cross-border tenders where linguistic, legal and administrative barriers as well as continued practices of local preferences serve as a restraint on participation (Pîrvu et al., 2013) thereby creating conditions favorable to corruption. A serious help to reduce compliance cost might come from new regulation such as the planned adoption of a European Procurement Passport and the further development of use of e-procurement portals. The EU Green Paper (2011) emphasizes simplification and transparency of the procedures (public opening of the bids, compulsory publications of reports, ect.) as means potentially more effective than sanctions in curbing corruption through a reduction of correlated phenomena such as favoritism and collusion.

### **4.3 Privatization and selling of public property**

Many studies discuss the possibility of corruption when SOEs are privatized. In general, although privatizing SOEs might reduce the opportunities for corruption, the privatization process itself can increase corrupt incentives. A firm may pay to be included in the list of qualified bidders or to restrict their number (Rose–Ackerman, 1996) or to obtain favorable condition during the post-privatization period (laxed regulation, subsidies, ect.). Hence, privatization measures offer several occasions for corrupt behaviour. Hall (1999) reports several cases of corruption fuelled by government privatization in the UK, France and other European countries. According to Auriol et al. (2011) corruption in privatization, in some cases, may simply be an additional cost in the process which does not distort the optimal privatization decisions but, in some other cases corruption not only increases costs but also distorts privatization decisions, for instance by distorting the choice of the object being privatized. Cost increasing or cost decreasing regulation becomes a crucial element in

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<sup>18</sup> Directive 2004/18/EC on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts (OJ L 134, 30.4.2004, p. 114) and Directive 2004/17/EC coordinating the procurement procedures of entities operating in the water, energy, transport and postal services sectors (OJ L 134, 30.4.2004, p. 1).

<sup>19</sup> Green Paper on the modernisation of EU public procurement policy. Towards a more efficient European Public Procurement Market, COM (2011) 15 final.

determining the conditions for corruption by reducing or increasing the access barriers to the market or allowing officers to exercise a certain discretionary power in regulating both the access to the tendering and the final ex-post market power of the winner. At the same time, the amount and the kind of information disclosed on competitive tendering may have positive or negative effects in terms of risk of collusion among participants (Carpinetti et al., 2006). In the case of privatization of several lots of public assets with a single multi-unit procedure, since bids may signal participants' preferences for specific lots a full disclosure of each bid during the auction may make collusion easier. Still, the adoption of uniform rules across EU member states about information disclosure is a useful, but so far not recommended, measure for the phase following following the conclusion of the procedure.

Our results show that corruption in privatization may result from the way in which the privatized markets in which firms will operate are regulated. Compliance costs in  $E[U_P]$  may be represented by investment to be made by the winner after privatization to foster competitiveness and efficiency as required by the government. This is clearly ex-ante uncertain and the private firms may find it beneficial to corrupt officers managing the privatization process in order to obtain a favorable regulation of the market in which they will operate. In other words, privates may win the "competition for the field" by using for corruption purposes the resources that they expect from the "competition within the field" that follows the privatization procedure. This is particularly important for IPOs privatization where it is difficult to determine a "true" initial offer values of the shares offered and government officers might embezzle state revenues to influence the privatization decisions and outcomes, and the presence of advisors and intermediaries during the entire privatization procedure can make the entire process even less transparent. When the fear of been discovered is low (low value of  $\Theta$ ) this implies that corruption may lead to bribing since the value of  $x(r)$  (which we may interpret as the anti-competitive behaviour after privatization) might be high too, and an high concentrated private industry should be expected after privatization. This result is consistent with that obtained in an other model of corruption in privatization by Bjorvatn et al. (2005). This notwithstanding the issue is, however, almost entirely missing from EU agenda.

#### **4.4 Accounting standards and statutory audit for EU companies**

The use of International Financial Reporting Standards for consolidated financial statements of companies listed on the EU's stock markets became mandatory in 2005<sup>20</sup>. The procedures on statutory audit were harmonised<sup>21</sup>, introducing a requirement for external quality assurance, provisions on public supervision, duties and independence of statutory auditors and the application of international standards. These measures increased the credibility, quality and transparency of financial reporting, reducing the risks of corruption. Still, in the lights of (5), which states that the bribe is increasing in the specific gain of the bribee, generic recommendations for the auditing activity (transparency, good governance, economy, efficiency, ect.) look insufficient. Instead, the EU should prescribe the adoption of sector specific auditing procedure related to the

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<sup>20</sup> Regulation (EC) No 1606/2002 of the European Parliament and of the Council of 19 July 2002 (OJ L 243, 11.9.2002, p. 1).

<sup>21</sup> Directive 2006/43/EC on statutory audits of annual accounts and consolidated accounts, amending Council Directives 78/660/EEC and 83/349/EEC and repealing Council Directive 84/253/EEC (OJ L 157, 9.6.2006, p. 87).

technical or specialized operations of the department or agency being audited. For example, these issues would relate to review of specific laws and rules relating to the technical work of the department such as Income Tax Law, or Customs Law and rules and procedures framed subordinate to these laws. Following Modugu et al. (2012), once the auditors have an inventory of corruption opportunities, they should proceed to prepare a shortlist of these opportunities in the environment of the organization under audit. They should try to figure out the status of the organization or its various operations with respect to opportunities for corruption. This can be done by applying some common – across Europe – Corruption Opportunity Test which would represent a sort of benchmark procedure against which the actual audit activity can be evaluated. The effect in many cases could be to increase the probability to discover some forms of corrupt behaviours.

#### **4.5 Preventing and fighting political corruption**

Finally, let us consider the government sphere itself. As political scandals have repeatedly shown, complex connections are sometimes developed between political actors, private undertakings, media, trade associations and foundations<sup>22</sup>. These connections are driven by mutual benefits in influencing key political and economic decisions, putting democratic institutions and procedures at risk and rendering the detection of corrupt practices more difficult. Under the impetus of the GRECO monitoring process, some progress has been seen in the legal and institutional setting for the financing of political parties in several Member States. Unfortunately, the enforcement of transparency and supervision rules is still unsatisfactory in some Member States.

### **5. Conclusions**

By partially endogenizing privates' compliance decisions to government regulation policy and leaving ethical considerations aside, this paper provides a general theoretical analysis of the relationship between regulation, compliance, corruption and punishment. When compliance costs are high, and so are the privates' potential gains from non compliance, a correspondingly high corruption might be expected. Government regulation can make compliance either easy or burdensome and this enters the privates' decision process about corruption. Indeed, in many cases high compliance costs depend upon complicated and onerous regulation prescriptions and then simplification of the rules may induce more compliance and reduce corruption by lowering the potential pay-off (avoided compliance costs, net of bribes) from corrupted transactions. In a Principal-Agent model of government-privates relationship with asymmetry of information, we have derived optimal fine structures and shown how fines should be designed to incorporate incentives for maximum compliance and minimum corruption. Under the hypothesis that bribes generate a debt-weight loss of their own – like distortive taxes – we have also shown how this cost should be charged to agents and how the fines structure should be modified. In all, our results show that the punishment policy of corruption ought to be a carrot-stick menu of measures in which special attention should go to the compliance costs of regulation. We have finally emphasized that the extent to which the recommended European policy measures (available at the moment)

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<sup>22</sup> Allegations of links between politicians and influential businesses or media owners have been made repeatedly in recent years, notably regarding financing of electoral campaigns.

incorporate these characteristics of the punishment tools in their guidelines to member countries is not entirely satisfying.

## References

- Ades A. and R. Di Tella (1997), The new economics of corruption: a survey and some new results, *Political studies*, XLV, 496–515
- Ades A. and R. Di Tella (1999), Rents, competition and corruption, *American economic review*, 89, 982–993
- Aidt T. S. (2003), Economic analysis of corruption: a survey, *Economic journal*, 113, 632–652
- Arin K. P., V. Chmelarova, E. Feess and A. Wohlschlegel (2011), Why are corrupt countries less successful in consolidating their budgets?, *Journal of public economics*, 95, 521–30
- Auriol E. and S. Straub (2011), Privatization of rent-generating industries and corruption, in Rose-Ackerman S. and P. Søreide (Eds.), *International handbook on the economics of corruption*, Vol. II, Edward Elgar, Cheltenham, UK, 207–230
- Bjorvatn K. and T. Søreide (2005), Corrupt ion and privatization, *European journal of political economy*, 21, 903–914
- Brunetti A., G. Kisunko and B. Weder (1998), Credibility of rules and economic growth: evidence from a world wide private sector survey, *World Bank economic review*, 12, 353–384
- Brunetti A. and B. Weder (2003), A free press is a bad news for corruption, *Journal of public economics*, 87, 1801–1824
- Ciocchini F., E. Durbin and D.T.C. Ng (2003), Does corruption increase emerging market bond spreads, *Journal of economics and business*, 55, 503–528
- European Commission (2011), Green Paper on the *Modernisation of EU public procurement policy. Towards a more efficient European Procurement Market*, Brussels, COM(2011) 15 final
- Gupta S., H. Davoodi and R. Alonso–Terme (2002), Does corruption affect income inequality and poverty?, *Economics of governance*, 3, 23–45
- Hall D. (1999), Privatization, multinational and corruption, *Report 9909-U-U-Corrupt.doc*, PSIRU, University of Greenwich
- Helmy H. A. (2013), The impact of corruption on FDI: is MENA an exception?, *International review of applied economics*, 27, 491–514
- Jain A. K. (2001), Corruption: a review, *Journal of economic surveys*, 15, 71–121
- Johnson N., W. Ruger, J. Sornes and S. Yamarik (2013), Corruption, regulation, and growth: an empirical study of the United States, *Economics of governance*, DOI 10.1007/s10101-013-0132-3
- Lambsdorff J. G. (2002), Making corrupt deals: contracting in the shadow of the law, *Journal of economic behaviour and organization*, 48, 221–241
- Lambsdorff J. G. (2006), Causes and consequences of corruption: What do we know from a cross–section of countries, in Rose-Ackerman S. (Ed.), *International handbook on the economics of corruption*, Vol. I, Edward Elgar, Cheltenham, UK, 3–51
- Lambsdorff J. G. (2007), Deterrence and constrained enforcement – Alternative regimes to deal with bribery, *Universität of Passau Diskussionsbeitrag*, Nr. V–60–10
- La Porta R. F. Lopez-de-Silanes and R. Vishny (1998), *The quality of government*, NBER W.P. 6727



- Lui F. T. (1985), An equilibrium queuing model of bribery, *Journal of political economy*, 93, 760–781
- Jain A. K. (2001), Corruption: a review, *Journal of economic surveys*, 15, 71–121
- Mauro P. (1995), Corruption and growth, *Quarterly journal of economics*, 110, 681–712
- Mauro P. (1998), Corruption and the composition of government expenditure, *Journal of public economics*, 69, 263–279
- Modugu P., N. Ohonba and F. Izedonmi (2012), Challenges of auditors and audit reporting in a corrupt environment, *Research journal of finance and accounting*, 3, 77–82
- Myrdal G. (1968), *An Asian drama: an inquiry into the poverty of Nations*, Vol. II, Pantheon, N.Y, USA.
- Mookherjee D. and I. P. L. Png (1992), Monitoring vis-à-vis investigation in enforcement of law, *American economic review*, 82, 556–565
- Mookherjee D. and I. P. L. Png (1997), Corruptible law enforcers: how should they be compensated?, *Economic journal*, 105, 145–159
- Persson T, G. Tabellini and F. Trebbi (2011), Electoral rules and corruption, *Journal of the European Economic Association*, 1, 958–989
- Pîrvu D. and C. Bâldan (2013), Access to the EU public procurement market: are there disparities based on the origin of economic operators?, *Journal of economic issues*, 3, 765–779
- Polinsky A. M. and S. Shavell (2001), Corruption and optimal law enforcement, *Journal of public economics*, 81, 1–24
- Potter J. D. and M. Tavits (2011), Curbing corruption with political institutions, in Rose-Ackerman S. and P. Søreide (Eds.), *International handbook on the economics of corruption*, Vol. II, Edward Elgar, Cheltenham, UK, 52–78
- Rose-Ackerman S. (1975), The economics of corruption, *Journal of public economics*, 4, 187–203
- Rose-Ackerman S. (1978), *Corruption: a study in political economy*, Academic Press, N.Y., USA
- Rose-Ackerman S. (1996), The political economy of corruption – Causes and consequences, *World Bank Public policy for the private sector*, Note #74, Washington DC: The World Bank
- Rose-Ackerman S. (2006), Introduction and overview, in Rose-Ackerman S. (Ed.), *International handbook on the economics of corruption*, Vol. I, Edward Elgar, Cheltenham, UK, xiv–xxxviii
- Rose-Ackerman S. (2011), Introduction, in Rose-Ackerman S. and P. Søreide (Eds.), *International handbook on the economics of corruption*, Vol. II, Edward Elgar, Cheltenham, UK, xiv–xxxi
- Rose-Ackerman S. and R. Truex (2012), *Corruption and policy reform*, Working paper prepared for the Copenhagen Consensus Project
- Salant S. W. (1987), Treble Damage Awards in Private Lawsuits for Price Fixing, *Journal of political economy*, 95, 6, 1326–36
- Seim L. T. and T. Søreide (2009), Bureaucratic complexity and impacts of corruption in utilities, *Utility Policy*, 17, 176–184
- Shavell S. (1980), Damage measurement for breach of contracts, *Bell journal of economics*, 11, 2, 466–490

Shleifer A. and R. Vishny (1993), Corruption, *Quarterly journal of economics*, 108, 3, 599–617  
Swamy A., S. Knack, Y. Lee and O. Azfar (2001), Gender and corruption, *Journal of development economics*, 64, 25–55