# Corruption, organized crime and the bright side of subversion of law☆

Astrid Gamba[a], Giovanni Immordino[b,d], Salvatore Piccolo[c,d,*]

[a] University of Milan-Bicocca, Department of Economics, Italy
[b] University of Naples Federico II, Department of Economics, Italy
[c] University of Bergamo, Italy
[d] CSEF, Italy

## ARTICLE INFO

## ABSTRACT

We study an enforcement model in which, as soon as a Legislator grants an amnesty to low-rank criminals cooperating with the justice, top criminals react by bribing public officials in order to avoid being sanctioned. We show that, to prevent this form of *subversion of law*, the optimal policy must grant leniency not only to low-rank criminals but also to officials who plead guilty and report bribe-givers. By doing so, the policy increases the conviction risk not only for top criminals but also for their soldiers. This higher risk increases the reservation wage that top criminals must pay in order to recruit soldiers and therefore reduces the crime profitability (the *bright side* of subversion of law).

## 1. Introduction

When Governments promote leniency programs to disrupt trust among criminal partners and stimulate cooperation between prosecutors and whistleblowers, top criminals may bribe law enforcers (police officers, prosecutors and judges) in order to *minimize* the risk of conviction not only for themselves but also for their soldiers, who may otherwise flip and turn informants. This form of 'avoidance' (Malik, 1990) or 'subversion' of the law (Glaeser and Shleifer, 2003) often hinders the policy's beneficial effects.

Corruption and organized crime are deeply connected phenomena. Even if there does not exist a universally agreed definition of organized crime[1], social scientists usually insist on the essential role played by corruption and the establishment of deep connections between criminal organizations and the public domain. Finckenauer (2005), for example, argues that "organized crime generally seeks to neutralize or nullify government by avoiding investigation, arrest, prosecution, and conviction through payoffs to the police, prosecutors and judges."[2]

Surprisingly, in spite of the potential subversive role of corruption

little is known on the costs and benefits of leniency programs when corruption is a potential danger. How should these programs be designed when corruption can neutralize or even subvert their scope? Is it a good idea to grant amnesties also to corrupt officials who plead guilty and report bribe-givers? If so, how generous should these amnesties be? Understanding the mechanisms allowing governments to actually exploit subversion of law and possibly turn it into a new instrument to fight organized crime seems a crucial normative goal.

We study a simple game between a Legislator, a criminal organization and a continuum of public officials (prosecutors or other law enforcers) that are heterogeneous with respect to their moral cost of accepting a bribe. The Legislator, having forbidden some illegal activities, sets up a leniency program that grants reduced sanctions to law-breakers who plead guilty and cooperate with the justice. The criminal organization has a hierarchical structure and is formed by two mobsters who are in a 'principal-agent' type of relationship: a boss and his fellow (soldier). After the crime has been committed, the fellow can disclose his insider information (about the boss and his involvement into crimes) to the prosecutor and obtain as a reward a lighter sanction

---

[1] See, e.g., Ianni and Ruess-Ianni (1976), Hagan (1983, 2006) and Maltz (1985, 1994).
[2] For the most recent conceptualizations of organized crime, see also Varese (2010), Hagan (2006), von Lampe (2001), and Albanese (2004). See also the definitions collected by von Lampe at the link http://www.organized-crime.de/organizedcrimedefinitions.htm.

chosen by the Legislator at the outset of the game. Yet to prevent such cooperation the boss may decide to capture the prosecutor who, upon accepting a bribe, may either acquit both criminals and face the risk of being charged for corruption, or self-report and induce both criminals to be convicted with a certain probability. As a reward for this, the official is charged a reduced sanction (also chosen by the Legislator at the outset of the game).

We show that policies that stimulate subversion of law — leniency programs — might have a bright side when enforcement is relatively weak. Specifically, we characterize conditions under which, to optimally deter crime, the Legislator designs a policy that purposefully encourages the boss to bribe the official. This objective is achieved by awarding an 'excessively' lenient amnesty to corrupt officials who report the bribe-giver (boss). Therefore, in order to minimize the equilibrium amount of crime, the Legislator is willing to tolerate some degree of corruption by designing a coordinated policy that grants an amnesty not only to low-rank criminals who turn informants, but also to corrupt prosecutors who self-report.

In this setting, the role of corruption is determined by the interplay among three effects that an increase in the official's amnesty generates on the organization's cost of committing the crime. Choosing a (relatively) high amnesty for self-reporting officials tends to increase the crime rate for two reasons. First, by reducing the official's expected sanction, a higher amnesty lowers the official's reservation bribe. Therefore, *ceteris paribus*, the boss has a greater incentive to capture the official (subvert the law) in order to avoid being sanctioned. Second, the implied higher rate of corruption also leads the fellow to blow the whistle less often because (when captured) the official files the case. This lower risk of conviction reduces the fellow's reservation wage and decreases the cost for the boss to recruit soldiers. Both these effects tend to reduce the cost of crime for the boss and determine the dark side of subversion of law.[3] However, by increasing corruption, a higher amnesty for the official also makes it more likely to convict the fellow when the official self-reports. This effect increases the fellow's reservation wage, since it increases his conviction risk, whereby increasing the cost for the boss to recruit soldiers: the *bright side* of subversion of law.

We show that this bright side bites if the fellow's conviction risk is relatively small when he remains loyal to the organization — i.e., when enforcement is relatively weak. In this case, the Legislator purposefully induces corruption in equilibrium by combining both policy instruments — i.e., leniency for the fellow and the official — which are complementary one to the other. In contrast, when enforcement is relatively strong, the net effect of an increase of corruption on the fellow's reservation wage is negative. Therefore, the Legislator prefers to choose a policy that does not induce corruption in equilibrium. In this case, only the fellow is allowed to blow the whistle.

These results hinge on the hierarchical structure typical of criminal organizations and then do not apply to crimes perpetrated by single offenders. In different contexts, other scholars have argued that corruption can have a positive impact on welfare (e.g., growth) by stimulating investment and facilitating transactions in countries with excessive regulation: it allows people to avoid 'bureaucratic delay' (Lui, 1985, among others). The channel we propose here is completely different since it is based on the effect that corruption has on the costs and benefits of criminal organizations.

On the normative ground, our analysis is related to the recent debate initiated by the Indian chief economic advisor Kaushik Basu, on harassment bribes and the social desirability of forms of asymmetric liability — i.e., legal mechanisms where bribe-takers are culpable but

bribe-givers have legal immunity (see, e.g., Basu, 2011; Basu et al., 2014; Dufwenberg and Spagnolo, 2015; Rose-Ackerman, 2010).[4] Differently from harassment bribes, where only two parties are involved, corruption is not the final offence in our framework but an *input* for a more dangerous crime, which involves the participation of more than two parties. In other words, while in the case of harassment bribes the offence materializes if and only if the public official accepts the bribe, in our model the execution of the crime may occur even in the absence of corruption. Moreover, the hierarchical nature of organized delinquency makes our problem different from a simple bilateral relationship. Therefore, it should not be surprising that our policy implications are quite different from Basu's proposal: in our framework, it is the bribe-taker who should be partially or even completely immune (provided he reports the bribe-giver). In addition, while Basu's argument does not require corruption to happen in equilibrium, in our model a salient feature of the optimal policy is that bribery occurs along the equilibrium path.

### 1.1. Related literature

Our analysis is related to the strand of literature on organized crime. Jennings (1984), Polo (1995), Konrad and Skaperdas (1997, 1998) and Garoupa (2000) started to model criminal organizations as vertical structures, whose bosses need to discipline their fellows with implicit rewards and credible threats (see, e.g., also Baccara and Bar-Isaac, 2008, who consider both vertical and horizontal organizations).[5] These models are silent on the role of leniency programs as a tool to generate conflicts within criminal organizations, which is instead the building block of our analysis.

The idea of applying leniency programs to fight organized crime builds upon the antitrust law enforcement literature which studies the effects of reduced sanctions on cartel formation in oligopolistic markets — see, e.g., Motta and Polo (2003), Spagnolo (2003, 2008), Rey (2003), Aubert et al. (2006), Chen and Harrington (2007), Chen and Rey (2013) and Harrington (2008).[6] The main difference between this literature and papers that deal with organized crime is that while cartels are horizontal institutions, criminal organizations are typically hierarchical.

The optimal design of leniency programs meant to fight organized crime and collective delinquencies has recently been discussed in Acconcia et al. (2014), who also provide an empirical analysis of the phenomenon, and Piccolo and Immordino (2017), who emphasize the benefits and the costs of these programs when whistleblowers have private information. None of these papers have discussed the effect of corruption on leniency.

Our analysis also shares important features with the literature on corruption. Stemming from Becker and Stigler (1974) the law and enforcement literature has acknowledged that bribery reduces punishment and thus deterrence. To contrast this fall in deterrence they propose the payment of efficiency wages to prevent bribe taking.[7] Bowles and Garoupa (1997) focus on the effects of bribery on the optimal allocation of public resources and they show that the maximal fine may not be optimal (see also Basu et al., 1992; Marjit and Shi, 1998; Chang et al., 2000; Garoupa and Jellal, 2002). Polinsky and Shavell (2001) consider the diminishment of deterrence caused by corruption (due to bribing by criminals) and by extortion of the innocent by enforcers.

---

[3] They are in line with the standard negative view of corruption. For example, in a context with harassment bribes, Shleifer and Vishny (1993) show that the illegality of corruption and the need for secrecy make it much more distortionary and costly than its sister activity, taxation. Hence, they explain why, in some developing countries, corruption is so costly to development. See also Mauro (1995) and Wei (2000).

[4] The idea behind Basu's proposal is simple: after the act of bribery is committed, the interests of the bribe-giver and the bribe-taker diverge owing to asymmetric liability. Indeed, the bribe-giver will be willing to cooperate in getting the bribe-taker caught. Anticipating this, the bribe-taker will not accept the bribe.

[5] See also Fiorentini and Peltzman (1995) and Mansour et al. (2006).

[6] Related and more recent models are offered by Harrington (2013), Sauvagnat (2014, 2015) and Silbye (2010).

[7] Besley and MacLaren (1993) and Mookherjee and Png (1995) also propose efficiency wages to deter bribery.

They propose rewards for corruption reports in order to mitigate the deterrence breakdown. Finally, Kugler et al. (2005) analyze an oligopoly model in which criminal organizations compete on criminal activities and engage in corruption. Differently from Bowles and Garoupa (1997), where a higher fine may deter crime but will encourage corruption, they find that the maximal fine is not optimal because it results in more rather than less crime. Our paper is the first that bridges this literature with that on leniency.

The rest of the paper is organized as follows. In Section 2 we discuss some useful empirical and anecdotal evidence on organized crime, corruption and leniency programs that helps framing the problem into a formal model. Accordingly, in Section 3 we set up the model. In Section 4, we provide the equilibrium analysis and determine the optimal policy. Section 5 concludes. All proofs are in the Appendix. An online Appendix contains additional material.

## 2. Background

Before setting up the model, we first survey the evidence that motivates the analysis and its underlying assumptions.

### 2.1. Empirical and anecdotal evidence

The idea that corruption is a salient input for criminal organizations seems to be strongly supported by recent anecdotal and empirical evidence. In Italy, the 'motherland' of the Sicilian Mafia, the existence of deep connections between *Cosa Nostra* and many public officials and prosecutors is widely covered in the press and has been the subject of recent empirical investigations (see, e.g., Alesina et al., 2016; Daniele and Dipoppa, 2016; De Feo and De Luca, 2013). Cosa Nostra frequently tried to manipulate court decisions by bribing police officers and, in some cases, even prosecutors (see, e.g., Gambetta, 1992). In 2011, former Italian judge Giancarlo Giusti was sentenced to four years of prison for the 2009 release of several members of the Calabrian 'Ndrangheta, an emerging criminal organization located in southern Italy. Many whistleblowers, mostly low or middle rank criminals, have alleged ties between their clans and important judges. In 1993 Gaspare Mutolo, former member of the Sicilian Mafia and now collaborating with the Italian justice, accused several of judge Falcone's collaborators for being on the payroll of Totò Riina. Cases of corruption also involved members of the Italian police forces and intelligence services.

The phenomenon is not specific to Italy, but has spread out all over the world. In a large sample of 64 countries, Buscaglia and Van Dijk (2005) analyze the link between perceived corruption and the extent of organized crime. They identify a negative correlation between the level of organized crime and the quality of judicial rulings[8] and between organized crime and the independence of the judiciary. They conclude that corrupt judges typically abuse their substantive and procedural discretion through rulings that slowed down or obstructed law enforcement in organized crime cases.[9]

The European Commission has recently financed a study to identify best practices in prevention and countering corruption linked to organized crime (Gounev and Bezlov, 2010). The final report, based on a collection of several case studies, highlights the diffusion, the roots and the most recent trends of the phenomenon. In particular, it is argued that police forces have the most direct exposure and frequent contacts with organized crime and, consequently, organized crime most often targets them. The main reasons for organized crime to use corruption are to obtain information on investigations, operations, or competitors,

and protection (immunity) for continued illegal activities. Criminal groups also corrupt the judiciary by accessing magistrates via social, political, professional and family networks. Elite social networks allow criminals to enjoy direct contact with judiciary members. Professional networks, where defense lawyers (often former prosecutors) intermediate between organized crime and the judiciary also facilitate such contact. Although most of the cases are kept silent and dealt with internally (Van Duyne, 1996), there are sufficient indications of corruptive interactions between public officials and organized crime which have revealed a worrying capacity to disrupt police work.[10]

The Center for the Study of Democracy (2009) reports that judicial corruption has been determinant for the impunity of criminals in Bulgaria where there have been a limited number of prosecutions and convictions of members of criminal organizations over the past five years. Holmes (2006) argues that the marked discrepancy between the number of cases reported to the authorities and those ending with a conviction should be interpreted as a signal of pervasive judicial corruption in countries like Bulgaria and Hungary. Gutauskas et al. (2004) explains that in Lithuania, between 1999 and 2001, only 41% of investigated smuggling cases reached the trial phase, the key factor being the corruption practices in the criminal justice system. According to Gutauskas et al. (2004) there are thirteen cases pending against judges accused of rejecting prosecutors' requests to arrest criminals, helping them avoid prison or obtain reduced sentences. Surprisingly, corruption and organized crime seem to be connected even in The Netherlands and UK, two of the most developed European countries. Van de Bunt (2004) explains that Dutch criminal organizations bribe policemen mainly to access confidential information or to obtain protection and cooperation in the logistics of their drug trafficking. Similarly, Miller (2003) reports that in 2000 six police forces in the UK recorded 122 police corruption cases in total, most of which were related to disclosure of information or participation in crimes connected to drugs and prostitution.

Other notable examples of links between criminal organizations and the public domain are found in Latin America — see, e.g., Acemoglu et al. (2013) and Solís and Foglesong (2009). Corruption and intimidation characterized Pablo Escobar's dealings with the Colombian system. Mexican cartels are also well known to found their operations on complicities with law enforcement officials. For example, Mexican municipal, state, and federal government officials, along with the police forces, often work together with the cartels in an organized enduring network of corruption. Serious concerns have been recently expressed by the International Narcotics Control Board, reporting that, although the central government of Mexico has made efforts to reduce corruption in recent years, it remains a deep problem. Many agents of the Federal Investigations Agency (AFI) are suspected to work as enforcers for various cartels: according to the Attorney General, in 2015, nearly 1500 of AFI's 7000 agents were under investigation for suspected criminal activity, and 457 were convicted. Between 2008 and 2009 several police agents and top officials were arrested and accused of selling information or protection to drug cartels. Among those there were some with a high institutional profile — e.g., chiefs of the Federal Police, ex-chiefs of the Organized Crime Division and ex-directors of Mexico's Interpol office.[11]

### 2.2. Leniency programs

Leniency programs are widespread in many developed and developing countries, especially those that are historically more troubled with organized delinquency.

For instance, the Italian Criminal Code granted partial or total

---

[8] For a better understanding of how the index about the effectiveness of the judicial system is constructed see Buscaglia (2001), that contains a case-files analysis of the judicial systems of 67 countries.

[9] See also Van Dijk (2007) which confirmed the existence of the relation between independence of the judiciary (as measured by the World Bank) and the prevalence of organized crime.

[10] See also the resolution of the United Nations Convention Against Corruption and the 2001 evaluation reports of the Group of States Against Corruption (GRECO) and the Europol (2009) report, in which several member states acknowledge the presence of criminal organizations using corruption to avoid detection or to manipulate trials.

[11] http://edition.cnn.com/2009/WORLD/americas/07/15/mexico.violence/.

immunity to cooperating offenders in cases of political conspiracy or gang-related activities already in 1930. In the 1970s, as a direct consequence of the violent actions of the Red Brigades, a series of laws were enacted in order to encourage dissociation from terrorist groups and collaboration with the authorities. However, it was not until 1984, that witness protection became formalized when Tommaso Buscetta turned against the Sicilian Mafia and in exchange for his help was relocated under a new identity. Those events induced more Mafia members to cooperate, with the result that by the end of the 1990s the Italian authorities had benefited from the services of more than 1000 justice collaborators.

In Colombia, the witness protection program dates back to the Constitution of 1991, which delegates the Office of the Attorney General the obligation to provide protection for witnesses, victims and other parties of criminal proceedings. A special investigative team is responsible for evaluating criminal investigations, studying witness participation in proceedings and ultimately assessing the level of risk and threat that arises as a direct consequence of such participation.

In contrast, in Mexico the witness program is rather weak. In 2012 President Felipe Calderon attempted to make it more effective by authorizing benefits, including new identities, for people who find themselves at risk due to their cooperation with the justice. However, the Mexican justice system still seems unable to exploit the opportunities offered by whistleblowers. Well known problems are faulty testimonies and the lack of protection. The Attorney General's Office used only 379 of such witnesses during Calderon's administration.

The anecdotal evidence on Nations' effort to promote coordinated leniency programs for self-reporting officials and flipping criminals is, however, rather scarce. In practice, their complementarity is often neglected: they are usually treated as two different institutions, whose main difference lies in the informant's retribution risk. This view has been clearly expressed in two separate United Nations Conventions, against transnational organized crime and against corruption.[12] In these two documents it is argued that States parties should take appropriate measures to protect witnesses in criminal proceedings related to organized crimes and corruption (articles 32, 33 and 37). Our model offers the first theoretical contribution highlighting the need for more effort to interconnect these programs.

## 3. The model

**Players and environment.** The game involves a Legislator, a (hierarchical) criminal organization and a public official ruling the case against the organization.[13] The Legislator, having forbidden socially harmful acts, designs a leniency program — i.e., commits to grant lighter sanctions to law-breakers that cooperate with the justice. The Legislator is benevolent and its objective is to minimize crime.[14] For simplicity, the criminal organization is formed by two members: a principal (boss) and an agent (fellow). The boss plans and finances the crime, while the fellow (soldier) is in charge of its execution.

Committing the crime yields a random monetary return $\pi$ to the boss, with $\pi$ distributed on the support $[0, +\infty)$ with cdf $G(\pi)$ and pdf $g(\pi)$. The boss has full bargaining power and offers the fellow a wage $w$, after the monetary return $\pi$ has realized. This wage is paid after the crime is committed, but before the investigation takes place. We normalize the fellow's outside option to zero.

Once the crime is committed, the public official detects it with

probability $1$.[15] The boss can, however, decide to bribe the official in order to subvert the law — i.e., upon receiving the bribe $x$, the corrupt official guarantees immunity to the organization members. The official's moral cost $m$ of infringing the law is a random variable that distributes on the support $[0, +\infty)$ with continuously differentiable cdf $F(m)$ and pdf $f(m)$. At the time the bribe is offered, the boss knows $m$.[16]

**Conviction technology.** To save on notation, we assume that all criminals — i.e., the boss, the fellow and a corrupt official — are sanctioned with the same penalty, which we normalize to $1$.[17] The conviction *technology* depends on the Legislator's policy, the fellow's reporting behavior, the boss' corruption decision and the official's self-reporting behavior.

When the official is not corrupt, the fellow is 'pivotal' in determining expected sanctions.

- If the fellow remains loyal to the organization, he is fully accountable for the crime and is convicted with probability $p$. The boss is not sanctioned (we relax this assumption in the online Appendix).
- If the fellow blows the whistle, he obtains an amnesty $\phi \geqslant 0$ and is charged the (certain) discounted sanction $1 - \phi$. In exchange for this reduced sanction, the whistleblower provides information against the organization that leads the judicial authority to convict the boss with probability $\alpha$, which reflects the accuracy of the fellow's information about the boss.[18]

In contrast, when the official is corrupt and decides not to report the bribe-giver, neither the boss nor the fellow are sanctioned: the official may, in fact, prevent or discontinue investigations, ignore a police or victim report, or interpret the evidence in a favorable light for the defendants. The official is convicted with probability $p$. Assuming that the fellow and the corrupt official are convicted with the same probability $p$ is just a simplification that allows us to economize on notation.[19] Accordingly, throughout we interpret $p$ as the general level of enforcement.

If, instead, the official reports the boss after having accepted the bribe, he obtains an amnesty $\lambda \geqslant 0$. In this case, the probability of sanctioning both members of the organization is $\beta$. The idea is that once the boss has 'fallen' also his 'fellows' do: a sort of *domino effect* that echoes Baccara and Bar-Isaac (2008). We assume that $\beta \leqslant \alpha$ to capture the idea that the fellow's information is more accurate than that offered by the official. Since the fellow usually knows the boss, his traffics, habits and involvement into crimes better (than the official) this assumption seems natural.

We assume that, when the official is corrupt, the fellow cannot blow the whistle, even if he wants to. This assumption seems realistic when the official is the prosecutor or the judge ruling the case against the fellow. In both cases, the official can persuade the fellow not to blow the whistle either by filing away the case, or by deeming unreliable the evidence offered by the fellow at the trial.[20]

**Timing and solution concept.** The timing of the game is as follows:

---

[12] See, e.g., UNODC (2003), General Assembly resolution 58/4, annex.

[13] We assume that there is only one official for simplicity. One can think of a more complex model where there are more stages of judgment. Our results would still go through as far as the number of possible appeals is finite.

[14] The assumption that the Legislator is benevolent is usually imposed in the literature and provides the most interesting and relevant normative benchmark. Considering the case in which even the Legislator is corrupt and chooses the policy that maximizes the criminals' welfare would yield a trivial outcome in which no leniency is granted.

[15] The qualitative results of the model do not change when the official detects the crime with probability lower than 1.

[16] The assumption that the boss knows the official's moral cost is a short-cut to formalize the idea that, in reality, bribery is the outcome of an efficient bargaining process based on a complex network of complicities and intermediaries operating on both sides.

[17] In the working-paper version we show that the results do not change when sanctions are agent-specific.

[18] Following the literature (see, e.g., Chen and Rey, 2013) as a tie-breaking condition we assume that when the fellow is indifferent between blowing the whistle and remaining loyal to the boss, he chooses the former option.

[19] In the working-paper version we show that the results do not change when these probabilities are different.

[20] Clearly, if the official is neither a prosecutor nor a judge, but a police officer in charge of the investigative activity against the organization, the fellow may still be able to cooperate with the justice (provided that the prosecutor leading the case is honest). In the online Appendix we discuss more in depth the role of this assumption and its implications for the equilibrium analysis.

$\tau = 0$ The Legislator commits to a policy ($\phi,\lambda$).

$\tau = 1$ The crime return $\pi$ materializes. The boss decides whether to commit the crime. He offers a wage $w$ to the fellow. The game ends if the offer is rejected. Otherwise, once the illegal act is committed, the wage is paid and the game proceeds to the next stage.

$\tau = 2$ The investigation opens. A realization of the official's moral cost $m$ occurs and the boss (knowing $m$) decides whether to bribe the official or not.

$\tau = 3$ If the official has not been bribed, the fellow (knowing this) decides whether to cooperate with the justice or be loyal to the boss. If, instead, bribery has occurred, it is the official who decides whether to plead guilty and report the boss, or face the risk of conviction, while the fellow is not allowed to blow the whistle.

$\tau = 4$ The trial uncertainty resolves and sanctions are imposed.

The assumption that the fellow knows whether the official is corrupt or not seems natural. It may either be the boss who tells the fellow that the official is corrupt,[21] or it could be the official himself (when corrupt) to persuade the fellow not to blow the whistle.[22] Moreover, since the boss makes a take-it-or-leave-it offer to the official, we assume that whenever indifferent between rejecting or accepting a bribe (and then pleading guilty), the official always prefers the latter option. The idea is that the bribe giver can always offer slightly more than the reservation bribe in order to induce any type $m$ to accept his offer.[23]

Since the model is sequential and at any node there is perfect information of the history of the game, we use Subgame Perfect Nash Equilibrium as a solution concept. Specifically, for a given policy ($\phi,\lambda$) set by the Legislator: (*i*) a strategy for the boss specifies a decision on whether to commit the crime, a wage offer $w$ and a bribe $x$; (*ii*) the fellow's strategy specifies a decision on whether accepting the boss' offer and a decision on whether blowing the whistle; and (*iii*) the official's strategy specifies a decision on whether accepting the bribe and a self-reporting decision.

All players are risk neutral. Hence, sanctions can be interpreted as the monetary equivalent of the imprisonment terms, fines, damages, and so forth, to which the criminals expose themselves. As a technical requirement we assume that the inverse hazard rate $h(m) \equiv \frac{F(m)}{f(m)}$ is increasing and satisfies the following Inada condition:

$$h(\alpha - \beta) > \beta - p. \tag{1}$$

Imposing an increasing inverse hazard rate is a standard condition in many 'regular' decision-making problems. The Inada condition stated in condition (1), instead, guarantees that the Legislator's maximization problem is single peaked and that, in equilibrium, the boss pays only positive bribes.

## 4. Equilibrium analysis

In this section we provide the equilibrium characterization. We first describe the model's solution when there is no corruption and illustrate the simple logic of subversion of law. Then, building on these results, we derive the optimal policy combining an amnesty for low-rank

criminals who blow the whistle and an amnesty for corrupt officials who self-report.

As a preliminary remark, it is noted that when there is no leniency for the fellow the boss has no incentive to bribe the official: corruption plays no role. This is because, in order to highlight the relationship between corruption, subversion of law and leniency in the clearest possible way, we purposefully assumed that the boss faces no risk of conviction when the fellow does not report. Hence, he would gain nothing from bribing the official.

### 4.1. Benchmark: leniency without corruption

Following Piccolo and Immordino (2017), we first consider the benchmark where the official cannot be bribed and a leniency program is in place. The fellow blows the whistle if and only if $\phi \geqslant 1 - p$; that is as long as the expected sanction for remaining loyal to the boss $p$ is larger than the reduced sanction $1 - \phi$. The crime is committed if and only if

$$\pi \geqslant \pi^* \equiv \underbrace{1 - \phi + \alpha}_{\text{Cost of crime}},$$

where $1 - \phi$ is the fellow's reservation wage, and $\alpha$ is the boss' expected sanction (conditional on the fellow blowing the whistle).

**Proposition 1.** *When corruption is not viable, the optimal amnesty is equal to $1 - p$ and the crime rate is*

$$\Pr[\pi \geqslant p + \alpha] = 1 - G(p + \alpha).$$

It is to be noted that, other things being equal, a higher amnesty tends to make the crime more profitable because it reduces the fellow's reservation wage and increases the boss' return from crime. Hence, it must be set at the fellow's indifference point.

### 4.2. The simple logic of 'subversion of law'

What is the impact of corruption on the simple result highlighted in Proposition 1? Does corruption subvert the law? How should the Legislator react to this threat? In the rest of the paper we address these issues. To this purpose, in this section we revisit the simple logic of subversion of law by setting $\lambda = 0$ — i.e., there is no leniency for the corrupt official who therefore has no incentive to plead guilty.

Suppose that the official can be bribed. In this case, the boss can choose whether to trust the fellow and count on his loyalty, or bribe the official. In order to characterize the optimal policy it is useful to start from the last stage of the game and focus first on the fellow's confession choice. Since the fellow knows whether the official is honest and the corrupt official always files the case, he has an incentive to blow the whistle only when the public official has not been captured. Therefore, the rule according to which the fellow is induced to cooperate is the same as in the benchmark. Accordingly, suppose that $\phi \geqslant 1 - p$.[24] The bribe $x$ that the boss is willing to pay in order to avoid conviction must be such that

$$x \leqslant \alpha, \tag{2}$$

that is, it must be lower than the boss' expected sanction in case of no corruption, which depends on the accuracy of the information reported by the fellow (as reflected by $\alpha$). Yet, in order to satisfy the official's participation constraint, the bribe $x$ must cover the sum of the official's moral cost $m$, the official's expected sanction $p$— i.e.,

$$x \geqslant \underbrace{m + p}_{\text{Reservation bribe}}. \tag{3}$$

---

[21] Of course, if the fellow does not know whether the official has been bribed or not, the boss may have an incentive to lie and tell the fellow that the official is corrupt even if he is not. Although, this strategy might pay off in a one-shot game, it is certainly not optimal in a repeated game where the boss needs to build a good reputation *vis-à-vis* his fellows. In a sense, here we implicitly assume that the cost of loosing reputation is sufficiently high for the boss, so that he never lies.

[22] A prosecutor who has accepted a bribe has good reasons to let the fellow know that he is corrupt. If not reassured the fellow could indeed manifest his intention to blow the whistle to honest police officers or other prosecutors that have not been bribed, whereby complicating the prosecutor's attempt to fix the trial.

[23] This is clearly a shortcut. However, the results would not change had we assumed a more complex bargaining protocol such that the boss and the corrupt official end up sharing the surplus that is generated by the law being subverted.

[24] Notice that if $\phi < 1 - p$ the boss does not bribe the official since the fellow does not blow the whistle — i.e., there is no law to be subverted.

It is to be noted that the official's reservation bribe depends on his type $m$ since this parameter is known by the boss at the time he offers the bribe.

**Lemma 2.** *If $\alpha < p$ the boss never bribes the official. Otherwise, the official is bribed when his moral cost is small enough — i.e., for $m \leqslant \overline{m} \equiv \alpha - p$. In this case, the boss always offers the reservation bribe $m + p$.*

When the fellow's insider information is relatively not too accurate ($\alpha < p$), the boss prefers not to bribe the official because the cost of being exposed to the fellow's defection is lower than the cost of rewarding the corrupt official for his risk of conviction. In this region of parameters the outcome of the game is uninteresting since it is the same as in the benchmark without corruption.

By contrast, when the fellow's insider information is relatively accurate ($\alpha \geqslant p$) the boss prefers to bribe the official in order to subvert the law. In this case the crime is committed if and only if

$$\pi \geqslant \hat{\pi} \equiv \underbrace{\int_0^{\overline{m}} (m + p)dF(m)}_{\text{Official's expected bribe}} + \underbrace{(1 - F(\overline{m}))\alpha}_{\text{Boss' expected sanction}} + \underbrace{(1 - F(\overline{m}))(1 - \phi)}_{\text{Fellow's reservation wage}},$$

so that the corresponding crime rate is $\Pr[\pi \geqslant \hat{\pi}]$. The right-hand side of this inequality reflects the total cost of committing the crime. That is, the sum of the official's expected reservation bribe, the boss' expected sanction and the fellow's reservation wage.

**Proposition 3.** *If $\lambda = 0$ the optimal policy sets an amnesty equal to $1 - p$. The crime rate is always higher than in the case without corruption — i.e., $G(\hat{\pi}) < G(p + \alpha)$.*

This result illustrates the simple logic of subversion of law: since the boss can avoid being sanctioned by bribing the official, the introduction of a leniency program triggers socially harmful acts that weaken the law's beneficial effect.

### 4.3. Optimal policy and the bright side of subversion of law

We can now derive the main result of the paper, which highlights the bright side of subversion of law. Suppose that the Legislator can use both policy instruments — i.e., $\phi$ and $\lambda$. Consider the subgame in which the official has accepted a bribe $x$. Assume that $\lambda \geqslant 1 - p$, so that the corrupt official self-reports.[25] The bribe $x$ that the boss is willing to pay in order to avoid conviction must be such that

$$x \leqslant \alpha - \beta, \tag{4}$$

that is, it must be lower than the difference between the boss' expected sanction when the fellow blows the whistle ($\alpha$) and the boss' expected sanction when the corrupt official self-reports ($\beta$). Yet, in order to satisfy the official's participation constraint, the bribe $x$ must cover the sum of the official's moral cost $m$ and the official's discounted sanction $1 - \lambda$ — i.e.,

$$x \geqslant \underbrace{m + 1 - \lambda}_{\text{Reservation bribe}}. \tag{5}$$

As before, the official's reservation bribe depends on his type $m$; however, now it is decreasing in $\lambda$: the more lenient the Legislator is with a self-reporting official, the lower the bribe that the latter is willing to accept. Hence, other things being equal, a higher $\lambda$ induces more corruption in equilibrium.

**Lemma 4.** *If $\phi < 1 - p$ the boss never bribes the official. By contrast, if $\phi \geqslant 1 - p$ there is corruption in equilibrium only if*

$$\lambda \geqslant 1 - (\alpha - \beta).$$

*In this region of parameters, the official is bribed when his moral cost is small enough — i.e., if*

$$m \leqslant m(\lambda) \equiv \alpha - \beta - (1 - \lambda), \tag{6}$$

*with $m(\cdot)$ being greater than 0 and increasing in $\lambda$. In this case, the boss always offers the reservation bribe $m + 1 - \lambda$.*

As argued before, corruption is worthless for the boss when the fellow does not blow the whistle. Therefore, an equilibrium in which the official is bribed can exist only if the Legislator sets an amnesty that triggers the fellow's cooperation. In that case, corruption emerges in equilibrium if the amnesty granted to the official is large enough. In fact, a relatively high $\lambda$ reduces the official's reservation bribe and makes it less costly for the boss to capture him.

**Lemma 5.** *Let $\lambda_0 \equiv 1 - (\alpha - \beta)$ solve $m(\lambda) = 0$. Then, $\lambda_0 \geqslant 1 - p$ if and only if*

$$p \geqslant \alpha - \beta. \tag{7}$$

Condition (7) guarantees that the Legislator can always choose a $\lambda$ such that the official self-reports, and the boss does not find it optimal to bribe him (even when the official's moral cost is zero) because the reservation bribe is too large compared to the sanction that the boss avoids when the official is corrupt. This means that, in the region of parameters where condition (7) holds — i.e., when the enforcement ($p$) is relatively strong — the Legislator can always implement the outcome of the no-corruption benchmark by setting the official's amnesty equal to $\lambda_0$. To simplify exposition we first assume that condition (7) holds and determines the conditions under which the Legislator relies on corruption to optimally deter crime. The analysis of the region of parameters in which condition (7) is not verified, is discussed below.

Consider a policy such that $\lambda \geqslant \lambda_0$ and $\phi \geqslant 1 - p$ so that both the official and the fellow are willing to report.[26] The fellow's reservation wage is

$$\int_0^{m(\lambda)} \beta dF(m) + \int_{m(\lambda)}^{+\infty} (1 - \phi)dF(m), \tag{8}$$

which is decreasing in $\phi$. The higher the fellow's ex post-utility, the lower the wage he is willing to accept ex ante.

The boss' expected sanction is

$$\int_0^{m(\lambda)} \beta dF(m) + \int_{m(\lambda)}^{+\infty} \alpha dF(m), \tag{9}$$

which is decreasing in the official's amnesty $\lambda$ since the fellow's information is more accurate than the official's — i.e., $\alpha \geqslant \beta$.

Finally, the official's (expected) reservation bribe is

$$\int_0^{m(\lambda)} (m + 1 - \lambda)dF(m), \tag{10}$$

whose derivative with respect to $\lambda$ has an ambiguous sign. On the one hand, a higher $\lambda$ reduces the actual bribe that the official is willing to accept — i.e., $m + 1 - \lambda$. On the other hand, a higher $\lambda$ also increases the mass of officials bribed in equilibrium — i.e., the threshold $m(\lambda)$ — which tends to increase the expected bribe that the boss has to pay.

Adding up Eqs. (8)–(10), the crime is committed if and only if

$$\pi \geqslant \widetilde{\pi} \equiv \int_0^{m(\lambda)} (m + (1 - \lambda) + 2\beta)dF(m) + \int_{m(\lambda)}^{+\infty} (1 - \phi + \alpha)dF(m),$$

and the corresponding crime rate is $\Pr[\pi \geqslant \widetilde{\pi}]$. Notice that if the Legislator chooses the amnesty $\lambda_0$ for the official, there is no corruption in equilibrium and, as discussed before, the optimal policy and the corresponding crime rate are the same as in the benchmark without corruption. Holding $\lambda$ constant and letting $y \equiv m(\lambda)$, a simple change of variable allows to write the Legislator's problem as

$$\max_{\phi \geqslant 1 - p, y \in [0, +\infty)} \int_0^y (m - y)dF(m) + F(y)(\beta - (1 - \phi)) + (1 - \phi) + \alpha.$$

---

[25] Clearly, if $\lambda < 1 - p$, the condition under which the boss bribes the official is the same as that obtained in Lemma 2.

[26] By Lemma 5, $\lambda \geqslant \lambda_0$ implies that $\lambda \geqslant 1 - p$.

Differentiating with respect to $\phi$, we have

$$-(1 - F(y)) < 0, \quad \forall \, y \geqslant 0.$$

This derivative is always negative. Hence, it is optimal to set the lowest possible amnesty for the fellow $(1 - p)$ regardless of $y$.

Secondly differentiating with respect to $y$ (or, equivalently, $\lambda$ since $m(\cdot)$ is monotone) we have

$$-F(y) + f(y)(\beta - p) \leqslant 0 \quad \Leftrightarrow \quad h(y) \geqslant \beta - p. \tag{11}$$

This derivative shows that a higher amnesty for the official has three effects on the Legislator's objective function. By setting a higher $\lambda$ (equivalently, a higher $y$) the crime rate increases for two reasons: (i) more officials are bribed (since their reservation bribe is lower), which reduces the boss' conviction risk because the self-reporting official knows less than the fellow (i.e., $\beta \leqslant \alpha$); and (ii) since corruption occurs more often, the fellow blows the whistle less often. The implied lower risk of conviction reduces the fellow's reservation wage, whereby increasing the crime rate. Both these effects determine the dark side of subversion of law. However, by inducing more corruption in equilibrium, a higher $\lambda$ also exposes the fellow to a higher risk of conviction when the official self-reports — i.e., a domino effect à la Baccara and Bar-Isaac (2008). This third effect increases the risk premium that the boss has to pay the fellow in order to recruit him. Hence, other things being equal, it reduces the crime rate: *the bright side of subversion of law.*

We can thus state the following result.

**Proposition 6.** *If $\beta > p$, the Legislator is willing to tolerate a positive level of corruption $\widetilde{m} > 0$ in equilibrium, with $\widetilde{m}$ being solution of*

$$h(\widetilde{m}) = \beta - p. \tag{12}$$

*The optimal amnesty for the official is*

$$\widetilde{\lambda} \equiv 1 - [\alpha - \beta - h^{-1}(\beta - p)] > \lambda_0.$$

*The optimal amnesty for the fellow is equal to $1 - p$, and he blows the whistle if and only if $m > \widetilde{m}$. The crime rate induced by this policy is lower than that obtained in the benchmark without corruption.*

*If $\beta \leqslant p$ the optimal amnesty for the official is $\widetilde{\lambda} = \lambda_0$ (there is no corruption in equilibrium, $\widetilde{m} = 0$ ), and the fellow is granted an amnesty $1 - p$ such that he always blows the whistle. The crime rate induced by this policy is equivalent to that obtained in the benchmark.*

This result highlights the conditions under which the bright side of subversion of law is so strong to induce the Legislator to tolerate some degree of corruption in equilibrium in order to optimally deter crime. The intuition is as follows: when the information disclosed by the self-reporting official is sufficiently accurate compared to the enforcement ($\beta > p$), the positive impact of a higher amnesty $\lambda$ on the fellow's reservation wage (as reflected by the term $\beta$ in Eq. (11)) offsets the negative effect of the reduced expected sanction on the fellow's reservation wage (as reflected by the term $-p$ in Eq. (11)). Hence, the optimal policy trades off the social cost of allowing the boss to subvert the law, which increases his willingness to commit the crime, and the net benefit that corruption has on the fellow's ex ante wage (which is positive when $\beta > p$).[27] Interestingly, the (equilibrium) crime rate is lower than the one obtained in the benchmark without corruption. Indeed, (by revealed preferences) the Legislator can always induce an equilibrium without corruption equivalent to the one obtained in the benchmark by setting a sufficiently low amnesty $\lambda$ for the official.

Obviously, when $\beta \leqslant p$ the Legislator prefers not to induce corruption in equilibrium.

**Proposition 7.** *Suppose that $\beta > p$. Then, in equilibrium: (i) the mass of corrupt officials is increasing in $\beta$ and decreasing in $p$; (ii) the mass of fellows that blow the whistle is decreasing in $\beta$ and increasing in $p$; and (iii) $\widetilde{\lambda}$ is*

*increasing in $\beta$, and decreasing in $p$ and $\alpha$.*

Noteworthy, when the optimal policy induces corruption in equilibrium, the two leniency instruments are complements: the higher $p$—i.e., the less generous is the amnesty granted to the fellow — the lower the amnesty granted to the official. Finally, notice that since the fellow can report only when the official is not corrupt, the optimal policy also limits the fellow's access to the program. Hence, an additional empirical implication of our model is the negative correlation between the number of self-reporting officials and the number of fellows who blow the whistle.

So far, we assumed that the boss is never caught when the official is prosecuted. Although extreme, this assumption does not affect our results. The reason is as follows. Assume that the boss is jailed with probability $\nu$ once the official is caught. When corruption occurs in equilibrium and both leniency programs are in place, the official always self-reports and the relevant risk of prosecution for the boss is still $\beta$. Hence, the optimal policy is not affected by $\nu$ if there is corruption in equilibrium.[28]

### 4.3.1. Weak enforcement

We now complete the analysis by considering the region of parameters in which condition (7) is violated. To begin with, recall that (by Lemma 5) if condition (7) does not hold, then $m(\lambda) > 0$ for every $\lambda \geqslant 1 - p$ — i.e., for every amnesty that induces the official to self-report, it is not possible to have zero corruption. As a consequence, in this region of parameters, the Legislator can choose between one of the following strategies:

(i) Induce corruption in equilibrium by setting $\min\{\lambda, \phi\} \geqslant 1 - p$.
(ii) Deny leniency to the fellow in order to hinder corruption.

Indeed, it is never optimal for the Legislator to induce only the fellow to blow the whistle — i.e., the Legislator cannot reduce the crime rate by choosing $\phi \geqslant 1 - p$ and $\lambda < 1 - p$. Intuitively, in the region of parameters under consideration, the Legislator can always better deter crime by setting $\lambda = 1 - p$. The reason is that, while the official's reservation bribe and the fellow's reservation wage do not change (compared to the case in which $\lambda < 1 - p$), the boss' expected sanction is higher since the corrupt official in this case would self-report, which increases the boss' expected sanction and reduces the crime rate (see the Appendix).

Hence, in order to determine the optimal policy, we must compare the costs of crime under strategy (i) — i.e.,

$$\max_{\phi \geqslant 1-p, y \in [m(1-p), 1]} \int_0^y (m - y)dF(m) + F(y)(\beta - (1 - \phi)) + (1 - \phi)$$
$$+ \, \alpha,$$

with the cost of crime under strategy (ii) — i.e., $p$.

**Proposition 8.** *When condition (7) is not met, the optimal policy is the one described in* Proposition 6 *if $\beta - p > h(m(1 - p))$. Otherwise, it is optimal to set $\lambda = 1 - p$, so that there is always the lowest possible amount of corruption in equilibrium — i.e., all officials with type $m \leqslant m(1 - p)$ are bribed.*

Interestingly, in the region of parameters in which condition (7) is violated, the Legislator may want to tolerate a positive level of corruption in equilibrium when the only alternative to deter crime is to prevent the fellow from blowing the whistle.

## 5. Concluding remarks

The introduction of lighter sanctions for low-rank criminals who cooperate with the justice are widely recognized as one of the most

---

[27] Enforcement can be low either when a Government has poor resources to invest in investigative activities or when it faces organizations that are not vulnerable to these activities.

[28] Clearly, nothing changes if the official is not corrupt.

effective tools in the worldwide battle against organized crime. Yet these policies seem to be extremely fragile when corruption allows top criminals to subvert the law by capturing their prosecutors. This threat calls for a better understanding of how Governments should react and design leniency programs that internalize their effects on corruption.

We have argued that tolerating some degree of corruption may have positive effects on crime deterrence. Specifically we have shown that a Legislator may want to award amnesties also to corrupt public officials who self-report. The main channel through which such programs may turn effective is the hierarchical structure of criminal organizations. By inducing corrupt public officials to testify against the criminal organization, the Legislator can exploit the induced increase in the fellow's

reservation wage, implied by a higher risk of conviction, in order to minimize crime. The official's testimony triggers a domino effect that allows to convict the entire organization: a bright side of subversion of law.

Obviously, such a 'positive' view of corruption must not be interpreted as a general principle, but it should be framed in an organized crime context for the type of corruption aiming at fixing trials. Yet uncovering the bright side of subversion of law might help policymakers when they discuss the opportunity of introducing leniency programs for corrupt law enforcers, especially in countries that feature low enforcement or when criminal organizations are particularly resilient to investigations and infiltrations by the police forces.

## Appendix

**Proof of Proposition 1.** When corruption is not viable, granting an amnesty $\phi < 1 - p$ to the fellow is never optimal. In fact, such a policy induces the fellow to remain loyal to the boss, and the ex ante cost of crime is equal to $p$. But then, the Legislator would be better off by setting $\phi = 1 - p$, so to induce a cost of crime $1 - \phi + \alpha = p + \alpha > p$. Hence, it must be $\phi \geqslant 1 - p$. Also granting an amnesty $\phi > 1$ is never optimal as it induces a negative break-even wage for the fellow $(1 - \phi < 0)$ and thus, a cost of crime lower than $\alpha$. Hence, it must be $1 - p \leqslant \phi \leqslant 1$. Since the cost of crime is decreasing in $\phi$ the optimal policy must set $\phi$ equal to $1 - p$. ∎

**Proof of Lemma 2.** If $\alpha < p$ there does not exist any bribe $x$ that meets both the boss' participation constraint and the participation constraint of an official with positive moral cost $m \in [0, +\infty)$ — i.e., conditions (2) and (3), respectively. Hence, in this region of parameters, there is no corruption in equilibrium. By contrast, $\overline{m} \geqslant 0$ if $\alpha \geqslant p$ so that every official with moral cost $m \leqslant \overline{m}$ will be bribed. ∎

**Proof of Proposition 3.** Suppose that $\phi < 1 - p$ so that the fellow does not blow the whistle and the boss does not bribe the official. The cost of crime is equal to $p$. Next, suppose that $\phi \geqslant 1 - p$, so that the fellow blows the whistle. Using Lemma 2, the (ex ante) cost of crime is

$$\widehat{\pi} \equiv \int_0^{\overline{m}} (m + p) dF(m) + (1 - F(\overline{m}))\alpha + (1 - F(\overline{m}))(1 - \phi). \tag{13}$$

Hence, for $\overline{m} > 0$, the Legislator prefers to choose $\phi = 1 - p$ rather than $\phi < 1 - p$ if and only if

$$\int_0^{\overline{m}} (m + p) dF(m) + (1 - F(\overline{m}))\alpha + (1 - F(\overline{m}))p \geqslant p,$$

that implies

$$\int_0^{\overline{m}} m \, dF(m) + (1 - F(\overline{m}))\alpha \geqslant 0,$$

which is always satisfied.

Note that the Legislator never finds it optimal to choose $\phi > 1$ since such policy induces the same amount of corruption $\overline{m} \geqslant 0$ as $\phi = 1 - p$ but a lower expected cost of crime, due to the negative break-even wage (the last term in Eq. (13) is negative).

Note also that setting $\phi > 1 - p$ is never optimal. Indeed, the cost of crime in Eq. (13) is decreasing in $\phi$— i.e.,

$$\frac{\partial \widehat{\pi}}{\partial \phi} = -(1 - F(\overline{m})) < 0.$$

Hence, the optimal policy is such that $\phi = 1 - p$. ∎

**Proof of Lemma 4.** If $\phi < 1 - p$, the fellow does not blow the whistle. Hence, the boss does not bribe the official. By contrast, if $\phi \geqslant 1 - p$, the fellow blows the whistle and the boss' expected sanction is $\alpha$ when he does not capture the official. If, instead, the boss bribes the official and pays $m + 1 - \lambda$, his expected sanction is $\beta$ (as long as the official reports). Therefore, there is corruption in equilibrium if and only if $m(\lambda) \geqslant m$, provided that $m(\lambda) \geqslant 0$. ∎

**Proof of Lemma 5.** The result follows immediately by using condition (6) and equalizing $m(\lambda) = 0$. ∎

**Proof of Proposition 6.** Suppose that $\phi \geqslant 1 - p$ and $\lambda \geqslant \lambda_0$. The ex ante cost of crime is equal to

$$\widetilde{\pi} \equiv \int_0^{m(\lambda)} (m + 1 - \lambda + 2\beta) dF(m) + \int_{m(\lambda)}^{+\infty} (1 - \phi + \alpha) dF(m),$$

Under condition (7) the optimal policy maximizes $\widetilde{\pi}$ subject to $\phi \geqslant 1 - p$ and $\lambda \geqslant \lambda_0$. By applying the change of variable $y = m(\lambda)$, we can rewrite

$$\max_{\phi \geqslant 1-p, \lambda \geqslant \lambda_0} \widetilde{\pi} = \max_{\phi \geqslant 1-p, y \in [0,+\infty)} \int_0^y (m - y) dF(m) + F(y)(\beta - (1 - \phi)) + 1 - \phi + \alpha.$$

Differentiating with respect to $\phi$, we obtain

$$\frac{\partial \widetilde{\pi}}{\partial \phi} = -(1 - F(y)) < 0, \quad \forall \, y \geqslant 0.$$

Hence, the optimal policy is such that $\phi = 1 - p$.

Next, differentiating with respect to $y$ and substituting for $\phi = 1 - p$ we obtain

$$\frac{\partial \widetilde{\pi}}{\partial y} = -F(y) + f(y)(\beta - p),$$

whose sign depends on the sign of $\beta - p$.

If $\beta \leqslant p$, then $\frac{\partial \widetilde{\pi}}{\partial y} < 0$. Hence, it is optimal for the Legislator to set $\lambda = \lambda_0$ so that $y = m(\lambda) = 0$. Actually, under assumption (7) any $\lambda \in [1 - p, \lambda_0]$ is optimal in this case (since it implements the no corruption outcome).

If $\beta > p$, condition (1) implies that the optimal amount of corruption $\widetilde{m}$ is interior, and solves the first-order condition

$$h(\widetilde{m}) = \beta - p.$$

The corresponding amnesty for the official is pinned down by the identity $m(\lambda) \equiv \widetilde{m}$. That $\widetilde{\lambda} > \lambda_0$ follows immediately from $\beta \leqslant \alpha$ and condition (1) that jointly imply $h^{-1}(\beta - p) > 0$.

We now show that it cannot be the case that $\phi < 1 - p$, since this policy is dominated by a policy such that $\phi = 1 - p$. When $\beta \leqslant p$, the optimal policy is such that there is no corruption in equilibrium and the fellow blows the whistle, so that the ex ante cost of crime is $p + \alpha$. In this case, the Legislator is worse off by setting a policy that does not induce the fellow to blow the whistle as the induced cost of crime ($p$) would be obviously lower. When $\beta > p$ the optimal policy induces corruption in equilibrium and the equilibrium expected cost of crime $\widetilde{\pi}$ satisfies

$$\widetilde{\pi} \geqslant \int_0^{\widetilde{m}} (m + 1 - \widetilde{\lambda} + 2p)dF(m) + \int_{\widetilde{m}}^{+\infty} (p + \alpha)dF(m) > p.$$

Thus, the Legislator cannot choose $\phi < 1 - p$.

Finally, we show that provided that $\phi \geqslant 1 - p$, the Legislator always prefers to induce the official to self-report — i.e., the Legislator always offers $\lambda \geqslant 1 - p$. Indeed, assuming $\phi \geqslant 1 - p$, if $\lambda < 1 - p$ the boss bribes the official when $m \leqslant \overline{m} \equiv \alpha - p$. Hence, the expected cost of crime is

$$\widehat{\pi} \equiv \int_0^{\overline{m}} (m + p)dF(m) + (1 - F(\overline{m}))\alpha + \int_{\overline{m}}^{+\infty} (1 - \phi)dF(m). \tag{14}$$

In contrast, if $\lambda = 1 - p$, bribery does not occur and the expected cost of crime is equal to $\widetilde{\pi} \equiv 1 - \phi + \alpha$.

Since $m \leqslant \overline{m}$ implies $m + p \leqslant \alpha$, it then follows that $\widehat{\pi} \leqslant (1 - F(\overline{m})(1 - \phi) + \alpha < \widetilde{\pi}$, which concludes the proof. ∎

**Proof of Proposition 7.** The proof is immediate and follows from condition (1) and the definition of $\widetilde{m}$ and $\widetilde{\lambda}$. ∎

**Proof of Proposition 8.** Assume that $\lambda \geqslant 1 - p$ and $\phi = 1 - p$ under policy (i). Such policy has to be preferred to policy (ii) if and only if

$$\max_{y \in [m(1-p),1]} \int_0^y (m - y)dF(m) + F(y)(\beta - p) + \alpha > 0. \tag{15}$$

For every $\lambda \geqslant 1 - p$ the expected cost of crime under policy (i) (provided that $\phi = 1 - p$) is higher than the cost of crime under policy (ii), since

$$\mathbb{E}[m | m \leqslant m(\lambda)] + \frac{1 - F(m(\lambda))}{F(m(\lambda))} + 2\beta > 0.$$

Hence, the optimal policy is either that described in Proposition 6 if

$$h(m(1 - p)) < \beta - p, \tag{16}$$

or it requires a minimal amount $m(1 - p)$ of corruption in equilibrium.

Obviously, setting an amnesty for the fellow $\phi > 1 - p$ is not optimal as the expected cost of crime is decreasing in $\phi$ as in the baseline model. Yet, to complete the proof we need to show that setting an amnesty $\lambda < 1 - p$ for the official is not optimal. Indeed, the Legislator is better off by setting $\lambda = 1 - p$. In this case, corruption occurs when $m \leqslant m(1 - p) \equiv \alpha - \beta - p$; when, instead, $\lambda < 1 - p$ corruption occurs for $m \leqslant \overline{m}$, with $m(1 - p) < \overline{m}$. Hence, we need to show that the cost of crime at $\lambda = 1 - p$ is larger than that at $\lambda < 1 - p$— i.e.,

$$\int_0^{m(1-p)} (m + p)dF(m) + 2\beta F(m(1 - p)) +$$
$$+ (1 - F(m(1 - p)))(1 - \phi + \alpha)$$
$$> \int_0^{\overline{m}} (m + p)dF(m) + (1 - F(\overline{m}))(1 - \phi + \alpha).$$

Rearranging terms this inequality can be rewritten as

$$\int_0^{m(1-p)} 2\beta dF(m) + \int_{m(1-p)}^{\overline{m}} (1 - \phi + \alpha)dF(m) - \int_{m(1-p)}^{\overline{m}} (m + p)dF(m) > 0, \tag{17}$$

which is always satisfied since, by definition,

$$m + p < 1 - \phi + \alpha.$$

Hence, even if corruption occurs less often when the official is induced to self-report, the ex ante cost of crime is larger. The effect of the lower (expected) reservation bribe (third term of condition (17)) is more than compensated by the higher (expected) reservation wage and the higher expected sanction due to the larger number of contingencies where the fellow blows the whistle (second term of condition (17)) and by the domino effect when the corrupt official self-reports (first term of condition (17)). ∎

## References

Acconcia, A., Immordino, G., Piccolo, S., Rey, P., 2014. Accomplice-witnesses and organized crime: theory and evidence from Italy. Scand. J. Econ. 116, 1116–1159.

Acemoglu, D., Robinson, J.A., Santos, R.J., 2013. The monopoly of violence: evidence from Colombia. J. Eur. Econ. Assoc. 11, 5–44.

Albanese, J.S., 2004. Organized Crime in Our Times. Anderson/ Lexis Nexis,

Cincinnati, OH.

Alesina, A., Piccolo, S., Pinotti, P., 2016. Organized crime, violence and politics. NBER Working Paper, No. 22093.

Aubert, C., Kovacic, W., Rey, P., 2006. The impact of leniency and whistleblowing programs on cartels. Int. J. Ind. Organ. 24, 1241–1266.

Baccara, M., Bar-Isaac, H., 2008. How to organize crime. Rev. Econ. Stud. 75, 1039–1067.

Basu, K., 2011. Why, for a class of bribes, the act of giving a bribe should be treated as legal. Ministry of Finance Government of India Working Paper, No. 1/2011.

Basu, K., Battacharya, S., Mishra, A., 1992. Note on bribery and the control of corruption. J. Public Econ. 38, 349–359.

Basu, K., Basu, K., Cordella, T., 2014. Asymmetric punishment as an instrument of corruption control. Policy Research Working Paper Series, No. 6933. The World Bank.

Becker, G., Stigler, G., 1974. Law enforcement, malfeasance and the compensation of enforcers. J. Leg. Stud. 3, 1–19.

Besley, T., MacLaren, J., 1993. Taxes and bribery: the role of wage incentives. Econ. J. 103, 119–141.

Bowles, R., Garoupa, N., 1997. Casual police corruption and the economics of crime. Int. Rev. Law Econ. 17 (1), 75–87.

Buscaglia, E., 2001. An analysis of judicial corruption and its causes: an objective governing-based approach. Int. Rev. Law Econ. 21, 233–249.

Buscaglia, E., Van Dijk, J., 2005. Controlling organized crime and corruption in the public sector. Working Paper Series of the Berkeley Program in Law Economics.

Chang, J.J., Lai, C.C., Yang, C.C., 2000. Casual police corruption and the economics of crime: further results. Int. Rev. Law Econ. 20, 35–51.

Chen, J., Harrington Jr., J.E., 2007. The impact of the corporate leniency program on cartel formation and the cartel price path. In: Ghosal, V., Stennek, J. (Eds.), The Political Economy of Antitrust. Elsevier, Amsterdam, pp. 59–80.

Chen, Z., Rey, P., 2013. On the design of leniency programs. J. Law Econ. 54, 917–957.

Center for the Study of Democracy, 2009. Crime Without Punishment: Countering Corruption and Organised Crime in Bulgaria. CSD, Sofia.

Daniele, G., Dipoppa, G., 2016. Mafia, elections and violence against politicians. Mimeo.

De Feo, G., De Luca, G., 2013. Mafia in the ballot box. Mimeo.

Dufwenberg, M., Spagnolo, G., 2015. Legalizing bribe giving. Econ. Inq. 53, 836–853.

Europol, 2009. Trafficking in Human Beings in the European Union: A Europol Perspective. Author, The Hague.

Finckenauer, J., 2005. Problems of definition: what is organized crime? Trends Organ. Crime 8, 63–83.

Fiorentini, G., Peltzman, S., 1995. The Economics of Organized Crime. Cambridge University Press, Cambridge.

Gambetta, D., 1992. La Mafia Siciliana (The Sicilian Mafia). Einaudi, Torino.

Garoupa, N., 2000. The economics of organized crime and optimal law enforcement. Econ. Inq. 38, 278–288.

Garoupa, N., Jellal, M., 2002. Information, corruption and optimal law enforcement. CEPR Discussion Paper Series No. 3560.

Glaeser, E.L., Shleifer, A., 2003. The rise of the regulatory state. J. Econ. Lit. XLI, 401–425.

Gounev, P., Bezlov, T., 2010. Examining the Link Between Organized Crime and Corruption. Center for the Study of Democracy, Sofia.

Gutauskas, A., Juska, A., Johnstone, P., Pozzuto, R., 2004. Changing typology of organised crime in a post-socialist Lithuania (the late 1980s–early 2000s). Glob. Crime 6, 201–221.

Hagan, F., 1983. The organized crime continuum: a further specification of a new conceptual model. Crim. Justice Rev. 8, 52–57.

Hagan, F., 2006. Organized crime and organized crime: indeterminate problems of definition. Trends Organ. Crime 9, 127–137.

Harrington, J., 2008. Optimal corporate leniency programs. J. Ind. Econ. 56, 215–246.

Harrington, J., 2013. Corporate leniency programs when firms have private information: the push of prosecution and the pull of pre-emption. J. Ind. Econ. 61, 1–27.

Holmes, L.T., 2006. Rotten States? Corruption, Post-communism and Neo-liberalism. Duke University Press, Durham, NC.

Ianni, F., Ruess-Ianni, E., 1976. A family business: business and societal organization in the Lupollo family. In: Ianni, Ruess-Ianni (Eds.), The Crime Society: Organized Crime and Corruption in America. Times-Mirror, New York, pp. 239–254.

Konrad, K.A., Skaperdas, S., 1998. Extortion. Economica 65, 461–477.

Konrad, K.A., Skaperdas, S., 1997. Credible threats in extortion. J. Econ. Behav. Organ.

33, 23–39.

Kugler, M., Verdier, T., Zenou, Y., 2005. Organized crime, corruption and punishment. J. Public Econ. 89, 1639–1663.

Jennings, W.P., 1984. A note on the economics of organized crime. East. Econ. J. 3, 315–321.

Lui, F.T., 1985. An equilibrium queuing in model of bribery. J. Polit. Econ. 93, 760–781.

Malik, A.S., 1990. Avoidance, screening and optimum enforcement. Rand J. Econ. 21, 341–353.

Maltz, M., 1985. Toward defining organized crime. In: Alexander, H.E., Caiden, G. (Eds.), The Politics and Economics of Organized Crime. D.C. Heath, Lexington, MA.

Maltz, M., 1994. Defining organized crime. In: Kelly, R.J., Chin, K.L., Schatzberg, R. (Eds.), Handbook of Organized Crime in the United States. Greenwood Press, Westport, CT and London.

Mansour, A., Marceau, N., Mongrain, S., 2006. Gangs and crime deterrence. J. Law Econ. Org. 22, 315–339.

Marjit, S., Shi, H., 1998. On controlling crime with corrupt officials. J. Econ. Behav. Organ. 34, 163–172.

Mauro, P., 1995. Corruption and growth. Q. J. Econ. 110, 681–712.

Miller, J., 2003. Police Corruption in England and Wales: Assessment of Current Evidence. Home Office, London.

Mookherjee, D., Png, I., 1995. Corruptible law enforcers: how should they be compensated? Econ. J. 105, 145–159.

Motta, M., Polo, M., 2003. Leniency programs and cartel prosecution. Int. J. Ind. Organ. 21, 347–379.

Piccolo, S., Immordino, G., 2017. Organised crime, insider information and optimal leniency. Econ. J. 127 (606), 2504–2524.

Polo, M., 1995. Internal cohesion and competition among criminal organizations. In: Fiorentini, G., Peltzman, S. (Eds.), The Economics of Organized Crime. Cambridge University Press, Cambridge and CEPR, 87-109.

Polinsky, M., Shavell, S., 2001. Corruption and optimal law enforcement. J. Public Econ. 81, 1–24.

Rey, P., 2003. Toward a theory of competition policy. In: Dewatripont, M., Hansen, L.P., Turnovsky, S.J. (Eds.), Advances in Economics and Econometrics: Theory and Applications. Eighth World Congress Cambridge University Press.

Rose-Ackerman, S., 2010. The law and economics of bribery and extortion. Annu. Rev. Law Soc. Sci. 6, 217–236.

Sauvagnat, J., 2015. Prosecution and leniency programs: the role of bluffing in opening investigations. J. Ind. Ecol. 63, 313–338.

Sauvagnat, J., 2014. Are leniency programs too generous? Econ. Lett. 123, 323–326.

Shleifer, A., Vishny, R., 1993. Corruption. Q. J. Econ. 108, 599–617.

Silbye, F., 2010. Asymmetric evidence and optimal leniency programs. In: Topics in Competition Policy: Cartels, Leniency, and Price Discrimination. University of Copenhagen PhD Thesis.

Solís, L.G., Foglesong, T., 2009. Organized crime and its impact on democratic societies. Mimeo.

Spagnolo, G., 2003. Optimal deterrence mechanisms against cartels and organized crime. Mimeo, Mannheim.

Spagnolo, G., 2008. Leniency and whistleblowers in antitrust. In: Buccirossi, P. (Ed.), Handbook of Antitrust Economics. M.I.T. Press, Cambridge Ch.12.

UNODC, 2003. General Assembly Resolution 58/4 United Nations Convention against Corruption. United Nations, New York.

Van de Bunt, H., 2004. Police corruption in The Netherlands. In: Amir, M., Einstein, S. (Eds.), Police Corruption: Challenges for Developed Countries. Comparative Issues and Commissions of Inquiry. The Office of International Criminal Justice, London.

Van Dijk, J., 2007. Mafia markers: assessing organized crime and its impact upon societies. Trends Organ. Crime 10, 39–56.

Van Duyne, P., 1996. Organized crime, corruption and power. Crime Law Soc. Chang. 26, 201–238.

Varese, F., 2010. What is organized crime? In: Varese, F. (Ed.), Organized Crime: Critical Concepts in Criminology. Routledge, London, pp. 1–33.

von Lampe, K., 2001. Not a Process of Enlightenment: The Conceptual History of Organized Crime in Germany and the United States of America. Forum Crime Soc. 1 (2), 99–116.

Wei, S., 2000. How taxing is corruption on international investors? Rev. Econ. Stat. 82, 1–11.