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Corruption, Organized Crime and the Bright Side of Subversion of Law

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Corruption, Organized Crime and the Bright Side of Subversion of Law

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Abstract

When Legislators award amnesties to “low-rank” criminals cooperating with the justice, top criminals may react by capturing public officials to subvert the law and avoid being sanctioned. Policies that optimally deter crime should anticipate this danger and fight it back by granting amnesties not only to low-rank criminals, but also to officials who plea guilty and report bribe-givers. Indeed, even if the threat of being betrayed by their fellows may induce top criminals to bribe prosecutors, these policies boost the conviction risk not only for top criminals but also for low-rank ones, whereby increasing the risk premium that the latter require to participate in the crime. This higher risk premium increases the reservation wage that top criminals need to pay in order to recruit soldiers, and hence reduces the crime profitability: the bright side of subversion of law.

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1. Introduction

The use of insider information in criminal proceedings is one of the most successful instruments in the worldwide fight to organized crime. Yet, when Governments promote leniency programs to disrupt trust among criminal partners and stimulate cooperation between prosecutors and whistleblowers, top criminals may use their political, military and financial influence to corrupt law enforcers (police officers, prosecutors and judges). Bribery, indeed, allows kingpins 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 law’ (Glaeser and Shleifer, 2003) often neutralizes the beneficial effects of the policy and may, paradoxically, even intensify illegal activities.

Corruption and organized crime are deeply connected phenomena. Evidence on the links existing between criminal organizations, politics and state officials is abundant — see, e.g., Acemoglu *et al.* (2013), Alesina *et al.* (2016) and De Feo and De Luca (2013) among many others. Corruption of police officials, local politicians and prosecutors is common, for instance, in Latin America — e.g., in Mexico and Colombia — where the Narcos use their financial and military power to build a network of state complicities that weaken enforcement, favor their business and protect the major drug transit routes. In Italy, the Sicilian Mafia has been historically connected to center-right politicians mainly to interfere with investigations, fix trials and avoid convictions.

Surprisingly, in spite of the potential subversive role of corruption, and the overwhelming evidence on the ties between organized crime and the polity, little is known on the forces that shape leniency programs when corruption is a concrete danger. How should these programs be designed when corruption can neutralize, or even subvert, their scope? Is it a good idea to introduce complementary laws that grant amnesties also to corrupt officials that plea guilty and report bribe-givers? And, if so, how intense these amnesties should be?

To address these issues we study a simple game between a Legislator, a hierarchical 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 can decide to plea guilty and cooperate with the justice. The criminal organization is formed by two mobsters that are in a ‘principal-agent’ type of relationship: a boss and his fellow. After the crime has been committed, the fellow can disclose his insider information (about the boss and his illicit activities) to the prosecutor and obtain, as a reward, a lighter sanction chosen by the Legislator at the outset of the game. 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 given 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 — a leniency program in our setting — might have a bright side when enforcement against members of criminal organizations, especially low-rank ones, 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 by awarding an excessively lenient amnesty to corrupt officials that plea guilty and report the bribe-giver. Hence, in order to minimize the equilibrium amount of crime, the Legislator is willing to

tolerate some degree of corruption which is induced by a coordinated policy that awards an amnesty not only to low-rank criminals that flip and turn informants, but also to prosecutors that first accept a bribe from the boss, and then self-report, the two instruments being interconnected.

The social value of corruption is determined by the interplay between three effects that an increase in the official's amnesty generates on the organization's cost of crime — i.e., the sum of the fellow's reservation wage, the official's expected bribe and the boss' expected sanction. On the one hand, stimulating corruption by choosing a too generous amnesty for self-reporting officials tends to increase the crime rate for two reasons. First, *ceteris paribus*, subversion of law occurs more often because the boss can avoid a higher risk of conviction. Second, a higher rate of corruption also leads the fellow to blow the whistle less often because the official will file the case so that he enjoys the amnesty with lower probability. This reduces the fellow's reservation wage, and decreases the cost for the boss of recruiting people, whereby increasing the crime rate. Both these effects determine the dark side of subversion of law, and are in line with the standard negative view of corruption.¹ On the other hand, however, by increasing corruption the Legislator 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 of recruiting people willing to work for him: *the bright side of subversion of law*.

We show that this bright side bites, and induces the Legislator to purposefully induce corruption in equilibrium, if the fellow's conviction risk when he remains loyal to the organization is relatively small — i.e., when enforcement against criminal organizations and their members is relatively weak. In this case, the Legislator combines both policy instruments — i.e., leniency for the fellow and the official — which are complementary one with the other. By contrast, when enforcement against criminal organizations is relatively strong, the net effect of an increase of corruption on the fellow's reservation wage is negative. In this case, the Legislator prefers not to induce corruption in equilibrium and only the fellow is allowed to blow the whistle: the two policy instruments are, in this case, substitutes since the Legislator only relies on the fellow's testimony to deter crime.

Our comparative statics offers novel empirical implications on the link between the efficacy of the judicial environment and the severity of sanctions, the optimal amount of corruption that a Legislator should be willing to tolerate, and the amount of low rank criminals that blow the whistle. Specifically, we show that the crime minimizing level of corruption is increasing with the influence of the corrupt official (i.e., with his ability to influence the trial outcome and induce the fellow not to blow the whistle), with the accuracy of the information that he is able to provide against the boss (the bribe-giver) and with the severity of the charges against the fellow; while it is decreasing in the efficacy of conviction and of the investigative technology against the fellow. On the contrary, the probability that the fellow blows the whistle — i.e., the mass of low-rank criminals that flip and turn informants — is decreasing with the influence of the corrupt official, with the accuracy of the information that he is able to provide against the boss and with the severity of the charges against the fellow, while it is increasing in the efficacy of conviction and of the investigative technology. We also show that it might be in the Legislator's interest to even reward cooperation by public officials, especially when the accuracy of the fellow's insider information is not too high, when the evidence

¹For 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).

offered by the official is strong enough and when the fellow’s conviction risk is low.

Noteworthy, these results hinge on the hierarchical structure typical of criminal organizations, and hence do not apply to crimes perpetrated by single offenders. In different contexts, other scholars have previously argued that corruption can have a positive impact on welfare (growth) by stimulating investment and facilitating transactions in countries with excessive regulation: it allows people to avoid ‘bureaucratic delay’ — see, e.g., 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. Our analysis is also related, and offers a novel point of view, to the recent debate, initiated by the India’s 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, 2011, Rose-Ackerman, 2010, among many others).² 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. Differently from harassment bribes, where only two parties are involved, in our framework corruption is not the final offence but is 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 than a simple bilateral relationship. Hence, it should not be surprising that our policy implications are quite different than Basu’s proposal: in our framework, it is the bribe-taker that should be partially or even completely immune (provided that he reports the bribe-giver). Moreover, 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.

Taken together, our results suggest that being too severe with corrupt officials might reduce deterrence when dealing with organized delinquency, especially if enforcement against the members of criminal organizations is weak relative to the evidence that an official’s testimony could provide in trial. Although in our baseline model corruption generates only an indirect social cost — i.e., it enables the boss to avoid the sanction, which may lower the ex-ante cost of crime and reduce welfare, yet, in real life, corruption may also generate a direct welfare harm. We show that our results survive when these extra costs are taken into consideration, as long as they are not too large. Lastly, it should be noted that the somewhat positive view of corruption that emerges from our analysis must not be interpreted as a general principle, but it should be framed in an organized crime context. Yet, the existence of a bright side of subversion of law provides useful guidelines for policymakers when they discuss the opportunity of introducing leniency programs for corrupt law enforcers.

The rest of the paper is organized as follows. In Section 2 we discuss some useful 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. In Section 5, we discuss some extensions. In Section 6 we review the related literature and highlight the contribution of our paper. Section 7

²For experimental evidence on the effects of leniency for bribe-givers on harassment bribes see, e.g., Abbink *et al.* (2014) and Engel *et al.* (2012) among others.

concludes. Proofs are in the Appendix.

2. Background and anecdotal evidence

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

2.1. Corruption and organized crime

Many Governments and International Institutions — e.g., the United Nations and the European Council — have acknowledged the existence of hidden links between politics, the judiciary and organized crime.³ The 2009 Europol report highlights that criminal groups exert influence on the judiciary in most European countries. Accordingly, several member states like Czech Republic, Latvia, Lithuania, Romania, Slovak Republic and, to a lesser extent, Hungary, Poland, Ireland and the UK have reported the presence of criminal organizations using corruption to avoid detection or to manipulate trials.

Two recent Eurobarometer surveys (2006, 2008) examined the public perceptions of the links between organized crime and corruption revealing that more than half of EU citizens (54%) believed that ‘most corruption is caused by organized crime’.

The Sicilian Mafia The existence of deep connections between the Sicilian Mafia (Cosa Nostra) and many Italian politicians, public officials and prosecutors, is widely covered in the press. Cosa Nostra frequently tried to manipulate court decisions by bribing, threatening, and, occasionally, even murdering judges, prosecutors and police officers. Tommaso Buscetta was the first former mafia member to expose in detail the secret ties that linked politicians to this powerful and enduring organization. In 1992, he testified in front of the Antimafia Commission about the links between Cosa Nostra and Salvo Lima (an important Christian Democrat politician at that time), indicating that Lima was in charge of fixing problems for the organization whose solution laid in Rome — i.e., bribing and/or intimidating prosecutors to fix or even avoid trials, mitigating sanctions, preventing investigations, gathering consensus to oppose national laws hurting the business, delaying special measures intended to strengthen enforcement in Sicily, etc. More recently, in 2011, former Italian judge Giancarlo Giusti was sentenced to four years of prison for releasing in 2009 several members of the Calabrian 'Ndrangheta, a criminal organization located in the south of Italy. Many whistle-blowers have alleged ties between their clans and important judges. Gaspare Mutolo, former member of the Sicilian Mafia and now collaborating with the Italian justice, accused several friends and collaborators of judge Falcone of being on the payroll of Totò Riina.

Cases of corruption also involved members of the Italian police forces and intelligence services.⁴ For example, Bruno Contrada, a former head of the SISDE (the Italian Intelligence Agency) was sentenced to ten years for collusion with Cosa Nostra. On the basis of testimonies provided by some informants, Contrada was accused of informing the Mafia for upcoming police operations, preventing

³See, e.g., the resolution of the United Nations Convention Against Corruption and the 2001 evaluation reports of the Group of States Against Corruption (GRECO). See,

[http://www.coe.int/t/dghl/monitoring/greco/evaluations/round1/reports\(round1\)_en.asp](http://www.coe.int/t/dghl/monitoring/greco/evaluations/round1/reports(round1)_en.asp)

⁴See e.g., Ayala (2008), Anselmo and Braucci (2008) and Cantone (2008).

in particular an early capture of the fugitive Totò Riina, one of the most violent leader in the history of Cosa Nostra.⁵

Not only Italy Links between criminal organizations and the public domain are widespread. Notable examples are found, for instance, in Latin America — see Solís and Floglesong (2009) among others. Corruption and intimidation characterized Pablo Escobar’s dealings with the Colombian system. He managed to bribe a long list of government officials, judges and other politicians. The strategy was the so called ‘plata o plomo’ deal, according to which either a public official would accept a bribe and live in peace, or he would refuse it, but accept the risk of being killed (see, e.g., Dal Bò *et al.*, 2006). 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 concerted 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.⁶

The Centre 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. 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.

Finally, corruption and organized crime seem to be connected even in the Netherlands and UK. 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.

2.2. Leniency programs

Leniency programs are widespread in developed and developing countries, especially those that are historically more troubled with organized delinquency. There are, however, various sources of heterogeneity between these programs across the world.

⁵See, e.g., “Audizione del collaboratore di giustizia Gaspare Mutolo”, Antimafia Commission, February 9, 1993.

⁶<http://edition.cnn.com/2009/WORLD/americas/07/15/mexico.violence/>

Criminal proceedings The Italian Criminal Code granted partial or total 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 to encourage dissociation from terrorist groups and collaboration with the authorities were enacted. However, it was not until 1984, when Tommaso Buscetta turned against the Mafia and in exchange for his help was relocated under a new identity, that witness protection became formalized. 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 1,000 justice collaborators.

In Colombia, the witness protection program dates back to the Constitution of 1991, which delegates to the Office of the Attorney General the obligation to provide protection for witnesses, victims and other parties to criminal proceedings. A special team of investigators 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. By 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 seems still 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.

Corruption The anecdotal evidence on Nations' effort to promote coordinated leniency programs for self-reporting officials and flipping criminals is 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*.⁷ 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, para. 4).

3. The model

Based on the evidence discussed above, we now lay down the simplest possible model that shows that the optimal policy may induce the boss to subvert the law.

Players and environment. The game involves a benevolent Legislator, a criminal organization and a public official ruling the case against the organization.⁸ 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 criminal organization is formed by two members: a principal (boss) and an agent (fellow or soldier).

The crime yields a random monetary return π , 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

⁷See, e.g., UNODC (2003), General Assembly resolution 58/4, annex.

⁸We assume that there is only one official for simplicity and without loss of generality. One can think of a more complex model where there are more stages of judgment. The model results would still go through as far as the number of possible appeals is finite.

return π has realized. This wage is paid after the crime is committed, but before the investigation takes place. For simplicity, we normalize the fellow’s outside option to zero without loss of generality.

Once the crime is committed, the public official detects it with probability λ , which we normalize to 1 without loss of generality. The boss can, however, decide to bribe the official in order to subvert the law — i.e., upon receiving the bribe, hereafter x , the corrupt official acquits the organization members. The official’s moral cost of infringing the law, hereafter m , is a random variable that distributes on the support $[0, +\infty)$ with cdf $F(m)$ and pdf $f(m)$. At the time the bribe is offered, the boss knows m .⁹

Conviction technology. 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: he is convicted with probability p and charged a sanction S_a . The boss is not sanctioned.
- If the fellow blows the whistle, he is charged a (certain) discounted sanction $(1 - \phi) S_a$, where ϕS_a is the penalty that is waived by the Legislator. In exchange of this reduced sanction, the whistleblower provides information against the organization that leads the judicial authority to convict the boss with probability α and charge him S_p .

By 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 light favorable to the defendants. The official is convicted with probability q , and is charged a sanction S_o . If, instead, the official pleads guilty and reports the boss after having accepted the bribe, he obtains an amnesty $\rho \geq 0$. In this case, the probability of sanctioning both members of the organization is β . The idea is that once the boss has ‘fallen’ also his ‘soldiers’ do: a sort of domino effect that echoes Baccara and Bar-Isaac (2008).

For the moment we assume that, when the official is corrupt, the fellow cannot blow the whistle, even if he wants to do so. 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 convince the fellow not to blow the whistle either because he can file away the case, even before the trial starts, or because, he can negatively evaluate the quality of the evidence offered by the fellow at the trial, file the case and prevent the latter being accepted in the leniency program. Of course, things may change if the official is neither a prosecutor nor a judge, but a police officer in charge of the investigative activity against the organization. In that case, the fellow may still be able to cooperate with the justice and accuse both the boss and the corrupt official (of course, provided that the prosecutor leading the case is honest). In Section 5.1 we discuss more in depth the role of this assumption and its implications.

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

⁹The 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. Analyzing how this bargaining process develops is outside the scope of the paper.

$\tau=0$ The Legislator commits to a policy (ϕ, ρ) .

$\tau=1$ The crime return materializes. The boss decides whether to commit the crime. He offers a wage w to the fellow. If the offer is rejected the game ends. 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 him 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 plea 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 corrupt¹⁰; or, it could be the official himself, when corrupt, to let the fellow know that he should not blow the whistle.¹¹ For simplicity, and with no loss of insights, we assume that the boss does not retaliate on whistleblowers (we will discuss the role of this assumption in Section 5.3).

The solution concept is Subgame Perfect Nash Equilibrium.

Technical assumptions. All players are risk neutral: sanctions can be interpreted as the monetary equivalent of the imprisonment terms, fines, damages, and so forth, to which the criminals expose themselves. In addition, we impose the following assumptions.

A1 The Legislator's objective is to minimize crime — i.e., the probability that the boss hires the fellow.

This assumption is imposed in most of the existing literature — see, e.g., Piccolo and Immordino (2016). In Section 5.4 we discuss the implications of assuming alternative social goals.

A2 When the fellow is indifferent between blowing the whistle and remaining loyal to the boss, he chooses the former option.

This is a necessary tie breaking condition that guarantees the existence of a policy that induces the fellow to report in equilibrium.

A3 The boss is never charged less than the official and the fellow — i.e., $S_p \geq \max\{S_a, S_o\}$.

¹⁰Of 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 losing reputation is infinitely high for the boss, so that he never lies.

¹¹A 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.

This assumption seems appealing for criminal organizations: the most dangerous and culpable criminals are those that operate behind the scenes (see, e.g., Jeffries and Gleeson, 1995), hence they are usually punished more harshly than their fellows.

A4 The information reported by the fellow is more accurate than that offered by the official — i.e., $\alpha \geq \beta$.

The assumption that the fellow’s information is more valuable than that offered by the official seems natural since the fellow usually knows better the boss, his traffics, habits and involvement into crimes.

A5 The inverse hazard rate $h(m) \equiv \frac{F(m)}{f(m)}$ is increasing and satisfies the following Inada condition

$$h(+\infty) > (\beta - p) S_a. \quad (3.1)$$

Imposing an increasing inverse hazard rate is a standard condition in many ‘regular’ screening problems — see, e.g., Laffont and Martimort (2002). The Inada condition stated in (3.1), instead, guarantees that the Legislator’s maximization problem is single peaked.

4. Equilibrium analysis

In this section we provide the equilibrium characterization. We will first briefly analyze the no-corruption benchmark and illustrate the simple logic of subversion of law. Building on these results, we then derive the optimal policy that combines an amnesty for low-rank criminals that blow the whistle and an amnesty for corrupt officials that self report.

4.1. The ‘no corruption’ benchmark

To begin with, consider the benchmark in which the official cannot be bribed. Clearly, if the fellow is not allowed to blow the whistle — e.g., because $\phi = 0$ — the crime is committed as long as its monetary return π exceeds the fellow’s expected sanction pS_a , which defines his reservation wage. Hence, the crime rate is $1 - G(pS_a)$, which is decreasing with the fellow’s expected sanction: the higher the fellow’s expected sanction, the lower the boss net return from crime since he has to pay a higher reservation wage to the fellow.

Next, suppose that a leniency program is introduced. The fellow blows the whistle if and only if the probability of conviction p is larger than the share $1 - \phi$ of the sanction that is not waived by the policy — i.e.,

$$(1 - \phi) S_a \leq pS_a \quad \Leftrightarrow \quad \phi \geq 1 - p.$$

In this case the crime is committed if and only if

$$\pi \geq \pi^* \equiv (1 - \phi) S_a + \alpha S_p,$$

where $(1 - \phi) S_a$ is the fellow’s reservation wage, and αS_p is the boss’ expected sanction conditional on the fellow blowing the whistle. Note 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’ net return from crime.

The optimal policy solves the following minimization problem

$$\min_{\phi \in [1-p, 1]} \Pr[\pi \geq \pi^*].$$

Hence,

Proposition 1. *When corruption is not viable, the optimal policy induces the fellow to blow the whistle and grants an amnesty $\phi^* = 1 - p$.*

Without corruption it is always optimal to induce the fellow to blow the whistle. In so doing, however, the Legislator chooses the lowest possible amnesty because granting an amnesty larger than $1 - p$ would only have the effect of reducing the fellow's reservation wage, whereby increasing the boss' net return from crime and the crime rate.¹²

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 lead to subversion of law? If so, under what conditions? 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 assuming that $\rho = 0$ so that there is no leniency for the self-reporting official, who has of course no incentive to plea 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. 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, and then move back to the boss' bribing decision.

Since the fellow knows whether the official is corrupt or not, and the corrupt official always files the case, blowing the whistle is profitable for the fellow only when the public official has not been bribed. Hence, the rule according to which the fellow is induced to cooperate is the same as in the benchmark — i.e., the fellow blows the whistle if and only if $\phi \geq 1 - p$. Note 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.

Consider the most interesting case in which the Legislator chooses an amnesty $\phi \geq 1 - p$ so that the fellow blows the whistle (when the official is not corrupt). The bribe x that the boss is willing to pay in order to avoid conviction must be such that

$$x \leq \alpha S_p, \tag{4.1}$$

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 α). 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 expected sanction qS_o — i.e.,

$$x \geq \underbrace{m + qS_o}_{\text{Reservation bribe}}. \tag{4.2}$$

¹²See, e.g., Piccolo and Immordino (2016) for a more general analysis of the costs and benefits of leniency programs for criminal organizations in the absence of corruption.

Taken together, conditions (4.1) and (4.2) imply the following useful lemma.

Lemma 1. *If $\alpha \leq \frac{qS_o}{S_p}$, there is no corruption in equilibrium. Otherwise, the boss bribes the official when his moral cost is small enough — i.e., for $m \leq \bar{m} \equiv \alpha S_p - qS_o$.*

Essentially, when the fellow’s insider information is not too accurate, the boss prefers not to bribe the official since the cost of being exposed to the fellow’s allegation is lower than the cost of rewarding the official for his risk of conviction. By contrast, when the fellow’s insider information is accurate enough, the boss prefers to bribe the official in order to subvert the law. To focus on the most interesting case for our purposes assume that $\bar{m} > 0$, so that there is always a sufficiently dishonest official that is bribed by the boss in equilibrium — i.e., $m \leq \bar{m}$.¹³ Note that, the region of parameters in which this happens expands when the information disclosed by the fellow is relatively more productive — i.e., when α is high — when the judicial system is relatively more severe with the boss — i.e., when S_p is large — when the probability of convicting the official is not too high — i.e., when q is relatively low — and when corruption is not sanctioned too severely — i.e., when S_o is not too large.

In the region of parameters under consideration, the crime is committed if and only if

$$\pi \geq \hat{\pi} \equiv \underbrace{\int_0^{\bar{m}} (m + qS_o) dF(m)}_{\text{Official's expected bribe}} + \underbrace{(1 - F(\bar{m})) \alpha S_p}_{\text{Boss' expected sanction}} + \underbrace{(1 - F(\bar{m})) (1 - \phi) S_a}_{\text{Fellow's reservation wage}}$$

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.

We can state the following result.

Proposition 2. *Suppose that $\bar{m} > 0$. The Legislator allows the fellow to blow the whistle and grants him the lowest possible amnesty ϕ^* if and only if*

$$pS_a - qS_o \leq \mathbb{E}[m|m \leq \bar{m}] + \frac{1 - F(\bar{m})}{F(\bar{m})} \alpha S_p. \quad (4.3)$$

Otherwise, it is optimal not to allow the fellow to blow the whistle. Regardless of whether a leniency program is introduced or not, the crime rate is always higher than in the benchmark.

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 may trigger socially harmful acts that undermine the effect of the law, and may even subvert it — i.e., when (4.3) does not hold. When this happens, the Legislator finds it optimal not to allow the fellow to blow the whistle because corruption not only allows him to avoid being sanctioned, but it also reduces the reservation wage that the fellow is willing to accept since his conviction risk is lower. Hence, pursuing strong enforcement goals may harm welfare insofar as this may trigger subversion of law.

¹³When $\bar{m} \leq 0$ there is no corruption and the outcome of the game is as in the benchmark.

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. Hence, differently than before, the Legislator now sets the pair (ϕ, ρ) at the outset of the game. In order to solve the model, consider the subgame in which the official has accepted a bribe x . He will self-report if and only if

$$qS_o \geq (1 - \rho) S_o \quad \Leftrightarrow \quad \rho \geq 1 - q.$$

Moving back to the corruption stage, we now characterize the boss' decision to bribe the official. Clearly, if $\rho < 1 - q$, the condition under which the boss bribes the official is the same as that obtained in Lemma 1. Hence, consider the most interesting case in which $\rho \geq 1 - q$. The bribe x that the boss is willing to pay in order to avoid conviction must be such that

$$x \leq (\alpha - \beta) S_p, \tag{4.4}$$

that is, it must be lower than the difference between the boss' expected sanction when the fellow's blows the whistle — i.e., αS_p — and the boss' expected sanction when the corrupt official self reports — i.e., βS_p . 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 $(1 - \rho)S_o$ — i.e.,

$$x \geq \underbrace{m + (1 - \rho) S_o}_{\text{Reservation bribe}}. \tag{4.5}$$

Note that the official's reservation bribe is decreasing in ρ : the more lenient the Legislator is with a self-reporting official, the lower is the bribe that the latter is willing to accept in order to help the boss subverting the law. Hence, other things being equal, a higher ρ induces more corruption in equilibrium. That is, being excessively lenient with corruption may facilitate bribery.

Taken together, conditions (4.4) and (4.5) imply the following useful lemma.

Lemma 2. *If $\phi < 1 - p$ the boss never bribes the official. By contrast, if $\phi \geq 1 - p$ there is corruption in equilibrium only if*

$$1 - \rho \leq (\alpha - \beta) \frac{S_p}{S_o}.$$

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

$$0 \leq m \leq m(\rho) \equiv (\alpha - \beta) S_p - (1 - \rho) S_o, \tag{4.6}$$

with $m(\cdot)$ being increasing in ρ .

As argued before, corruption is worthless for the boss when the fellow does not blow the whistle. Hence, 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: this, in fact, reduces the official's reservation bribe and makes it less costly for the boss to approach the official. Quite intuitively, the higher the rate of corruption that the Legislator wants to induce in equilibrium, the more generous the amnesty granted to the self-reporting official must be (other things being equal) — i.e., the function $m(\cdot)$ is monotone and increasing in ρ .

It then follows that:

Lemma 3. *In the region of parameters where*

$$qS_o \geq (\alpha - \beta) S_p, \quad (4.7)$$

the level of ρ that solves $m(\rho) = 0$, hereafter denoted by $\underline{\rho}$, is always larger than $1 - q$.

Essentially, condition (4.7) guarantees that the Legislator can always choose a ρ 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 relative to the sanction that the boss avoids when the official is corrupt. This means that, in the region of parameters where (4.7) holds — i.e., when the enforcement against corruption (qS_o) is relatively strong — the Legislator can always implement the outcome of the no-corruption benchmark by setting the official's amnesty equal to $\underline{\rho}$. To simplify the analysis, with no loss of insights, in what follows assume that (4.7) holds and determine the conditions under which the Legislator relies on corruption to optimally deter crime.¹⁴

Accordingly, consider a policy such that $\rho \geq \underline{\rho}$ and $\phi \geq 1 - p$ so that both the official and the fellow are willing to report.¹⁵ The fellow's reservation wage is

$$\int_0^{m(\rho)} \beta S_a dF(m) + \int_{m(\rho)}^{+\infty} (1 - \phi) S_a dF(m),$$

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

The boss' expected sanction is

$$\int_0^{m(\rho)} \beta S_p dF(m) + \int_{m(\rho)}^{+\infty} \alpha S_p dF(m),$$

which is decreasing in ρ since we assumed that the fellow's information is more accurate than that of the official — i.e., $\alpha \geq \beta$ as stated in assumption A4.

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

$$\int_0^{m(\rho)} (m + (1 - \rho) S_o) dF(m),$$

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

Summing up, the crime is committed if and only if

$$\pi \geq \tilde{\pi} \equiv \int_0^{m(\rho)} (m + (1 - \rho) S_o + \beta (S_a + S_p)) dF(m) + \int_{m(\rho)}^{+\infty} ((1 - \phi) S_a + \alpha S_p) dF(m).$$

¹⁴The case in which (4.7) is not verified, is discussed in Section 5.2, where we show that results are even stronger in that region of parameters.

¹⁵By Lemma 3 if $\rho \geq \underline{\rho}$ then $\rho > 1 - q$.

Since we assumed that (4.7) holds, the optimal policy solves

$$\min_{\phi \geq 1-p, \rho \geq \underline{\rho}} \Pr [\pi \geq \tilde{\pi}].$$

Note that if the Legislator chooses the amnesty $\underline{\rho}$ for the official, there is no corruption in equilibrium and, as discussed above, the optimal policy and the corresponding crime rate are the same as in the benchmark without corruption. Holding ρ constant and letting $y \equiv m(\rho)$, a simple change of variable allows to write the Legislator's problem as

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

Differentiating with respect to ϕ , we have

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

As in the benchmark, the crime rate is increasing in ϕ . Hence, it is optimal to set the lowest possible amnesty for the fellow — i.e., $\phi^* = 1 - p$. Moreover, differentiating with respect to y and substituting for ϕ^* , we have

$$-F(y) + f(y) (\beta - p) S_a \leq 0 \quad \Leftrightarrow \quad h(y) \geq (\beta - p) S_a. \quad (4.8)$$

This derivative shows that a higher rate of corruption has three effects on the Legislator's objective function. Two of these effects determine the dark side of corruption — i.e., they increase the crime rate — while the third one determines its bright side — i.e., it decreases the crime rate. Indeed, by increasing corruption — i.e., by setting a higher y , and thus a higher ρ — the crime rate increases for two reasons: (i) *ceteris paribus*, corruption occurs more often, which allows the boss to reduce the risk of being sanctioned — i.e., he is convicted with probability $\beta \leq \alpha$ — and (ii) a higher rate of corruption also leads the fellow to blow the whistle less often, which reduces the likelihood of being charged the discounted sanction $(1 - \phi) S_a = p S_a$. 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, and are in line with the traditional negative view of corruption. However, by increasing corruption, it is also more likely to convict the fellow when the official self-reports and charge him βS_a — i.e., a domino effect à la Baccara and Bar-Isaac (2008). This effect increases the fellow's reservation wage since it magnifies the risk of conviction that he bears when accepting the boss' offer, so it reduces the crime rate (other things being equal): the bright side of subversion of law.

We can state the following result.

Proposition 3. *If $\beta > p$, the Legislator is willing to tolerate a positive level of corruption $\tilde{m} > 0$ in equilibrium, with \tilde{m} being solution of*

$$h(\tilde{m}) = (\beta - p) S_a. \quad (4.9)$$

Hence, the optimal amnesty for the official is

$$\tilde{\rho} = 1 - \frac{(\alpha - \beta) S_p - h^{-1}((\beta - p) S_a)}{S_o} > 1 - q.$$

The optimal amnesty for the fellow is $\phi^* = 1 - p$ as in the benchmark. Hence, in this equilibrium the fellow blows the whistle if and only if $m > \tilde{m}$.

By contrast, if $\beta \leq p$ the optimal policy features no corruption in equilibrium — i.e., $\tilde{\rho} = \underline{\rho}$ so that $\tilde{m} = 0$ — and the fellow always blows the whistle since he is offered an amnesty ϕ^* . In this case, the crime rate is equivalent to that obtained in the benchmark.

This proposition conveys the central message of the paper: it 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 result hinges on the hierarchical structure of criminal organizations and holds true when $\beta > p$. The intuition is as follows: when β is larger than p , the positive impact of the official's reporting behavior on the fellow's reservation wage (as reflected by the term βS_a in (4.8)) — offsets the negative effect of the reduced expected sanction on the fellow's reservation wage (as reflected by the term $-pS_a$ in (4.8)). Hence, when the enforcement against criminal organizations is relatively weak (that is, p is low) the optimal degree of corruption that the Legislator implements in equilibrium trades off the social cost of allowing the boss to subvert the law and avoid being sanctioned, 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 $\beta > p$).¹⁶ In addition, in this case, the two leniency instruments are complements: the higher is p — i.e., the less generous is the amnesty granted to the fellow — the lower is the amnesty granted to the official.

By contrast, in the region of parameters where $\beta \leq p$, the net effect of an increase in corruption on the fellow's reservation wage is negative. In this case, the Legislator prefers not to induce corruption in equilibrium and implements the outcome of the benchmark where only the fellow is allowed to blow the whistle. Hence, when the prosecution ability and/or the enforcement technology *vis-à-vis* the criminal organization is relatively strong (namely, when p is relatively high), the Legislator only relies on the fellow's testimony to deter crime.

In the next proposition we highlight some interesting comparative statics and show the conditions under which the bright side of subversion of law is so strong to induce the Legislator to provide a bonus for an official that self-reports.

Proposition 4. *Suppose that $\beta > p$. Then: (i) \tilde{m} is increasing in β and S_a and decreasing in p ; (ii) the mass of fellows that blow the whistle is decreasing in β and S_a and increasing in p ; (iii) $\tilde{\rho}$ is increasing in β and S_a and decreasing in p , α and S_p . Moreover, $\tilde{\rho} > 1$ if, and only if*

$$(\alpha - \beta) S_p < h^{-1} ((\beta - p) S_a).$$

This comparative statics has some interesting empirical implications. First, the amount of corruption that is required to minimize crime is increasing with the accuracy of the information provided by the official and is increasing with the sanction charged to the fellow. Second, using corruption in equilibrium to deter crime is less effective when the fellow is more likely to be convicted in trial, when the fellow's information is more accurate, and when the boss (once convicted) is charged very severe sanctions.

¹⁶Enforcement 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.

Of course, since the fellow can report only when the official is not corrupt, the optimal policy also limits the fellow’s access to the program — i.e., the contingencies in which he can blow the whistle, which are by construction equal to the contingencies in which the official does not self-report. Hence, as an additional empirical implication, our model suggests that there is a negative correlation between the number of self-reporting officials and the number of fellows who blow the whistle (in equilibrium).

Finally, when the bright side of subversion of law is strong enough, in order to stimulate corruption in equilibrium, the Legislator may find it optimal to even provide rewards to self-reporting officials.

5. Extensions and robustness

In this section we discuss some extensions of the model and show that the results obtained in the baseline analysis hold qualitatively, if the main assumptions imposed throughout are relaxed.

5.1. Imperfect corruption

Up to this point, we assumed that the fellow cannot blow the whistle if the official is corrupt. This assumption is clearly restrictive since it identifies the official with the prosecutor in charge of the case. Yet, in some cases, criminal organizations fold up bribing members of the police forces, who then eventually plea guilty and testify against them (see the anecdotal evidence discussed in Section 2). Hence, it seems natural to check robustness of results by enabling the fellow to testify against both the boss and the corrupt official. Accordingly, assume that the fellow and the corrupt official can both blow the whistle, even if the latter is corrupt. To simplify exposition, assume (without loss of insights) that the fellow moves first and denote by $z \in [0, 1]$ the probability that he is allowed to testify even if the official is corrupt (the limiting case where $z = 0$ is equivalent to the baseline model). We interpret z as a proxy of the official’s influence: the higher z , the less influential the official because he has a lower ability to refrain the fellow from blowing the whistle. To simplify notation, assume that when the fellow blows the whistle, the official and the boss are convicted with probability 1 — i.e., α is normalized to 1 — and that $\beta > p$ in order to restrict attention to the most intriguing case in which subversion of law has a bright side in the baseline model.

Note that, as before, also in this new setting the game has a trivial outcome that features no corruption if the fellow is never willing to blow the whistle. Hence, to focus on the most interesting case, consider an equilibrium candidate in which the fellow blows the whistle. Again, to solve the game, we need to consider two cases (or, subgames): one in which the official is corrupt, and the other in which he is not corrupt. The equilibrium of the latter subgame is the same as that characterized above — i.e., the fellow blows the whistle if and only if $\phi \geq \phi^*$. Therefore, let us focus on the more relevant case in which the official has been bribed and the fellow must decide whether to report or not. Clearly, the official’s self-reporting strategy is crucial to determine the fellow’s incentive to blow the whistle. Suppose that $\rho \geq 1 - q$, so that the official self reports. Then, the fellow blows the whistle if and only if

$$z(1 - \phi)S_a + (1 - z)\beta S_a \leq \beta S_a \quad \Leftrightarrow \quad \phi \geq 1 - \beta. \quad (5.1)$$

This condition implies that when the official is corrupt and is expected to self report, the fellow is

willing to accept a lower amnesty than in the baseline model (recall that $\beta > p$).

Summing up: for $\phi < 1 - \beta$, the fellow always remains loyal to the boss; for $\phi \in [1 - \beta, \phi^*)$, he blows the whistle only if the official is corrupt; for $\phi \geq \phi^*$ he always blows the whistle. Hence, for any $\rho \geq 1 - q$ and $\phi \geq 1 - \beta$, the bribe x that the official is willing to accept is

$$x \geq m + zS_o + (1 - z)(1 - \rho)S_o = m + (1 - \rho(1 - z))S_o, \quad (5.2)$$

which is increasing in z : the lower the official's influence — i.e., the higher z — the larger the reservation bribe because the official faces a higher conviction risk. Of course, the boss never finds it optimal to bribe the official when $\phi \in [1 - \beta, \phi^*)$ because in that case, the fellow reports only if the official is corrupt: corruption cannot happen in equilibrium. By contrast, for $\phi \geq \phi^*$ the boss finds it optimal to pay the bribe if and only if the implied expected sanction of not doing so is larger than the sum of the official's bribe and the expected sanction triggered by the official's report — i.e.,

$$S_p \geq x + zS_p + (1 - z)\beta S_p \Leftrightarrow x \leq S_p(1 - z)(1 - \beta). \quad (5.3)$$

The right-hand side of this condition is again increasing in z : as the official becomes less influential, the appeal of bribery *vis-à-vis* the boss drops.

Taken together, conditions (5.2) and (5.3) imply that, when $\rho \geq 1 - q$ and $\phi \geq \phi^*$, there is corruption in equilibrium if and only if

$$m \leq m_z(\rho) \equiv (1 - \beta)(1 - z)S_p - (1 - \rho(1 - z))S_o.$$

with $m_z(\rho)$ being decreasing in z and $m_{z=0}(\rho) = m(\rho)$. Hence, as intuition suggests, other things being equal, there is less corruption in equilibrium when the official's influence is weaker. Note that, in the region of parameters where

$$q \geq (1 - \beta) \frac{S_p}{S_o} - \frac{z}{1 - z}, \quad (5.4)$$

the level of ρ that solves $m_z(\rho) = 0$, hereafter denoted by $\underline{\rho}_z$, is larger than $1 - q$. Hence, (5.4) is weaker than (4.7): as the official's influence falls, it is easier for the Legislator to induce no corruption in equilibrium because the official requires a higher reservation bribe in order to cope with the risk of being accused by the fellow.

In sum, for $\rho \geq 1 - q$ and $\phi \geq \phi^*$, the crime is committed if and only if

$$\begin{aligned} \pi \geq \tilde{\pi}_z \equiv & \int_{m_z(\rho)}^{+\infty} ((1 - \phi)S_a + S_p) dF(m) + \\ & + \int_0^{m_z(\rho)} (m + z(S_p + S_o + (1 - \phi)S_a) + (1 - z)((1 - \rho)S_o + \beta(S_a + S_p))) dF(m). \end{aligned}$$

By contrast, for $\rho \geq 1 - q$ and $\phi \in [1 - \beta, \phi^*)$, the boss never finds it optimal to pay the bribe as he can count on the fellow's loyalty (since $\phi < \phi^*$). Hence, the Legislator is indifferent between setting an amnesty $\phi < 1 - \beta$ and an amnesty $\phi \in [1 - \beta, \phi^*)$. Indeed, in both cases there is never corruption in equilibrium and the cost of crime is equal to pS_a .

A leniency program that does not induce the fellow to blow the whistle when the official is not

corrupt — i.e., $\phi < \phi^*$ — is never optimal for the Legislator. In fact, by setting $\phi = \phi^*$ she can better deter crime since $\tilde{\pi}_z$ is decreasing in ϕ . The cost of crime under such a policy is

$$\begin{aligned} \tilde{\pi}_z \equiv & \int_{m_z(\rho)}^{+\infty} (pS_a + S_p) dF(m) + \\ & + \int_0^{m_z(\rho)} (m + z(S_p + S_o + pS_a) + (1-z)((1-\rho)S_o + \beta(S_a + S_p))) dF(m). \end{aligned}$$

that is strictly larger than pS_a since $\beta > p$.

Thus, given that the cost of crime when $\rho \geq 1 - q$ and $\phi \geq \phi^*$ is decreasing in ϕ , the optimal leniency program prescribes an amnesty for the fellow exactly equal to $1 - p$: the minimum amnesty level that induces him to blow the whistle independently of whether corruption occurs or not. Then, letting $y_z \equiv m_z(\rho)$, it can be shown, by a standard change of variables, that the optimal leniency policy for the official solves the following maximization problem

$$\max_{y_z \geq 0} \int_0^{y_z} (m - y_z + S_p + S_a(\beta + z(p - \beta))) dF(m) + \int_{y_z}^{+\infty} (pS_a + S_p) dF(m).$$

Differentiating with respect to y_z , and rearranging, in an internal solution, the optimal degree of corruption that the Legislator induces in equilibrium, solves

$$-F(y_z) + f(y_z)(\beta - p)(1 - z)S_a = 0$$

We can state the following result.

Proposition 5. *If $\beta > p$ the Legislator is willing to tolerate a positive level of corruption $\tilde{m}_z > 0$ in equilibrium, where \tilde{m}_z solves*

$$h(\tilde{m}_z) = (\beta - p)(1 - z)S_a. \quad (5.5)$$

The optimal amnesty for the official is

$$\tilde{\rho}_z = 1 - \frac{(\alpha - \beta)S_p - h^{-1}((\beta - p)(1 - z)S_a)}{S_o} > 1 - q.$$

The corresponding crime rate is decreasing in z . Otherwise, there is no corruption in equilibrium.

Hence, the bright side of subversion of law is decreasing in z , and it actually vanishes when $z = 1$. Comparing condition (5.5) with (4.9), it follows that $\tilde{m}_z < \tilde{m}$ and $\tilde{\rho}_z < \tilde{\rho}$. Intuitively, the complementarity between the two types of leniency programs is increasing with the official's influence. In other words, other things being equal, the Legislator is relatively more willing to tolerate corruption in equilibrium, and hence to award a more generous amnesty to a self-reporting official, as the influence of the official that is bribed grows large. The fact that the crime rate is decreasing in z suggests that separating the task of managing informants from the prosecution activity may improve welfare and create positive externalities.

5.2. Weak enforcement

We now develop the analysis for the region of parameters where condition (4.7) is violated. As discussed above, this condition enables the Legislator to choose a feasible amnesty ρ that is sufficiently

generous to induce the official to plea guilty and self report and, at the same time, not too generous so to make it excessively costly for the boss to bribe the official. What happens when this assumption does not hold? In what follows we show that results remain qualitatively unaltered and that they are actually even stronger.

Recall that, as shown in Lemma 3, when condition (4.7) does not hold it must be true that $m(\rho) > 0$ for every $\rho \geq 1 - q$ — 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 $\phi \geq \phi^*$ and $\rho \geq 1 - q$.
- (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 $\phi \geq \phi^*$ and $\rho < 1 - q$. Intuitively, in the region of parameters under consideration, the Legislator can always better deter crime by setting $\rho = 1 - q$, other things being equal. Therefore, while the official's reservation bribe and the fellow's reservation wage do not change (relative to the case in which $\rho < 1 - q$), the boss' expected sanction is higher since the corrupt official in this case self-reports, which increases the boss' expected sanction and reduces the crime rate (see the Appendix for a formal proof).

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

$$\Pr \left[\pi \geq \max_{\phi \geq 1-p, y \in [m(1-q), 1]} \int_0^y (m-y) dF(m) + F(y) (\beta - (1-\phi)) S_a + (1-\phi) S_a + \alpha S_p \right],$$

with the crime rate under strategy (ii) — i.e.,

$$\Pr [\pi \geq p S_a].$$

Direct comparison of these two expressions yields the following result.

Proposition 6. *When (4.7) is not met, the Legislator still prefers to induce corruption in equilibrium as long as $\beta - p > 0$: in this region of parameters the optimal policy is the same as in Proposition 3. By contrast, if $\beta - p < 0$ there is corruption in equilibrium if and only if*

$$(p - \beta) S_a \leq \mathbb{E}[m | m \leq m(1-q)] + \frac{1 - F(m(1-q))}{F(m(1-q))} + \beta S_p + q S_o.$$

Otherwise, it is optimal not to allow the fellow to blow the whistle to deter corruption.

Hence, the main qualitative insights of the baseline model carry over. They are actually even stronger because the Legislator may now wish to induce corruption in equilibrium even when β is lower than p . The intuition is straightforward. In the region of parameters under consideration the Legislator cannot completely deter corruption by choosing an amnesty $\rho \geq 1 - q$. Hence, the fall-back option is to use at her own advantage the official's report.

5.3. The role of retaliation

Up to this point, we have assumed that the boss does not punish disloyalty — i.e., we assumed that both the fellow and the official are not punished by the boss once they decide to cooperate with the justice. What happens when this possibility is taken into account? Of course, the danger of being curtailed makes the fellow and the official less willing to cooperate with the justice: as a prize for their testimony they request an amnesty that covers not only the risk of conviction they face when remaining loyal to the boss, but also the punishment after defection. Denoting by $R \geq 0$ such retaliation loss, the conditions under which the fellow and the official cooperate with the justice are

$$pS_a \geq (1 - \phi)S_a + R \quad \Leftrightarrow \quad \phi \geq 1 - p + \frac{R}{S_a},$$

and

$$qS_o \geq (1 - \rho)S_o + R \quad \Leftrightarrow \quad \rho \geq 1 - q + \frac{R}{S_o},$$

respectively. How does R impact the optimal policy?

Clearly, if R is very large — i.e., if the boss has a strong military power and he is willing to use it in order to punish disloyalty — it might be impossible for the Legislator to induce the fellow and the official to blow the whistle because this would require rewards rather than lighter sanctions for the fellow — i.e., $\phi > 1$. In fact, it might be difficult to implement such a rule because the public opinion may be reluctant to accept a policy that employs public funds to reward former criminals. In this case, using leniency programs cannot benefit the Legislator: a somewhat intuitive extensive margin effect of retaliation.

Yet, when R is not excessively large so that leniency programs are still viable — e.g., because a witness protection program is in place — the presence of a retaliation loss after cooperation has at least one less obvious effect on the optimal policy through the intensive margin. Specifically, the bright side of subversion of law strengthens when R increases because the fellow also requires a higher amnesty. And, a higher amnesty lowers the fellow's reservation wage when the official is not corrupt, whereby magnifying the positive impact on welfare of inducing corruption in equilibrium.

Hence, while strong organizations (very high R) may impede leniency programs (both for the fellow and the corrupt official) to bring potential social benefits, for relatively moderate values of R the bright side of inducing subversion of law in equilibrium may actually be higher than in the baseline model.

5.4. Alternative social goals

In the model developed so far, corruption generates only an indirect social cost — i.e., it enables the boss to avoid the sanction, which may lower the ex-ante cost of crime and reduce welfare. Yet, in real life, corruption may also generate a direct welfare harm, which can either reflect the moral cost that the honest crowd of a society attributes to corruption, or it can capture the obvious drawbacks deriving from the loss of a moral code by corrupt public officials, who are likely to impose further negative externalities on the judicial system, their colleagues and the people that interact with them in cases that do not necessarily involve the boss or its organization.

Do our results survive when these extra costs are taken into consideration? To answer this question, one can slightly modify the Legislator's objective function by assuming that, despite mini-

mizing crime, her objective function also weights (negatively) the amount of corruption that emerges in equilibrium. For example, if \underline{m} denotes the marginal type of public official — i.e., the one that is indifferent between accepting the bribe and remaining loyal to the state — one can imagine that the Legislator minimizes the following utility

$$\Pr[\pi \geq \tilde{\pi}] + \gamma G(\underline{m}),$$

where $\gamma \geq 0$ reflects the importance of the direct harm of corruption.

Then, it can be shown that, in this case, corruption has an obvious new dark side, which may offset the bright side emphasized above if $\gamma > \beta - p$. Yet, as long as γ is not too large, our main results hold qualitatively.

An alternative specification for the social welfare function could also take into account career concerns. Essentially, instead of minimizing crime, politicians in charge of designing the law may want to maximize the rate of conviction in order to increase their reputation and, hence, the likelihood of being reappointed. In this case, there could be an even stronger incentive to induce corruption in equilibrium in order to maximize the domino effect generated by the official's confession, so to magnify the boss' conviction rate.

6. Related Literature

In addition to the literature cited in the Introduction, our analysis is also 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 heads 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).¹⁷ But, these models have overlooked the role of leniency programs as a policy tool to generate conflict within criminal organizations, which is instead the building block of our analysis.

The idea of applying leniency programs to criminal organizations 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) and Spagnolo (2003), Rey (2003), Spagnolo (2008), Aubert *et al.* (2006), Chen and Harrington (2007), Chen and Rey (2007) and Harrington (2008). 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 (2016), who emphasize the benefits and the costs of these programs when whistleblowers have private information not known by prosecutors. Yet, none of these papers has discussed the effect of corruption on leniency. Our paper fills this important gap by showing that, when dealing with organized crime and collective delinquency, ‘avoidance’ (Malik, 1990) or ‘subversion of law’ (Glaeser and Shleifer, 2003) may not necessarily lead to weaker enforcement (less leniency), as it typically happens in the case of individual crimes.

Our analysis also shares important features with the literature on corruption.¹⁸ Stemming from

¹⁷See also Fiorentini and Peltzman (1995) and Mansour et al. (2006).

¹⁸International comparisons relying on opinion surveys suggest that perceived corruption turns out to in-

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.¹⁹ 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.²⁰ Polinsky and Shavell (2001) consider the dilution of deterrence caused by corruption not only due to bribing by criminals but also extortion of the innocent by enforcers. They propose rewards for corruption reports to mitigate the breakdown of deterrence. Finally, Kugler, Verdier and Zenou (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 results in more rather than less crime. The role of corruption is not only in diluting deterrence, but also as a strategic complement (input) to crime, as a catalyst to crime. Our paper is the first that combines the leniency and corruption literatures. To the best of our knowledge none of the existing papers analyzes policies that jointly offer amnesties to accomplice-witnesses and corrupt public officials, a key feature to find a bright side in the subversion of law.²¹

7. Concluding remarks

The introduction of lighter sanctions for low-rank criminals that cooperate with the justice are widely recognized as one of the most effective tools in the worldwide fight against organized crime. Yet, these policies seem to be extremely fragile when corruption allows top criminals (kingpins) to subvert the law by capturing their prosecutors. This threat, whose danger is widely corroborated by the anecdotal evidence presented in Section 2, calls for a better understanding of how Governments should react to this danger and design leniency programs that internalize criminal organizations' corruption decisions, and fight them back optimally.

Following this point of view, in this paper 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 that self-report and exploit corruption to her own advantage. 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

crease with ethnic fragmentation (Mauro, 1995) and appears to be affected by countries' cultural traditions and the long exposure to democracy (Treisman, 2000). Glaeser and Saks (2006) confirm that ethnic heterogeneity matters by exploiting U.S. cross-state variation in the number of government officials convicted for corrupt practices. Strong and robust evidence that more educated states have less corruption also emerge. When we focus instead on the impact of corruption on growth, mixed results emerge depending upon the level of analysis. Looking at the micro data, corruption depresses firms' growth and reduces the efficacy of redistribution for development (see, for instance, Fisman and Svensson, 2007; Olken, 2006). However, no robust evidence emerges that corruption negatively affects long run growth across countries (Svensson, 2005). A plausible explanation for the mismatch between the micro and macro evidence is that some types of corruption may be efficiency enhancing, by determining competition for government resources and by speeding up administrative procedures.

¹⁹Besley and McLaren (1993) and Mookherjee and Png (1995) also propose efficiency wages to deter bribery.

²⁰See also Basu *et al.* (1992), Marjit and Shi (1998), Chang *et al.* (2000) and Garoupa and Jellal (2002).

²¹There are very few studies relating corruption to institutional changes or, more in general, to particular event. Two experiences of corruption-crackdowns have been documented by Skidmore (1996) and Di Tella and Schargrodsky (2003). The former refers to the well-known example of the successful performance of the Independent Commission Against Corruption in Hong Kong; the latter instead focuses on the program of monitoring the price levels of a number of goods in the public hospitals of Buenos Aires.

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 determines indeed a domino effect that allows to convict the entire organization: a bright side of subversion of law.

From the policy standpoint, this result implies that efficient leniency rules in criminal proceedings must be complemented by rules that award amnesties also to corrupt officials, especially in countries that feature low enforcement against criminal organizations and/or when these organizations are particularly resilient to investigations and infiltrations by the police forces. Interestingly, our results also produce policy implications that are quite different from the Basu's proposal concerning harassment bribes: in our framework, it is the bribe-taker that should be partially or even completely immune (provided that he reports the bribe-giver). Moreover, 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.

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 pS_a . But then, the Legislator would be better off by setting $\phi = 1 - p$, so to induce a cost of crime $(1 - \phi)S_a + \alpha S_p = pS_a + \alpha S_p > pS_a$. Hence, it must be $\phi \geq 1 - p$. However, since the cost of crime is decreasing in ϕ (as argued in the main text) the optimal policy must be such that $\phi^* = 1 - p$. ■

Proof of Lemma 1. If $\alpha \leq \frac{qS_o}{S_p}$ 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 (4.1) and (4.2), respectively. Hence, in this region of parameters, there is no corruption in equilibrium. By contrast, $\bar{m} > 0$ if $\alpha > \frac{qS_o}{S_p}$ so that every official with moral cost $m \leq \bar{m}$ will be bribed. ■

Proof of Proposition 2. 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 pS_a . Next, suppose that $\phi \geq 1 - p$, so that the fellow blows the whistle. Using Lemma 1, the (ex ante) cost of crime is

$$\hat{\pi} \equiv \int_0^{\bar{m}} (m + qS_o) dF(m) + (1 - F(\bar{m}))\alpha S_p + (1 - F(\bar{m}))(1 - \phi)S_a. \quad (.1)$$

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

$$\int_0^{\bar{m}} (m + qS_o) dF(m) + (1 - F(\bar{m}))\alpha S_p + (1 - F(\bar{m}))pS_a \geq pS_a$$

which implies

$$\int_0^{\bar{m}} m dF(m) + (1 - F(\bar{m}))\alpha S_p \geq F(\bar{m})(pS_a - qS_o).$$

Dividing both sides by $F(\bar{m})$, condition (4.3) follows.

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

$$\frac{\partial \hat{\pi}}{\partial \phi} = -(1 - F(\bar{m}))S_a < 0.$$

Hence, when condition (4.3) is satisfied, the optimal policy is such that $\phi = 1 - p$. By contrast, when condition (4.3) is violated, the optimal policy is such that $\phi = 0$. ■

Proof of Lemma 2. If $\phi < 1 - p$, the fellow does not blow the whistle. Hence, the boss does not bribe the official. By contrast, if $\phi \geq 1 - p$, the fellow blows the whistle and the boss' expected charge is αS_p when the official is not captured. If, instead, the boss bribes the official and pays $m + (1 - \rho)S_o$, his expected charge is βS_p . Therefore, there is corruption in equilibrium if and only if $m(\rho) \geq m \geq 0$. ■

Proof of Lemma 3. The result follows immediately by using condition (4.6) and equalizing $m(\rho) = 0$. ■

Proof of Proposition 3. Suppose that $\phi \geq 1 - p$ and $\rho \geq 1 - q$. We first characterize the optimal policy under these restrictions and then show that the Legislator has no incentive to violate them — i.e., by choosing neither a policy such that $\phi < 1 - p$, nor one such that $\phi \geq 1 - p$ and $\rho < 1 - q$.

Hence, assuming $\phi \geq 1 - p$ and $\rho \geq 1 - q$, the ex ante cost of crime is equal to:

$$\tilde{\pi} \equiv \int_0^{m(\rho)} (m + (1 - \rho) S_o + \beta (S_a + S_p)) dF(m) + \int_{m(\rho)}^{+\infty} ((1 - \phi) S_a + \alpha S_p) dF(m),$$

Under condition (4.7) the optimal policy solves

$$\max_{\phi \geq 1-p, \rho \geq \underline{\rho}} \tilde{\pi}.$$

By applying the change of variable $y = m(\rho)$, we can rewrite the cost of crime as

$$\max_{\phi \geq 1-p, \rho \geq \underline{\rho}} \tilde{\pi} \equiv \max_{\phi \geq 1-p, y \in [0, +\infty)} \int_0^y (m - y) dF(m) + F(y)(\beta - (1 - \phi))S_a + (1 - \phi)S_a + \alpha S_p$$

Differentiating with respect to ϕ we obtain

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

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

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

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

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

If $\beta < p$, then $\frac{\partial \tilde{\pi}}{\partial y} < 0$. Hence, it is optimal for the Legislator to set $y = 0$ and choose an amnesty $\tilde{\rho}$ such that $m(\tilde{\rho}) = 0$, which by Lemma 3 is larger than $1 - q$.

If $\beta \geq p$, the optimal amount of corruption \tilde{m} is interior under A5 and solves

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

The corresponding amnesty for the official $\tilde{\rho}$ is pinned down by the identity $m(\tilde{\rho}) \equiv \tilde{m}$.

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 $\beta \leq p$, 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 $pS_a + \alpha S_p$. In this case, the Legislator is worse off by deviating to a policy that does not induce the fellow to blow the whistle as the induced cost of crime (pS_a) would be obviously lower. When $\beta \geq p$ the optimal policy induces corruption in equilibrium and the equilibrium expected cost of crime $\tilde{\pi}$ satisfies

$$\tilde{\pi} > \int_0^{\tilde{m}} (m + (1 - \tilde{\rho}) S_o + p(S_a + S_p)) dF(m) + \int_{\tilde{m}}^{+\infty} (pS_a + \alpha S_p) dF(m) > pS_a.$$

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

Finally, we show that provided that $\phi \geq 1 - p$, the Legislator always prefers to induce the official to self-report. Indeed, assuming $\phi \geq 1 - p$, if $\rho < 1 - q$ the boss bribes the official when $m \leq \bar{m} \equiv \alpha S_p - qS_o$. Hence, the expected cost of crime is

$$\hat{\pi} \equiv \int_0^{\bar{m}} (m + qS_o) dF(m) + (1 - F(\bar{m})) \alpha S_p + \int_{\bar{m}}^{+\infty} (1 - \phi) S_a dF(m). \quad (.2)$$

In contrast, if $\rho = 1 - q$, bribery occurs for $m \leq m(1 - q) \equiv (\alpha - \beta)S_p - qS_o$. Hence, the expected

cost of crime is

$$\tilde{\pi} \equiv \int_0^{m(1-q)} (m + qS_o + \beta(S_a + S_p)) dF(m) + \int_{m(1-q)}^{+\infty} ((1-\phi)S_a + \alpha S_p) dF(m). \quad (.3)$$

Notice that under A4 ($\alpha \geq \beta$), the following relation holds true

$$m(1-q) = (\alpha - \beta)S_p - qS_o \leq \alpha S_p - qS_o \equiv \bar{m},$$

Therefore,

$$\hat{\pi} \equiv \int_0^{m(1-q)} (m + qS_o) dF(m) + \int_{m(1-q)}^{\bar{m}} (m + qS_o) dF(m) + \int_{\bar{m}}^{+\infty} ((1-\phi)S_a + \alpha S_p) dF(m),$$

and

$$\begin{aligned} \tilde{\pi} \equiv & \int_0^{m(1-q)} (m + qS_o + \beta(S_a + S_p)) dF(m) + \\ & + \int_{m(1-q)}^{\bar{m}} ((1-\phi)S_a + \alpha S_p) dF(m) + \\ & + \int_{\bar{m}}^{+\infty} ((1-\phi)S_a + \alpha S_p) dF(m). \end{aligned}$$

Since $m \leq \bar{m}$ implies $m + qS_o \leq (1-\phi)S_a + \alpha S_p$, it then follows that $\tilde{\pi} > \hat{\pi}$ since

$$\int_0^{m(1-q)} \beta(S_a + S_p) dF(m) + \int_{m(1-q)}^{\bar{m}} ((1-\phi)S_a + \alpha S_p) dF(m) > \int_{m(1-q)}^{\bar{m}} (m + qS_o) dF(m),$$

which concludes the proof. ■

Proof of Proposition 4. The proof is immediate and follows from assumption A5 and the definition of $\tilde{\rho}$. ■

Proof of Proposition 5. Assume that $\rho \geq 1 - q$ and $\phi \geq 1 - \beta$. The official accepts a bribe x if

$$x \geq m + (1 - \rho(1 - z))S_o$$

Hence, the boss' decision on whether to corrupt the official will depend on the fellow's behavior in the subgame without corruption. If $\phi < 1 - p$, the fellow does not blow the whistle, so that the boss will not be sanctioned. In this case the boss will never bribe the public official: the ex ante cost of crime is pS_a . By contrast, if $\phi \geq 1 - p$ the fellow blows the whistle and the boss expects to pay S_p in the subgame without corruption. Such a policy implies corruption in equilibrium and yields an expected cost of crime

$$\begin{aligned} \tilde{\pi}_z \equiv & \int_{m_z(\rho)}^{+\infty} (pS_a + S_p) dF(m) + \\ & + \int_0^{m_z(\rho)} (m + z(S_p + S_o + pS_a) + (1-z)((1-\rho)S_o + \beta(S_a + S_p))) dF(m), \end{aligned}$$

which is maximized at $\phi = 1 - p$ since, as seen before, the cost of crime is decreasing with ϕ . When

$\beta > p$, it can be easily shown that $\tilde{\pi}_{z,p}$ is strictly larger than pS_a , as

$$F(m_z(\rho))(zpS_a + (1-z)\beta S_a) + (1-F(m_z(\rho)))pS_a > \\ F(m_z(\rho))(zpS_a + (1-z)pS_a) + (1-F(m_z(\rho)))pS_a = pS_a.$$

Hence, the cost of crime under a policy such that $\phi \geq 1-p$ is larger than the cost of crime under a policy that grants $\phi \in [1-\beta, 1-p)$. Hence, the optimal leniency for the official maximizes $\tilde{\pi}_z$ — i.e., \tilde{m}_z that solves condition (5.5).

Obviously, setting $\phi < 1-\beta$ is not optimal. In this case, the fellow remains loyal to the boss even when the official is corrupt and willing to self-report (given that $\rho \geq 1-q$). Hence, since the boss can count on the fellow's loyalty while the official self-reports, bribery is never profitable: the corresponding cost of crime is pS_a , which is smaller than the cost of crime induced by the policy \tilde{m}_z .

Finally, we show that $\rho < 1-q$ is not optimal. Consider the subgame in which the official is corrupt. If the official does not self-report, the fellow does not blow the whistle regardless of ϕ . Hence, the boss' decision as to whether bribe or not the official depends on whether the fellow blows the whistle in the subgame without corruption. If $\phi < 1-p$ so that the fellows does not blow the whistle, the boss does not bribe the official, so that the ex ante cost of crime is pS_a , which is smaller than the cost of crime induced by the policy \tilde{m}_z . If $\phi \geq 1-p$ the fellow blows the whistle in the subgame without corruption, thus the boss bribes the official with moral cost $m \leq S_p - qS_o$. Notice that in this case there will be more corruption than \tilde{m}_z , but it can be easily shown that the cost of crime is lower than that induced by the policy $\phi = 1-p$ and $y = \tilde{m}_z$. In fact, when $\rho < 1-q$: (i) the official's reservation bribe is cheaper, since the official does not bear any risk of being sanctioned; (ii) the boss subverts the law more often (since he can afford bribing more officials); (iii) the fellow's reservation wage is lower since the official does not self-report.

To conclude the proof note that by the Envelope Theorem it is immediate to show that the crime rate is decreasing in z since $\beta > p$. ■

Proof of Proposition 6. Setting $\phi = 1-p$, it follows immediately that policy (i) has to be preferred to policy (ii) if and only if

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

which is always true as long as $\beta - p > 0$.

Hence, in this region of parameters, the optimal policy is either that described in Proposition 3 if

$$h(m(1-q)) < (\beta-p) S_a, \tag{.4}$$

or it requires a minimal amount $m(1-q)$ of corruption in equilibrium. Hence, the condition for subversion of law to deter crime becomes tighter. When condition $\beta > p$ does not hold, the optimal strategy for the Legislator is (i) with $\rho = 1-q$, if and only if

$$(p-\beta) S_a \leq \mathbb{E}[m|m \leq m(1-q)] + \frac{1-F(m(1-q))}{F(m(1-q))} + \beta S_p + qS_o.$$

To complete the proof we need to show that setting $\rho < 1-q$ is not optimal. Indeed, the Legislator is better off by setting $\rho = 1-q$. In this case, corruption occurs when $m \leq m(1-q) \equiv (\alpha-\beta)S_p - qS_o$; when, instead, $\rho < 1-q$ corruption occurs for $m \leq \bar{m} \equiv \alpha S_p - qS_o$, with $m(1-q) < \bar{m}$. Hence, we

need to show that the cost of crime at $\rho = 1 - q$ is larger than that at $\rho < 1 - q$ — i.e.,

$$\begin{aligned} \int_0^{m(1-q)} (m + qS_o) dF(m) + F(m(1-q)) (\beta(S_a + S_p)) + \\ + (1 - F(m(1-q))) [(1 - \phi)S_a + \alpha S_p] > \\ \int_0^{\bar{m}} (m + qS_o) dF(m) + (1 - F(\bar{m})) ((1 - \phi)S_a + \alpha S_p). \end{aligned}$$

Rearranging terms this inequality can be rewritten as

$$\begin{aligned} \int_0^{m(1-q)} \beta(S_a + S_p) dF(m) + \\ + \int_{m(1-q)}^{\bar{m}} [(1 - \phi)S_a + \alpha S_p] dF(m) + \\ - \int_{m(1-q)}^{\bar{m}} [m + qS_o] dF(m) > 0, \quad (.5) \end{aligned}$$

which is always satisfied since, by definition,

$$m + qS_o < (1 - \phi)S_a + \alpha S_p.$$

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 (.5)) 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 (.5)) and by the domino effect when the corrupt official self-reports (first term of condition (.5)). ■

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