

Accomplice Witnesses, Organized Crime and Corruption: Theory and Evidence from Italy*

Antonio Acconcia[†] Giovanni Immordino[‡] Salvatore Piccolo[§] Patrick Rey[¶]

June 19, 2009

Abstract

The optimal accomplice-witnesses regulation is characterized in a model with hierarchical criminal organizations and corruption. We identify the determinants of the optimal amnesty rate and show that such a policy stifles incentives for crime as well as corruption. We argue that rewarding informants is sometimes necessary to fight organized crime and show how the optimal amnesty rate varies with the effectiveness of the witnesses-protection program, the reliability of the informants' testimonies and the degree of trust and cohesion between the members of the organizations. The implications of our analysis are tested by exploiting a quasi-experimental panel data set, relative to 95 Italian provinces. The evidence allows to identify the positive effect of the policy on prosecution as well as its deterrence effect on crimes. Moreover, by using data on the number of accomplices we also underscore the positive impact of the policy on corruption prosecution.

Keywords: Accomplice-witnesses, Criminal Organizations, Leniency, Whistle-Blower.

*We are indebted to Ran Abramitzki, Orazio Attanasio, Ciro Avitabile, Dimitrios Christelis, Roberta Dessi, Luigi Guiso, Tullio Jappelli, Jakub Kastl, Riccardo Martina, Marco Pagano and Giancarlo Spagnolo for many useful insights, as well as to participants to seminars in Naples, Milan and Stanford for their comments. Many discussions with Marco Antonucci serving as captain in the Guardia di Finanza (Italian Customs Police) helped the project development at its early stages. Finally, we are grateful to Iolanda Barone whose help at the data collection stage was invaluable.

[†]Università Federico II di Napoli and CSEF.

[‡]Università di Salerno and CSEF.

[§]Università Federico II di Napoli, CSEF and Toulouse School of Economics (GREMAQ).

[¶]Toulouse School of Economics (GREMAQ and IDEI).

1 Introduction

Since the pioneering work by Becker (1968), organized crime has attracted considerable attention by economists, and for good reasons. The diffusion of organized crime has forced governments to reform their legal and judicial systems in an attempt to strengthen deterrence and investigation agencies. These reforms have often promoted the approval of special laws changing the rules according to which sanctions and imprisonment policies are settled for ‘Mafia’ members. Among them ‘accomplice-witnesses regulations’ (also known as leniency programs), which are designed to encourage former mobsters to cooperate with prosecutors in exchange of reduced sanctions, are perhaps the most relevant.¹

Our paper has two main goals. First, in order to shed light on the determinants of accomplice-witnesses regulations, we study a model with hierarchical criminal organizations and corruption, where low-rank criminals can enjoy reduced sanctions as long as they cooperate with the justice. Second, by using evidence collected for Italy, we test the impact of the leniency laws approved in 1991 on crime rates and corruption. In line with our theoretical predictions, the evidence shows that these laws did affect in a significant manner mafia and corruption crimes in those Italian regions where the mafias have been historically more pervasive.

Corruption and organized crime are two connected phenomena, the spreading of corruption into the public domain has been the natural response of organized crime to stricter law-enforcement policies. Until mid 1980s, for instance, intimidating and bribing prominent politicians, public officials and prosecutors, worked out quite successfully in avoiding prosecution or convictions of several dangerous Italian mobsters, such as the heads of the *corleonesi* family Luciano Liggio, Bernardo Provenzano and Totò Riina.

In this paper we study the link between accomplice-witnesses regulations and the collusive relations between criminal organizations on one hand, and politicians and public officials on the other. We build the analysis on the simple idea that when individuals have the potential to engage in socially costly activities that lower the probability of being punished, setting fines as high as possible may not be a good idea. Such activities, like lobbying politicians or corrupting public officials to relax enforcement of regulations generate a phenomenon known as ‘avoidance’ (Malik, 1990) or ‘subversion of law’ (Glaeser and Shleifer, 2003).² An increase in the punishment encourages socially costly activities: for instance, a too high fine may deter crime, but it will encourage corruption.

¹These programs are nowadays in place in most developed countries. In Italy, for instance, more than 1,000 former criminals were taking part in the accomplice-witnesses protection programme in 1999. In the same year around 100 millions euros were spent for this program.

²See also Bowles and Garoupa (1997).

A natural question to address is then whether there exist deterrence mechanisms stifling at the same time crime and corruption. We argue that accomplice-witnesses regulation can play such a role. Think, for instance, of a criminal who may try to bribe a public official to avoid a sanction or, if a leniency program is in place, may obtain a ‘discount’ on his sanction in exchange for reporting evidence that frames the rest of the criminal organization. Then, the leniency program will induce to substitute corruption with a potentially beneficial activity.

We consider a simple economy populated by a benevolent Legislator, a criminal organization and a continuum of public officials. The Legislator, having forbidden welfare reducing criminal acts, decides whether to launch a leniency program and, accordingly, sets the amnesty granted to informants. The criminal organization is formed by two mobsters: a principal (boss) and an agent (*picciotto*), each with specific skills. The agent – the ‘arm’ of the organization – commits the crime, while the boss – the ‘mind’ – is in charge of bribing public officials, which participate, and can thus influence, the prosecution phase.

In this framework we show that granting amnesty to former criminals willing to cooperate with the justice has two effects on the crime rate. First, it encourages entry into the illegal business by lowering the agent’s expected sanction. Intuitively, a criminal expecting to face a lower sanction is more willing to accept a lower wage from his boss: this brings out the dark side of leniency programs. Second, the recognition of amnesties to criminals willing to cooperate with the justice exacerbates conflicts within criminal organizations: larger amnesties may induce criminals under investigation to cooperate with the justice, whereby mitigating the beneficial effect of corruption on the boss’s prosecution risk: the bright side of leniency programs.

The analysis robustly shows that the introduction of a leniency program stifles both the crime and the corruption rates. We identify the determinants of the optimal amnesty rate granted to informants and show that rewards are sometimes necessary to fight organized crime when the prosecution stage is not very effective, when criminal organizations feature a small degree of cohesion between their members and when the information provided by accomplice-witnesses has a valuable investigative content. The available historical evidence offers ample support to this result which, indeed, provides a rationale for the reform of the accomplice-witnesses program approved in February 2001 by the Italian Parliament: This law changed the former system by strengthening the criteria for the eligibility in the program and making the amnesty contingent on the information provided by the accomplice-witnesses.³

³This reform introduced a preliminary period of six months during which the accomplice witness has to reveal all the relevant information he owns; and only after this period, and upon an evaluation about the reliability of such information, he can be eligible for the program.

To test our theoretical predictions we exploit a quasi-experimental panel data set, relative to 95 Italian provinces, relying on the leniency and accomplice-protection program introduced by the Italian legislator in 1991. The program guarantees lower fines and protection to accomplices who provide useful information to contrast the activity of various mafias and their external complicity. Three main empirical predictions are tested.

First, the theoretical analysis implies that for a given ‘stock’ of crimes committed, the introduction of a leniency program should generate an increment in the number of mafia crimes prosecuted. Hence, the leniency program should increase the number of prosecutions for mafia. The evidence corroborates this prediction. Second, the main implication of our theoretical model is the indirect deterrence effect of leniency on mafia related crimes. Our key insight underscores that, by increasing the prosecution rate, the introduction of an optimal leniency policy hampers the propensity to misbehave. The empirical evidence robustly shows that the number of mafia-related murders have decreased after the introduction of leniency. Finally, since in practice accomplices may also reveal information on the relationship of mafia affiliates with public officials, we argue that prosecutions against corruption should be explained, at least partly, by the number of mafia accomplices who join the protection program. We set up an instrumental variable procedure relying on information about the number of witnesses of mafia related crimes, to identify the positive sign of the correlation between measured corruption and accomplices which suggests that the direct effect of the introduction of the leniency program on the rate of prosecution against corruption overcomes its deterrence effect.

After this Introduction, Section 2 provides an overview of organized crime, corruption and accomplice-witnesses regulations in Italy. Section 3 sets up the model. In section 4, the interaction between crime and corruption is analyzed and the main propositions are presented. Section 5, presents the evidence from Italy. Section 6 surveys the related literature and discusses some implications of the results obtained. Section 7 concludes. All proofs are in the Appendix.

2 The Italian experience: historical overview

The Italian experience offers a shining example of the revolutionary role played by accomplice witnesses in the fight against organized crime. In this section we report some evidence about Italian criminal organizations and their history which offer ample support to our theoretical approach and is consistent with the empirical results presented in Section 5.

2.1 Criminal organizations and leniency in Italy

Criminal organizations have historically characterized some areas of Italy. In 1982, the Italian Legislator recognized the pervasive role of ‘mafia-type criminal associations’ through the article 416-bis of the Penal Code: as stated by its third clause, the typical methodology of the mafia association is “the exploitation of the force of intimidation of the associative tie and of the condition of subjugation and silence (*omertà*) which derives from it”. Since then, people may be prosecuted because of being members of mafia families.⁴

From 1982 to 2001, the new offence determined the convictions of 5,443 Italian citizens. Data at regional level shows that 5,069 individuals, that is more than 93% of the total number of convicted mobsters, were sentenced by Courts having jurisdiction within 4 out of 20 Italian regions. Sicily and Campania are the regions with the highest number of convictions, followed by Puglia and Calabria (Table 1).⁵ These regions are historically troubled by different mafia groups: the Camorra in Campania, the ‘Ndrangheta in Calabria, the Sacra Corona Unita (SCU) in Puglia, and the Mafia in Sicily.⁶ Each group consists of a number of mafia associations, the most ‘famous’ being Cosa Nostra in Sicily and Casalesi in Campania.

Table 1: CONVICTIONS FOR MAFIA AFFILIATION

	Number of people convicted				
	1982-1991	1992-1996	1997-2001	1982-2001	
Campania	970	332	420	1722	31.7%
Calabria	150	168	229	547	10.0%
Puglia	35	245	396	676	12.4%
Sicily	229	681	1214	2124	39.0%
Rest of Italy	61	202	111	374	6.9%
Total	1445	1628	2370	5443	100.0%

The strength of the Italian criminal organizations, as well as their increasing influence on the legal economic activity, rest on the diffuse external complicity, namely, the growing

⁴A number of common crime offences constitutes the illicit activity of a criminal association (for instance, illicit traffic of drugs, loan sharking, murder, and extortion). However, the crime offence designated as mafia association refers to the possibility to induce fear in one’s behavior through the force of intimidation of the entire organization. Thus, a common crime offence like the extortion is considered in a different way in the sentencing if it is committed using mafia intimidation. Moreover, also a licit goal may be prosecuted if it is achieved through the force of subjugation.

⁵The strong concentration of convictions within those regions also emerges if we look at subperiods of the sample investigated.

⁶In the following we sometimes refer to those regions as core-regions.

relationships between various bosses and public officials like national or local politicians, judges, public local administrators and members of the police force (Dickey, 2004).

In order to break down *omertà* and weaken external complicities, the Italian Legislator reacted by setting harsher punishments for mafia affiliates and, at the same time, by granting full or partial amnesty to those accomplices who provide information leading to further mafia prosecutions or revealing external complicity. Actually, after an intense political debate, in 1991 the Legislator designed the accomplice-witness protection program, aimed at taking care of those who endanger themselves because of the information provided to the judicial authority (D.L. 15/01/1991 n. 8), and introduced a leniency policy that granted lighter sentences for the peculiar crime of mafia affiliation in exchange of relevant testimonies in the mafia trials (D.L. 13/05/1991 n. 152).⁷

Table 2: FORMER MAFIA AFFILIATES AND CONFISCATION

	Accomplice		Confiscation	
	2006		1992-2007	
Camorra	245	31%	3,018	52%
'Ndrangheta	99	12%	308	5%
SCU	82	11%	190	3%
Sicilian Mafia	250	32%	1,878	32%
Others	114	14%	431	7%
Total	790	100%	5,826	100%

Note: Accomplice denotes the number of former mafia accomplices who were taking part the protection program at the end of 2006. Confiscation denotes the value (million of euros) of total assets confiscated.

Table 2 reports the 2006 distribution of former mafia affiliates who were taking part in the protection program (they are grouped on the basis of the criminal association they provided information about). On the whole, 676 out of 790 accomplices, that is 86% of the total, revealed relevant information about the four mostly known mafia associations; the Sicilian mafia and the Camorra are each interested by roughly one third of total dissociates. The relevance of the above criminal associations also comes out when considering the distribution of the amount of illegal proceeds confiscated. Table 2, second column, shows that the 93%

⁷These programs provide for the health, safety, and welfare of informants and their families; in some cases they even grant rewards by securing minimum wages, housing and other financial needs. The ability of a witness to give testimony in a judicial setting or to cooperate with law enforcement investigations without fear of intimidation or reprisal is essential to maintaining the rule of law. Police officers, prosecutors, and defence advocates tend to agree that ‘flipping’ criminals had often chosen to accept the penalties for not testifying rather than risk serious injury. The regulatory regime relative to the accomplice-witness protection program has been modified in February 2001 (L. 13/02/2001, n. 45).

of total proceeds confiscated is relative to Camorra, Sicilian mafia, 'Ndrangheta, and SCU. As for the number of accomplices, the Camorra and the Sicilian mafia are those mostly interested by the effect of the confiscation laws.

2.2 The roots of accomplice-witnesses

The first Mafia member acknowledging the existence of 'Cosa Nostra' was Joseph Valachi; his testimony was key for the opening of the first important Italian Mafia trial in 1967. In the 1970s another two Mafia fellows, Beppe Di Cristina and Leonardo Vitale, publicly talked about the existence of a group of people from the town of Corleone – among which Vito Ciancimino, Luciano Liggio, Bernardo Provenzano and Totò Riina – leading illicit traffics in Sicily. Yet, Tommaso Buscetta is widely recognized as the first important former criminal breaking *omertà* in Italy. During the 1980s he helped the judges Giovanni Falcone and Paolo Borsellino to achieve significant successes in the fight against organized crime. He was the key witness in the Maxi Trial that led to almost 350 Mafia members being sent to prison. Buscetta revealed information about the existence and workings of the 'Sicilian Mafia Commission'.⁸ His intense cooperation enabled Falcone to argue that Cosa Nostra was a unified hierarchical structure ruled by a Commission, and that its leaders could be held responsible for criminal activities that were committed to benefit the organization. This premise became known as the 'Buscetta theorem' and was at the root of the Maxi Trial sentence in January 1992. His testimony in the 'New York Pizza Connection Trial' in the mid-1980s also allowed the conviction of hundreds of mobsters in Italy and the United States. As a reward for his help, Buscetta was allowed to live in the USA under a new identity in the Witness Protection Program.

Before the 1990's, there were very few, albeit significant, pentiti following Buscetta's example.⁹ However, this changed significantly during the early 1990's, especially from 1991 when, thanks to the successes of Falcone's group, the Italian Legislator introduced the accomplice-witnesses protection program. Since then, over a thousand mafiosi have agreed to collaborate with Italian justice not only in Sicily. For instance the information provided by the Camorra fellows, e.g., Carmine Alfieri, Domenico Bidognetti, Guglielmo Giuliano and Carmine Schiavone, also deeply supported the Antimafia activity in Campania.

Yet, the program has produced less enthusiastic results in Calabria; there are relatively

⁸The Commission is a body of leading Mafia members deciding on important questions concerning the actions of, and settling disputes within the Sicilian Mafia.

⁹For instance, the collaboration of Francesco Mannoia was extremely important because he was the first pentito that came out from the winning family of the second mafia war. Salvatore Contorno, also played a key role in the Palermo Maxi Trial.

few Calabrians who have opted out to become a pentito.¹⁰ This puzzle seems to rest on the peculiar organizational form of the 'Ndrangheta, which shows a greater cohesion between its members relative to the other Italian criminal organizations. The principal difference with Cosa Nostra and Camorra is in recruitment methods. The 'Ndrangheta recruits members on the criterion of blood relationships resulting in an extraordinary cohesion within the family clan that presents a major obstacle to investigation. Sons of 'ndranghetisti are expected to follow in their father's footsteps, and go through a grooming process in their youth to become boys of honor before they eventually enter the ranks as men of honor (Paoli, 2003).

2.3 Mafia trials: the role of accomplice-witnesses

The first important Italian trial against the Sicilian Mafia opened in 1967 and regarded its growing involvement in the international heroin trade. The trial, which was based on the little evidence provide by Joseph Valachi, ended one year later with the acquittal of all defendants. In the same period judge Cesare Terranova sent to trial 114 defendants, whereby the 'Trial of the 114', supporting the view that the crimes and those accused of carrying them out were all linked and should be treated as an organized body. The defendants were accused of crimes relating to the first mafia war, the charges including multiple murder, kidnapping, tobacco smuggling, theft, public massacre and organized crime (on the first mafia war see Gambetta, 1992). The trial opened in December 1967 and lasted until December 1968. It only resulted in ten convictions, with several of those being just for organized crime.

The third trial began in February 1969. There were sixty-four defendants, all from the town of Corleone. The charges related to a mafia war in Corleone that started in 1958, and resulting in over fifty murders. There was significant evidence tampering during the trial, which experienced the first public intimidation act. In fact, as the jury retired in July, they and the judge received an anonymous note that read: "To the President of the Court of Assise, and members of the Jury: You have not understood, or rather, you don't want to understand, what Corleone means. You are judging honest gentlemen of Corleone, denounced through caprice by the Carabinieri and Police. We simply want to warn you that if a single gentleman from Corleone is convicted, you will be blown sky high, you will be wiped out, you will be butchered and so will every member of your family. We think we've been clear. Nobody must be convicted. Otherwise you will be condemned to death - you and your families. A Sicilian proverb says: 'A man warned is a man saved'. It's up to you. Be wise". All sixty-four defendants were acquitted. Whilst there was undoubtedly witness intimidation and evidence tampering, a lot of the evidence was fairly thin. There were no 'pentiti' at the time and few non-Mafiosi willing to risk death by testifying for the

¹⁰At the end of 2002, there only were 157 Calabrian in the protection program.

prosecution.

During the early 1980s, the Corleonesi boss Totò Riina decimated other Mafia families, resulting in hundreds of murders, including several high-profile authority figures such as Carlo Alberto Dalla Chiesa: a period known as the second mafia war. The growing public revulsion at such killings provided the necessary premise to the ‘Palermo Maxi Trial’, whose preliminary phase was headed by judges Giovanni Falcone and Paolo Borsellino. Never before in the history of Italy so many Mafiosi were on trial at the same time. A total of 474 defendants were facing charges, which included 120 murders, drug trafficking, extortion and, of course, the new law that made it an offence to be a member of the Mafia. Most of the crucial evidence came from Tommaso Buscetta and Salvatore Contorno. The trial ended on December 1987, almost two years after its beginning. Of the 474 defendants 360 were convicted; 2,665 years of prison sentences were shared out between the guilty, not including the life sentences handed to the nineteen leading Mafia bosses and killers.

The major Italian trial against organized crime not involving Sicilian mobsters was the ‘Spartacus Maxi Trial’, which was specifically directed against the activities of the powerful Casalesi clan of the Camorra and its boss Francesco Schiavone. The trial was opened on July 1998 and continued until June 2008, when its final verdict was read. The 10-year legal trial charged 36 members of the clan with a string of murders and other crimes. All were found guilty and 16 sentenced to life imprisonment including the Casalesi bosses Francesco Schiavone and his chief lieutenant, Francesco Bidognetti. More than 500 witnesses and 25 accomplice-witnesses testified in the trial which saw a total of 700 years of imprisonment with nearly 6 billions euros confiscated to the defendants by the Italian Financial Police and Customs Police (Anselmo and Braucci, 2008).

2.4 Mafia and corruption

Corruption scandals have emerged throughout the history of the Italian state. The existence of deep links between the mafias and institutional figures, such as influent politicians, public officials and prosecutors, used to be a fact of life in Italy (see, for instance, Gambetta, 1992). In the 1970s many Sicilian authorities – whether out of naivety or otherwise – publicly denied the existence of the Mafia¹¹, and in fact it was not until 1982 that being a member of the Mafia became a formal crime.

Mafia associations frequently tried to manipulate court decisions by bribing, threatening, and, occasionally, even murdering judges and prosecutors. Tommaso Buscetta was the first to elaborate in great detail the hidden exchanges that linked politicians and the Sicilian

¹¹For example, both Erasmo Garruccio, mayor of the town of Trapani, and Franco Spagnolo, mayor of Palermo, publicly denied the existence of the Sicilian Mafia (see Lodato, 2007).

mafia.¹² On November 1992, he testified in front of the Antimafia Commission about the links between Cosa Nostra and Salvo Lima. He indicated Lima as the contact of the Mafia in Italian politics. “..Lima was, in fact, the politician to whom Cosa Nostra turned most often to resolve problems for the organization whose solution lay in Rome..” Buscetta testified. He also claimed that Lima was killed on March 1992 because he had outlived his usefulness. On January 1992 an appeal court had upheld the convictions of dozens of mobsters after a team of anti-mafia judges had taken control of the case. Lima had originally wished to appoint a judge of his own choice, instead, Giovanni Falcone had taken charge of the appeal and confirmed the sentences of many mobsters. Lima was therefore of no further use to the Mafia.

The first important example of an Italian politician convicted for Mafia membership was Vito Ciancimino. In 2001 he was declared guilty of being involved in several Mafia-linked crimes. Giulio Andreotti, a prominent Italian politician of the centrist Christian Democratic party, was investigated for alleged ties to the Mafia. In 2003 the court of Palermo acquitted him of ties to the Mafia. But, as reported by *The Independent* (26 July, 2003) “.. although Mr. Andreotti’s acquittal on charges of conspiring with the Mafia was upheld by appeal judges in Palermo, they said for many years Mr. Andreotti had enjoyed ‘authentic, stable and amicable’ relations with Mafiosi”. Between 1991 and 1999, more than half of the deputies of the Sicilian regional Parliament and 17 Sicilian deputies of the national Parliament were charged of mafia association and corruption.

There are various examples of opaque relationships between judges, public prosecutors and the Mafia. For instance, Corrado Carnevale became famous for his alleged, but never proved, collusion with the Mafia. Cases of corruption also involved members of the Italian police forces and intelligence services.¹³ 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 the testimony provided by the informant Gaspare Mutolo and many others, Contrada was accused of informing the Mafia for upcoming police operations, whereby preventing an early capture of the fugitive Totò Riina.¹⁴

¹²He stated: “..It is not Cosa Nostra that contacts the politician; instead a member of the Cosa Nostra says, that president is mine (è cosa mia), and if you need a favor, you must go through me. In other words, Cosa Nostra maintains a sort of monopoly on that politician. Every family head in the Mafia selects a man whose characteristics already make him look approachable. Forget the idea that some pact is reached first. On the contrary, one goes to that candidate and says: Onorevole, I can do this and that for you now, and we hope that when you are elected you will remember us. The candidate wins and he has to pay something back. You tell him: We need this, will you do it or not? The politician understands immediately and acts.”

¹³See the recent books by the public prosecutors Ayala (2008), Anselmo and Braucci (2008) and Cantone (2008).

¹⁴“Audizione del collaboratore di giustizia Gaspare Mutolo”, Antimafia Commission, February 9, 1993.

3 The model

Players and environment: Consider an economy populated by a benevolent Legislator, a criminal organization and a continuum of public officials. The Legislator, having forbidden welfare reducing criminal acts, designs an accomplice-witnesses program. The criminal organization is formed by a boss and a fellow, each with specific skills. The fellow (agent) is the ‘arm’ of the organization and commits the crime¹⁵, the boss (principal) is the ‘mind’ and is in charge of bribing public officials, which are able to influence the prosecution process of criminals infringing the law.¹⁶

The crime yields a revenue R which is stochastic and is drawn from the compact support $[0, \bar{R}]$, according to cumulative distribution function $F(R)$. The crime harms the rest of society by h , with $h > \bar{R}$ so that it is socially detrimental. The principal hires the agent after having observed the realization of R , he has full bargaining power and makes a take-it or leave-it offer. The criminal contract entails a wage w that is paid by the principal to the agent after the crime is committed but before the investigation takes place. For simplicity, we standardize the agent’s outside option to zero.

Corruption: Once the crime is committed, an investigation opens with probability α . For simplicity, assume that there are two types of public officials that may be in charge of the judicial and investigative process: *strong* officials, which cannot be corrupted, and *weak* officials, which are willing to accept a bribe b in exchange of acquitting the organization.¹⁷ The ‘reservation bribe’ b , can be either regarded as a measure of the honesty of weak officials or as the intimidation power of the boss. There is an overall measure 1 of officials in the economy, a fraction β of which is strong. The official’s type is observed only by the principal but not by the agent, who is not aware of the hidden links between the boss and law enforcers.¹⁸ The corruption stage takes place after the investigation has started and the

¹⁵These are the bottom of the chain of command: the *picciotti d'onore* or soldiers, who are expected to perform tasks with blind obedience until they are promoted to the next level, where they will be granted command over their own group of soldiers.

¹⁶In our setting, public officials can be either prosecutors, heading the prosecution phase, or they can also be members of the police force, whose investigative effort heavily influence the probability of convicting a defendant.

¹⁷Having a continuum of types would not add novel insights to the analysis. In that case, even though the fraction of strong and weak officials will be endogenously determined at equilibrium by the indifference condition between accepting the bribe and refusing it, the main effect of leniency on the fraction of informants, and thus on welfare, will be the same as the one illustrated in what follows.

¹⁸The available historical evidence offers ample support to this hypothesis. For instance, security concerns have led to the creation in the 'Ndrangheta of a secret society within the secret society: La Santa. Membership in the Santa is only known to its members. Bosses belonging to the Santa have the precise objective to establish close connections with state representatives, simple soldiers are unaware of these connections.

official's type is observed by the principal before the trial opens.

Legal regimes: There are two legal regimes, with and without leniency:

- **No leniency:** if the public official has not been bribed, the agent is convicted with probability p and bears the sanction S_a , the principal is convicted with probability $\underline{\theta} \leq p$ and bears the sanction S_p . This assumption simply reflects the idea that convicting the boss (i.e., the crime instigator) in the absence of testimonies is less likely than convicting the agent who has materially committed the crime. Otherwise, both mobsters are acquitted.
- **Leniency:** after the investigation starts, the agent can opt to cooperate with the justice, whereby testifying against his boss. The prize for this cooperation is an amnesty ϕ on the sanction S_a . If the agent cooperates, the boss bears the sanction S_p with probability $\bar{\theta}$, irrespective of the official's type.¹⁹ According to the historical evidence reported in Section 2.3, we shall assume that $\bar{\theta} \geq \underline{\theta}$. Generally, there can be no conviction solely on the basis of what is attested by an accomplice witness, there must be evidence from an unrelated source to corroborate the witness's testimony; therefore, we interpret $\bar{\theta}$ as a measure of the reliability of the informant.²⁰

Trial-reluctance, cohesion and retaliation costs: Only after the investigation is launched, the agent discovers his reluctance (δ) to face the trial. This parameter is drawn from the compact support $[\underline{\delta}, \bar{\delta}]$, according to the atomless and twice continuously differentiable cdf $G(\delta)$. There are various interpretations for this parameter. Differences in δ could be either due to psychological costs resulting from the fear and apprehension of imprisonment, which materialize only when the agent is about to face the trial;²¹ or, they might

However, as it will become clear soon, assuming that the official's type is observed both by the principal and by the agent does not add new key insights to our characterization of the optimal policy. In that case, the agent's reporting strategy depends on the official's type: only if the official is strong the agent will eventually report evidence against the boss. In this case the main trade-off at stake is the same as that we shall illustrate in what follows: A more lenient policy makes agents facing strong officials more willing to cooperate.

¹⁹We assume that once the agent decides to cooperate, even a corrupted official cannot manipulate the trial's outcome. This is consistent with the evidence discussed in Section 2. The murder of Salvo Lima, as argued by Buscetta, is an example where the corruption mechanism was broken by the will of Buscetta and Contorno to testify against their former partners.

²⁰This parameter might measure the status of the informant into the organization or its proximity to the leader: the higher levels of these hierarchies are a more reliable source of information than simple 'soldiers' who typically execute orders blindly.

²¹In mafia trials imprisonment of defendants is often mandatory even before the definitive verdict for precautionary reasons. And the trial can be very long depending on the importance of the charges and the number of defendants (the Spartacus Maxi Trial, for example, lasted ten years).

reflect those emotional costs the mobster incurs in when he realizes that the trial will have serious consequences on his relatives (e.g., children) by publicly attaching to their family name the ‘Mafia stigmata’.²²

Otherwise, as observed by judge Falcone (1991), the will of a mobster to cooperate could also reflect an unanticipated low degree of trust and cohesion inside the organization. For example, internal fights between formerly allied clans and partners (see Gambetta, 1992, pg. 162) might bring the losers to have their revenge by cooperating with the justice rather than facing the trial and then eventually seek the fight on the military ground.²³

We also assume that criminal organizations seek to punish whistle-blowers, a feature that we model with the retaliation loss L suffered by the informant. As explained earlier in Section 2, the ability of a witness to give testimony in a judicial setting or to cooperate with law enforcement investigations without fear of intimidation or reprisal is essential to maintaining the rule of law. Increasingly, countries are enacting legislation or adopting policies to protect witnesses whose cooperation with law enforcement authorities or testimony in a court of law would endanger their lives or those of their families. This is why, in the comparative statics analysis, we shall interpret a lower loss L as the result of better witness protection programs.

Timing: We follow the literature in assuming that the Legislator announces the amnesty rate ϕ first.²⁴ Upon observing the policy, the boss and the fellow interact in the criminal game. The sequence of events unfolds as follows:

t=0 The Legislator decides whether to launch a leniency program and accordingly commits to an amnesty rate ϕ .

t=1 Uncertainty about R resolves and the organization decides whether to commit the crime. Once the crime is committed, the principal pays the wage w to the agent.

²²According to judge Lia Sava, many informants decide to talk for the sake of their children well being: for instance, Giusy Vitale and Carmela Iuculano have decided to talk mainly because they did not want their sons to experience the same destiny (imprisonment or even premature death) of their brothers and fathers (Narcomafie, dossier n. 10, October, 2005 – available at http://www.narcomafie.it/articoli_2005/dos_10_2005.htm). Similarly, when asked about the motivations behind his cooperation, Calogero Ganci, one of Falcone’s and Dalla Chiesa’s killers, testified “...I will talk in order to guarantee a better future to my children...” (Lodato, 2006, pg. 402). Relatives of publicly known Mafia members are also often subject to discrimination on the labor market. For instance, in an interview with an Italian newspaper, the daughter of the boss Totò Riina complained of being often discriminated at the job application stage simply because of her last name (Repubblica, 28 January, 2009).

²³The testimonies of Buscetta and Contorno against the Corleonesi were an example of the revenge role played by the leniency program. However, this was not always the case, the informants Francesco Mannoia and Calogero Gancia were both former members of the winning Corleonesi family.

²⁴Motta and Polo (2003), Spagnolo (2003) and Rey (2003).

t=2 With probability α an investigation opens: the public official in charge is strong with probability β and weak with probability $1 - \beta$. In the latter case, the principal decides whether to bribe him. This decision is not observed by the agent.

t=3 If a leniency program is in place, the agent decides whether to cooperate with the justice. Depending on the legal regime, the trial uncertainty resolves, and sanctions (including the retaliation loss) are imposed.

In the Appendix we provide a more detailed illustration of the game tree.

Actions and equilibrium concept: An action profile for the principal involves a wage offer w and a corruption choice $x \in \{0, 1\}$, where $x = 1$ if a weak official is bribed and $x = 0$ otherwise. An action profile for the agent involves a participation rule, which depends on the difference between the wage and his expected sanction, and a confession decision $y \in \{0, 1\}$, where $y = 1$ if the agent cooperates and $y = 0$ otherwise, which will depend on his type δ . The Legislator simply announces ϕ . We shall look for the subgame perfect Nash equilibrium (SPNE) of this game.

Technical assumptions: The analysis will be conducted under the following simplifying restrictions:

A1 Corruption is viable at least in the regime with no leniency:

$$b \leq \underline{\theta} S_p. \quad (\mathbf{A1})$$

This assumption entails no loss of insights and is consistent with the historical evidence described in Section 2. Essentially, in the absence of a leniency program, the principal prefers to bribe a weak official as long as his expected sanction from the trial exceeds the cost of corruption.

A2 Monotone and (strictly) increasing hazard-rate:

$$\frac{g(\delta)}{1 - G(\delta)} > \frac{g(\delta')}{1 - G(\delta')}, \quad \text{for each } \delta > \delta'. \quad (\mathbf{A2})$$

As shown in the Appendix, **A2** ensures that the Legislator's program is single peaked. It implies an increasing and monotone hazard-rate and is typically imposed in economic applications.²⁵

²⁵For instance, the uniform and the Burr type XII distributions satisfy **A2**.

A3 A positive fraction of agents will cooperate in equilibrium:

$$g(\underline{\delta}) < \frac{1}{(\bar{\theta} - \beta\underline{\theta})S_p}. \quad (\mathbf{A3})$$

Restricting the analysis to this region of parameters rules out the uninteresting case where no agent talks in equilibrium. Also this restriction can be easily satisfied by the most standard distribution functions.

Finally, following the literature, all sanctions will be interpreted as monetary equivalent of the corresponding imprisonment terms. This assumption is made only for the sake of simplicity. Our insights readily extend to non-monetary sanctions as long as the social cost of imprisonment is not excessively large so that an internal amnesty is still optimal.²⁶

4 Equilibrium characterization

In this section we characterize the equilibrium of the game, with and without leniency. The main goal is to derive empirical predictions on the link between leniency, corruption and crime rates, which will be tested in Section 5.

4.1 No leniency

We begin by describing the solution of the game in the absence of leniency. This is the simplest case to analyze. In fact, once the investigation opens, the agent has no options: he has to face the trial. Yet, at the corruption stage, the principal has the option of bribing the weak official as long as the bribe b is not excessively large. At this stage his payoff is:

$$v(x) = \begin{cases} -b & \text{if he bribes the official } (x = 1), \\ -\underline{\theta}S_p & \text{if does not } (x = 0). \end{cases}$$

Then, the bribe b will be paid if it falls short of the expected sanction $\underline{\theta}S_p$ from the trial. As discussed earlier, this condition is met under **A1**. The principal's expected profit is then:

$$u = R - w - \alpha(\beta\underline{\theta}S_p + (1 - \beta)b),$$

where w is the expected wage that the principal pays to the agent for his participation into the criminal business:

$$w = \alpha(p\beta S_a + E[\delta]), \quad (1)$$

²⁶See Garoupa (1997) for an overview on optimal law enforcement with non-monetary sanctions.

where

$$E[\delta] = \int_{\underline{\delta}}^{\bar{\delta}} \delta dG(\delta),$$

is the expected cost that the agent bears from the trial, while $p\beta S_a$ is the agent's expected sanction.²⁷ In summary, condition (1) simply pins down the wage that equalizes the expected utility of the agent to his reservation utility.

The principal will decide to go on with the crime if and only if the return R is larger than his expected costs, that is:

$$R \geq \alpha(\beta(pS_a + \theta S_p) + (1 - \beta)b + E[\delta]) \equiv \widehat{R}_n.$$

The crime becomes less profitable the higher is the probability that the investigation is opened (α large), the more severe and efficient is the prosecution system (p , S_a and S_p large), the larger is the fraction of strong officials (β large) and the higher is the agent's expected cost from the trial or the lower is the cohesion between the members of the organization ($E[\delta]$ large). The economy crime rate in the no leniency case is thus given by:

$$r^n = \Pr(R \geq \widehat{R}_n) = 1 - F(\widehat{R}_n).$$

In the next section we shall see how this rate changes under a leniency program.

4.2 Leniency and the optimal policy

In this section we derive the optimal leniency policy. The analysis has three objectives. First, we characterize the optimal amnesty rate when corruption occurs and when it does not. Second, we wish to understand the comparative statics with respect to the main parameters. Finally, we shall study the effect that the leniency program produces on the principal's incentive to bribe officials.

4.2.1 Optimal leniency with corruption

The analysis of the leniency regime will be firstly conducted under the hypothesis that bribing a weak official is profitable for the principal. The game can then be solved with a simple backward-induction logic. For any announced amnesty ϕ , the agent's payoff at the

²⁷Our qualitative insights remain unchanged once it is assumed that, instead of capturing aversion to face the trial, the parameter δ measures an unanticipated cost associated to the enforcement of the sanction, such as the psychological cost of the conviction. In this case $E[\delta]$ should be weighted with the probability of being convicted $p\beta$.

investigation stage can be described as follows:²⁸

$$u = \begin{cases} -(1 - \phi) S_a - L & \text{if he cooperates} \\ -p\beta S_a - \delta & \text{if does not.} \end{cases} \quad (2)$$

The agent will then talk only if the sum of the discounted sanction, $(1 - \phi) S_a$, plus the retaliation loss, L , falls short of the sum of the expected sanction from the trial, $p\beta S_a$, and his cost parameter, δ . Therefore, he will cooperate as long as his type δ is larger than a threshold $\widehat{\delta}(\phi)$, that is:

$$y = \begin{cases} 1 & \text{if } \delta \geq \widehat{\delta}(\phi) \\ 0 & \text{otherwise,} \end{cases} \quad (3)$$

with

$$\widehat{\delta}(\phi) \equiv (1 - \phi - \beta p) S_a + L.$$

From the above expression it is readily seen that the agent is more keen to talk the more generous the amnesty ϕ is, the higher the proportion of strong officials in the economy is, and the more efficient the prosecution stage is. It is interesting to observe that the efficacy of a leniency program strengthens if this is complemented with an efficient witnesses protection program. As already discussed in Section 2, this kind of programs are designed to protect witnesses who testify in cases involving organized crime. In our setting the parameter L will measure the effectiveness of the protection program: if the accomplice witness feels well protected (low L) he will have better incentives to cooperate with the justice.

Using the cut-off rule described in equation (3) and assuming that $\widehat{\delta}(\phi)$ lies in the interior of the support $[\underline{\delta}, \bar{\delta}]$ – a condition that will be checked in the Appendix – the agent's participation constraint can be written as:

$$u(w) = w - \alpha \left[\int_{\widehat{\delta}(\phi)}^{\bar{\delta}} ((1 - \phi) S_a + L) dG(\delta) + \int_{\underline{\delta}}^{\widehat{\delta}(\phi)} (p\beta S_a + \delta) dG(\delta) \right] \geq 0.$$

Clearly, this constraint will be binding in equilibrium, so that the equilibrium wage $w(\phi)$ makes the agent just indifferent between committing the crime and enjoying his reservation utility, that is:

$$w(\phi) = \alpha \left[\int_{\widehat{\delta}(\phi)}^{\bar{\delta}} ((1 - \phi) S_a + L) dG(\delta) + \int_{\underline{\delta}}^{\widehat{\delta}(\phi)} (p\beta S_a + \delta) dG(\delta) \right].$$

²⁸As previously noted, we could interpret δ as an unanticipated cost associated to the enforcement of the sanction. Then, the agent's payoff at the investigation stage would be as in (2) if he cooperates, while it becomes $-p\beta(S_a + \delta)$ if he does not. In this case, the expected payoff of an agent who does not cooperate weights the cost δ only if the trial ends up with a conviction, that is, with the probability of being convicted $p\beta$. Our qualitative insights would not change in this case.

Equipped with this characterization, we can now turn to define the principal's expected utility. We begin by describing the corruption rule once the official matched to the organization is weak. The principal's payoff at this stage is:

$$v(x) = \begin{cases} -b - \int_{\widehat{\delta}(\phi)}^{\bar{\delta}} \bar{\theta} S_p dG(\delta) & \text{if he bribes the official } (x = 1), \\ - \int_{\widehat{\delta}(\phi)}^{\bar{\delta}} \bar{\theta} S_p dG(\delta) - \int_{\underline{\delta}}^{\widehat{\delta}(\phi)} \underline{\theta} S_p dG(\delta) & \text{if does not } (x = 0), \end{cases}$$

corruption will then take place if and only if the bribe b is lower than a threshold:

$$b \leq \int_{\underline{\delta}}^{\widehat{\delta}(\phi)} \underline{\theta} S_p dG(\delta) = \underline{\theta} S_p G(\widehat{\delta}(\phi)). \quad (4)$$

From the above condition it is easy to see that corruption becomes worthier the higher is the fraction $G(\widehat{\delta}(\phi))$ of agents who will not cooperate with the justice, that is, the larger is the threshold $\widehat{\delta}(\phi)$, and the larger is the expected sanction $\underline{\theta} S_p$.

Assuming that (4) is met, the principal's expected utility from committing the crime can be then written as:

$$v(R) = R - w(\phi) - C(\phi),$$

where $C(\phi)$ is his expected loss:

$$C(\phi) = \alpha\beta \left[\int_{\widehat{\delta}(\phi)}^{\bar{\delta}} \bar{\theta} S_p dG(\delta) + \int_{\underline{\delta}}^{\widehat{\delta}(\phi)} \underline{\theta} S_p dG(\delta) \right] + \alpha(1-\beta) \left[b + \int_{\widehat{\delta}(\phi)}^{\bar{\delta}} \bar{\theta} S_p dG(\delta) \right],$$

The Legislator sets the amnesty rate so as to maximize social welfare. Using the fact that $h > \bar{R}$, his objective can be written as:

$$\max_{\phi \in \mathbb{R}} \int_{\max\{0, w(\phi) + C(\phi)\}}^{\bar{R}} (R - h) dF(R), \quad (5)$$

which amounts to maximize the principal's expected costs, i.e., the sum of the wage $w(\phi)$ and his expected loss $C(\phi)$:

$$\mathcal{L} : \max_{\phi \in \mathbb{R}_+} \widehat{R}_l(\phi) \equiv \alpha \int_{\widehat{\delta}(\phi)}^{\bar{\delta}} ((1-\phi) S_a + L + \bar{\theta} S_p) dG(\delta) + \alpha \int_{\underline{\delta}}^{\widehat{\delta}(\phi)} (\beta(p S_a + \underline{\theta} S_p) + \delta) dG(\delta).$$

The next proposition describes the solution of \mathcal{L} and characterizes the optimal amnesty rate. Let $h(\delta) \equiv (1 - G(\delta)) / g(\delta)$,

Proposition 1 *There exists a unique internal optimal amnesty rate ϕ^* which maximizes the Legislator's program \mathcal{L} and that solves the following necessary and sufficient first-order condition:*

$$h(\widehat{\delta}(\phi^*)) = (\bar{\theta} - \beta \underline{\theta}) S_p. \quad (6)$$

As long as $\phi = \phi^$, the introduction of a leniency program stifles the crime rate relative to the regime with no leniency.*

The result that a leniency program always stifles the crime rate rests on a simple revealed preference argument. Essentially, the Legislator can replicate the outcome of the no leniency case by setting an amnesty rate so low that even the more trial-averse agent, i.e., that with type $\bar{\delta}$, will opt for not cooperating. All the amnesty rates that satisfy the inequality $\bar{\delta} \leq \hat{\delta}(\phi)$ deliver this result, that is all values:

$$\phi \leq \underline{\phi} \equiv 1 - p\beta + \frac{L - \bar{\delta}}{S_a}.$$

However, since the principal's objective function is concave in ϕ and has a maximum at ϕ^* (which under **A3** exceeds $\underline{\phi}$), it will never be optimal to induce no cooperation at all.

By the same token, the legislator never wants to grant an amnesty rate so high that all agents will cooperate. Indeed, such an amnesty rate would lower the principal's expected costs, whereby spurring the crime rate. Formally, it cannot be the case that $\underline{\delta}$ exceeds $\hat{\delta}(\phi)$, hence:

$$\phi > \bar{\phi} \equiv 1 - p\beta + \frac{L - \underline{\delta}}{S_a}.$$

Going back to the characterization result, the first-order condition (6) has a simple, yet interesting economic interpretation. The optimal amnesty ϕ^* must balance (at the margin) the social gains and the social costs associated with the introduction of the accomplice-witnesses program. On the one hand, increasing the amnesty ϕ reduces the agent's expected sanction, whereby making entry into the organization less costly for the principal. On the other hand, a higher amnesty makes the agent more willing to cooperate by lowering the threshold $\hat{\delta}(\phi)$, this increases the probability of convicting the principal, whereby stifling his incentive to commit the crime.

While the latter effect brings out the *bright side* of a leniency program, the former one underscores its *dark side*. Obviously, the relative strength of these two effects depends on the underlying parameters of the model: namely, on the severity of the legal system, as measured by higher sanctions S_a and S_p , on the efficiency of the prosecution system, as measured by larger probability of prosecution for both the agent and the principal, respectively p and $\underline{\theta}$, on the quality of the information provided by the accomplice-witness $\bar{\theta}$, on the fraction of honest public officials in the economy β and on the retaliation power of the organization L . The next proposition summarizes the comparative statics of the optimal policy:

Proposition 2 *The optimal amnesty rate satisfies the following properties:*

- *it increases with respect to the quality of the evidence provided by the informant $\bar{\theta}$, the principal's sanction S_p and the retaliation loss L ;*
- *it decreases with respect to the fraction of strong officials β and the efficiency of the prosecution system, $\underline{\theta}$ and p .*

- *it increases with respect to the agent's sanction S_a as long as the optimal amnesty rate ϕ^* is lower than the probability of being acquitted if the agent decides to face the trial, $1 - \beta p$. The converse holds otherwise.*

This comparative statics rests on the following simple ideas. Clearly, a more intense amnesty is needed the more reliable is the evidence provided by the informant and the more harshly the legal system punishes the boss of the criminal organization. This is because both these parameters increase the sanction that the principal gets when the agent cooperates, whereby making the crime less profitable. The same conclusion holds with regard to the retaliation loss L : if the organization can punish the whistle-blower more harshly, or if the witnesses protection program is not very effective, the amnesty rate needs to be more generous for the agent to find cooperating worthwhile.

There is, however, less need for a generous amnesty as long as the fraction of honest officials in the economy gets larger, and if the prosecution system becomes more efficient. Intuitively, an increase of each of these parameters makes the crime less worthwhile even in the absence of a leniency program, whereby calling for lower discounts.

The impact of the agent's sanction S_a on the optimal amnesty is ambiguous: it depends only on the effect that harsher sanctions produce on the agent's propensity to talk, that is on the equilibrium threshold $\widehat{\delta}(\phi^*)$. Essentially, if the optimal amnesty rate ϕ^* is lower than the probability of being acquitted if the agent decides to face the trial $1 - \beta p$, the fraction of informants decreases ($\widehat{\delta}(\phi^*)$ increases), therefore the Legislator is forced to increase the amnesty rate in order to counterbalance the positive effect that a higher S_a has on the principal's profits via fewer informants. Otherwise, the opposite result obtains.

4.2.2 Optimal leniency without corruption

When the leniency mechanism makes corruption unattractive, that is, if the bribe exceeds the expected sanction the principal faces when he does not bribe the weak official,

$$b > \underline{\theta} S_p G(\widehat{\delta}(\phi^*)), \quad (7)$$

there will be no corruption in equilibrium. In this case, the agent anticipates that all officials will be honest and his cooperation choice is determined by the following payoffs:

$$u = \begin{cases} -(1 - \phi) S_a - L & \text{if he cooperates} \\ -p S_a - \delta & \text{if does not.} \end{cases}$$

The agent will then talk only if the sum of the discounted sanction, $(1 - \phi) S_a$, plus the retaliation loss, L , falls short of the sum of the expected sanction from the trial, $p S_a$, which

is now accounting for the fact that weak officials are not corrupt and his cost parameter, δ . Therefore, he will cooperate if and only if his type δ is larger than a threshold $\widehat{\delta}'(\phi)$, that is:

$$y = \begin{cases} 1 & \text{if } \delta \geq \widehat{\delta}'(\phi), \\ 0 & \text{otherwise,} \end{cases} \quad (8)$$

with

$$\widehat{\delta}'(\phi) \equiv (1 - \phi - p) S_a + L.$$

Using the same logic as before, the Legislator's program writes as:

$$\mathcal{L}' : \max_{\phi \in \mathbb{R}_+} \widehat{R}'_l(\phi) \equiv \alpha \int_{\widehat{\delta}'(\phi)}^{\bar{\delta}} ((1 - \phi) S_a + L + \bar{\theta} S_p) dG(\delta) + \alpha \int_{\underline{\delta}}^{\widehat{\delta}'(\phi)} (p S_a + \underline{\theta} S_p + \delta) dG(\delta).$$

This leads to the following proposition:

Proposition 3 *Assume (7), then there exists a unique internal optimal amnesty rate ϕ^{**} which maximizes the Legislator's program \mathcal{L}' and that solves the following necessary and sufficient first-order condition:*

$$h(\widehat{\delta}'(\phi^{**})) = (\bar{\theta} - \underline{\theta}) S_p. \quad (9)$$

*As long as $\phi = \phi^{**}$, the introduction of a leniency program stifles the crime rate relative to the regime with no leniency.*

The same trade-off underscored in Proposition 1 is at play also here. More intense amnesties reduce the agent's expected sanction, whereby reducing the principal's expected costs, but at the same time create conflict into the organization, so as to make the criminal business less attractive. The comparative statics analysis in this case yields the same qualitative insights as Proposition 2, with the exception that here the amnesty rate ϕ^{**} does not change with β since all officials are honest.

A simple inspection of (6) and (9), though, immediately reveals that the extent to which the principal gains from bribing a weak official matters in determining the bright side of leniency. In contrast to what emerges from (6), when (7) is met the social gain of leniency (the right-hand side of (9)) is unaffected by the fraction of weak officials β and is only determined by the increase in the principal's expected sanction resulting from the informant's testimony: that is, by $(\bar{\theta} - \underline{\theta}) S_p$.

In the next proposition we study how the equilibrium fraction of flipping agents and the optimal amnesty rate change depending on the size of the reservation bribe b necessary to corrupt a weak official.

Proposition 4 *In the region of parameters where corruption is viable, both the fraction of agents who cooperate and the optimal amnesty rate are larger relative to the case where the weak official cannot be bribed: $\widehat{\delta}'(\phi^{**}) \geq \widehat{\delta}'(\phi^*)$ and $\phi^{**} \leq \phi^*$.*

The interpretation of this result rests on the simple idea that when the principal can reduce the probability of conviction by bribing a weak official, the need for leniency becomes more intense. Then, only by inducing agents to talk more often the legislator can undo the beneficial role of corruption on the principal's expected costs. Interestingly, this result implies that the intensity of the amnesty rate should be more generous in economies where bribing public officials is less costly or in the presence of organizations with a strong intimidation power.

4.2.3 Rewarding the informants

In this section we underscore an interesting feature of our analysis; specifically, we identify the region of parameters where it is optimal for the Legislator to grant rewards to the informant: that is, $\phi^* > 1$. Rewards have, indeed, often been granted to key informants in mafia trials. As already discussed in Section 2, these programs often secure a stable wage, a health insurance, as well as housing and other financial needs. When is it optimal to reward an informant? Does this possibility depend on the features of the organization to which the informant himself belongs to?

To address these questions in the simplest possible way for our purposes, we assume that the cdf $G(\cdot)$ is uniform on the support $[0, \bar{\delta}]$, where the width of this support directly measures the criminal organization's internal cohesion.

Recalling that **A3** implies $\bar{\delta} > S_p(\bar{\theta} - \beta\theta)$, it is easy to verify that in this example there will be a positive fraction of “talkers” at equilibrium. Solving the first-order condition (6), one obtains:

$$\phi^* = 1 - p\beta + \frac{L}{S_a} - \frac{\bar{\delta} - S_p(\bar{\theta} - \beta\theta)}{S_a}. \quad (10)$$

Simple inspection of (10) implies that the comparative statics analysis of this example is consistent with Proposition 2. In particular, more cohesion between the members of the organization, as implied by a low $\bar{\delta}$, and more reliable testimonies, as implied by high $\bar{\theta}$, call for more generous amnesties and may thus favour the recognition of rewards:

Proposition 5 *Assume that $G(\cdot)$ is uniform, then the informant receives a reward ($\phi^* > 1$) if the following condition holds:*

$$L > p\beta S_a + \bar{\delta} - S_p(\bar{\theta} - \beta\theta). \quad (11)$$

In words, if the retaliation loss exceeds the agent’s expected sanction from the trial, an optimal leniency program must reward accomplice-witnesses. One interesting insight of this result, which can be immediately seen from (11), is that rewards are optimal as long as the informant’s testimony is highly reliable ($\bar{\theta}$ large) and in the presence of organizations with strong internal cohesion ($\bar{\delta}$ low), that is, with few potential informants. Both these features are consistent with the available evidence. First, the link between the opportunity of granting rewards only to informants whose testimonies are highly reliable is exemplified by the case of Tommaso Buscetta, the first important *pentito*, who was allowed to live in the USA under a new identity in the Witness Protection Program after his testimony in the ‘New York Pizza Connection Trial’ in the mid-1980s.²⁹ Second, the fact that members of organizations with strong internal cohesion are less likely to talk, and need more intensive discounts to cooperate, seems consistent with the very few informants belonging to the Calabrian ‘Ndrangheta, a criminal organization whose members are mainly linked by blood relationships.

4.3 Leniency and corruption

We now turn to analyze the effects of accomplice-witness regulations on corruption. While there is a great deal of anecdotal evidence supporting the view that the Italian leniency program did generate positive effects both on the number of prosecutions and on the number of convictions for mafia (as exemplified by the Palermo and the Spartacus Maxi Trials), the impact of this reform on corruption is less clear.³⁰ Our theoretical framework provides predictions on this link, which will be tested in Section 5.

We have already seen that, in the absence of amnesties for informants, the boss bribes a weak official if the bribe b falls short of his expected sanction from the trial $\underline{\theta}S_p$. Essentially, both a harsher sanction and a more efficient prosecution system spur the principal’s incentive to seek for the external complicity of a weak official. In the leniency regime, instead, the condition needs to account for the possibility of cooperation, and becomes:

$$b \leq \underline{\theta}S_p G(\widehat{\delta}(\phi^*)). \quad (12)$$

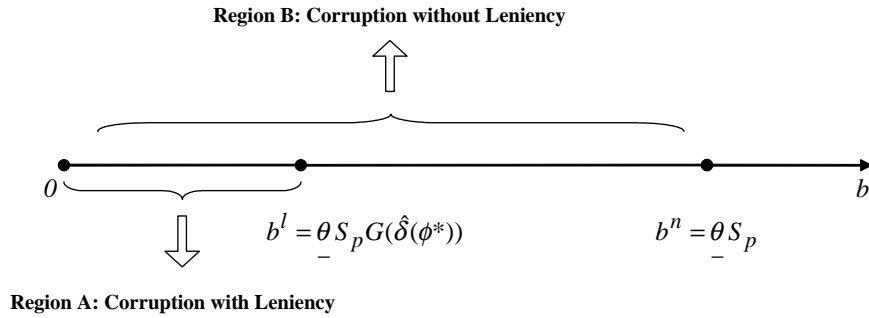
In our simple framework where officials can be either strong or weak, showing that leniency reduces corruption amounts to verify that (12) defines a subset of parameters smaller than the one defined by $b \leq \underline{\theta}S_p$. The next proposition then follows:

²⁹Rewards are nowadays also granted to former members of the Japanese *Yakuza* cooperating with prosecutors. In exchange of information they are helped by the State to find a job (Corriere della Sera, 2 June, 1992).

³⁰This is partly due to the fact that while mafia convictions have been mostly enforced through ‘mass trials’, public officials charged for mafia-related crimes have been judged on an individual basis.

Proposition 6 *The introduction of a leniency program stifles corruption relative to the no leniency regime; this effect gets larger the more generous the optimal amnesty rate is.*

The economic intuition for this result is simple: by creating a conflict inside the criminal organization, a leniency program weakens the principal's incentive to bribe a weak official. To gain insight about the result, below we provide a graphical illustration of how the incentive to bribe the public official changes with and without leniency: the critical bribe below which corruption takes place is lower in the regime with leniency – $b^l \equiv \underline{\theta} S_p G(\hat{\delta}(\phi^*))$ – relative to that without leniency – $b^n \equiv \underline{\theta} S_p$.



CORRUPTION WITH AND WITHOUT LENIENCY

Obviously, the more informants there will be in equilibrium, the stronger will be the effect of leniency on corruption. In other words, the more generous the amnesty is, the larger will be the fraction of talkers and the lower will be the principal's incentive to bribe officials.

We conclude the theoretical analysis with a comment on the way corruption has been formalized in our setting and how this could be extended in a very natural dimension. The conceptual framework developed so far can easily encompass the extent to which criminal organizations bribe public officials not only to minimize the risk of prosecution, but also to secure licenses and public contracts, i.e., to increase the crime revenue. Although we have not considered this theoretical possibility in our model, it should be clear that the same qualitative insights on the deterrence effect of leniency programs on corruption would still be true in the slightly more complex setting where corruption also increases the size of the crime revenues: Everything else being kept equal, the introduction of a leniency program reduces the principal's overall benefit from corruption as long as some agents will talk in equilibrium. As we shall see in Section 5.3., this remark will be quite important for the empirical analysis of the link between corruption and leniency.

5 Empirical analysis

This section develops the empirical analysis. We exploit a quasi-experimental panel data set, relative to 95 Italian provinces (see the Appendix for details), relying on the leniency and accomplice-protection program introduced by the Italian legislator in 1991. The program guarantees lower fines and protection to the accomplices of *mafia* associations who provide information that is useful for prosecuting the crimes committed by the association itself, and more generally for shedding new light on its internal structure and external complicities. The program was introduced mainly for two reasons: (i) as a reaction of the legislator to the series of murders committed by various mafia groups during the 1980s; (ii) to break down *omertà* and weaken external complicities.

The main objective is to argue that the available evidence supports our theoretical results. In order to do so, throughout, we shall interpret the number of committed crimes as an indicator of all those crimes yielding a return R which exceeds the threshold $\widehat{R}_l(\phi)$ for a given amnesty rate $\phi \geq 0$. Taking this view, our theoretical model delivers three clear testable implications about: (i) the direct impact of leniency on the rate of prosecution of criminal organizations; (ii) its indirect (deterrence) effect on the propensity to misbehave, that is, on the crime rate; (iii) its effect on corruption.

- (i) Using our theoretical analysis, it can be readily verified that, for a given ‘stock’ of crimes committed, the introduction of a leniency program granting an amnesty ϕ shifts upward the prosecution rate from β to $\beta + (1 - \beta)(1 - G(\widehat{\delta}(\phi)))$. Where, β can be interpreted as the rate of prosecution in the absence of leniency and $(1 - \beta)(1 - G(\widehat{\delta}(\phi)))$ is the variation of this rate as implied by the inflow of new information provided by the mass $(1 - G(\widehat{\delta}(\phi)))$ of informants. This observation, together with the fact that, by law, any new accomplice must provide fresh information to be eligible for the program, imply that the rate of prosecution should be positively correlated with the number of accomplices in the program.
- (ii) Coming back to the indirect impact of leniency, it should be clear that the introduction of the leniency program should have a deterrence effect on the crime rate. More precisely, as shown in Proposition 1, by increasing the prosecution rate, the introduction of an optimal leniency policy hampers the propensity to misbehave insofar as the crimes become less worthwhile. Thus, after the introduction of leniency, the number of crimes should drop, as reflected by $\widehat{R}_l(\phi^*) > \widehat{R}_n$. Of course, while our theoretical model predicts that this inequality holds as long as the amnesty rate is the optimal one (ϕ^*), it must be acknowledged that we cannot be sure that this is the case in practice. However, since our welfare measure $\widehat{R}_l(\phi)$ is strictly concave in ϕ , there exists a very large range of amnesty rates for which the inequality $\widehat{R}_l(\phi) > \widehat{R}_n$ holds; and, as we

will see in the next sections, this prediction is supported by the evidence that shows that criminal organizations did cut back their illicit activities after the introduction of the Italian leniency program.

- (iii) Finally, as stated in Proposition 6, our model predicts that corruption should be reduced after the introduction of the leniency program. Unfortunately, the available evidence does not allow us to disentangle effective and measured corruption, and this makes it impossible to identify the deterrence effect of leniency on corruption. Nevertheless, the logic of our model can be used to argue that a positive correlation between the number of prosecuted corruption cases and the pool of accomplices should emerge. The idea is that accomplices might reveal not only relevant information about their former mafia partners, but also on the relationships that these have established with public officials, and this should spur the number of corruption cases prosecuted after 1991.³¹ In a nutshell, although we cannot test whether effective corruption actually diminished after 1991, we can try to show how the introduction of the leniency program for mafia crimes affected the prosecution rate of corruption cases before and after 1991.

5.1 Looking for the deterrence effect of leniency

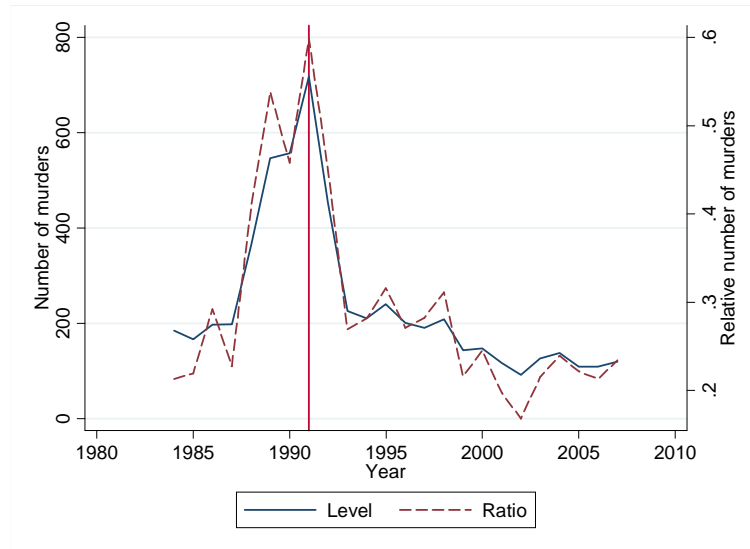
For expositional purposes, we begin by illustrating the deterrence effect of leniency on crimes. As discussed above, consistent with Proposition 1, the introduction of the leniency and accomplice-protection program should lower the mafia crime rate. This leads to the first empirical prediction of our model:

- **Empirical prediction 1:** *The number of mafia-related crimes perpetrated should decrease after the introduction of the leniency program.*

Before presenting the evidence, a few remarks about the main empirical issue at stake are worthwhile. Since illegal acts do not typically take place in broad daylight, assessing the deterrence effect of a new policy is in general a difficult task. More precisely, if the policy affects negatively the crime population (deterrence) and positively the share of uncovered crimes, identifying deterrence can be very hard as long as only the number of prosecuted crimes is observed. In principle, an highly successful policy, which would completely deter

³¹A recent example is that of Massimo Ciancimino, son of one of the most powerful historical heads of the Corleonesi family, Vito Ciancimino. Massimo Ciancimino has recently started to collaborate with prosecutors by providing them evidence on the hidden links between its clan and politics. This information has led to the opening of new investigations and prosecutions of important politicians and public officials in Sicily (Repubblica, 13 June, 2009).

Figure 1: MAFIA MURDERS IN ITALY



crime, might be indistinguishable from an ineffective policy as long as the detection rate is small.³²

We argue that data on murders allow to overcome this obstacle, thus providing evidence on deterrence. In fact, differently from other mafia related crimes, almost all murders are uncovered: *measured* murders consistently reflect the amount of *effective* ones.³³ Figure 1 illustrates the number of mafia-related murders reported by the police forces in Italy, both in absolute level and relative to the number of malicious (intentional) murders committed for reasons different than the mafia one.³⁴

The vertical bar marks the introduction of the leniency program in 1991. Strikingly enough, after an increasing trend culminated in 1991 with 719 mafia murders, which corresponded to roughly 50% of all other malicious murders, a downward sloping path started one year after the introduction of the Italian leniency program. In 2007 the number of mafia murders in Italy decreased up to 119, that is roughly 20% of the rest of murders. More importantly, the aggregate path is neither due to some composite effects, nor to a specific mafia association: A similar evolution, indeed, characterizes provinces within the

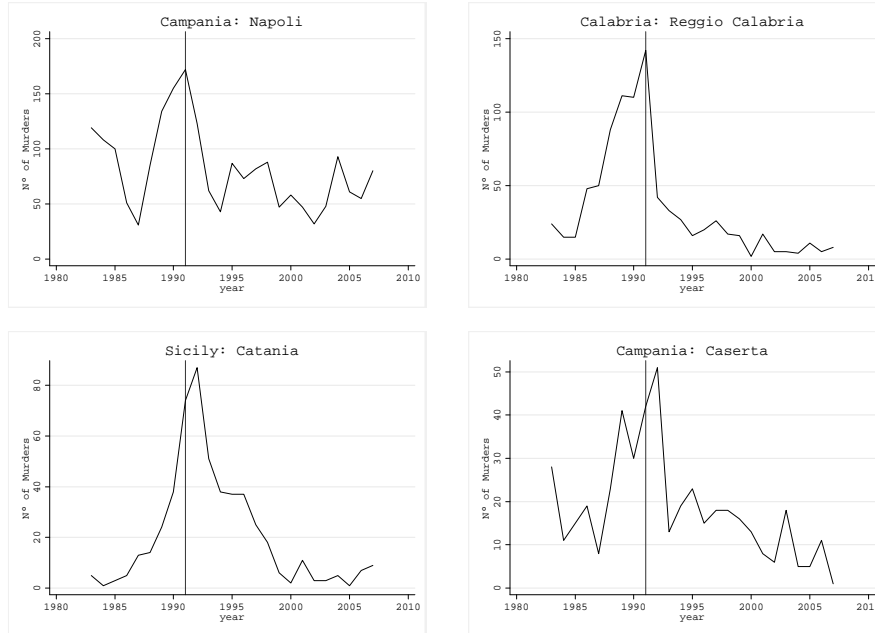
³²A similar problem arises in the literature dealing with the empirical analysis of collusive agreements among firms (see, for instance, Harrington, 2006 and Miller, 2007).

³³The dataset that we shall use includes all mafia related murders (i.e., the number of people killed for mafia purposes), including those for which the executor is prosecuted and those for which it remains unknown.

³⁴The Italian penal code distinguishes between two categories of murders: (i) malicious or intentional murders, whose executor had the deliberate will to commit the crime, and (ii) non-intentional or involuntary murders, which are committed without an intentional purpose.

same region and across the core-regions. As shown in Figure 1-bis, deterrence is detected within all the 4 provinces — Naples, Reggio Calabria, Catania and Caserta — with the largest numbers of mafia murders in 1991-92.

FIGURE 1-BIS: PROVINCES WITH MOST MAFIA-RELATED MURDERS



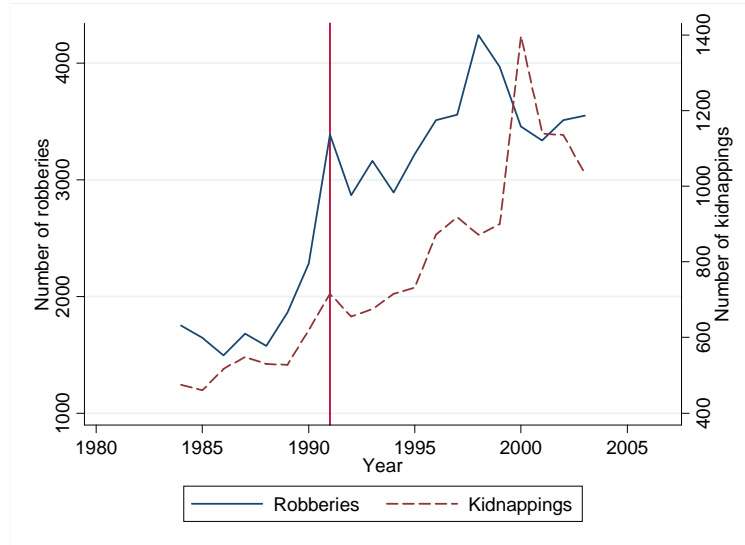
Other crimes do not feature the same pattern. As a robustness check, we close this section by looking at the evolutions of robberies in banks and post offices, and kidnappings whose ultimate purpose is not extortion. Arguably, like for the case of murders, observed values of these crimes reflect to a large extent the corresponding population. But, it is well known that robberies and kidnappings are usually unrelated to mafia associations.³⁵ Thus, in this case we should not observe a drop after the 1991. In accordance with the previous argument, for both variables Figure 2 shows an increasing path during the 1990s. Such evidence offers ample support to our conclusion about the deterrence effect of leniency on mafia murders.

5.2 Leniency and prosecution

We now study the direct effect of leniency on the rate of prosecution. We will base our arguments on the legal definition of mafia-type crimes in Italy. In fact, two distinct articles

³⁵We have excluded the kidnapping aimed at extortion because one cannot be sure that these crimes are completely unrelated to mafias. Note indeed that Reggio Calabria, which is the Calabrian area featuring the highest concentration of 'Ndrangheta clans, is one of the four provinces — Torino, Reggio Calabria, Milano and Roma — with the largest numbers of kidnappings aimed at extortion. Incidentally, we have verified that only in Reggio Calabria, among these four provinces, the number of kidnappings features a strong drop after 1991.

Figure 2: ROBBERIES AND KIDNAPPINGS IN ITALY



of the Italian penal code deal with criminal organizations: **art. 416** refers to the crime of ‘criminal association’, while **art. 416-bis** refers to the crime of ‘mafia-type association’. These articles deal with different types of crimes, but share some common features. For instance, associations of at least three people may be prosecuted both as criminal or as mafia-type associations. Moreover, both criminal and mafia-type associations are generally involved in the same kind of illicit activities. Nevertheless, the peculiarity of mafia-type associations, as stated by the third clause of art. 416-bis, is the exploitation of the force of intimidation, the condition of silence (*omertà*) which derives from it and the perverse relationships that they have with public officials. For our purpose, the key difference is that the Italian legislator allowed the possibility to enjoy lighter sentences in exchange of valuable information only to mafia affiliates (art. 8 D.L. 13/05/1991 n.152).

Prosecutions for both crimes are recorded according to the year in which the judicial authority begins the penal action and the province in which the crime has been committed. The time period begins in 1993 and lasts until 2005 since data before 1993 have not been collected by the Italian Statistical Office (ISTAT).

As expected, the provinces located in Sicily, Calabria and Campania exhibit the largest shares of prosecutions for the mafia association crime – see Table 3 which shows the top-5 provinces with most prosecutions for both crimes. The prosecutions for criminal association, instead, feature a higher degree of dispersion across the country (note that Milan is in the north and Rome in the center of Italy). Naples and Palermo are the provinces with the highest numbers of prosecutions for mafia; incidentally, Naples is also the province featuring the greatest number of prosecutions for generic criminal association.

Table 3: TOP-5 PROVINCES WITH MOST PROSECUTIONS

Mafia-type association (art. 416-bis)		Criminal association (art. 416)	
Provinces	Prosecutions	Provinces	Prosecutions
Caltanissetta (Sicily)	255	Bari (Puglia)	382
Catanzaro (Calabria)	262	Palermo (Sicily)	422
Catania (Sicily)	286	Milano (Lombardia)	720
Napoli (Campania)	401	Roma (Lazio)	1125
Palermo (Sicily)	476	Napoli (Campania)	1306

Note: The table reports the total number of crimes prosecuted during 1993-2005, relative to artt. 416 and 416-bis of the Italian penal code.

In Italy prosecutions can be triggered either by the policy forces³⁶ or by prosecutors themselves. Therefore, the total number of prosecuted crimes must reflect the sum of the subset of crimes reported to the judicial authority by the police forces which result in a prosecution, and those crimes brought into the spotlight by prosecutors themselves. Actually, for any crime reported by the investigation forces, the judicial authority may eventually prosecute more than one crime, possibly because the investigation and prosecution process may generate fresh information about other crimes. As a result, both the level and the evolution of the ratio between total crimes prosecuted and those reported by the police forces, appear as good proxies for identifying the impact of the testimonies of ‘flipping’ criminals on the rate of prosecution. This is because the information provided by the accomplices officially participating to the protection program is handled exclusively by the judicial authority and not by the police forces. This leads to the second empirical prediction of our model:

- **Empirical prediction 2:** *The introduction of the leniency program should generate an increment in the ratio of crimes prosecuted by the judicial authority to the number of crimes reported by the police forces.*

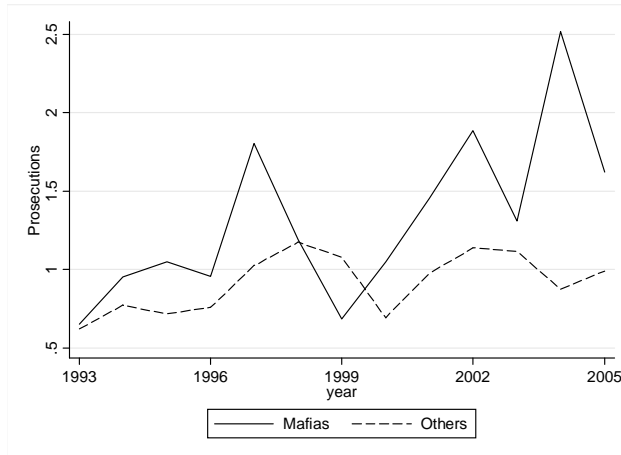
Figure 3 illustrates the evolution of the ratio between crimes prosecuted and those reported by the police forces in Italy from 1993 to 2005, both for criminal and mafia-type organizations.³⁷ Although in 1993 the two ratios were smaller than 1 and roughly the same³⁸, prosecutions related to mafia association did increase up to values around 2 in the

³⁶Namely, the *Carabinieri*, the Police and the Customs Police.

³⁷Note that each prosecution must last at most one year, after which either the trial begins, provided that there is enough evidence, or the case is closed. Therefore, we construct our ratio by using the average value of crimes reported to the judicial authority by the police forces in two adjacent years as the denominator. Results do not change however if we use only the contemporaneous value.

³⁸Remember that not all police investigations necessarily lead to a prosecution.

Figure 3: ‘PROSECUTIONS’ AGAINST ORGANIZED CRIME IN ITALY



period under consideration, while those related to criminal association were more stable and tended to fluctuate around 1. This evidence seems to bring support to the idea that since 1993 more and more mafia crime cases were opened by prosecutors themselves thanks to the leniency program. This suggests that, like in antitrust cases (see for instance, Rey, 2003), in addition to investigation activities, the design of leniency programs is an important tool in the fight against organized crime.

A more formal evidence of the trending pattern of prosecutions for mafia associations can be provided by estimating the following simple equation:

$$P_{i,t} = a_i + bT_{i,t} + \varepsilon_{i,t},$$

where $P_{i,t}$ is the ratio between crimes prosecuted on crimes reported to the judicial authority by the police forces in province i and year t , a_i is the province fixed effect, $T_{i,t}$ is a deterministic trend, and $\varepsilon_{i,t}$ is an error term.

The simple OLS estimates are reported in Table 4. The column labelled “Core-regions” refers to a restricted sample, which just contains the provinces belonging to Campania, Puglia, Calabria and Sicily. Instead, the column labelled “Others” is relative to the other Italian provinces. The positive and significant coefficient for the trend clarifies that prosecutions relative to mafia association strongly increased after the introduction of leniency within the core-regions, i.e., those in which mafia type organizations have been historically more pervasive. A positive trend also emerges if we look at prosecutions related to criminal groups different from the mafia ones. However, the point estimate of b is now about one fourth of the corresponding coefficient for mafia-type associations. Differently, for the rest of Italy, the path of the ratio $P_{i,t}$ does not feature a statistically significant trend. Taken together, these findings suggest that, in the post leniency period, the larger and more reli-

able information managed by the judicial authority thanks to the informants' testimonies, provided a significant impulse to the prosecution activity against mafia association crimes.³⁹

Table 4: CRIMES PROSECUTED AFTER LENIENCY

	Mafia-type associations: art. 416-bis			Criminal associations: art. 416		
	Italy	Core-regions	Others	Italy	Core-regions	Others
Trend	0.053*	0.116***	-0.019	0.015	0.029*	0.011
	(2.05)	(3.62)	(-0.52)	(1.23)	(2.15)	(0.69)
N	620	281	339	1212	286	926

Note: Dependent variable is the number of crimes prosecuted expressed as ratio with respect to the number of crimes accused by the police forces. For any t, the latter is the average of current and lagged accusations. Provincial dummies (not reported) are allowed. Time span: 1993-2005. Standard errors are robust to heteroschedasticity and intraprovince serial correlation (t-values are in parentheses). Significant coefficients are indicated by * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

5.3 The external complicity of mafia-type associations

We now turn to study the impact of the Italian accomplice witnesses regulation on corruption. As already mentioned before, our model predicts that effective corruption should be reduced after the introduction of the leniency program. But, unlike the mafia crimes, the available evidence does not allow us to disentangle effective and measured corruption, and this makes it impossible to identify the deterrence effect of leniency on corruption. Nevertheless, in this section, we shall argue that the logic of our model also implies that a positive correlation between the number of prosecuted corruption cases and the pool of accomplices should emerge.

As stated by the Italian penal code, the peculiarity of mafia-type associations, when compared to other criminal organizations, rests on the perverse relationships that these establish with public officials. Our theoretical analysis formalizes the idea that bribing police officers or judges allows to reduce the risk of prosecution of the affiliates; leniency programs may be useful in weakening this link. As explained in the theoretical model developed above, when former members of a criminal organization can enjoy lighter sanctions in exchange of information, the incentive to bribe public officials is weakened since convictions occur with

³⁹We have also verified (result not reported) that prosecutions for mafia are significantly positively correlated with the number of former mafia accomplices who benefit from the protection program (even when we control for the time trend) while prosecutions for other criminal associations are not correlated with such variable. However, due to data constraint we have restricted the time span to 1995-2005.

higher probability.

Arguably, one of the most profitable types of relationship between public officials and mafias is in the area of public works contracts (see, for instance, Gambetta, 1992, Ch. 8). To be executed a typical public investment project usually needs to be contracted out to a private firm, that is selected by some public authority at local, regional or national level. Clearly, as long as officials have some discretion over the process selecting the firm and can alter the competitive conditions of the bidding game, a mutual beneficial collaboration between some officials and the mafia association might build up. At a more general level, such collaboration is often the outcome of a stable relationship between politicians and mafias based on the exchange of votes for favours. It then follows that, prosecuting mafia affiliates who afterwards reveal information about the external relationships of the organization, may lead to the prosecution for corruption of public officials who are, directly or indirectly, linked to mafia-type criminal organizations. We build our analysis on the idea that former mafia accomplices, who decide to benefit of the leniency policy, should be the natural candidates to test this prediction given that each has to provide relevant information about the structure and the economic activities of his organization to obtain a discount on his sanction. Building on this insight, the third empirical prediction of our model follows:

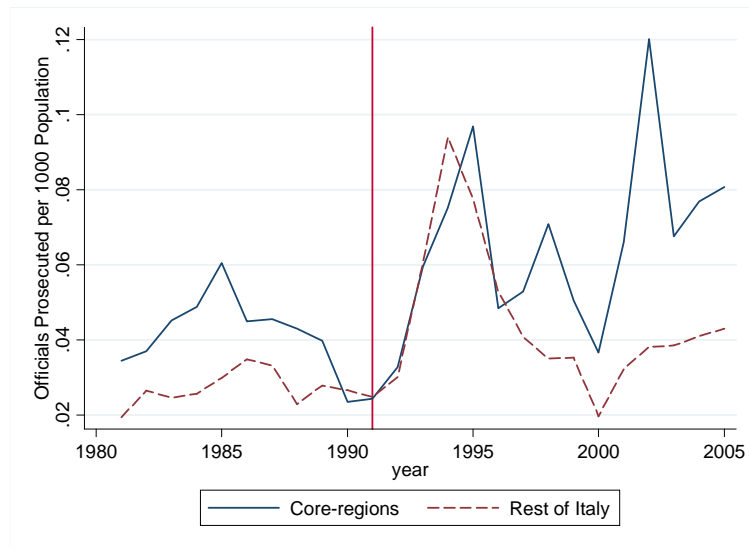
- **Empirical prediction 3:** *The number of corruption cases that are prosecuted is correlated with the number of mafia accomplices who join the protection program. Moreover, the sign of this correlation is positive whenever the direct effect on the rate of prosecution of corruption cases overcomes the deterrence effect.*

Our measure of corruption prosecution is the number of crimes or public officials prosecuted because of bribery, extortion, and embezzlement, across 95 Italian provinces.⁴⁰ Each prosecution is recorded when the judicial authority begins the penal action. Under the rule of ‘concurrency of charges’, an individual is recorded only for the crime that is punished more harshly by the penal code. During 1980-2005, crimes and public officials prosecuted amount to, respectively, 42,329 and 59,856, that is roughly 4,1 people prosecuted per 1000 population, on average.

In order to provide some suggestive evidence of the impact of the leniency program on prosecuted corruption cases, as a preliminary exercise, we compare corruption cases within provinces characterized by the highest concentration of mafia convictions with those in the

⁴⁰This dataset allows us to define an objective measure of corruption, which is very different from those based on opinion surveys that are standard in the cross-country literature. Many criticisms have been raised to the validity of the surveys for comparing levels of corruption, mainly because the definition of corruption can be very different from one country to another and its meaning is often subjective. In fact, recent work on corruption has used within country data (Svensson, 2003; Glaeser and Saks, 2006). Unfortunately, though, our dataset does not allow us to distinguish among different types of corruption.

Figure 4: CORRUPTION, OFFICIALS PROSECUTED



rest of Italy. Indeed, since the introduction of the leniency program eventually affects just mafia-related corruption, a first rough evidence of its impact may be delivered by such comparison. Figure 4 reports the path of the number of officials prosecuted for corruption, per 1000 population, within the core-regions and the rest of Italy. A common feature across the two areas of the country is a strong peak of prosecutions during 1992-93. This suggests that during the first half of the 1990s some nation-wide phenomenon did trigger large variations in measured corruption.⁴¹ But, Figure 4 also highlights that the difference in corruption prosecutions between the core-regions and the rest of the country widened during the second half of the 1990s and the 2000s.⁴²

Although the leniency policy is nationwide, as shown before, mafia-type criminal associa-

⁴¹On 2/17/1992, the chairman of a public rest-home was arrested while receiving a bribe for the awarding of a public procurement. In the following two years, the most important anti-corruption campaign ever realized in Italy developed, that is *Mani Pulite* (literally, clean hands). It revealed a diffused system of corrupt practices involving entrepreneurs, bureaucrats, judges, and representatives of all political parties.

⁴²There are at least two further explanations for the path of corruption during the 1990s and both tend to suggest a decrease of measured corruption. First, up to the 1980s Italy was characterized by a system of proportional representation such that voters were allowed to choose up to four individual candidates. As someone argued central or local government officials tried to enhance their own re-election prospects through a patronage-induced votes system that became a system of political corruption, during the second half of the 1970s, when politicians started to extract illegal kickbacks as part of the process of bidding out public works contracts. In the parliamentary election of 1992 the number of preference votes was reduced to one as a consequence of the 1991 referendum; this might have decreased the incentive by party officials to illegally fund-raise thus determining a lower level of effective corruption across the country (Golden, 2003). Second, someone argues that one of Berlusconi's aims, when he entered the political scene with his party, was to soften the power of judges to prosecute corrupt politicians and firms. During the 1990s he run an intensive media campaign against judges that prosecute corruption. Afterward, he also became prime minister and changed some laws in a direction that could have reduced the number of prosecuted cases of corruption.

tions operate mostly in Campania, Calabria, Puglia, and Sicily. This evidence suggests that a more formal test of the differential path of corruption among provinces can be done. More precisely, by relying on provincial data we have regressed the number of officials prosecuted on a dummy which takes values equal to 1 for the years 1992-2005 across the 22 provinces of the core-regions and to 0 otherwise. Province fixed effects as well as year dummies are also included. Results are consistent with the idea that leniency helped prosecutors at revealing the external complicity of mafia associations: the relevant coefficient is positive although not significant at 5%. A similar result obtains if we look at the number of corruption crimes prosecuted instead of officials. This suggests that, if leniency affects positively the rate of prosecutions and negatively the corruption crime population, then the previous estimate must capture its composite effect on measured corruption.

Starting from 1995, very detailed yearly information about the number of individuals participating to the protection program is available. The available dataset associates to each accomplice his former criminal organization – labelled as Camorra, N’drangheta, Sacra Corona Unita and Mafia. As explained before, given the regional nature of different mafia organizations, this information also allows us to exploit regional as well as time variation in the number of accomplices. We can then test Prediction 3 by regressing corruption prosecutions at province level on the number of accomplices who benefit from the protection program, that is:

$$C_{i,r,t} = a_i + \gamma_t + bA_{r,t} + \varepsilon_{i,r,t},$$

where $C_{i,r,t}$ is corruption crimes prosecuted per capita in province i , region r , and year t , a_i and γ_t are province and time fixed effects, $A_{r,t}$ is the number of accomplices per capita, and $\varepsilon_{i,r,t}$ is an error term.⁴³

The main problem with this regression is that causality may also run in the opposite direction from corruption to accomplices. Indeed, more effective prosecution systems, better deter corruption, and may thus eventually lower the number of accomplices because fewer corruption opportunities might reduce the incentive to commit mafia related crimes. Thus, the OLS estimator of the causal impact of leniency on corruption should be biased downward.⁴⁴ To overcome this endogeneity problem we rely on an instrumental variable estimator based on the number of non-mafia witnesses who provide relevant information for challenging the mafias. Differently from accomplices, indeed, witnesses are citizens, not involved in any prosecution, who possess and spontaneously report evidence on mafia crimes

⁴³Since any single mafia group is mainly active in one of the core-regions, for each year we assign the number of accomplices to the corresponding region where the group operates.

⁴⁴The simple OLS estimation shows that the coefficient of accomplice is not statistically different from zero.

committed by mobsters that eventually may decide to collaborate with the justice.⁴⁵ Hence, the number of accomplices should be positively correlated with the number of witnesses. The idea that the number of witnesses does not affect directly our measures of corruption stems from the body of laws governing the eligibility into the protection program. More precisely, as stated in art 9. of the law n. 8 January, 1991, the eligibility into the program is granted only to those witnesses that provide relevant information about mafia crimes, which according to art. 51. comma 3 bis of the ‘*Codice di Procedura Penale*’⁴⁶ does not include corruption. The anecdotal evidence offers an ample range of examples of casual witnesses of mafia related murders and traffic smuggling. Even in the case of extortions, which do not typically take place in the broad daylight, the witnesses are often the victims of the extortion themselves and their relatives. In contrast to typical mafia crimes, though, corruption activities, such as briberies and kickbacks, are less exposed to casual observation, hence in practice is very hard to find cases of witnesses experiencing corruption crimes. This explains why the witness variable is a good instrument for accomplice.

Table 5 reports the main results. As a control we have also used provincial data on the number of local governments dismissed because of mafia infiltration, such variable being referred as Municipality.⁴⁷ The first two columns are based on the core-region provinces since 1995, thus they show the effect of variations in Accomplice conditional on the leniency policy, while the third and fourth columns refer to all Italian provinces since 1980, and thus now the estimates may be interpreted as measuring the overall effect of leniency, analogously to a diff-in-diff (DID) estimation strategy. In the latter estimates we have also added DID-constant, which takes values 1 for the years 1992-2005 across the 22 provinces of the core-regions and 0 otherwise, and DID-trend, which equals a deterministic trend when DID-constant is equal to 1. In general, estimate of the causal effect of Accomplice on measured corruption turns out to be positive and strongly statistical significant, implying that we are mainly detecting the impact of leniency on the rate of prosecutions.⁴⁸ The sign of Municipality is positive,

⁴⁵As for the accomplices, for each year since 1995 data are available on how many witnesses have provided information about crimes or mafia accomplices related to the Camorra, N’drangheta, Sacra Corona Unita and Mafia.

⁴⁶The Italian ‘*Codice di Procedura Penale*’ differs from the Penal Code (*Codice Penale*) to the extent that the former offers, among other things, guidelines about how the laws contained in the latter must be applied.

⁴⁷There are three levels in the local administrative system in Italy. At the bottom of the scale there are Municipalities, and above them Provinces and then Regions. Municipalities are the most important administrative units, they are lead by the *Consiglio Comunale*, the town or city council. Starting from 1990 – see the Appendix – the Italian parliament has approved various laws regulating the activities of town councils’ which are located in typical mafia Regions. These laws make sure that city councils can be dismissed in case of mafia infiltration.

⁴⁸First stage estimation validates our choice of the instrument. For instance, the t-statistics of the coefficient of Witness, related to the second column of table 5, is 4.22.

too.

Table 5: CORRUPTION AND MAFIA ACCOMPLICES: IV ESTIMATES

	Core-regions, 1995-2005		Italy, 1980-2005	
Accomplice	14.919**	15.312**	1.155***	1.124***
	(3.001)	(3.040)	(7.586)	(5.743)
Municipality		18.411*	8.540***	8.583***
		(2.188)	(3.745)	(3.767)
DID-constant			-0.044***	-0.046***
			(-5.262)	(-5.203)
DID-trend				0.000
				(0.330)
N	242	242	2375	2375

Note: Dependent variable is the number of officials prosecuted because of corruption per capita. The instrument for Accomplice is Witness. Provincial as well as calendar year dummies (not reported) are allowed. The t-values are in parentheses; significant coefficients are indicated by * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

6 Literature review

By focusing on the relationship between organized crime, corruption of law enforcers and leniency programs, our paper contributes and is related to different strands of the literature on law enforcement. This literature, which begins with Becker (1968), has emphasized the deterrence capacity of the judicial system on criminal activities.⁴⁹

The role played by corruption in our model is the main difference with the works on self-reporting and self-policing by Kaplow and Shavell (1994) and Innes (1999). Self-reporting saves enforcement resources because individuals reporting their harmful acts need not be detected. Self-policing, on the other hand, increases efficiency in two ways: the enforcement effort is often reduced, and efficient remediation is achieved early and with certainty.⁵⁰

⁴⁹See also Stigler (1970), Becker and Stigler (1974) and Polinsky and Shavell (2000) for a comprehensive survey on law enforcement. On the deterrence and incapacitation effects of the criminal justice system see Ehrlich (1973) and Levitt (1996, 1997 and 1998).

⁵⁰Innes (1999) calls self-policing of behavior, when violators *voluntarily* engage in remediation activities that reduce the harm caused by their violation.

Because the individual can act after committing the crime, but before being caught, what makes those policies socially beneficial is the fact that they save on enforcement. In our paper, instead, the socially beneficial effect of leniency stems from the induced substitution from corruption, which lowers deterrence, to whistleblowing that strengthens deterrence by increasing the probability of apprehending other criminals.

The possibility of whistleblowing makes our analysis also related to the literature on antitrust law enforcement studying the effects of leniency programs on cartel formation in oligopolistic markets. The first paper explicitly addressing the effects of leniency programs on cartels is Motta and Polo (2003). They analyze the impact of reduced fines for cartel members that inform the antitrust authority and show that it can be efficient to reduce fines even when the authority has already started an investigation, but has not yet obtained evidence of misbehavior. This paper however, takes leniency rules as exogenous and does not allow for corruption: two points which are key to our analysis. Contrary to Motta and Polo (2003), Spagnolo (2003) assumes that when a cartel is detected it is also convicted. This allows to focus on the impact of leniency on cartels which are not already under investigation. In addition, following the approach taken in Rey (2003) and Spagnolo (2003), we also take into account the role of rewards to former criminals by studying their determinants and social value. Perhaps, the spirit of our paper is much closer to Chen and Rey (2007), which study the optimal design of leniency programs in a standard oligopoly framework. As Chen and Rey, we also take a mechanism design approach to leniency, but in a very different context. Finally, in an antitrust setting, Aubert et al. (2006), analyze a model where leniency programs could have a positive social value insofar as they create a conflict of interests between members of different organizations (cartels or firms). They also discuss informally the idea that leniency programs could be desirable insofar as generate conflicts between the members of the same organizations (e.g., firms). Our model is built precisely on this intuition but, in contrast to them, it fully develops the formal arguments, and it identifies the main trade-offs at stake by shedding novel light on the available historical and empirical evidence.

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.⁵¹ 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.⁵² Polinsky and Shavell (2001) consider

⁵¹Besley and McLaren (1993) and Mookherjee and Png (1995) also propose efficiency wages to deter bribery.

⁵²See also Basu et al. (1992), Marjit and Shi (1998), Chang et al. (2000) and Garoupa and Jellal (2002).

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, in a recent paper Kugler, Verdier and Zenou (2005) analyze an oligopoly model of criminal organizations, where the competing clans also 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: The role of corruption is not only in diluting deterrence but also as a strategic complement to crime, as a catalyst to crime. Our approach contributes to this literature in that we focus for the first time on the relationship between organized crime, corruption of public officials and endogenous leniency programs.

Finally, there are very few studies relating corruption to institutional changes. Two experiences of corruption-crackdowns have been documented by Skidmore (1996) and Di Tella and Schargrodsy (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. Our empirical analysis is also closely related to that of Miller (2007). Although being silent on the link between leniency and corruption, he also provides evidence consistent with the idea that leniency enhances deterrence and detection capabilities.⁵³

7 Concluding remarks

We have identified the determinants of accomplice-witnesses programs by underscoring the beneficial role that granting amnesty to informants plays on crime rates as well as on corruption. Our theoretical analysis has shown that the necessity of dealing with former criminals willing to cooperate with the justice, becomes more intense as long as the prosecution system is poorly efficient and the information provided by “flipping criminals” is highly reliable. Consistent with the available historical evidence, the analysis has also shown that the degree of cohesion between the members of a criminal organization is key for the design of the optimal leniency policy: rewards to informants are indeed sometimes necessary in the presence of organizations featuring strong cohesion between their members.

The implications of our analysis are tested by using data collected for Italy before and after the introduction of a leniency policy in 1991. The evidence allows to identify the positive effect of the policy on prosecution as well as its deterrence effect on crimes. Moreover, by using the evidence on the number of accomplices we also identify the positive impact of

⁵³Miller (2007) relies on data generated by the leniency program introduced by the U.S. Department of Justice in 1993 with the intent of destabilizing existing cartels and deterring new cartels.

the policy on corruption prosecution.

Appendix

Proof of Proposition 1: Differentiating $\widehat{R}_l(\phi)$ with respect to ϕ and using the fact that $\partial\widehat{\delta}(\phi)/\partial\phi = -S_a$, we have the first-order condition:

$$-S_a(1-G(\widehat{\delta}(\phi))) + S_a((1-\phi)S_a + L + \bar{\theta}S_p)g(\widehat{\delta}(\phi)) - S_a(\beta(pS_a + \underline{\theta}S_p) + \widehat{\delta}(\phi))g(\widehat{\delta}(\phi)) = 0.$$

Collecting terms and using the definition of $\widehat{\delta}(\phi)$, the above equation immediately implies (6). In order to prove uniqueness we need to show two preliminary results. Specifically, we must verify that the Legislator cannot gain by setting the amnesty rate neither so large that all agents will talk, that is $\widehat{\delta}(\phi) \leq \underline{\delta}$, nor so small that no one will talk, that is $\widehat{\delta}(\phi) \geq \bar{\delta}$. Suppose first that δ satisfies $\widehat{\delta}(\phi) = \underline{\delta}$, so that $G(\widehat{\delta}(\phi)) = 0$. The sign of the first-order derivative of $\widehat{R}_l(\phi)$ with respect to ϕ is determined by:

$$\text{sign} \left. \frac{\partial \widehat{R}_l(\phi)}{\partial \phi} \right|_{\widehat{\delta}(\phi)=\underline{\delta}} = \text{sign} [-1 + (\bar{\theta} - \beta\underline{\theta}) S_p g(\underline{\delta})],$$

and under **A3** this sign is negative, implying that setting ϕ so large to induce all agents to talk is not optimal. Consider now the case where $\widehat{\delta}(\phi) = \bar{\delta}$, so that $G(\widehat{\delta}(\phi)) = 1$. The sign of the first-order derivative of $\widehat{R}_l(\phi)$ with respect to ϕ is determined by:

$$\text{sign} \left. \frac{\partial \widehat{R}_l(\phi)}{\partial \phi} \right|_{\widehat{\delta}(\phi)=\bar{\delta}} = \text{sign} [(\bar{\theta} - \beta\underline{\theta}) S_p g(\bar{\delta})],$$

implying immediately that setting ϕ so small to induce no agent to talk is also not optimal.

Now, showing that \mathcal{L} features a unique interior solution identified by (6) amounts simply to verify that $\widehat{R}_l(\phi)$ is single peaked (or strictly quasi-concave): this implies that for all $\phi \geq \phi^*$ the derivative of $\widehat{R}_l(\phi)$ must be negative. Therefore, given the link between the function $\widehat{\delta}(\cdot)$ and ϕ it must be true that:

$$-(1 - G(\delta)) + (\bar{\theta} - \beta\underline{\theta}) S_p g(\delta) < 0 \text{ for all } \delta \leq \widehat{\delta}(\phi^*). \quad (13)$$

Using the fact that by (6) it must be

$$(\bar{\theta} - \beta\underline{\theta}) S_p = h(\widehat{\delta}(\phi^*)),$$

and substituting into (13) we will have uniqueness if:

$$-(1 - G(\delta)) + h(\widehat{\delta}(\phi^*))g(\delta) < 0 \text{ for all } \delta \leq \widehat{\delta}(\phi^*),$$

which, in turn, implies:

$$h(\widehat{\delta}(\phi^*)) < h(\delta) \text{ for all } \delta \leq \widehat{\delta}(\phi^*),$$

but this inequality is directly implied by **A2** stating that the hazard rate $g(\delta)/(1-G(\delta))$ is strictly increasing in δ . Hence the result.

Finally, showing that the crime rate always reduces under leniency relative to the no leniency regime requires a simple revealed preference argument. In fact, the Legislator could obtain the same outcome as in the no leniency case by setting a rate such that $\widehat{\delta}(\phi) \geq \bar{\delta}$. But, as shown above, this is never optimal under **A2** and **A3**. ■

Proof of Proposition 2: The comparative statics results illustrated in this proposition can be obtained by a simple application of the Implicit Function Theorem. Let

$$\dot{h}(\delta) = \frac{\partial}{\partial \delta} \left(\frac{1-G(\delta)}{g(\delta)} \right),$$

which is negative under **A2**. Differentiating with respect to $\bar{\theta}$ we have:

$$\text{sign} \frac{\partial \phi^*}{\partial \bar{\theta}} = \text{sign} \frac{S_p}{|h(\widehat{\delta}(\phi^*))| \left| \frac{\partial \widehat{\delta}(\phi^*)}{\partial \phi} \right|},$$

which directly implies $\partial \phi^*/\partial \bar{\theta} > 0$.

Differentiating with respect to S_p on has:

$$\text{sign} \frac{\partial \phi^*}{\partial S_p} = \text{sign} \frac{\bar{\theta} - \beta \underline{\theta}}{|h(\widehat{\delta}(\phi^*))| \left| \frac{\partial \widehat{\delta}(\phi^*)}{\partial \phi} \right|},$$

which, implies $\partial \phi^*/\partial S_p > 0$ since $\bar{\theta} \geq \beta \underline{\theta}$.

By using the same logic one has:

$$\text{sign} \frac{\partial \phi^*}{\partial L} = \text{sign} \frac{\frac{\partial \widehat{\delta}(\phi^*)}{\partial L}}{\left| \frac{\partial \widehat{\delta}(\phi^*)}{\partial \phi} \right|},$$

which implies $\partial \phi^*/\partial L > 0$ since $\partial \widehat{\delta}(\phi^*)/\partial L = 1 > 0$.

Differentiating with respect to β and rearranging one has:

$$\text{sign} \frac{\partial \phi^*}{\partial \beta} = -\text{sign} \frac{|h(\widehat{\delta}(\phi^*))| \left| \frac{\partial \widehat{\delta}(\phi^*)}{\partial \beta} \right| + \underline{\theta} S_p}{|h(\widehat{\delta}(\phi^*))| \left| \frac{\partial \widehat{\delta}(\phi^*)}{\partial \phi} \right|},$$

where by definition of $\widehat{\delta}(\cdot)$ it must be $\partial \widehat{\delta}(\phi^*)/\partial \beta = -p S_a < 0$. It then follows that $\partial \phi^*/\partial \beta < 0$.

Differentiating with respect to p we have:

$$\text{sign} \frac{\partial \phi^*}{\partial p} = -\text{sign} \frac{\left| \frac{\partial \widehat{\delta}(\phi^*)}{\partial p} \right|}{\left| \frac{\partial \widehat{\delta}(\phi^*)}{\partial \phi} \right|},$$

which implies $\partial\phi^*/\partial p > 0$ since $\partial\widehat{\delta}(\phi^*)/\partial p = -\beta S_a < 0$.

Differentiating with respect to $\underline{\theta}$ we have:

$$\text{sign} \frac{\partial\phi^*}{\partial\underline{\theta}} = -\text{sign} \frac{\beta S_p}{|h(\widehat{\delta}(\phi^*))| \left| \frac{\partial\widehat{\delta}(\phi^*)}{\partial\phi} \right|},$$

which immediately shows that $\partial\phi^*/\partial\underline{\theta} > 0$.

Finally, differentiating with respect to S_a and using the first-order condition (6) one gets:

$$\text{sign} \frac{\partial\phi^*}{\partial S_a} = \text{sign} \frac{\frac{\partial\widehat{\delta}(\phi^*)}{\partial S_a}}{\left| \frac{\partial\widehat{\delta}(\phi^*)}{\partial\phi} \right|}.$$

Now, since $\partial\widehat{\delta}(\phi^*)/\partial S_a = 1 - \phi^* - p\beta$ it follows:

$$\text{sign} \frac{\partial\phi^*}{\partial S_a} = \text{sign}(1 - \phi^* - p\beta),$$

the proof is then concluded. ■

Proof of Proposition 3: Using **A2** and **A3**, the proof follows the same logic of that of Proposition 1, and is thus omitted. ■

Proof of Proposition 4: In order to show the result it is useful to consider $\widehat{\delta}$ and $\widehat{\delta}'$ as the choice variable solving the first-order conditions (6) and (9), respectively. Using the fact that $\partial\widehat{\delta}(\phi^*)/\partial\phi = -S_a$, one has:

$$(\bar{\theta} - \beta\underline{\theta}) S_p = h(\widehat{\delta}), \quad (14)$$

and

$$(\bar{\theta} - \underline{\theta}) S_p = h(\widehat{\delta}'). \quad (15)$$

Then, notice that both these equations have the same right-hand side, while since $\bar{\theta} - \underline{\theta} < \bar{\theta} - \beta\underline{\theta}$ the left-hand side of (14) is strictly larger than the left-hand side of (15), which immediately implies $\widehat{\delta} < \widehat{\delta}'$ by **A2**. Finally, comparing $\widehat{\delta}(\phi^*)$ and $\widehat{\delta}'(\phi^{**})$ one has:

$$\widehat{\delta}(\phi^*) - \widehat{\delta}'(\phi^{**}) = S_a(\phi^{**} - \phi^*) + S_a p(1 - \beta) < 0,$$

implying that $\phi^{**} < \phi^*$. ■

Proof of Proposition 5: Consider equation (10), simple algebra allows to show that $\phi^* > 1$ if the inequality in (11) holds. ■

Proof of Proposition 6: As explained in Section 4.3, in order to compare the corruption rate with and without leniency we must sign the difference:

$$b^l - b^n = \underline{\theta} S_p G(\widehat{\delta}(\phi^*)) - \underline{\theta} S_p,$$

which is clearly negative. This means that the introduction of leniency reduces the subset of parameters where the principal prefers to bribe the weak official. ■

Data Sources

Mafia (malicious or intentional) murders. The number of mafia murders reported by the police forces to the judicial authority. The source is ISTAT, *Statistiche giudiziarie penali* (various issues).

Malicious or intentional murders. The total number of malicious murders, for reasons different than mafia, reported by the police forces to the judicial authority. The source is ISTAT, *Statistiche giudiziarie penali* (various issues).

Robberies in banks and post offices. The number of robberies in banks and post offices reported by the police forces to the judicial authority. The source is ISTAT, *Statistiche giudiziarie penali* (various issues).

Kidnappings. The number of kidnappings excluding those related to extortion reported by the police forces to the judicial authority. The source is ISTAT, *Statistiche giudiziarie penali* (various issues).

Prosecution of mafia-type association cases. The number of cases of mafia association (art. 416-bis of the Italian penal code) prosecuted. The source is ISTAT, *Statistiche giudiziarie* (various issues). Each prosecution is recorded according to the starting year, that is when the judicial authority begins the penal action. For each year the spatial distribution reflects the province where the crime prosecuted is presumed to be committed.

Prosecution of criminal association cases. The number of cases of criminal association (art. 416 of the Italian penal code) prosecuted. The source is ISTAT, *Statistiche giudiziarie* (various issues). Each prosecution is recorded according to the starting year, that is when the judicial authority begins the penal action.

Mafia-type association accusation. The number of cases of mafia association (art. 416-bis of the Italian penal code) reported by the police forces to the judicial authority. The source is ISTAT, *Statistiche giudiziarie* (various issues).

Criminal association crime accusation. The number of cases of criminal association (art. 416 of the Italian penal code) reported by the police forces to the judicial authority. The source is ISTAT, *Statistiche giudiziarie* (various issues).

Corruption cases prosecuted. Crimes of public officials prosecuted because of bribery, extortion and embezzlement. The source is the Italian Institute of Statistics (ISTAT), *Statistiche giudiziarie* (various issues). Each prosecution is recorded according to the starting year, that is when the judicial authority begins the penal action. Under the rule of ‘concurrency of charges’, an individual is recorded only for that crime which is punished more harshly by the penal code. Data are relative to 95 Italian provinces during 1980-2005; for each year the spatial distribution reflects the province where the crime prosecuted is pre-

sumed to be committed. In the following we report the relationship between the analytical classification of crimes provided by the ISTAT and the corresponding articles of the Italian Penal Code. Note that according to the latter, crimes from 286 to 292 of ISTAT classification may be only committed by public officials and persons in charge of a public service, whereas the crime recorded at number 294 may involve both public officials and individuals in the private sector.

Crimes	Italian Penal Code articles	ISTAT classification numbers
Embezzlement	314-316	286-287
Extortion	317	289
Bribery	318-320	290-292
Incitement to corruption	322	294

Accomplice. The number of former mafia affiliates participating to the Italian accomplice-witnesses protection program. Source: *Commissione parlamentare d'inchiesta sul fenomeno della criminalità organizzata mafiosa o similare*, technical report (various issues).

Witness. The number of persons who provide relevant information about mafia-related crimes and that participate to the Italian accomplice-witnesses protection program. Source: *Commissione parlamentare d'inchiesta sul fenomeno della criminalità organizzata mafiosa o similare*, technical report (various issues).

Municipality. Local governments dismissed by the central government because of ties between administrators and the Mafia either through direct infiltrations of mobsters into the local administrations or by indirect influence. Source: *Commissione parlamentare d'inchiesta sul fenomeno della criminalità organizzata mafiosa o similare*, technical report (various issues).

Population. The source is ISTAT, *Statistiche Demografiche* (various issues).

For all variables but Accomplice and Witness data are relative to 95 Italian provinces. Starting from 1995, yearly information about the individuals taking part to the protection program is available. The dataset associates to each accomplice his former criminal organization (labelled as Camorra, N'drangheta, Sacra Corona Unita and Mafia). As for the accomplices, since 1995 yearly information about on how many witnesses have provided information about crimes or mafia accomplices related to the Camorra, N'drangheta, Sacra Corona Unita and Mafia.

Fighting mafias in Italy

History of main laws from 1982 to 2005

1982: ‘La Torre’ law: The mafia-type criminal association became a crime per se (*Associazione per Delinquere di Tipo Mafioso*, art. 416-bis of the Italian penal code).

1982: Special law regulating the seizure and requisition of mafia activity proceeds. L. 1982 n. 646 art. 14 (art. 416-bis of the Italian penal code, section 7)

1990: First law requiring the dismissal of local governments for mafia infiltration. L. 1990 n. 142.

1991: Lenient punishments granted to mafia affiliates collaborating with prosecutors. D.L. 13 May 1991 n. 152; L. 12 July 1991 n. 203.

1991: Further instances of local government dismissal for mafia infiltration. L. 1991 n. 221.

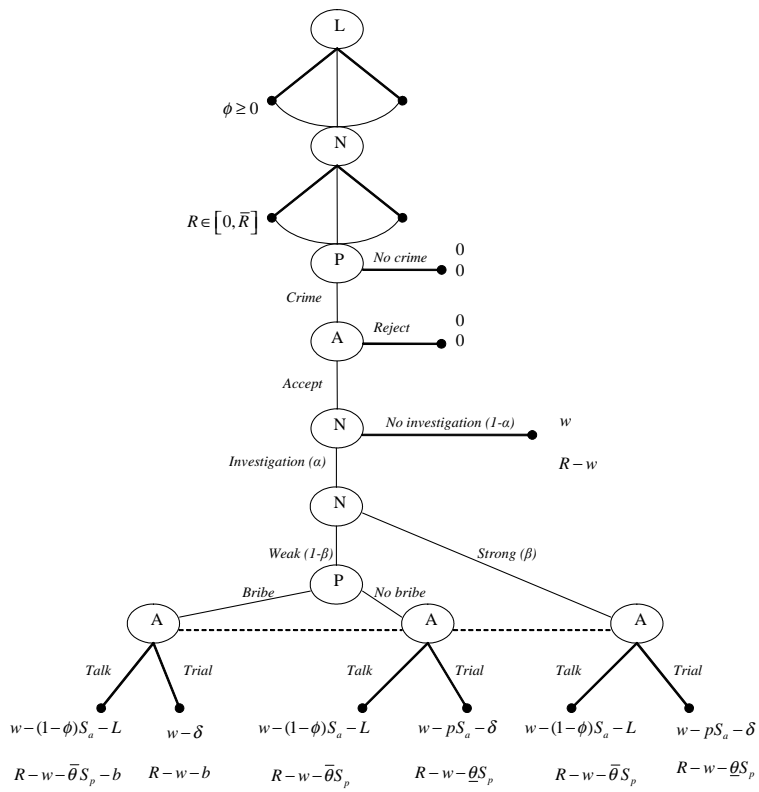
1992: More severe punishments for mafia affiliates and extended benefits granted to accomplices. D.L. June 1992 n. 306; L. July 1992 n. 356.

1992: Further instances of requisition of mafia activity proceeds. L. 1992 n. 356 art. 12-sexies.

1994: Further instances of local government dismissal for mafia infiltration. L. 1994 n. 108.

2000: Further instances of local government dismissal for mafia infiltration. L. 2000 n. 267.

2001: Reform of the Italian accomplice-witnesses protection program. L. 13 February 2001 n. 45.



GAME TREE

Bibliography

- Aubert, C., Kovacic, W., and Rey P., “The Impact of Leniency and Whistleblowing Programs on Cartels”, *International Journal of Industrial Organization*, 24: 1241-1266.
- Ayala, G., (2008), *Chi ha Paura Muore ogni Giorno*, edited by Mondadori, Milano.
- Anderson, A., (1979), *The Business of Organized Crime: A Cosa Nostra Family*, Stanford, The Hoover Institution.
- Anselmo, M., Braucci, M., (2008), *Questa Corte Condanna: Spartacus, il Processo al Clan dei Casalesi*, edited by L’Ancora, Naples.
- Backhaus, J., (1979), “Defending Organized Crime? A note,” *Journal of Legal Studies*, 8: 623-631.
- Basu, K., Battacharya, S., Mishra, A., (1992), “Note on Bribery and the Control of Corruption,” *Journal of Public Economics*, 38: 349-359.
- Buchanan, J., (1973), “A Defense of Organized Crime?”, in *The Economics of Crime and Punishment*, edited by S. Rottenberg, American Enterprise Institute.
- Becker, G., (1968), “Crime and Punishment: an Economic Approach,” *Journal of Political Economy*, 76: 169-217.
- Becker G., Stigler, G., (1974), “Law Enforcement, Malfeasance and the Compensation of Enforcers,” *Journal of Legal Studies*, 3: 1-19.
- Besley, T., MacLaren, J., (1993), “Taxes and Bribery: The Role of Wage Incentives,” *Economic Journal*, 103: 119-41.
- Bowles, R., Garoupa, N., (1997), “Casual Police Corruption and the Economics of Crime,” *International Review of Law and Economics*, 17: 75-87.
- Cantone, R., (2008), *Solo per Giustizia*, edited by Mondadori, Milano.
- Cassese, S., (1977), “Regionalizzazione del 1977: Un primo bilancio”, *Politica ed Economia*, 8: 37-40.
- Cassese, S., (1983), “Espansione e controllo della spesa pubblica: Aspetti istituzionali”, *Rivista di Politica Economica*, 73: 153-171.
- Chang, J., Lai, C., Yang, C., (2000), “Casual Police Corruption and the Economics of Crime: Further Results,” *International Review of Law and Economics*, 20: 35-51.
- Chen, Z., Rey, P., (2007), “On the Design of Leniency Programs,” mimeo TSE.

- Dickey, J., (2004), *Cosa Nostra: A History of the Sicilian Mafia*, edited by Hodder & Stoughton.
- Di Tella, R., Schargrotsky, E., (2003), “The Role of Wages and Auditing During a Crack-down on Corruption in the City of Buenos Aires,” *Journal of Law & Economics*, 46: 269-92.
- Ehrlich, I., (1973), “Participation in Illegitimate Activities,” *Journal of Political Economy*, 81: 521-565.
- Falcone, G., (1991), *Cose di Cosa Nostra*, edited by Rizzoli, Milano.
- Fisman, R., Svensson, J., (2007), “Are Corruption and Taxation Really Harmful to Growth? Firm Level Evidence,” *Journal of Development Economics*, 83: 63–75.
- Gambetta, D., (1992), *La Mafia Siciliana*, edited by Einaudi, Torino.
- Garoupa, N., (1997), “The Theory of Optimal Law Enforcement,” *Journal of Economic Surveys*, 11: 267-295.
- Garoupa, N., (2000), “The Economics of Organized Crime and Optimal Law Enforcement,” *Economic Inquiry*, 38: 278-288.
- Garoupa, N., Jellal, M., (2002), “Information, Corruption and Optimal Law Enforcement,” CEPR Discussion Paper Series No. 3560.
- Glaeser, E., Shleifer, A. (2003), “The Rise of the Regulatory State,” *Journal of Economic Literature*, XLI: 401-425.
- Glaeser, E., Saks, R.E., (2006), “Corruption in America,” *Journal of Public Economics*, 90: 1053-1072.
- Golden, M., (2003), “Electoral Connections: The Effects of the Personal Vote on Political Patronage, Bureaucracy and Legislation in Postwar Italy,” *British Journal of Political Science*, 33: 189-212.
- Innes, R., (1999), “Self-policing and Optimal Law Enforcement when Violator Remediation is Valuable,” *Journal of Political Economy*, 107: 1305-1325.
- Kaplow, L., Shavell, S., (1994), “Optimal Law Enforcement with Self-reporting of Behavior,” *Journal of Political Economy*, 102: 583-606.
- Konrad, K., Skaperdas, S., (1998), “Extortion,” *Economica*, 65: 461-477.
- Konrad, K., Skaperdas, S., (1997), “Credible Threats in Extortion,” *Journal of Economic Behavior and Organization*, 33: 23-39.

- Kugler, M., Verdier, T., Zenou, Y., (2005), "Organized Crime, Corruption and Punishment," *Journal of Public Economics*, 89: 1639-1663.
- Jennings, W., (1984), "A Note on the Economics of Organized Crime," *Eastern Economic Journal*, 3: 315-321.
- Levitt, S., (1997), "Using Electoral Cycles to Estimate the Effect of Police on Crime," *American Economic Review*, 87: 270-90.
- Levitt, S., (1998), "Juvenile Crime and Punishment," *Journal of Political Economy*, 106: 1156-1185.
- , (1996), "The Effect of Prison Population Size on Crime Rates: Evidence from Prison Overcrowding Litigation," *Quarterly Journal of Economics*, 111: 319–51.
- , (1997), "Using Electoral Cycles in Police Hiring to Estimate the Effect of Police on Crime," *American Economic Review*, 87: 270–90.
- Lodato., S., (2006), *Trent'Anni di Mafia*, edited by Rizzoli, Milano.
- Malik, A., (1990), "Avoidance, Screening and Optimum Enforcement," *Rand Journal of Economics*, 21: 341-353.
- Mansour, A., Marceau, N., Mongrain, S., (2006), "Gangs and Crime Deterrence," *Journal of Law Economics and Organization*, 22: 315-339.
- Marjit, S., Shi, H., (1998), "On Controlling Crime with Corrupt Officials," *Journal of Economic Behavior and Organization*, 34: 163-172.
- Mauro, P., (1995), "Corruption and Growth" *Quarterly Journal of Economics*, 110: 681-712.
- Miller N. H. (2007), "Strategic Leniency and Cartel Enforcement" mimeo.
- Mookherjee, D., Png, I., (1992), "Monitoring vis-a-vis Investigation in Enforcement of Law," *American Economic Review*, 82: 556-65.
- Mookherjee, D., Png, I., (1994), "Marginal Deterrence in the Enforcement of Law," *Journal of Political Economy*, 102: 1039-66.
- Motta, M., Polo, M., (2003), "Leniency Programs and Cartel Prosecution," *International Journal of Industrial Organization*, 21: 347-379.
- Olken, B., (2006), "Corruption and the Cost of Redistribution: Micro Evidence from Indonesia," *Journal of Public Economics*, 90: 853-870.

- Paoli, L., (2003), *Mafia Brotherhoods: Organized Crime, Italian Style*, New York, Oxford University Press.
- Persson, T., Tabellini, G., Trebbi, F., (2003), "Electoral Rules and Corruption," *Journal of the European Economic Association*, 1: 958-989.
- Polinsky, M., Shavell, S., (2000), "The Economic Theory of Public Enforcement of Law," *Journal of Economic Literature*, 38: 45-76.
- Polinsky, M., Shavell, S., (2001), "Corruption and Optimal Law Enforcement," *Journal of Public Economics*, 81: 1-24.
- Portes, A., (1998), "Social Capital: Its Origins and Applications in Modern Sociology," *Annual Review of Sociology*, 24: 1-24.
- Posner, R., (1992), *The Economic Analysis of Law*, 4th Edition. Boston: Little Brown.
- Rey, P., (2003), "Toward a Theory of Competition Policy," in *Advances in Economics and Econometrics: Theory and Applications*, Eighth World Congress, M. Dewatripont, L. P. Hansen, S. J. Turnovsky eds, Cambridge University Press.
- Salop, S., (1979), "Monopolistic Competition with Outside Goods," *Bell Journal of Economics*, 10: 141-156.
- Shavell, S., (1987), "The Optimal Use of Nonmonetary Sanctions as a Deterrent," *American Economic Review*, 77: 584-92.
- Shavell, S., (1992), "A Note on Marginal Deterrence," *International Review of Law and Economics*, 12: 345-355.
- Skidmore, M., (1996), "Promise and Peril in Combating Corruption: Hong Kong's ICAC," *Annals of the American Academy of Political and Social Science*, 547: 118-130.
- Spagnolo, G., (2003), "Optimal Deterrence Mechanisms against Cartels and Organized Crime," mimeo, Mannheim.
- Stigler, G., (1970), "The Optimum Enforcement of Laws," *Journal of Political Economy*, 78: 526-36.
- Svensson, J., (2003), "Who must pay Bribes and how Much? Evidence from a Cross Section of Firms," *Quarterly Journal of Economics*, 118: 207-230.
- Svensson, J., (2005), "Eight Questions about Corruption," *Journal of Economic Perspectives*, 19: 19-42.