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ABSTRACT

Leniency and Whistleblowers in Antitrust*

The paper reviews the recent evolution of leniency programs for cartels in the US and EU, surveys their theoretical economic analyses, and discusses the empirical and experimental evidence available, also looking briefly at related experiences of rewarding whistleblowers in other fields of law enforcement. It concludes with a list of desiderata for leniency and whistleblower reward programs, simple suggestions how to improve current ones, and an agenda for future research. The issues discussed appear relevant to the fight of other forms of multi-agent organized crime – like auditor-manager collusion, financial fraud, or corruption – that share with cartels the crucial features that well designed leniency and whistleblower programs exploit.

JEL Classification: K31, K42, L13 and L44
Keywords: amnesty, antitrust, cartels, collusion, competition policy, corporate crime, corruption, deterrence, immunity, leniency, organized crime, self-reporting, snitches and whistleblowers

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1 Introduction

The last ten years have witnessed what one could call, with little or no exaggeration, a revolution in competition policy and antitrust enforcement, "the leniency revolution". Since the DoJ's new leniency policies where introduced in 1993 (the *Corporate Leniency Policies*) and 1994 (the *Individual Leniency Policy*), and began displaying their effects, antitrust authorities' "normal way" to detect, prosecute, and hopefully also deter cartels appears to have radically changed, from buyers' complaints, audits and dawn raids, to well designed leniency policies and self-reporting cartel participants, only followed by the traditional methods.

Leniency policies, or programs, reduce sanctions against colluding firms that report information on their cartel to the Antitrust Authority and cooperate with it along the prosecution phase, helping to convict their former partners. The achievements of the new US leniency policies are described in a number of public speeches by the DoJ staff (available at *http://www.usdoj.gov/atr/public/criminal.htm*) and in several international reports (e.g. OECD 2002, 2003). Since their introduction, an unprecedented number of cartels has been detected and successfully prosecuted, much higher fines have been levied against participants, and several top executives from different countries have served jail sentences in the US. This led the European Union and many other countries around the world to introduce analogous programs.[1]

This "leniency revolution" also led an increasing number of economists to try go beyond the surface of the number of cartels detected or prosecuted and fines levied, to try understand in depth how these programs actually work, what are their likely (positive, and possibly negative) economic effects, and whether they can be improved upon in a way or another.

In this paper I review the recent evolution of leniency programs in the US and the EU; survey theoretical economic analyses of leniency programs; and summarize and evaluate the scarce empirical and experimental evidence available on the subject.[2] I then discuss recent proposals to reward the first cartel member or manager that reports "hard information" on an yet undetected cartel, and look briefly at the related experience of rewarding individuals that blow the whistle against corporations committing fraud against the US government (following the False Claim Act). I conclude with a list of desiderata for leniency programs in antitrust, some suggestions how to improve current ones and eventually introduce whistleblower compensation schemes, and an agenda of open issues

[1] Those policies differ substantially across countries - for example in their generosity and in their treatment of firms reporting second. They are formalized and can be downloaded in many languadges from the homepages of the antitrust authorities that introduced them.

[2] Rey (2003) offers a thorough discussion of the importance of implementation and enforcement issues in antitrust, with particular focus on cartel deterrence and leniency program (see also Motta, 2004). This survey complements Rey (2003) by offering an update on the specific and fast growing literature on leniency and whistleblower reward programs, and on the evidence that starts to be available.

for future research. The survey has no ambition of being objective: having worked extensively on the subject, I have developed rather strong views on the crucial issues at stake, and the survey will reflect these views.

The paper appears also relevant to the fight of many other forms of multi-agent organized crime - corruption, auditor-manager collusion, corporate crime in general - because these share with cartels the crucial features that well designed leniency and whistleblower-reward programs exploit.[3]

For simplicity, in the remainder of this paper I will write under the assumption that all cartels are bad for society and should ideally be deterred. It is important to keep in mind, though, that there are situations in which competition may harm consumers - for example when non-contractible qualitative aspects are very important in terms of gains from trade - in which case agreements to restraint competition may increase welfare.[4]

2 Important preliminaries

2.1 What is special about cartels and analogous forms of organized crime?

Cartels are a form of illegal activity involving the joint, coordinated effort of several agents aimed at restricting competition by fixing prices, allocating market shares, preventing entry, and so on. In this sense, cartels can be considered a mild form of *organized crime*.[5] As emphasized in Spagnolo (2000a,b), organized crimes like cartels share three fundamental features that make them very different from the standard, isolated criminal act committed by an individual wrongdoer at the core of the modern economic literature on public law enforcement stemming from Becker's (1968) seminal contribution.[6]

- The first feature is that cooperation among several agents is required to perform the illegal activity, so that problems of free riding, "hold-up", "moral hazard in teams",

[3] In fact, the debate in antitrust has been followed at short distance by a smaller, parallel debate on the treatment of whistleblowers in financial crimes, sparkled by the recent episodes of corporate mismanagement, from Enron to Parmalat, and by the consequent introduction of the Sarbane-Oxley Act in the US. See e.g. Zingales (2004), and Friebel and Guriev (2005).

[4] Lande (1983) disusses first examples of cartels whose social benefits counterbalance their social costs. Stiglitz (1989) notes that investments in high product quality supply backed by reputation are worth only if there are supracompetitive profits to win in the future. Fershtman and Pakes (2000), Kranton (2003), and Calzolari and Spagnolo (2005) present dynamic models where reducing competition by fixing prices may be beneficial for both producers and consumers.

[5] This section will sound obvious and may perhaps be skipped by readers with a robust industrial organization and/or dynamic games background, or that read Stigler (1964) with due care. The section is however crucial for other readers: my experience is that even experienced economists (some top journal referees) brilliant in law and economics but without industrial organization background may have a hard time understanding the crucial peculiarities of organized crime like cartels. So we take here the chance to discuss them as simply and clearly as possible.

[6] Polisnky and Shavell (2000) offer an elegant encompassing survey of this literature. See also Ganuza (1997), who however focuses mostly on why fines should not always be maximal.

and opportunism in general become relevant: each individual wrongdoer could "run away with the money" and must be prevented from doing it. This "governance problem" cannot be solved in standard ways in illegal organizations because - to curb opportunism of its individual members and ensure internal cooperation - these cannot rely on explicit contracts enforced by the legal system, as do legal organizations. Stigler (1964) made forcefully this point for cartels, arguing that they are intrinsically unstable because of the individual cartel member's incentive to profit from "cheating" on the cartel, i.e. to undercut others cartel members by offering profitable and secret price cuts to their customers.

- The second important feature is that organized criminal activity typically takes the form of "ongoing relationships": instead of isolated criminal acts with given benefit and harm, it delivers *flows* of present and expected future benefits and costs. This is of course a direct consequence of the first feature. Since free riding and individual opportunism cannot be limited by explicit contracts enforced by the legal system, internal cohesion of the criminal organization must be ensured by the agents themselves, illegal arrangements must be "self-enforcing". And the typical way to ensure this is long term interaction, i.e. developing in time a reputation for being tough against who violates the agreement and/or establishing relational contracts sustained by the expectation of future gains from continued cooperation. In both cases, a dynamic, continued activity - "the shadow of the future" - is essential. Again, Stigler (1964) made this point implicitly for cartels, arguing that besides being profitable, to be feasible a cartel must, among other things, be able to police cartel members' compliance with the collusive agreement and credibly threaten to react to defections with analogous price cuts, so that these will not to "cheat" e.g. for fear of provoking a price war or other forms of retaliation.[7]

- The third, crucial feature, only noticed by economists in recent years, is that cooperating wrongdoers, by acting together, inevitably end up having - as a by-product - information on each others' misbehavior that could then in principle be reported to third parties, including law enforcers. This third feature is in turn a consequence of the first two, and is at the very hart of the effects of leniency programs. When crime is committed by a single agent, this will be very careful about being alone and unobserved, so that nobody can betray him but his own mistakes. With cartels and organized crime, instead, each wrongdoer must coordinate with and monitor the others, and automatically acquires information on the others' wrongdoing that can potentially be induced to reveal. How to extract this freely available information is the main issue in the optimal design of leniency programs and whistleblower schemes.

[7]This is why, as cartels, most organized crime *must* take the form of - or be conducted within - long-term dynamic criminal *relationships*. As we know since Schelling (1960) and Friedman (1971), only in a dynamic relationship there may be reactions and threats, credible punishment against partners that defect. See Polo (1995) for an economic analysis of internal cohesiveness and competition problems for criminal organizations.

These three peculiar features imply complex, dynamic incentive structures for the agents involved that are crucial to the optimal design of law enforcement policies. In particular, the fact that cartels are only feasible if participants are able to deter unilateral defections - like secret price cuts - by monitoring and threatening credible retaliation, introduces *a novel kind of deterrence*, not considered in the literature on law enforcement preceding recent dynamic analyses of antitrust enforcement and leniency programs, beginning with Cyrenne (1999) and Motta and Polo (2003). This condition, necessary for any cartel or illegal agreement because of the impossibility to use explicit contracts, is called "incentive compatibility" or "self-enforcing" constraint, in contrast to the "participation" constraint simply requiring that expected additional profits from entering a cartel net of expected antitrust consequences be positive.

Both participation and incentive constraints must necessarily be satisfied for a cartel to be viable, so that if at least one of the two is violated, the cartel is deterred.[8] It turns out that it is much easier for law enforcers to ensure that the incentive constraint is violated than the participation one, in particular by using leniency and whistleblower programs. Many agree that these programs can increase deterrence by increasing the likelihood that cartels are convicted, but a crucial and often disregarded point is in my view that they can deter cartels with much lower expected sanctions than standard law enforcement, by ensuring that the self-enforcing constraint is not satisfied even when sanctions are still way below the level needed to make participation to the cartel unprofitable in expectation, which is what static theories of public law enforcement would require for crime deterrence.[9]

In other words, traditional economic analysis of law enforcement posits that a crime is deterred if the expected payoffs from participating $E(\Pi^c)$, net of the expected legal or antitrust consequences $E(A^c)$, are non-positive:

$$E(\Pi^c) - E(A^c) \leq 0.$$

The fact that self-enforcing constraints must also be satisfied for collusion to be viable implies, instead, that a cartel is already deterred if, for at least one of its members, the benefits from participating to the cartel $E(\Pi^c)$ net of the expected antitrust costs of colluding $E(A^c)$ are below the gains from participating and then defecting and secretly undercutting the cartel $E(\Pi^d)$, minus expected antitrust costs when defecting and undercutting the cartel $E(A^d)$:

$$E(\Pi^c) - E(A^c) \leq E(\Pi^d) - E(A^d).$$

Comparing the two inequalities one sees that the second may easily be made much less stringent than the first, as $E(\Pi^d)$ is larger than $E(\Pi^c)$, while leniency and whistleblower

[8] In addition to these two constraints, there are a number of other conditions that must also be simultaneously satisfied for a cartel to be viable, including that this is able to prevent entry, achieve coordination and establish internal trust (in Sect. 4.2 we will discuss how leniency may also deter cartels by reducing internal trust, increasing the perceived riskiness of such illegal collaboration).

[9] Simulations in Buccirossi and Spagnolo (2006) show that the minimal expected fines with deterrence effects in this case may be less that 10% the minimal "beckerian" expected fines that violate the participation constraint.

reward programs could let $E(A^d)$ go to zero or become negative. Deterrence may therefore be achieved when the expected benefits from forming a stable cartel - net of expected antitrust costs - are still very, very large.

Another crucial thing to note already at this stage is that this novel kind of deterrence is maximized when the incentive for an individual firm to unilaterally deviate and undercut the cartel are maximal, that is, when individual and collective interests of cartel members are most divergent. This means that the problem of maximizing cartel deterrence through leniency can be seen as the inverse of a public good contribution problem, an interpretation that naturally suggests a "winner take all" approach, that concentrates all benefits on one individual - the first one to self-reports - maximizing the conflict of interest with the rest of the group/cartel.

2.2 Leniency programs: "nothing new under the sky"?

Promises of lenient treatment or rewards to elements of an opponent front that "betray" their partners have always been used in war-like situations, and do not have a crystal clear reputation.[10] In law enforcement, offering captured wrongdoers a lenient treatment in exchange for information valuable to prosecution has been a standard tool for centuries practically everywhere.[11] In the US, *plea bargains*, kind of post-detection exchanges of a lenient treatment against self-reporting have been taking place long before the introduction of leniency programs. Analogous post-detection exchanges during prosecution are still routinely used (and sometimes misused) in the US and other countries to fight drug-dealing and other organized crime, even though no publicly announced leniency policy is present.[12] Public promises of prizes or leniency *before* detection and/or prosecution have also often been used in the past.[13] These promises, however, where typically decided case by case, crime by crime.

[10] The mot *Divide et Impera,* of uncertain but ancient origin, describes Julius Cesar and other commanders strategy of breaking coalitions of enemies by striking advantageous deals with one or few of them. Nazi occupants used rewards for "snitches" or a lenient treatment for them and their relatives to fight resistance in France and Italy. More recently, Saddam Hussein and his sons and some Al Quaeda terrorists have been located with the same system.

[11] The fact that leniency/information exchanges at the prosecution stage - i.e. after wrongdoers have been discovered - has been "standard practice" for centuries is also witnessed by how natural it appeared to Albert Tucker in 1950 that casting in terms of a Prisoner's Dilemma story the strategic situation studied by Merrill Flood and Melvin Dresher at the Rand Corporation would easy its understanding by a Stanford psychology class.

[12] The misuse occurs when prosecutors and courts rely exclusively upon a testimony obtained in exchange for leniency. A useful introduction to the drawbacks of this practice is at *http://www.pbs.org/wgbh/pages/frontline/shows/snitch/.* Throughout the paper we will assume that the party applying for leniency must report "hard information" against his partners to obtain it, and that his testimony is only admitted when corroborated by "hard" pieces of evidence.

[13] Schemes that reward whistleblowers with part of recovered funds have been used to reduce the cost of law enforcement since thirteen century England. Bounties for "wanted" criminals have been common in many different countries and historical periods, and often did not distinguish whether it was a gang member or an innocent witness (or a bounty killer) to turn in the wanted.

So what's new about leniency programs in antitrust?

In my view, the feature that makes the leniency programs in antitrust somewhat special, apart from the new field of law enforcement they are directed to, is their being "ex ante", "general", and "public".

They are "ex ante" because - in their first and most innovative parts - they are directed at wrongdoers that have not yet been identified/detected, encouraging these to self-report. In doing this, leniency policies act before detection and the prosecution stage, not only after detection occurred and prosecution began, as plea bargains.

They are "general" in the sense that they apply anonymously, to anybody who is in a certain codified situation and behaves or may think of potentially behaving in a certain way.

They are "public", in the sense that, even in the US, where prosecutorial discretion has always allowed for exchanges of leniency against evidence, they take the form of codified, automatic (hence predictable) and publicly advertised policies.

Codification is actually instrumental to both generality and publicity, and helps reducing uncertainty and discretionality, two aspects that greatly discourage self-reports. Publicity is crucial for leniency programs because the crucial objectives of law enforcement they are well suited to achieve - if well designed - are:

i) deterring (preventing) cartel formation by undermining trust among potential co-conspirators with the increased likelihood that one of them could then loose confidence and turn the others in;

ii) detecting (discovering) cartels that were not deterred, by eliciting information on and from them.

Both these objectives require that the program is general, public, transparent, predictable and very well advertised in the legal and - above all - business community. This is perhaps one reason why DoJ officials are (and should) be spending so much time going around at businessmen and lawyers' meetings to present the results of these programs in terms of convicted cartels.

General, formalized and anonymous policies promising leniency, protection, and sometimes rewards against collaboration to not-yet-detected individuals have recently and successfully been used in Italy to fight Sicilian Mafia and Red Brigades' terrorists. These public policies are probably the closest ever to the current leniency policies in antitrust, although their (successful) implementation, at least in Italy, has been much less careful than one would have hoped for.[14]

A third, important function of leniency programs in antitrust is *ex post*: iii) facilitating prosecution through exchanges of a lenient treatment against information and/or testimony on the infringement *after* a cartel has been detected in other ways. This function is particularly important in adversarial systems like the US, where a jury must be

[14] Obvious mistakes in the implementation of these programs - particularly in terms of letting applicant reveal information selectively, piece after piece, and in relying too much on them as witness rather than as sources of "hard information" - have led in Italy to their practical downfall in spite of their demonstrated effectiveness in the fight against Mafia and terrorism.

persuaded rather than an administrative, trained body, because it is typically hard to find sufficient hard evidence on cartels to persuade a jury without direct witnesses. However, this function does not require the generality and publicity of a public Leniency Policy; post-detection leniency/information exchanges can be done, and have always been done - with plea bargaining in Anglo-Saxon countries and Prisoner's Dilemma style promises in other systems - with direct, "private", tailor-made agreements between prosecutors and the specific individual wrongdoers. In this regard, therefore, leniency programs appear to bring less novelty to law enforcement. This view appears consistent with that of some practitioners involved with these programs. For example, according to the staff of the most experienced agency on the subject, the DoJ, the main issue about leniency programs is:

> *How do you build a leniency program that will cause a company to come forward and voluntarily report its participation in a cartel that has gone previously undetected?* (Hammond 2004, p. 2).

2.3 The objectives of (antitrust) laws: what is a "success" in law enforcement?

Most antitrust practitioners, prosecutors and lawyers, and most casual observers have celebrated leniency programs as a terrific success. Can we be really sure that leniency programs are such a success? I believe they are effective, but we don't *know* it. To answer this simple question, that few have asked in the policy debate, we have to clarify what exactly is a success in antitrust law enforcement against cartels, and to do this we must go back to the objectives of antitrust laws. The discussion may appear redundant to many readers, but again my personal experience is that there is a lot of confusion around, in particular between instruments and objectives, that makes an introductory discussion worthwhile.

As for most other laws, the main objective of antitrust law enforcement against cartels is avoiding that the outlawed courses of action - in our case collusive product market agreements - take place. There are of course other objectives, including victim compensation and justice/fairness per se, but they are clearly of second order relevance: the main reason why societies invest large amounts of resources to enforce the law is to reduce the frequency of inefficient, outlawed courses of action, i.e. crime *deterrence* (Beccaria, 1763, §XII).

With respect to cartels, this general objective can take at least two forms:

- the first and by far most important one is *ex ante* or *general deterrence* (or just *deterrence* in the remainder of the paper) i.e. preventing cartel formation with the threat of sufficiently heavy and prompt expected sanctions against violators, and with other mechanisms that make cartels either unprofitable or unstable (on the dominance of prevention on any other target of law enforcement see again Beccaria, 1763, §XLI);

- a second and secondary objective is *ex post deterrence* or *desistance,* i.e. ensuring that those among the cartels that could not be deterred ex ante but are then detected

and prosecuted by law enforcers, are induced to interrupt the illegal practice, either by the threat of even higher expected sanctions for repeat offenders, or by other, tougher mechanisms, like incapacitation through imprisonment or disqualification.

Ex ante deterrence is by far the most important objective because it may be achieved for a very large number of potential infringements and at a much lower social and individual cost than desistance.

Potential cartels that are not deterred will form, and then either go undetected, in which case they will directly reduce social welfare for the time of their existence; or they are detected at some point by law enforcers, who then prosecute them, so that the direct cost to society is reduced by the shorter life of the cartel (provided prosecution leads to desistance), but the additional, substantial social costs of prosecution are incurred.[15]

Potential cartels that law enforcement deter ex ante (prevents from forming) do not imply these social costs; nor ex ante deterrence requires that law enforcement agencies detect each particular potential violator, as is the case for desistance. Deterrence, therefore, acts *generally*, on a much larger number of potential infringements. And the more deterrence is produced by a law enforcement system, the less desistance is needed and occurs, the larger are the savings in prosecution costs society enjoys.

For these reasons, ex ante deterrence is, and must be the by far primary objective of law enforcement, and the first an foremost criterion for the evaluation of its optimality/efficiency.

Note that if we abstract from its effects on deterrence, secondary objectives aside prosecution is a pure deadweight loss to society. If prosecution had no deterrence effects, e.g. because sanctions are too low (e.g. lower than gains from the infringement), from an economic efficiency point of view it should simply be avoided.[16]

The preceding discussion should have clarified that since law enforcement is a costly activity for society, the success of a (antitrust or other) law enforcement policy should be principally measured by the welfare increase from its *deterrence effects,* particularly ex ante ones, relative to its costs. A general problem, therefore, in evaluating the appropriateness and effectiveness of law enforcement policies, is that it is hard (though not impossible) to estimate their deterrence effects, as it requires identifying and measuring the costs of illegal acts that did not take place but that would have taken place in the absence of the law enforcement policy under scrutiny, and compare them with the costs of the policy.

Going back to our leniency revolution, in the last decades we observed a steep *increase* in the number of successfully prosecuted cartels and in the size of imposed sanctions.

[15] Prosecution costs include, among other things: the budgets of involved courts and agencies, plus the cost of distortionary taxation required to finance them; the costs of prosecution/litigation not included in those budgets, like the cost of defence lawyers, expert witnesses, and the time loss of their clients; the social costs of Type I errors, i.e. of convictions of innocents; and the costs of imposing sanctions on (rightly or wrongly) convicted parties.

[16] Again we are exaggerating a bit to clarify. Of course there are other reasons to prosecute criminals, including pursuing "justice", which may directly produce utility in a society of justice-lovers; and offering compensation to victims. But the main motive is of course deterrence, and in case of cartels this objective appears even more dominant.

This tells us something about the change in prosecution costs (they may have fallen thanks to the improved information from leniency applicants, and their total may have increased together with the number of prosecuted infringements), but little about changes in deterrence. This is why we may well believe that in the US the increase in convictions and prosecution costs should have fed up into increased deterrence, but clearly we don't *know* this.[17] One should keep in mind that in case of a "complete" success - complete prevention/deterrence - we would observe a *decrease* (to zero) in the number of detected and prosecuted infringements, not an increase!

Leaving aside complete deterrence, consider an hypotethical country in which antitrust sanctions are so mild that cartels would continue being formed even if the probability of being convicted was close to one. Suppose that the initial probability of conviction before the introduction of leniency programs was one-sixth, and that the introduction or a leniency program doubles this probability to one-third, and even reduces per-conviction prosecution costs of one-fourth (because of the improved information it makes available to prosecutors). In this case, assuming that convicted cartels start again colluding after conviction because of the very mild sanctions, the introduction of the "effective" leniency program causes a net social loss, as it increased total prosecution costs of about half their pre-leniency amount without any countervailing benefit in term of increased deterrence. In such a situation, if sanctions cannot be drastically raised, the second best policy is not introducing leniency programs, but rather to completely stop wasting resources in trying enforce cartel prohibitions with risible sanctions. Note that although this example may appear somewhat extreme, an observer that does not know that the sanctions are too mild to deter cartels would observe exactly what we observe today: a sharp increase in the number of detected and convicted cartels. And if this observer was as optimistic as we are, he would also conclude that yes, the leniency program was a terrific success: it doubled the number of convicted cartels!

To conclude, the optimistic view that the increase in convicted cartels reflects an increase in cartel deterrence is plausible, but the actual change in active cartels caused by the Corporate Leniency Policy is not directly observable, so that in principle the observed increase in convicted cartels could even be due to an increase in cartel activity.[18] And even if we were sure that current leniency programs increased cartel deterrence, we would not know whether differently designed ones would have done better. This calls loud for theoretical, experimental, and econometric research.

3 Evolution of Leniency Programs

In this section I will briefly discuss the evolution of Leniency Programs in the two world largest jurisdictions that introduced them, as they exemplify the two main legal frame-

[17] Perhaps the strongest indication that US Antitrust Policy is having deterrence effects (and that the EU one is not) is the observation that some recently uncovered international cartels chose to collude and meet in all markets around the world but the US one (see Hammond, 2004).

[18] In fact, this is a conclusion of the only two econometric analysis of leniency programs I am aware of, Brenner (2005), for the EU between 1996 and 2002.

works within which antitrust law is being enforced around the world: an adversarial system, where juries and judges decide on the case since the first instance; and an administrative/inquisitorial system, where a public agency has both prosecutorial and judicial power, though it is subject to appeal to higher courts.

3.1 The evolution of US LPs

The US DoJ introduced a leniency policy for cartels already in 1978, but this old policy was much less generous than the new one introduced in 1993, both in terms of reductions in sanctions awarded to spontaneously reporting firms, and in terms of the possibility to award leniency when firms start cooperating when they are already under investigation. The first program was also not very transparent, not at all "automatic", leaving the DoJ with much discretion in its implementation, and prospective applicants with a lot of uncertainty on the likely outcome of a leniency application. As a result, very few firms applied for leniency under the old US leniency program.

In 1993, the programme was revised and changed significantly, making the scope of amnesty much clearer and broader. In particular, Section A of the new *Corporate Leniency Policy* makes the awarding of complete amnesty to the first cartel member that self-report *automatic* under the condition that no investigation is underway before the applicant comes forward. Its Section B awards leniency to the first reporting firm even when it reports after an investigation has begun, as long as at the time of the report the DoJ does not have already evidence "likely to result in a sustainable conviction". Also, as long as reporting is a "truly corporate act", under the new policy amnesty is granted to all individual officers, directors, and employees of the applicant firm who cooperate with the investigation.

In addition, the *Individual Leniency Policy* was introduced in 1994, to complement the corporate one by offering individuals involved in a conspiracy the possibility to directly apply and receive amnesty independently of their company, in which case the company and all fellow managers involved are not covered by leniency.

These revisions had a profound impact on the programme. Since their introduction the number of applications increased more than ten-fold and was accompanied by a dramatic increase in the magnitude of penalties imposed. Leniency applications appear directly responsible for successful prosecutions in several if not most recent high profile US cases. According to the OECD (2002, 2003), the dramatic increase in leniency applications is also due to the substantial increase in sanctions, both corporate and individual fines and jail sentences, that took place in recent years. But the two forces are likely to have operated together, reinforcing each other. The improved quality and quantity of evidence provided by leniency applicants are probably an important determinant of the DoJ improved ability to obtain higher sanctions from US courts, and these higher and well advertised sanctions in turn further increased the attractiveness of leniency programs.

The combination of high sanctions and guaranteed amnesty for the first comer appears to have created strong incentives for corporations to come forward. According to Scott Hammond, former Director of Criminal Enforcement of the DoJ Antitrust Division, more

than 50% of the leniency applications are taking place before an investigation is opened, falling therefore within Section A of the Corporate Leniency Policy (personal communication). In his words, "over the last five years, the Amnesty Program has been responsible for detecting and prosecuting more antitrust violation than all of our [other investigating tools]" (2001). Similar statements can be found in Spratling (1998, 1999).[19]

Even after the enormous increase in convictions and fines of the last decade, concerns remained in the Antitrust Division and among commentators (e.g. Rey 2003; Spagnolo 2000a, 2004) that the prospect of treble-damage lawsuits was dissuading some antitrust wrongdoers from participating in the programme. In particular, cartel participants had to weight the benefits of immunity from criminal prosecution against the likelihood of federal and state treble-damage claims based on their admitted wrongdoing. Leniency applicants might have found themselves liable not only for triple the damages suffered by customers that they dealt with, but also for three-times the damages of their co-conspirators' customers under joint and several liability rules.

Many of these concerns were removed by the 2004 Criminal Penalty Enhancement and Reform Act. This new legislation limits the total private civil liability of corporations that have entered into leniency agreements with the antitrust Division (combined with that of their officers, directors, and employees who are covered by the agreement) to actual damages "attributable to the commerce done by the applicant in the goods or services affected by the violation" plus attorneys' fees, costs, and interest. That is, corporations that meet the requirements and obtain amnesty are no longer liable for treble but only single damages, and are no longer jointly and severally liable for damages suffered by their co-conspirators' customers. Conversely, the legislation increases the potential liability for cartel participants that do *not* obtain leniency, because in addition to their previous liability they may now also be jointly and severally liable for twice the actual damages suffered by customers of the leniency applicant. It also dramatically increases potential criminal penalties (much higher fines and up to ten years of jail) for price-fixing and analogous infringements.

3.2 Evolution of the EU LPs

The European Commission was among the first jurisdictions to follow the example of the DoJ, introducing a Leniency Program in 1996. As happened with the first US Leniency Policy, the first EU Leniency Notice was not very effective in eliciting reports from cartel members, as the amount of fine reduction was uncertain and discretional. Moreover, fines had been very low before 1996, and in the absence of criminal sanctions, the incentive to come forward was rather low for corporations.

[19] One must be careful to separate really spontaneous reports by members of yet undetected cartels from: a) reports when the DoJ is suspicious and may be about to start an investigation of the industry, e.g. because a cartel in that industry has been detected elsewhere; and b) reports about a new cartel obtained by members of a detected cartel under prosecution and asked whether they have anything else to report (the "Omnibus Question"). It would be nice if the DoJ and other Antitrust Authorities could help out providing more precise data on this important issue.

In February 2002 the Commission revised its six-year old Leniency Program by reducing its discretion in its implementation and increasing the size of fine reductions leniency applicants can expect, also starting to offer almost *automatic* immunity from fines to the first member of a cartel that reports valuable information before an investigation is opened (§ 8a, 9) or when the EU has very little information (§ 8b, 10) on the cartel. Moreover, the 2002 Leniency Notice substantially reduced the amount of information an applicant needs to report to obtain leniency when applying before an investigation is opened.

If a leniency application takes place before an investigation is open and falls under paragraphs 8a and 9 of the new Notice, then the amount of reported information required for leniency to be awarded must only be sufficient *to enable the Commission to carry out an investigation*. If, instead, the report takes place after the investigation started, falling under paragraphs 8b and 10 of the 2002 Notice, the requirement remains more stringent: the amount of reported information must be sufficient for the commission to *find an infringement*.

Also, the new EU Leniency Notice offers extended coverage: ringleaders can now obtain leniency, provided they did not force other firms to join the cartel.

In the year following the February 2002 revision a clear "structural break" occurred in the path of reports, as more than twenty application for leniency were filed, most of which were immunity applications made before an investigation was opened. In contrast, in the six years between 1996 (when the first EU Leniency Program was introduced) and 2002 only 16 applications for leniency were filed, of which just three led to the granting of immunity (Van Barlingen, 2003). This trend continued with about half of the applications falling under paragraphs 8a and 9, forcing DG Competition to undertake an internal reorganization without which it would not have been able to handle all the cartel cases that are being reported.[20]

As for June 13 2005, since the entry into force of the new Notice on 14 February 2002, DG Competition received about 140 leniency applications. Of these, about 75 were for immunity, i.e. were submitted before an investigation started, and about 65 were for a reduction of fines. Of the 75 immunity applications, about 55 were granted, which

[20] In November 2004, the Commissioner Mario Monti wrote:

> "Since adoption of the revised Leniency Notice in 2002, the Commission received 92 immunity applications and applications for reduction of fines which so far led to over 38 conditional immunity decisions. As to the distinction between the different types of applications, it should be noted that only one application for full immunity can be granted for each cartel. Apart from that several applications are usually received in the same case, sometimes competing ones. *While many of these applications lead to inspections as they provide the first evidence of a cartel infringement, the Commission has also received applications on the occasion of inspections launched on the Commission's own initiative.* In these cases, the application – if successful – enables the Commission to determine the exact scope of a cartel infringement (for example its geographic scope, where previous information related only to cartel activities in a particular Member state)." (Answer given by Mr Monti on behalf of the Commission to EU Parliament; written question: P-2432/04, 17 November 2004; italic mine).

among other things signals that many of them were relative to real infringements. Most of these, in fact, have led to investigatory measures. Most of the remaining 20 immunity applications were still being processed, some others were not granted.[21]

3.3 Main differences

The US and EU leniency policies are often regarded as rather different in several respects. In my view, the two instruments are more similar than how often described, though they do differ in some respects and, most importantly, can be interpreted and implemented very differently.

A first difference regards the treatment of ringleaders. Allowing also ringleaders to obtain leniency, as in the EU but contrary to what is done in the US, may be important to elicit self-reporting, as it may not be that clear to a firm considering whether to apply for leniency if it risks being regarded as a ringleader; and may increase ex ante deterrence by ensuring that even the ringleader cannot be completely "trusted", as it also may potentially lose confidence and rush to report under the leniency program. On the other hand, in an adversarial system, where testimony is crucial to persuade juries, testimony by a ring leader may not be convincing. This may provide a ground for the DoJ decision to exclude ringleaders from their winner-take-all leniency policy.[22]

A perhaps more important difference is that the EU program offers milder forms of leniency also to all other firms that are not the first to come forward, provided the additional information they report is sufficiently valuable to prove the case. The US program does not allow instead to be lenient to a second reporting firm, it only awards amnesty to the very first firm providing valuable information. Since plea bargaining was eliminated from US antitrust enforcement in 1989, leaving sentences of wrongdoers that did not qualify for leniency to judges and Sentencing Guidelines, this implies that the DoJ does not have formal instruments left to reward a second or third firm that reports helpful information.[23] However, this difference is less sharp than it looks like, as US courts have been given increasing discretion in setting sanctions, and may reduce them for firms that cooperated with investigators but did not qualify for amnesty.

It is sometimes argued that in the US the first firm reporting information on a cartel automatically receives amnesty, while in the EU whether a firm reporting after an investigation started receives leniency depends on the amount and novelty of the information actually reported (§ 10 of the EU Notice; as noted, the requirement of § 9 for reports before an investigation started are milder). In my view the two stated policies are in practice not that different, although they may certainly be implemented in very different ways, because also the US program places conditions about the information reported by

[21] Personal communication, Bertus Van Barlingen, DG Competition, 13 June 2005.

[22] I thank Gregory Werden for drawing my attention on this point. It would be nice to see these trade-offs analyzed formally.

[23] Of course, it does have some informal instruments to be lenient with a second cartel participant if it wishes to.

an applicant.[24] If implemented strictly, these conditions limit the awarding of leniency to situations in which the information provided is highly valuable, either because it detects an unknown cartel, or because the Division has very little evidence against the firms it is investigating. This implicitly creates the link between the value of reported information and the awarding of leniency that is made explicit in the EU leniency program. Therefore, in principle both programs can be implemented strictly, denying leniency - for example - when the reported information is not that valuable, to limit "pro forma" or "strategic" applications from firms withholding important information.

In my view, the most important statutory difference is that in the US there is individual liability for cartel infringements and therefore a correspondent Individual Leniency Policy that complements the Corporate one. The ability of individual employees to obtain leniency on their own tends to generate agency problems in colluding firms which may lead these to come forward more often, before a manager or employee decides to come forward on its own under the Individual Leniency Policy, or not to collude in the first place (see Sections 4.4.1 and 4.5.3 below).

The remainder of this chapter will make clear that I tend to be in favor of a strict winner-take-all approach like the US one, with generous leniency and possibly rewards, but only for the first applicant and only if enough information is reported (or collected through ex post collaboration, e.g. with a secret microphone/camera), not least because reducing sanctions to several (possibly all) cartel members - as possible in the EU - besides reducing incentives to report first (wait and report only if somebody else does it first may become the optimal strategy for cartel members, rasther than rushing to report hoping not to arrive second or third with a winner-take-all program), it also tends to reduce total fines paid by the cartel. Both effects may substantially reduce deterrence, the very first objective of antitrust law, and if the positive effect in terms of facilitating prosecution is not really dramatic (it may just consist in a easyer life for Antitrust Authorities' officials), such generosity may end up increasing prosecution costs through the increased number of prosecuted cartels and staff required, while reducing general deterrence by reducing expected sanctions, the worst it could happen.

[24]The US program states that leniency can be awarded if either A) no investigation has been opened and "*1. At the time the corporation comes forward to report the illegal activity, the Division has not received information about the illegal activity being reported from any other source*; or, independent of whether an investigation was opened, B) "*1. The corporation is the first one to come forward and qualify for leniency with respect to the illegal activity being reported;* and *2. The Division, at the time the corporation comes in, does not yet have evidence against the company that is likely to result in a sustainable conviction.* Moreover, the US program requires that "*the corporation reports the wrongdoing with candor and completeness and provides full, continuing and complete cooperation to the Division throughout the investigation*". If it is discovered that some information was been withhold by the reporting firm, leniency will not be awarded and the behavior of the reporting firm will be considered an aggravating factor (as in "Penalty Plus"; see Hammond, 2004).

4 Economic theories of leniency

From a theoretical viewpoint, the Prisoner's Dilemma game is perhaps the first and best known model of a leniency/information exchange: the sanctions for a detected wrongdoer are reduced to induce him to confess and prove guilty his former partner(s). The Prisoner's Dilemma refers to a situation in which the joint law violators have already been detected, and leniency seeks to elicit additional information to facilitate prosecution, much like what happens in multilateral plea bargaining (e.g. Kobayashi, 1992).

As argued before, the most novel and distinctive feature of leniency policies, not present in multilateral plea bargaining, is instead their potential ability to deter organized crime directly, rather than indirectly trough improved prosecution, by:

a) preventing cartel formation with the increased likelihood that a leniency application will be their conclusion; that is, discouraging cartels by "undermining trust" between wrongdoers with the increased risk that one of them will unilaterally report to enjoy the benefits of the leniency program, which are typically restricted to the first reporting party;

b) improving cartel detection by inducing undetected wrongdoers that lose confidence or interest in the cartel to spontaneously self-report and "turn in" their partners even though the law enforcement agency has no clue about their existence.

Despite the prominence of the Prisoner's Dilemma game in economics and the importance of organized crime in society, until very recently there was no systematic economic investigation of the effects of leniency programs on long-term, dynamic forms of organized crime like cartels (or large scale fraud, corruption etc.).

The literature on law enforcement did analyze leniency and self-reporting, but focusing on individual wrongdoers committing occasional crimes. For example, Kaplow and Shavell (1994) elegantly show how reducing sanctions against wrongdoers that spontaneously self-report lowers law enforcement costs by reducing the number of wrongdoers to be detected, and that when agents are risk averse, offering leniency to wrongdoers that self-report increases welfare by reducing the overall risk agents bear. Both these insights apply to leniency policies in general. Malik (1993) discusses the role of self-reporting in reducing auditing costs in environmental regulation; while Innes (1999) discusses the value of the early remediation of damages that fine reductions for self-reporting wrongdoers allow for. Koffman and Lawarrée (1996) offer a first model how collusion in a hierarchy can be prevented by leniency: in a static principal-supervisor-agent model à la Tirole (1986), they propose to bring in a second supervisor and structure the two supervisors' incentives as a Prisoner's Dilemma, so that the second supervisor has incentives to report against the first one in case this entered a collusive agreement with the agent.

These papers highlight important benefits that a lenient treatment of self-reporting wrongdoers may bring about, but they are static models, most of them of single agent crime, that cannot capture the new type of deterrence leniency brings in, the dynamic effects of leniency on cartels and other organized, self-enforcing criminal relationships linked to their crucial features discussed in section 2.1. Collusive agreements between price fixing firms, like those between auditors and managers or CEO and captured directors, are typically long-term, dynamic, and self-enforcing, and a full understanding of a dynamic

phenomenon typically requires a dynamic analysis.

The literature on plea bargaining is of course also strictly related to leniency programs, as it discusses the efficiency of exchanges of a lenient treatment against information/cooperation from wrongdoers, although taking place only after detection, at the prosecution stage (e.g. Grossman and Katz 1983; Reinganum 1988). The most closely related paper is probably Kobayashi (1992), discussing a model with multiple heterogeneous and jointly liable defendants with different amounts of information on each others' wrongdoing, showing that it may be optimal to award maximal leniency to the "worst" wrongdoer when this has better information. As mentioned earlier, however, plea bargains are exchanges of leniency against collaboration that only take place at the prosecution stage, i.e. after wrongdoers have been already detected by other means, and therefore do not capture the most novel effects linked to leniency programs, that are the ex ante effects relative to wrongdoers that have not yet been detected.

In the remainder of this section I will survey recent economic analyses of leniency programs in antitrust, focusing more on the contributions that I regard as more illuminating, and following the timing with which the contribution were produced and circulated among researchers. At this point two things are worth noting:

i) as for most other forms corporate crime - rational choice analysis is particularly well suited to analyze cartels and policies against them, as wrongdoers are well educated and calculating firm managers, trained in evaluating costs and benefits of choices and to react to incentives, rather than to rage, passions or instinct;[25]

ii) because the optimal design of leniency programs aims at destroying possibilities for illegal cooperation between competitors, it tends to destroy collusive equilibria in oligopolies and - ideally - leave only the competitive one; because of this tendency to reduce/eliminate multiple equilibria, dynamic analyses of leniency are much less subject to the caveats imposed by the presence of many equilibria to other research fields based on dynamic games analysis.

4.1 Leniency programs and cartel prosecution

The first, seminal paper explicitly addressing the effects of leniency policies on cartels in an appropriately dynamic analytical framework is **Motta and Polo (2003)**.[26] In this rich model, firms interact repeatedly in an oligopoly and choose whether to collude or not given the risk of being detected and prosecuted by an Antitrust Authority . If firms collude, they are subject to the risk of conviction; if they either do not collude or

[25]Recent experimental work has shown how agents often behave far from how a rational" homo economicus would be expected to behave (see e.g. Camerer, 2003). But if there is one field in law enforcement where rational choice models are likely to be useful to capture important features of the problem, this is the analysis of corporate crime, and in particular of cartel deterrence. The pricing decision is typically a thought over decision taken by skilled, strategic, forward-looking managers. While these agents can also make mistakes, they are obviously much less likely to make them regularly that less trained and calculating individuals.

[26]The (1999) working paper version of this path-breaking paper is sufficiently different from the published version to be also worth reading.

unilaterally defect from a collusive agreement, they are not. There is an exogenous budget of the Antitrust Authority that can be allocated to its two different tasks, detection and prosecution of detected cartels. A leniency program can be introduced that reduces fines against cartel members that provide information on the cartel, and that may or may not be open to colluding firms that only begin collaborating after having been detected, i.e. during prosecution. Detection of a cartel by the Antitrust Authority leads to conviction only with some probability, and this probability is increased by leniency. Convicted cartels do not collude for some periods, but then go back to collusion (previous versions used the alternative assumption that convicted firms would not start again collusion, with little change in results).

With its focus on prosecution this model is much in the spirit of the plea bargaining literature. It is designed to answer a precise question: whether firms that report information when being already under investigation should or not be also eligible to some leniency. The main object of this study, therefore, is Section B of the Corporate Leniency Policy, the part relative to firms that only start cooperating with the Antitrust Authority when they are already under investigation and is more similar to plea bargaining. Both the welfare effects in terms of ex ante deterrence and of ex post desistance are considered (this study is the first, to my knowledge to introduce this clarifying distinction).

The central, important result the model delivers is that although allowing cartel members already under prosecution to obtain a lenient treatment in exchange for information and collaboration has a negative effect on deterrence because it reduces overall sanctions against the cartel, it also tends to increase deterrence by making prosecution faster/cheaper and more effective; and this latter, positive effect tends to dominate the first, negative one. Increasing the probability of being convicted if detected by making prosecution more effective also allows to free resources from prosecution and reallocate them to improve cartel detection (the assumption is that the Antitrust Authority is benevolent and would not sit on the laurels of the increased number of successfully prosecuted cartels).

To obtain this central result, the model had to be simplified by assuming that

i) firms sustain collusive agreements with grim trigger strategies, and

ii) a defecting firm cannot be convicted for having taken part to a cartel, nor can report information on former partners.

Under these simplifying assumptions, however, cartel members report information only when they all agree to do so as part of the collusive strategy, and leniency programs appear unable to induce agents to spontaneously and non-cooperatively self-report. This leads to three secondary, less intuitive conclusions of the Motta and Polo model:

(a) that to have any effect a leniency program must be open to firms under investigation, a kind of "irrelevance result" for sections A of the US and 8a-9 of the EU leniency programs;

(b) that the same lenient treatment should be offered to all firms that apply for leniency, independent of the order with which they report (under the two assumptions above removing the "first comer rule" – the benefit of being the first firm to report – has no cost); and

(c) that leniency programs are second-best, so that if the Antitrust Authority has sufficient resources to deter cartels through fines and inspections, it should not introduce leniency programs.[27]

4.2 Leniency programs and direct deterrence

The three secondary conclusions of Motta and Polo (2003) are somewhat counterintuitive and contrast with the DoJ's statements on what are in their view the crucial features of an effective leniency program (see e.g. Hammond, 2004). Also, because of the focus on post-detection prosecution that model could not highlight important novel possibilities opened by leniency programs different from their indirect effects through easier prosecution also achievable, at least in part, through plea bargaining: their potential to *generally* and *directly* deter organized crime by 1) inducing undetected wrongdoers to spontaneously self-report and "turn in" their partners; and 2) preventing cartel formation by undermining trust between wrongdoers with the increased risk that one of them then reports to enjoy the benefits of the leniency program.

To highlight these direct effects in the simplest possible way, **Spagnolo (2000a)** develops a stylized dynamic model of self-enforcing collusive/criminal agreements within a law enforcement system that brings Motta and Polo's (2003) approach closer to Becker (1968) and Kaplow and Shavell (1994), who focus on ex ante deterrence and spontaneous self-reporting rather than on post-detection leniency/information exchanges at the prosecution stage, albeit in static single-agent contexts. To re-consider conclusion (a)-(c) above, Spagnolo (2000a) abstracts away the possibility to obtain leniency by reporting after having been detected and put under investigation, the object of Motta and Polo (2003), and focuses exclusively on the first sections of LPs, reserved only to firms that spontaneously report when their cartel has not been detected.

The first version of Spagnolo (2000a), directly building on Motta and Polo's work, inherits its assumption *ii)* that if a cartel member unilaterally defects undercutting the cartel price, he risks no more to be convicted for his past collusive activities. Because of this, the first version of the model delivered three main results:

1) that optimal leniency programs (their part on spontaneous reports before an investigation is opened) restrict maximum benefits to the first reporting party only;[28]

2) that a program that rewards with a fines-financed bounty the first reporting firm could completely deter cartels at a finite level of fines without any prosecution or inspection costs, a result about which I will talk more later on;[29] and

[27] This last conclusion is also due to the model's assumption that antitrust enforcement costs are exogenously given, do not enter social welfare, and cannot be traded off against higher fines or more effective leniency policies.

[28] Allowing more agents to obtain leniency reduces deterrence by reducing the number of wrongdoers that must pay the full fine, without having any countervailing positive effects on detection and deterrence.

[29] The optimal policy of course also maximizes fines. But high fines are now valuable not only because they reduce the expected value of collusive-criminal relations, as in Becker (1968), but also because they allow to offer higher rewards to agents that self-report by both financing the reward and preventing agents to exploit it (if the reward would be larger than the fines it generate, any group of agents could exploit

3) that leniency programs that only reduce/cancel fines have deterrence effect when repeat offenders are subject to higher expected sanctions; in that case, a *protection from punishment* effect emerges because a firm that deviates from the cartel can soften the toughest two-phase punishment à la Arbeu (1986) that firms can use against it by reporting the cartel under the leniency program when defecting: this reduces future expected cartel profits - the carrot that makes the stick credible - and therefore the maximal "toughness" of the punishment phase other firms can credibly threaten to impose.

The rather unrealistic assumption *ii)* that a cartel member that unilaterally defects can no more be convicted hided one of the most immediate effects of leniency and led to an "irrelevance results" analogous to Motta and Polo's result a). In extended versions of the model, circulating after (2001), assumption *ii)* was dropped. **Rey's (2003)** rich survey also discussed this assumption and noted that it is not very realistic and hinders other possible effects. Allowing for a positive expected fine for a firm that defects undercutting its cartel, Rey (2003) and Spagnolo (2004) clarified that the "irrelevance result" was fruit of that simplifying assumption and highlighted other possible deterrence effects of leniency policies, even without rewards. In particular, in addition to results *1)-3)* above, **Spagnolo (2004)** also showed that:

4) Absent leniency programs, law enforcing agencies should commit not to target agents that unilaterally defect from collusive strategies, and should make this policy public.[30]

5) Leniency programs that do not pay rewards but are restricted (or much more generous) with the first reporting party also deter cartel through a *protection from fines* effect, present as long as the reduced fines of the leniency program are below the expected fine of a defecting agent that does not report, an effect also discussed in Rey (2003). By increasing the expected payoff of an agent that defects and reports above that of an agent that just defects, the leniency program tightens individual firms' incentive constraint for colluding and destabilizes cartels.

6) Leniency programs that do not pay rewards may have a third direct deterrence effect by making illegal agreement more "risky". As often stressed by DoJ officials, leniency may generate "breakdowns in trust" among wrongdoers. To capture this effect, *strategic risk* considerations in the spirit of John Harsanyi and Reinhardt Selten (1988) risk dominance concept are introduced in the model, and it is shown that moderate leniency programs always strictly increase the riskiness of entering/sticking to a given collusive agreement relative to abandoning it; and that riskiness increases strictly more when eligibility to the program is restricted only to the first reporting party, as in the US. This last finding offers direct support to DoJ officials' claim that the first comer rule is crucial in generating

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the scheme by taking turn to report).

[30] The reason is close to the logic of leniency: if agents know that they will not be fined for their past wrongdoing if they defect from the collusive agreement, they are more prone to do it, which makes such agreements harder to sustain. The result is related to Cyrenne's (1999) one that if Antitrust Authorities use price wars as signals of the presence of a cartel, they may end up stabilizing cartels *by increasing the strength of the punishment phases* (see also Harrington, 2004). Relatedly, but differently, Spagnolo (2004) shows that by prosecuting firms that unilaterally defected from a cartel, Antitrust Authorities may end up stabilizing cartels *by reducing firms' expected gains from unilaterally defecting.*

breakdowns of trust in cartels and the consequent rushes to report.

Other studies followed at short distance focussing on the general, direct deterrence effects of leniency programs for cartels members spontaneously self reporting before an investigation is opened. **Ellis and Wilson (2001)** highlight an additional reason that may lead cartel members to spontaneously apply to a leniency program before an investigation is opened. Within a dynamic oligopoly model, it shows that a leniency program may induce colluding firms to report information under the leniency program in order to damage competitors, i.e. *to raise (future) rivals' costs* through fines and imprisonment of their management, thereby gaining a profitable strategic advantage in the following competitive phase. This incentive to use leniency to raise rivals' costs is anticipated by firms, and therefore adds to previously discussed direct effects in deterring cartel formation. Their model also shows that leniency may have a stabilizing effect on cartels whose formation was not deterred, a negative effect that will be further discussed later on. **Hinloopen (2003)** considers a dynamic oligopoly model where probabilities of detection change over time, and shows that cartel deterrence increases with the generosity of the leniency program and with a higher probabilities of detection in any future period. Both Ellis and Wilson (2001) and Hinloopen (2003) focus on two possible deviations from collusive strategies, the usual one of unilaterally undercutting the cartel, and the novel one of self-reporting the agreement. In both models, however, the optimal unilateral defection appears to be unilaterally undercutting the cartel price (to increase profits) *and* time reporting under the leniency program (to reduce the expected fine). It is would be interesting to know which results would go through anyway and which would not by taking the optimal defection into account.[31]

4.3 Negative side effects of leniency: self-reporting as a *threat*

Motta and Polo (2003) noted that by reducing sanctions for firms that cooperate at the prosecution stage, leniency programs have a negative effect on imposed fines that reduces deterrence, although this effect tends to be overcompensated by the positive effect of a higher probability of conviction. Economic analysis identified other possible negative side effects of imperfectly designed leniency.

I mentioned that leniency makes self-reporting more attractive, and this may induce cartel members to defect and report. When self-reporting becomes attractive, the *threat* of self-reporting to punish an agent that did not behave as the cartel agreed upon may also become credible. This, in turn, may be exploited by smart wrongdoers to enforce cartels that would not be sustainable in the absence of this law-induced threat. This issue did not arise in most models discussed until now because, to simplify, the information

[31] A model by **Fees and Walzl (2004a)** also highlights the potential direct deterrence effects of a leniency program on multi-agent forms of crime like cartel. However, this model is static and in the analysis the ability of the criminal team to cooperate/collude under different law enforcement regimes is assumed, rather than derived. It is not clear therefore how its results could be interpreted relative to intrinsically dynamic and self-enforcing illegal relationships like cartels and most other forms of organized crime.

cartel members generate and can report each period is there assumed to evaporate after one period.

Buccirossi and Spagnolo (2001, 2006) first highlights and model this side effect of leniency on bilateral, sequential, asymmetric illegal transactions, such as corruption or manager/auditor collusion. In this model, an illegal action (a favor) is exchanged sequentially against a bribe, and the illegal partners can optimally choose both the level of the bribe and the timing of the transaction (who delivers first), after having observed the parameters of the law enforcement systems. The model shows that the 'moderate' forms of leniency typically implemented in the real world could have the counterproductive side effect of facilitating occasional, and even some repeated illegal transactions. The possibility to obtain a reduced sanction by self-reporting can be used as a credible threat to enforce otherwise unenforceable occasional (one-shot) illegal deals. The first party that performs can force the second party to comply and reciprocate by credibly threatening to report the crime in case of non-compliance. Even in corrupt relationships where transactions are frequently repeated, moderate leniency programs may increase the parties' ability to punish deviations, thereby stabilizing the illegal arrangements by reducing gains from defecting. In practice, the information that wrongdoers have on each other plays the role of a "hostage" that is used as a credibly threat to govern the illegal exchange, punishing failures to comply with the agreement. The model also shows that awarding "rewards" to the parties that blow the whistle destroys this counterproductive side effect of leniency by making the "promise" not to report no longer credible.

Spagnolo (2000b) studies whether and how this negative side effect may apply to cartels in oligopolistic industries and to bidding rings in multi-unit auction markets. It finds that - when information on a collusive agreement is durable - a leniency program that reduces sanctions for agents that self-report can enforce collusive behavior in occasional (one-shot or infrequently repeated) multi-unit auctions, in particular in procurement ones. Again, the leniency program has the side effect of conferring credibility to the threat to report the collusive agreement if a member of the ring undercuts it.

The model shows that this negative side effect applies to multi-unit auctions and it is strongly reinforced by current (EU and US) procurement regulation, which requires that, if it turns out that bids were rigged - e.g. because the bid rigging agreement is reported under a leniency program, the outcome of the procurement auction is nullified and the auction is repeated. This rule, aimed at increasing the ability to monitor the awarding decisions and reduce the likelihood of corruption or favoritism, guarantees that it is not profitable for a firm in a ring to undercut the bid rigging agreement and simultaneously report under the leniency program, as the auction must then be re-run so that all gains from defection disappear. The paper also shows that the mechanism tends not apply to "smooth deviation games", like standard oligopolies with many small buyers, because it requires a discontinuous payoff function - typical of multi unit auctions but not of oligopolies with well divisible demand - so that a defecting party cannot smoothly fine tune its defection to leave other cartel members lower but sufficient demand and collusive rent that they prefer not to report after such partial defection.

Ellis and Wilson (2001) obtain a related effect in their already mentioned model.

Besides the potential incentive to report to raise rival costs discussed in the previous section, their model shows that, for cartels that are not deterred by this risk - and it turns out that these are the cartels most important to deter, those with worse social welfare consequences - the leniency program has the effect of further stabilizing them. The reason is that if the cartel is formed, then leniency induces cartel members to self-report after any defection from agreed collusive strategies, thereby strengthening the punishment for defections of an amount equal to antitrust fines, much like in the models just discussed.[32]

Brisset and Thomas (2004) analyze the effect of leniency programs on a ring's ability to exchange private cost information to organize a bidding ring in a first price sealed bid auction. Focussing on coordination while assuming enforcement they find that also from a coordination point of view, a poorly designed "low powered" leniency program may not have the desired deterrence effects while it may act as a threat that facilitates information exchanges within ring members. They then show numerically that a program that rewards ring members reporting before an investigation is open does not have this counterproductive effects, and increases deterrence by hindering a ring's ability to credibly exchange the private cost information necessary to form the ring.

Analogous counterproductive side effects of leniency emerge in several more recent models (Aubert et al. 2004, Motchenkova 2005, Harrington 2005, and Chen and Harrigton 2005, Festerling 2005a), confirming and reinforcing this section's message that leniency policies must be designed and implemented with *extreme care*, as they may otherwise produce rather negative effects.

4.4 Leniency programs and rewards to whistleblowers

The best known result in Spagnolo (2000a, 2004) is probably that in a dynamic multi-agent version of a model à la Becker (1968) for organized crimes like cartels, the *first best* (complete deterrence without inspection/prosecution costs) could be achieved with high enough *finite* fines by promising the first wrongdoer that applies for leniency and self-reports a sufficiently high "fines-financed" reward (i.e. a reward smaller than the sum of fines levied on other co-conspirators). To my knowledge, this is the first law enforcement instrument that delivers the first best since Becker (1968), who in fact showed that with standard instruments the first best cannot be achieved even with *infinite* fines, as with zero inspection costs/probability of detection even infinite fines have zero deterrence effect.[33]

[32] However, as mentioned before, with full immunity or with sufficiently generous fine reductions for the first comer the defection strategy of undercutting the cartel *and* reporting weakly dominates those of simply undercutting or reporting considered in the paper. It is unclear whether this result would survive taking the optimal defection into account.

[33] The requirement that the reward paid to the first leniency applicant should not be larger than the sum of the fines paid by convicted cartel members is not an *ad hoc* budget balancing constraint as some readers looked at it, but rather an endogenous constraint without which any reward system is doomed to fail in any real world situation akin to the model: absent other sanctions than fines, if the reward is larger than the sum of the fines it generates, there is the obvious risk that plenty of people will start building up fake or real cartels just in order to immediately denounce them, cash the reward, pay the fines, and keep and share the positive difference between the two.

Spagnolo's (2000a, 2004) models do not distinguish between colluding individuals and colluding organizations, as it is conceived to address optimal deterrence for many forms of organized crime besides cartels, most of which involve multiple collaborating individuals, but not multiple organizations. When colluding agents are organizations, as is the case for cartels, and rewards can be paid to individual employees of these organizations, a number of novel issues emerge.

4.4.1 Rewards to individuals

The model of **Aubert, Kovacic and Rey (2005)** also focuses on the direct, general deterrence effects of leniency and rewards, and allows defecting firms to face the risk of conviction for past collusion. It greatly extends the approach to address the important novel issues linked to the effects of leniency and rewards offered to individual managers/employees on the internal organization of colluding and non-colluding firms. The model analyzes the costs and benefits of creating an agency problem between firms and their employees by allowing the latter to directly cash rewards when blowing the whistle and reporting their own firm's collusive behavior to the Antitrust Authority.

On the benefits side, the model shows that allowing employees of colluding firms that report information to obtain leniency and cash a reward increases the number of potential informants that a colluding firm must "bribe" to keep silent, directly increasing the cost of colluding and therefore the general deterrence effect of any given reward scheme. It also shows that rewards for individuals tend to be complementary to corporate leniency programs, as they make a colluding firm's strategy to defect, report, and stop "bribing" its own informed employees even more attractive, further destabilizing collusion.

On the cost side, they examine the main arguments put forward in the policy debate against offering (leniency and) rewards to individual employees that report a cartel, mainly based on the possible negative effects of this practice on firms' internal organization and performance.

These schemes may deter productive cooperation (e.g. welfare enhancing information-sharing on demand uncertainty) that could mistakenly be regarded as collusion by increasing the incentive to report it in the attempt to cash the reward. The paper shows, though, that if mistakes are not too frequent it is in principle possible to build a reward scheme that only induces truthful reports.

Rewards for individuals may also induce firms to inefficiently reduce turnover in order to minimize the number of parties informed about the collusive agreement. The paper's conclusion, though, is that this inefficiency increases the cost of colluding but not of non-colluding firms, and has therefore mainly positive cartel deterrence effects.

Colluding firms may also be induced by these schemes to adopt "innocent" attitudes, in particular, increasing investment in productivity enhancing technology, a type of investment that typically falls in cartelized industries. But these practices may also have positive welfare effects, as they induce colluding firms to be more efficient, and they are costly, which makes collusion less attractive, so it is not clear that this is always a drawback.

The paper also discusses several explanations for the puzzling fact that firms continue keeping much "hard" information on their cartel at the risk of being detected by competition authorities. Among the explanations advanced and analyzed are that firms may need information to report to persuade cartel partners that they did not "cheat" and undercut the agreement in situations of uncertainty and imperfect information, like when the cartel breaks down because of an exogenous (e.g. productivity) shock.

4.4.2 Other literatures on individual whistleblowers

The papers discussed before are the first to propose and analyze rewards schemes in antitrust. Problems related to individual whistleblowers were subject to economic analysis with respect to other crimes than cartels though, mostly in relation to the US False Claim Act that reward employees that reveal frauds to the federal government. I cannot survey here these literatures for obvious lack of space, but I can offer a short overview of what they hint at.

First, there is an extensive **sociological** literature, typically on "pure" whistleblowers, intended as innocent employees discovering and reporting wrongdoing by their firm, internally or externally, without expecting any monetary reward for it. Glazer and Glazer (1991) and Alford (2002) are good examples, including many references. This is a rich literature, but the points of interest for us that it stresses are fundamentally two:

1. That whistleblowers experience a (documented) terrible working, social, and private life after reporting, with employers of all the industry, colleagues, friends, neighbors, and often even family turning against them, implying that whistleblowers *must* be both rewarded and protected extremely well, otherwise they will come forward only by mistake.[34]

2. That rewards for whistleblowers may induce a bad climate in organizations in terms of reducing trust, cooperation, and efficiency (e.g. Dwarkin and Near, 1997).

There is a **legal** literature on whistleblower reward schemes, excellent pieces of which are Howse and Daniels (1995) and Kovacic (2001). The former is a brilliant informal law and economic analysis of the costs and benefits of rewarding whistleblowers under the False Claim Act, looking at the experience from very many points of view, and concluding with a rather positive note on it.[35] The latter proposes to extend the experience to antitrust and discusses the legal issues that this may raise. Both include many references on previous legal analyses on related subjects.

More or less formal **economic** analyses of whistleblowing in contexts different from antitrust can divided in two strands. The first strand deals with a team of colluding wrongdoers, typically employees of an organization, and includes work by Felli (1996), the already mentioned Koffman-Lawarree (1996), Leppamaki (1997), and Cooter and

[34] According to Alford (2002), about half of all whistleblowers get fired, and many of them lose their homes, and then their families too.

[35] See also Arlen's (1995) comment in the same volume. A more recent law and economic analysis of this issue is Depoorter and De Mot (2004), but it only discusses a subset of the issues discussed by Howse and Daniels (1995), without offering substantially novel insights.

Garoupa (2000). Common to these analyses is the message of the Prisoner's Dilemma that rewarding whistleblowing may deter illegal cooperation, but also a static approach that does not endogenize how wrongdoers govern/enforce the illegal cooperation in the first place, and cannot therefore capture the effects of rewarding whistleblowers' on self-enforcing relationships like cartels. Acemoglu (1997) is the first model I am aware of that considers whistleblowing while endogenizing self-enforcing collusion between a manager and an auditor. However, in this model whistleblowing (against improper managerial choices) is the statutory task of the auditor, hindered by manager-agent collusion, and is not seen as something to reward in order to hinder collusion on other dimensions.

The second strand, including Tokar (2000) and Buccirossi et al. (2005), focuses on the conflict of objectives that rewards schemes for individual whistleblowers create between a firm and its own employees, particularly when courts make mistakes and employees may find it convenient to "fabricate" information in the attempt to cash a reward. A more or less explicit conclusion of these papers is that high rewards for whistleblowers may require tougher sanctions against information fabrication to avoid negative effects on deterrence also in terms of courts choosing a higher standard of proof.

Two recent economic analyses of whistleblowing not fitting this classification are Heyes (2004) and Berentsen et al. (2005). The first models several kinds of intrinsic/behavioral motivations that may push employees to blow the whistle against crime in the absence of rewards, incurring the high economic and social costs this implies without expecting any monetary benefit. The second shows in an incomplete information framework how allowing for whistleblowers may deter forbidden "doping" equilibria in sport contests when competing agents do not collude but share private information on each other's behavior (on whether or not illegal means were used to obtain a competitive advantage in the contest).

Although interesting and closely related in spirit to the debate in antitrust, none of these analyses develop a dynamic model of self-enforcing collusion able to capture the trade offs typical of a cartel and the novel kind of deterrence they lead to when coupled with leniency and whistleblower reward schemes

4.5 Recent developments

4.5.1 Equilibrium reports

The models focussing on direct deterrence effects discussed in Sections 4.2 and 4.4.1 keep the analysis simple by remaining in the tradition of complete information models of dynamic oligopoly (e.g. Friedman, 1976; Abreu 1986, 1988). One cost of simplicity is that, if one were to take these models literally, reports would be predicted only from cartels formed before an unanticipated leniency program was introduced, as a disequilibrium phenomenon. After that, since agents are forward looking and there is no parameter uncertainty, either cartels form and are sustained, or they are deterred and do not form; in both cases, nobody spontaneously reports, just as in complete information oligopoly models in equilibrium punishments/price wars never occur. Although the results of these

models are clearly robust to the introduction of small stochastic shocks in various parameters (e.g. in the discount factor, or in the "disutility from sanctions") or simple forms of imperfect information (e.g. on the implementation of the leniency program), both of which would generate equilibrium reports without changing much else, richer models that obtain equilibrium reports in less obvious ways are certainly helpful in verifying the robustness of early findings and possibly highlighting novel effects.

A first analysis aimed at obtaining spontaneous equilibrium reports under a leniency program is **Alexander and Cohen (2004)**. This is a static model of crime participation, different from the dynamic models discussed previously, but close to Spagnolo (2000a, 2004) and Aubert et al. (2004) in its focus on general deterrence, rather than desistance and prosecution. In this model gains from offending are ex ante uncertain, while the legal sanctions wrongdoers face if convicted - in addition to confiscation of illegal gains - are fixed, i.e. are not related to the realized profitability of the crime. The model shows - among other things - that ex post, wrongdoers whose realized criminal gains are low will be induced to spontaneously self-report to have their sanctions waived while giving up the (low) criminal gain. The contrary will happen for wrongdoers whose realized criminal gains are high: they will prefer not to report and face the risk of being caught and fully sanctioned to have the chance to keep the high realized illegal gains. While the analysis is rich and elegant, and addresses several issues, the model is static and does not consider enforcement problems within the criminal team, so its results cannot be applied to cartels and similar forms of organized crime, where firms/agents interact dynamically, face repeatedly both the choice of self-reporting and the risk of being discovered, and are subject to retaliation from competitors.

An more recent model that does take the dynamic features of cartels fully into account and obtains equilibrium reports, although only from colluding firms already under investigation, is **Harrington (2005)**. It is a rich repeated oligopoly model that merges elements of several previous models and enrich them with a stochastically fluctuating continuous probability of successful prosecution after detection. The model is closest to Motta and Polo (2003), as it focuses on leniency awarded to firms that report after their cartel has been detected and an investigation has been opened (Sections B of the current US leniency program and paragraphs 8b and 10 of the EU one), i.e. on the prosecution stage. Also, the focus is mainly on the ex post desistance effects of such reports and of the corporate leniency program in general, under the assumption that convicted cartels do not start colluding again. Though, the model follows Rey (2003) and Spagnolo (2004) in allowing a defecting cartel member to face conviction for past collusion if caught, and therefore obtains in the same model the "protection from fines" effect discussed in Section 4.2 (re-named as Defector Amnesty Effect), together with the trade off discussed in Section 4.1 between the lower expected fines due to leniency obtained by reporting after having been detected (named Cartel Amnesty Effect) and the higher probability of conviction caused by the additional information obtained from firms' cooperating under the leniency program. An additional novel feature of this model is that along the equilibrium path, when a cartel is put under investigation firms may rush *non-cooperatively* to report information under a sufficiently generous leniency program (an effect named Race to the

Courthouse Effect).[36]

Equilibrium reports during prosecution, after colluding firms have been detected and an investigation has been opened, take place in this model when the realization of the probability of a successful conviction (and therefore of expected sanctions after the investigation started) is high.[37] When the realization of the probability of successful prosecution is low, it is an equilibrium for detected firms not to collaborate and report even at the prosecution stage.

The model confirms that it is optimal to restrict amnesty to the first reporting agent; that in most cases maximal leniency is optimal (in terms of desistance), though it shows there are cases where a slight increase in leniency may be harmful; and in addition shows that it is optimal to award leniency only when the additional information it produces is sufficiently valuable in terms of its impact on the probability that the investigation ends with a successful conviction, as explicitly prescribed by the 2002 EU leniency program.

4.5.2 How much information?

Asymmetrically informed co-conspirators Although it is focussing on plea bargaining, the first economic analysis of the role of asymmetries in self-reporting "team crimes" is the already mentioned one by **Kobayashi (1992)**. In this model multiple defendants indicted for a jointly carried out organized crime face prosecution. The "most guilty" defendant, e.g. the leader of the criminal team, is also the one with more information about the activity of the criminal team, and therefore on other wrongdoers. The model shows that it may then be optimal for the prosecutor to award the best deal exactly to the most culpable among the partner wrongdoers, to maximize the probability of convicting the others and cartel deterrence. Although the model is static and the focus is on post-detection prosecution, the intuition is rather strong and independent from dynamic incentive compatibility constraints, so that the logic of the result is likely to extends to leniency and deterrence in dynamic frameworks, as conjectured by Motta and Polo (2003, footnote 12). This policy implication is confirmed by a recent paper by **Feess and Walz (2004b)** focussing on differences between the US and EC leniency program, among other things relative to the different minimum amount of revealed information necessary to obtain leniency. The paper derives a result with a flavor similar to Kobayashi's one but with respect to leniency and deterrence: it finds that a more informed party that self reports providing more information should indeed be allowed to receive more generous benefits under the leniency programs than a less informed reporting firm. This model is also static, and therefore evaluates deterrence looking at violations of the participation constraint,

[36] Such rushes do not take place in Motta and Polo (2003) because in that model firms choose *cooperatively* whether or not to report when an investigation is opened. The possibility of such *non-cooperative* rushes to report is the source of cartel deterrence in the models discussed in Section 4.2 and 4.4.1, but such possibility never realizes along the equilibrium path because agents forecast it perfectly and in that case they do not start colluding in the first place.

[37] This model therefore produces equilibrium reports from cartels already under an investigation, as in Motta and Polo (2003), but has no implications regarding equilibrium reports before detection, the focus of Spagnolo (2000a, 2004), Ellis and Wilson (2001), and Aubert et al.'s (2004).

rather than of the more stringent incentive/self-enforcing constraints any cartel must satisfy. However, the intuition behind the result is again linked to the impact of different informational endowments on the information revelation game induced by leniency, and therefore it might go through also for dynamic multi-agent crimes like cartes.

One reason why the force highlighted by these two papers might lead to different policy prescriptions in a dynamic environment that takes properly into account cartel enforcement issues is that agents could anticipate and react to this, distorting the allocation of cartel shares so that the leader is also the one gaining more from a stable cartel and therefore losing more by self-reporting. In any case, it would be great if future research could verify the solidity of these conjectures in an appropriately dynamic framework.

Minimum information requirements DG Competition officials have had the impression that some companies reporting a cartel under the new Leniency Notice may have been strategically withholding information or made conflicting corporate statements. Because prosecuted applicants may face litigation and damages in this or other jurisdictions, they may perhaps be trying to obtain leniency and at the same time avoiding prosecution of the cartel.

Both the EU and US leniency programs explicitly condition immunity on open, complete, candid and continued cooperation. The EU program even explicitly requires the reported information to be a substantial improvement in knowledge about the cartel for the DG Comp if the investigation started. These qualifications to the leniency policies can (and in my view should) be implemented strictly, as they are there precisely to avoid strategic games of partial or distorted information revelation of the kind that took place in Italy when leniency programs were implemented against the Mafia and terrorism. Even though these qualifications are there and, if properly implemented, should deter strategically limited or manipulated information reporting, DG Comp officials still appear to feel unable to prevent attempts to "game the system" by applying for leniency but reporting only a small part of available information or distorting it.

Harrington's (2005) is the first model to analyze the crucial issue of how valuable the reported information must be to make awarding amnesty worthwhile, allowing for reports with different impacts on the likelihood of conviction. In most models discussed before, information reported is assumed to be "hard", i.e. verifiable by third parties like judges, and enough in quantity and precision to lead to a conviction (i.e. it was implicitly assumed that "soft" information, like testimony not supported by documents, pictures, or other tangible incriminating elements, would not be sufficient to give immunity). In this model also information is "hard" and, if reported, leads to sure conviction, but the probability that an open investigation ends up with a conviction is a continuous stochastic variable. When the realization of this probability is high further information from reporting firms has little value; with low realizations instead the additional information from reporting firms is highly valuable. Exploiting this source of variation, Harrington (2005) shows that to maximize desistance leniency should indeed only be awarded if it increases sufficiently the likelihood that prosecution ends up with a successful conviction. Otherwise, the negative effect on desistance of the Cartel Amnesty Effect could dominate

on other effects, in which case leniency during prosecution would decrease desistance. This result supports a strict implementation of the explicit qualifications in the leniency programs about the minimum value of information and the candid, *complete* cooperation from the beginning required to award leniency, and suggests that - to avoid strategically limited or distorted reports - Antitrust Agencies should always deny leniency when it realizes that the applicant withheld some information, and even consider it an important aggravating factor when setting sanctions. It would be nice, though, if future research could look at the ex ante general deterrence effects of these requirements.

4.5.3 Prices, timing, asymmetries, and other issues

Leniency and prices The deterrence effects of leniency programs of different generosity are modelled and numerically simulated in **Chen and Harrington (2005).** The paper considers a dynamic homogeneous good Bertrand oligopoly model where the probability of being detected and convicted is endogenous and is a function of transaction price changes (with Bertrand competition the transaction price is the minimum among the quoted prices in each period); and where sanctions include damages and are increasing in present and past realized profits. The model, therefore, brings together the literature on leniency programs and that on cartel pricing in the presence of an Antitrust Authority (e.g. Harrington 2004). Numerical simulations show that sufficiently generous leniency policies are beneficial in terms of direct deterrence, as they either deter cartel formation all together, or reduce the optimal collusive price path of cartels that could not be deterred. This happens because they exacerbate the "protection from punishment (or deviator amnesty) effect" discussed in Sections 4.2, 4.4.1 and 4.5.1. However, the simulations also show that at intermediate levels of leniency, i.e. when leniency is not very generous, its presence may end up stabilizing collusion, as it is then only used as a reaction after a defection takes place, with the consequence of contributing to punishing deviations and stabilizing the cartel, as in the models discussed in Section 4.3.

Timing More specific timing issues are considered in **Motchenkova (2004),** a dynamic model using a continuous time two-firm preemption game to try capture better the time dimension of the "rush to report" idea, so often stressed by DoJ officials. This innovative approach shows, among other things, that limiting amnesty (the strongest fine reduction) only to the first firm applying for leniency is essential to induce such a "rush", and that "less strict" leniency programs that are also quite generous with the firms reporting after the first may again display negative side effects of the kind discussed in Section 4.3. Although dynamic, to keep mathematical complexity under control most of the analysis of this model does not take into account the incentive constraints that make cartels strategies self-enforcing and the novel kind of deterrence leniency brings in through them. However, a final extension of the model does it, and the main results appear robust in this important respect.

Firm size, reputation and leniency Within a repeated duopoly model most close to Motta and Polo (2003), **Motchenkova and van der Laan (2005)** show a that colluding firms that are heterogeneous in size and degree of diversification may react differently to the introduction of leniency programs if antitrust convictions have substantial negative reputational effects in terms of customer losses. Larger, more diversified firms are likely to be active in more markets than those in which they are colluding. If the reputational loss from an antitrust conviction in a market is substantial and spills over to other markets in which they are active, larger firms active in many markets will suffer larger reputational losses from conviction that cannot be reduced by leniency. Thus larger firms may then be ceteris paribus less prone to report their cartel under a leniency program, but also to enter a cartel in the first place. The paper also derives implications about the optimal "strictness" of the leniency program, confirming that a larger difference in benefits awarded to the first and second firm reporting increases cartel deterrence.[38]

Individual versus corporate leniency The interaction between the individual leniency program and the corporate leniency program in the US is the focus of a rich recent model by **Festerling (2005a).** Since the introduction of the Corporate and then the Individual leniency programs in the US, there have been practically only applications to the former. Aubert et al. (2005) already discussed complementarities between leniency offered to a firm and leniency plus rewards offered to its employees that report. Festerling, however, focuses on the case in which managers fix prices against the will of their employers, and directly validates theoretically the DoJ's claim (see Hammond 2004) that the individual leniency program is very important even though individual reports are never observed, and that its main non visible effect consists in causing more and more corporate leniency applications through the threat that individual managers would apply individually otherwise.[39] It presents a dynamic duopoly model in which each firm is a hierarchy composed of a principal, firm owners, and an agent, the manager, with conflicting objectives regarding the legal consequences of antitrust convictions (e.g. exposure to private damage lawsuits, or limited ability to pay). The assumption is that the agent/manager chooses prices and whether to fix them with the competitor without firm owners' consent and against their will, but that owners may find out about the manager's misbehavior and report it to the Antitrust Authority . Corporate and individual sanctions and leniency policies give rise to a multistage revelation game where either firm owner or the

[38] The model is dynamic and evaluates the deterrence effects of leniency programs taking into account self-enforcement constraints. It seems to focus, however, on a specific set of strategies (Enter Cartel and Self-report; Enter Cartel and Not Self-report; Not Enter the Cartel in the first place), and not to considering optimal defections for cartel members, which at the interim stage appears again to be Undercut the Cartel *and* Self-Report. It would be nice if the authors could extend their work to encompass optimal defections at all stages, or if future work could verify whether and how their results would change by taking optimal defections into account.

[39] In Hammond's words: "The real value and measure of the Individual Leniency Program is not in the number of individual applications we receive, but in the number of corporate applications it generates. It works because it acts as a watchdog to ensure that companies report the conduct themselves." (Hammond 2004, p. 12). On this issue see also Mullin and Snyder (2005) and Buccirossi and Spagnolo (2005b).

agent/manager can report information about a cartel. The individual leniency program turns out never to be used, but its presence does generate in certain parameter configurations additional corporate leniency applications. In other parameters configurations instead the manager ability to report can "force" the owner to accept the cartel, a negative effect related to those discussed in Section 4.3.

Optimal fines, imprisonment, leniency and whistleblowers Leniency and whistleblowers schemes influence the need of different kinds of sanctions. **Buccirossi and Spagnolo (2005a)** consider how the theory and practice of antitrust sanctions is or at least should be influenced by the presence of these schemes. It shows that previous simulations of the deterrence effects of fines ignore the different type of deterrence that leniency programs bring about, and, therefore, grossly overstate the minimum fine likely to have deterrence effects. With schemes that reward whistleblowers, the minimum fine with deterrence effects is shown to fall to extremely low levels (well below 10% of the optimal "Beckerian" fine estimated before). This implies that with *well designed and correctly implemented* schemes of this type, problems of limited ability to pay and "judgement-proofness" may lose bite, and therefore that imprisonment may not be necessary to obtain sufficient deterrence, as many argue instead without taking into account the potential of well designed and implemented leniency and whistleblowers' reward schemes.

5 Empirical and experimental evidence

There is limited empirical and experimental evidence available on the effects of leniency programs in antitrust. In the following I discuss the three experimental studies and the two econometric analyses of leniency programs I am aware of. I then contribute a little to the empirical debate by informally discussing the little we can learn at this very early stage from the "natural experiments" of the changes in the design of leniency programs that took place respectively in 1993 in the US and in 2002 in the EU. The section ends with a short review of the recent experience of the US False Claim Act in terms of rewarding whistleblowers that help discover frauds against the US federal government with large bounties financed by recovered fines and damages.

5.1 Laboratory experiments

The experimental method is highly indicated to analyze leniency programs, particularly in terms of their otherwise unobservable general deterrence effects. **Apesteguja, Dufwemberg and Selten (2004)** take the first, elegant step in this direction. The paper develops a stylized theoretical framework that attempts to capture the main points made in the recent literature on the effects of leniency policies on direct cartel deterrence, and uses it to undertake an interesting experimental analysis of these effects. The market game analyzed is a one-shot homogeneous good Bertrand oligopoly with a discrete demand function embedded in four legal frameworks: in "Ideal" there is no antitrust law at all, cartels

are not forbidden and colluding firms face neither full nor reduced fines; in "Standard" convicted firms face fines equal to 10% of their revenue (and no fines at all if they have no revenue that period) and no reduction if they report; in "Leniency" firms that report a cartel they took part to receive a reduction in their fine; in "Bonus" reporting firms receive part of the fines paid by other firms as a reward. Strategically equivalent collusive subgame perfect equilibria exist (in fact, full folk theorems hold) both in "Standard" and "Leniency", sustained by the threat of reporting if a defection takes place as in the models described in Section 4.3. The experimental results confirm that agents understand and use the threat of reporting to sustain collusion, more in "Standard" than in "Leniency", and do not find that deterrence increases with the introduction of rewards.

The extremely stylized framework used in this first study, while adding to its elegance, opens a number of issues regarding the interpretation of its results. One issue is that the oligopoly game is not repeated, and that the experiment allows for only one round of decisions, leaving agents no way to learn the game, while the difference between "Standard", "Leniency" and "Bonus" treatments are not that easy to understand. It is therefore possible that some of the counterintuitive results, like that agents do not react to rewards, are driven by subjects not fully grasping the situation, as it happened to most early experiments on public good contribution, also not sufficiently often repeated.

A second issue is the somewhat unrealistic assumption that fines equal 10% of convicted firms' revenue in the relevant market and *zero* if these have in that period no revenue in such market. Together with the assumption of homogeneous good Bertrand competition, this assumption ensures that if a partner-cartelist "cheats" on the collusive agreement, reporting it is a "credible threat" (in the sense of Section 4.3) already in "Standard", i.e. even without leniency.[40] This, in turn, implies that in the underlying model, already the absence of leniency, in "Standard", antitrust law enforcement has only the counterproductive function of enforcing collusion, which in this static framework would otherwise not be sustainable (as long as "cartel contracts" remain void). If this starting point was realistic, the best of the world would then be no antitrust law enforcement at all: declaring collusive agreements/contracts legally void would suffice to prevent any cartel formation, and the question would then be why don't we get rid of antitrust laws (and related costly enforcement agencies, lawyers and experts) all together, rather than playing around with counterproductive fines, leniency, and bonuses. In my reading, therefore, this first experiment strongly suggests that subjects understand how to use

[40] The 10% of revenue rule was inspired by the EU cap of 10% of yearly revenue on antitrust fines. However, EU fines would never be zero in the absence of a leniency program. The 10% revenue cap for EU fines is relative to firms' overall yearly turnover in all lines of business and geographical markets, while the EU basic, minimum fine for horizontal cartels, independent of revenue, is 20 million euros. Moreover, having respected the collusive price is considered *an aggravating factor* that increases the minimum fine. Also, it is not easy to envisage a market where, if a firm undercuts the cartel, other firms in the cartel have zero revenue for one full year. Absent leniency policies, a firm with positive revenue that reports a cartel would be subject to a positive fine. The multiplicity of equilibria in Standard would then disappear as after a defection reporting is dominated by not doing it (and avoiding the fine), the outcome of Standard and Ideal would then coincide, and Leniency would fare much worse than how depicted, like predicted by models discussed in Section 4.3.

self-reporting as a "threat" to enforce collusion in occasional interactions, as discussed in models reviewed in Section 4.3, but is based on such particular and crucial assumption that tells us little about the effectiveness of real world leniency or bonus schemes against long-term, hard-core cartels.

A second experimental study by **Hamaguchi and Kawagoe (2005)** focuses on the effects of cartel size and of the restriction of amnesty to the first applicant on the likelihood that a cartel is reported. It finds the expected result that the larger is the cartel, the more effective is a given leniency program; and the less expected result that the effectiveness of a leniency program in inducing cartel members to self-report is not affected by whether all parties or only the first one that self-reports are eligible to leniency. This experiment, however, does not capture the effect of leniency on cartel formation, i.e. on general deterrence, as it first *forces* all the subjects to collude, and then checks which cartels are reported.

A third recent experimental study that overcomes most drawbacks of the first two is **Hinloopen and Soetevent (2005)**. In this study the underlying oligopoly game is repeated, communication is controlled for and allowed at different degrees, and subjects are free to choose whether or not to agree on a collusive price or not. When leniency is introduced, cartel members can only report and obtain a fine discount before (knowing whether) an investigation is (will be) opened, and the first reporting party receives full amnesty, the second a 50% fine reduction, and the rest no fine reduction at all. This means that this study addresses both direct, general deterrence and desistance effects, although not the indirect effects linked to faster and cheaper prosecution nor rewards. The study uses Apesteguja et al.'s (2004) oligopoly model as a stage game of a repeated game with uncertain horizon, and adds to the legal framework a small fixed cost of reporting (1 point) present even when revenue is "zero" because competition is à la Bertrand and a cartel partner defected undercutting and stealing all customers from the others. Though small (an additional fixed cost/fine, limited to no-leniency treatments, would have further increased realism), this positive reporting cost partly captures the real world feature that - absent a leniency policy - if a "cheated upon" cartel member would report, he would still be subject to a fine. In this more realistic framework, incorporating the "protection from fines" (and in my view also part of the "increased riskiness") deterrence effect(s) discussed in section 4.2, this study confirms the potential of the positive ex ante deterrence effects linked to Sections A of the US Leniency Policy, restricted to the first "spontaneously" reporting party (the study does not consider rewards, unfortunately). It finds that the introduction of a leniency program causes:

a) fewer cartels being established, i.e. a significant, direct, general ex ante deterrence effect of leniency programs restricted to firms reporting before an investigation is opened; and

b) a reduced life-time of cartels that were not deterred, but

c) a constant, high rate of "recidivism", in the sense that the same percentage of detected and convicted cartels starts colluding again after some time with and without leniency programs.

The lack of desistance effects implied by result c) is probably a consequence of the

absence of higher fines or higher probability of detection for repeated offenders, so that after a conviction collusion is practically as attractive as before for the convicted cartel.

5.2 Econometric studies

I am aware of only two econometric studies of the effects of leniency programs on cartels, both focussing on the 1996 version of the EU Leniency Program.

Brenner (2005) first analyzed econometrically the relationship between leniency applications, the size of actually imposed fines, and the duration of the investigation. Assuming that higher imposed fines signal, ceteris paribus, better information available to prosecution, it finds that the program did help by eliciting information from cartel participants, but not at the point to increase deterrence (fines are higher in cases where some firms cooperated under the leniency program, but not much higher). It finds no significant effects of leniency on the speed with which investigations are concluded; nor finds it indications that the leniency program had significant effects in terms of increasing the hazard rate at which cartels break down and reducing their expected life time.

Arlman (2005) also analyzes econometrically the effects of the 1996 EC leniency program. He documents that in 14 cases leniency was awarded under the old program's section reserved to cases where the investigation was not yet open, 12 of which received a 100% fine reduction, one 90% and one 80%. One case was intermediate, while the remaining 140 firms received very partial leniency for collaborating during prosecution. The econometric analysis confirms that fines tend to be somewhat higher when leniency is used but, contrary to Brenner (2005), it does find a significant effect of leniency on the speed with which the decision is taken by using the *maximal* amount of leniency awarded as explanatory variable, rather than whether leniency was awarded or not. This result, contrasted with that of Brenner (2005), suggests that the speeding up of prosecution is linked to timely and substantial forms of reports under leniency, to which higher fine discounts are awarded, rather than to later and minor forms of cooperation more similar to plea bargains. Again contrary to Brenner (2005), Arlman (2005) finds that leniency does not provide prosecutors with better information; however, Arlman proxies available information with the number of words in the decision, and the interpretation of this variable in terms of better information is somewhat awkward.[41]

Both studies note that only 5 of the 14 cases that obtained substantial leniency were really novel cases, the remaining being international cartels already detected and under prosecution (or already convicted) by the US DoJ. This makes the judgement on the likely deterrence effects of the 1996 EU program rather conservative.[42] This is consistent with

[41] It is at least debatable whether one needs more or less words to support a decision when he has better information. An inverse relation, more concise decisions when the evidence is very strong, appears to me at least as plausible as the one postulated in the study.

[42] However, this does not automatically imply that the EU was wrong in awarding full amnesty to overseas cartel members seeking amnesty in the EU. In the absence of an international one-stop-shop for leniency, when one international cartel member first applies for leniency in the US, and then later on in the EU, the optimal thing to do for the EU is to also award full leniency, even if it already had information on that cartel from the DoJ's investigation. Such a policy tends to encourage self-reporting

theoretical studies suggesting that to have a serious impact, a leniency program must be sufficiently transparent and generous; the 1996 EU program was criticized for leaving too much discretionality to the Commission. Since the incentive power of a leniency program directly depends on the severity of the sanctions a wrongdoer faces if caught because somebody else reported, these studies confirm Buccirossi and Spagnolo's (2005b) evaluation that EU fines are likely to be too low to have strong deterrence effects, even with current leniency programs.

5.3 Two natural experiments

As mentioned in Section 3, the US an EU leniency programs changed in time. The main changes, in 1993 for the US and 2002 for the EU took place in a "discrete" way, and are likely not to have been fully anticipated by firms and lawyers, so that they can be regarded as kinds of "natural experiments". I also mentioned that, according to informal communications of antitrust officials, the number of reports under the leniency program increased substantially after these changes. Here I try to exploit these changes to obtain some preliminary and tentative indications on what features of a leniency program are likely to have a stronger impact on the number of detected/reported cartels. Of course one should take these indications with due care, as they are based on non-verified aggregate information coming from informal communications, and are drawn without controlling for other external changes that may have influenced firms' incentives to self report. Also, as explained in Section 2.3, we should keep in mind that these indications have a rather far and uncertain connection with the likely deterrence effects of these programs, which is what ultimately matters.

5.3.1 US 1993

I mentioned that in 1993 the US leniency program was changed dramatically, along the following dimensions:

1. *Increased generosity/transparency;* the DoJ committed to award *automatic* full amnesty for the first applicant providing information at early stages, making clear in advance the benefits of cooperation to the amnesty-seeker;

2. *Extended coverage I:* amnesty has been made available to the first reporting party even after an investigation has been opened, provided the DoJ does not already have evidence likely to result in a sustainable conviction;

3. *Extended coverage II:* amnesty obtained by the first reporting firm - if it reports as a true corporate act - has been extended to cover all its directors, officers, and employees that collaborate;

in the US, and therefore facilitates the detection of international cartels in general.

4. *Positive rewards:* under the "Amnesty Plus" program, introduced a bit later, firms/managers convicted or under prosecution for one cartel for which did not obtain immunity are invited to unveil other cartels they are or were involved with; if they reveal a new cartel, not only they receive full amnesty with respect to this new cartel, they also get a substantial reduction in the sanctions/fines they would otherwise face for the first cartel, a net - though hidden - reward.

Before the 1993 changes, the DoJ received about one application for leniency per year. After 1993, it started receiving up to three application per month on average, an obviously significant (more than ten-fold) increase. Of all these post-1993 applications, more than half fell under Section A of the Corporate Leniency Policy, i.e. came in before an investigation was open, when the DoJ had either no or very little information on the cartel (personal communications, Scott Hammond and Gregory Werden, DoJ).

Tentative conclusion: It is not easy to distinguish between the relative contribution of the four changes above, all of which probably were relevant in determining the almost twenty-fold increase in leniency applications after 1993; but clearly the more than half applications made before an investigation is opened should be linked to changes 1, 3 and/or 4.

5.3.2 EU 2002

The main changes in the EU leniency program that took place in 2002 were:

1. *An increase in generosity and transparency:* also in the EU prospective applicants to the leniency program can now expect *automatic* full amnesty if they are the first to report information sufficiently useful to prosecutors before an investigation is opened.

2. *Extended coverage:* leniency is now also open to ringleaders, provided they did not coerce other firms to join the cartel.

Both the 1996 and the 2002 EU leniency notices allowed firms to obtain partial fine-reductions when applying for leniency and reporting only after an investigation of their industry was already opened.

As mentioned earlier, in the first six years of the EU leniency program, between 1996 and 2002, only 16 applications for immunity were filed, of which just three led to the granting of immunity. In the three years following the 2002 changes leniency applications and cases of immunity granted increased about ten-folds: between February 2002 and June 2005 about 140 leniency applications were received, and about half of them fell under sections 8a-9 of the Notice, i.e. took place before an investigation was opened, when DG Comp had little or no information on the cartel (personal communication, Bertus Van Barlingen, DG Comp).

Tentative Conclusion: The numbers above appear to indicate that the most crucial part of a leniency program may be the one reserved to the first party reporting when the cartels is not yet under an investigation, which should be sufficiently generous and automatic.

5.4 Examples of rewards to whistleblowers

Spagnolo (2000a) and (2004), Kovacic (2001), Rey (2003), Buccirossi and Spagnolo (2001, 2006), and Aubert et al. (2004) suggest that a carefully designed and implemented policy that rewards the first firm or agent that blows the whistle and turn in former partners would greatly increase cartel deterrence and simultaneously reduce the cost of antitrust law enforcement. Some observers have been highly skeptical about this possibly, suggesting that it is likely to bring in more costs than benefits, particularly in terms of false information fabricated and reported in order to cash rewards. In this section I briefly review three recent real world experiences with practices that reward whistleblowers.

Amnesty Plus in the US. In antitrust schemes that reward colluding firms/individuals that report information are already used with some success. As mentioned before, the DoJ is actively using rewards in exchange for information on new cartels on which it did not have information through its Amnesty Plus program directed at cartel members detected and successfully prosecuted (or under prosecution) that are did not qualify for fine reductions under the leniency program. Amnesty plus offers them, in case they reveal a second cartel they are or were involved with but about which the DoJ was not aware, a substantial reduction in the fine due for the first cartel for which they were convicted, besides full amnesty for the new one reported. The additional reduction in the fine for the first cartel can then be regarded as a net reward. According to DoJ officials, this is the most successful part of the US Leniency Program, directly responsible for the detection of most unknown cartels (Hammond, 2005).

5.4.1 Rewards in antitrust

Korea's rewards scheme. Even more than for leniency programs, introduced in 1996 together with the EU, **Korea** has been a front runner in the introduction of rewards to individual whistleblowers**,** as in 2002 it openly introduced cash rewards - not hidden as reduced fines - for whistleblowers reporting information on cartels. The rewards, aimed at reinforcing the leniency program, much as discussed in Aubert et al. (2004), were initially very low (the ceiling was about 20.000 US Dollars) and, not surprisingly, did not generate reports. In November 2003 the ceiling was increased (to about 100,000 US Dollars) and until May 2005 it generated five reports. In May 2005 the ceiling to rewards was raised ten-fold (to approximately 1 million US dollars), and we will soon know how will economic agents react. I believe these maximal rewards are still too small to encourage whistleblowing, given the economic and social costs whistleblowers tend to face, probably higher in a small country with tightly knit economic and social networks like Korea. The sociological literature on whistleblowers (see e.g. Section 4.4.3) makes it clear that individuals that blow the whistle may face very harsh sanctions from their former business partners, peers, and from the business community in general, from exclusion from future business and social relations to physical harassment. And this may last for the several years during which prosecution takes place. Because of this, when directed at individuals, we believe that only programs with very high expected rewards, like the US False Claim Act, are likely to be effective in inducing informed parties to spontaneously blow the

whistle.

5.4.2 The US *False Claim Act*

The most famous and successful program that rewards whistleblowers is probably the US False Claim Act against frauds to the federal government (the Sarbanes-Oxley Act is probably catching up with fame, but probably not with performance). It allows individual whistleblowers to file "Qui tam" lawsuits against companies or individuals that committed fraud against the federal government, and to claim a fraction of fines and recovered funds.[43] In 1986 the False Claims Act was revised by Congress following reports of large-scale fraud against the government, especially by defence contractors. In order to give more incentives for whistleblowers to come forward and for private attorneys to use their own resources to investigate fraud, the False Claims Act was amended to include the provision of treble damages, mandating the defendant to pay a successful qui tam relator's his or her legal expenses, increasing the relator's share to 15-30% of total recovery, and protecting relators from retaliation.

Cases that can be filed as qui tam actions regard false claims that are either directly or indirectly presented to the Government for "paying or approval". Along with a complaint the qui tam relator must also file a "written disclosure of substantially all material evidence and information the person possesses." The DoJ can then choose whether it will joint or not the whistleblower in the lawsuit. If the DOJ declines to join in a qui tam action, the relator has the right to investigate and prosecute the case. If the Government does not join and the relator is successful in pursuing the case, the relator, generally, will receive a larger percentage of the award. The relator cannot receive the award if he or she is convicted for criminal infringements related to the fraud, so that to elicit information from parties involved in the fraud immunity must be offered together with the possibility to file a qui tam lawsuit. Leniency and rewards are then complementary, much as discussed in Aubert et al. (2005).

The 1986 amendments to the False Claims Act have proved very effective in terms of generated government recovery. The scheme is now working in many other areas than defense, including prescription drug purchases, natural resource contracts and low-income housing. Since 1987, the number of successful whistleblower lawsuits has increased continuously (see the instructive statistics at http://www.taf.org/statistics.htm). The highest level of recoveries yet was achieved in 2003, at about $1.5 billion, and was achieved at a

[43] The words Qui tam come from '*Qui tam pro domino rege quam pro se ipso*', which means 'he who brings an action on behalf of the King, as well as for himself'. The organized use of whistleblowers in law enforcement in terms of Qui Tam seems to originate in 13th century England, when, due to the lack of an organized police force, English common law adopted various qui tam provisions in order to enforce the King's laws. To make such actions attractive, a bounty was paid to the private party who enforced the law. The founders of the United States followed the English example and included qui tam provisions into most of the penal statutes enacted by the Continental Congress, America's first ruling body. On March 2 1863, the False Claims Act, also known as the 'Lincoln Law', was passed by Congress at the urging of President Abraham Lincoln, following the report of widespread military contractor fraud at the expenses of the Union Army. The law applied not only to military, but all government contractors.

comparatively low level of Qui Tam cases filed, 334, with total relators' awards of about $350 millions, and *average* relator award above $1 million, over 20% of recoveries. This suggests that rewards for whistleblowers may reach very high levels without apparently causing strong negative side effects.[44]

Some observers have shown extreme skepticism about the proposal of offering rewards to whistleblowers in antitrust because of the possible increase in various types of legal enforcement costs these could bring about. As far as we can observe, the experience of the US False Claim Act does not support such extreme skepticism for well designed and competently administered schemes.

6 Conclusions

Taking stock of the work discussed before, one can safely conclude that a *well designed* and *properly administered* leniency program appears to be an important and useful tool of antitrust law enforcement, one that should *always* be present in the toolkit of an Antitrust Authority , independent of its budget. On the other hand, one should keep in mind that - as for any other incentive scheme - a poorly designed or administered leniency program may have serious counterproductive effects some of which were discussed before. In this concluding section, I will summarize the main features of what appears to be a well designed leniency program or whistleblower reward scheme in the light of current knowledge, and discuss some issues on which further research appears more urgently needed.

6.1 Characteristics of well designed programs

Since the objective of a leniency program is deterring cartels by making them hard to sustain, a well designed and implemented leniency program is one that makes the incentives of an individual (potential or real) cartel member as conflicting as possible with the interest of the cartel taken together. This means that a well designed program must maximize incentives to betray the cartel by reporting important information to the Antitrust Authority , while at the same time limiting as much as possible the reduction in fines imposed on the whole cartel.

This can be achieved by maximizing the benefits an individual cartel member can receive by reporting under the leniency program, but restricting such maximal benefit to one and only one reporting party, the first comer. This extreme "winner take all" approach maximizes the conflict between individual and collective incentives in the cartel, and is likely to be the most crucial success factor in terms of deterrence.

Limited benefits in terms of partial reduced fines to parties reporting second may be useful to further increase the chances of winning the case, but they should be used only in

[44] In general, recoveries in cases declined by the Department of Justice fluctuate much more than those accepted and are also much lower, which implies that sustaining and winning a case without the government's support is very hard, and/or the screening activity of the Department is precise in selecting most important cases.

extreme cases, when the information reported by the first reporting party, though useful, turns out insufficient to achieve a high probability of conviction by complementing it with all other ways to collect additional information that do not require further reductions in fines or other sanctions (dawn raids; records of further cartel activities obtained asking the first reporting party to go on "playing" the cartel member part, with a microphone and/or camera; etc.). The reason is of course that although it may further facilitate prosecution, being lenient with more than one party tends to reduce both the total fines imposed on the cartel and the conflict between individual and collective incentives within the cartel, the two main sources of cartel deterrence. The aim of leniency programs is (at least should) not be making the job of prosecutors easier, but rather increasing cartel deterrence; so fine reductions for second or third reporting parties should be avoided unless it is really impossible to achieve conviction with the first report and more effort in traditional fact finding strategies.

Well designed and implemented leniency programs must be sufficiently generous with the first party that reports sufficiently important and possibly "hard" information, because otherwise reporting can be used as a credible "threat" to enforce, rather than to destabilize collusion. In this sense, protecting as much as possible the first, and only the first reporting party from damage lawsuits is advisable, and I believe the US Congress should go all the way towards completely removing the possibility to obtain damages from a party that received amnesty under the leniency program. Conversely, requiring "restitution" of past collusive profits, as currently done by the US leniency program, is clearly suboptimal from the deterrence perspective, and should be avoided.

Along the same lines, powering the leniency program with a well designed and carefully implemented bounty scheme that rewards corporate and individual whistleblowing appears feasible and worthwhile, as it is likely to improve cartel deterrence strongly at rather low cost. No major problem emerges from the empirical observation of the (well designed and managed) US experiences with fraud, nor from economic and legal analyses of whistleblowers. Poorly designed or implemented schemes, on the other hand, are likely to produce negative effects of various type, as is the case for any other law enforcement instrument or incentive scheme.

Leniency should also be offered to the first party reporting only after an investigation has already been opened, but if sanctions are sufficiently robust and the leniency and reward program sufficiently generous, the maximal reward should be restricted only to applicants that spontaneously reports before an investigation is opened, when the Antitrust Authority has not yet knowledge about the cartel. The reason is that leniency awarded to parties reporting after an investigation has been opened, i.e. after the existence of the cartel has been detected, has a real cost in terms of reduced deterrence linked to the lower expected fines for a cartel it generates (it increases the attractiveness of the "wait and see" strategy of reporting only if the cartel is detected), and should therefore be less generous than for spontaneous reports of non-detected cartels.

As for any incentive scheme, the design and implementation of leniency and whistleblower reward programs must be as transparent and predictable as possible, so that every observer can easily asses how attractive it is for a firm or individual participating to

a cartel to betray his partners, and thereby lose confidence from the beginning that a cartel can be stable and lead to sustained high profits, rather than to a costly antitrust conviction.

6.2 Open issues for further research

Many issues in need of further research have been discussed in the previous sections. Here I would like to underline those I regard as most urgent.

As already stressed, more empirical and experimental evidence would be extremely welcome on all the aspects of leniency and whistleblower programs discussed in this Chapter. In particular, it would be great if researchers and the relevant competition authorities could collaborate in producing reliable *databases* and making them generally available for analysis. There are some issues, though, where more theoretical work would also be particularly needed, besides empirical one.

First, of course, the policy hot *international dimension* of these programs and of antitrust law enforcement in general. It is rather obvious that if only a subset of countries where an antitrust policy is seriously implemented (i.e. with serious sanctions against infringements) introduce a well designed leniency program, its effect on international cartels will be hindered by the threat to be sanctioned in the latter countries when applying for leniency in the former. This is why in the discussions around the *Empagran* case the EU argued that allowing foreign victims to file civil damage claims in US courts against infringements in the EU could reduce the effectiveness of the EU leniency program, as this cannot protect applicants from the threat of such claims abroad. It is also clear, though, that when only a subset of countries uses serious sanctions to deter cartels, it may fail to deter international cartels when their gains from collusion are very large and proportional to their world market. This is why many observers argued in the *Empagram* discussion that foreign customers should be allowed to file damage claims in US courts against international cartels, in order to compensate for the lack of sanctions in these and other countries (e.g. Bush et al. 2004).

An international "one-stop-shop" where the first applicant reporting sufficient information becomes eligible for amnesty in all countries where a leniency program is present and the cartel was active, accompanied by a full protection from any damage lawsuits in any country for this applicant is likely to be the best solution to solve these coordination problems, but it would be nice to have more formal analyses of these issues.[45]

A second important subject in need of further research in my view is *the type and quantity of reported information and the risks of strategic manipulation of these programs.* Most, though not all the theoretical work I surveyed focuses on exchanges of leniency against "hard information," i.e. against information difficult to falsify and easy to use as proof of the infringement. The most recent tendency in practice appears instead to accept more and more purely "oral statements", in order to encourage reports from cartel members that are afraid of facilitating lawsuits for damages following the cartel

[45] See Festerling (2005b) for a first step in this direction.

conviction if they were to report more "concrete" information. The problem is of course that oral statements are harder to verify, and may open the door to falsifications or distortions, as has happened sometimes in Italy with the leniency programs against Mafia. And as I mentioned in Section 4.5.2, some antitrust officials have the feeling that some companies coming forward reporting a cartel may have been strategically withholding or distorting information, even though leniency programs explicitly condition immunity on open, complete, candid, and continued cooperation.

Of course there may have been problems in the implementation of these rules, but the issue of how much and what type of information provided at the first and later stages by a leniency applicant should be sufficient to award immunity or rewards remains a delicate and unsettled one. On one hand, with high powered incentives like rewards for whistleblowers one would think that a substantial amount of "hard evidence" should be required to minimize the risk of facing plenty of "reward-hunters" reporting insignificant or false/fabricated information. On the other hand, given the paucity of resources devoted to antitrust policy and the large number of industries and procurements to monitor, even very little, very "soft" but truthful information may be extremely helpful in terms of cartel deterrence. The simple but correct indication that there is a cartel in a given industry may lead to a successful down raid and to detection and conviction of an unknown cartel. How to be sure then that the first reporting party said it all? It may have judged profitable to leak as few info as necessary to obtain the first place in the leniency line, and concealed or destroyed remaining evidence to reduce the probability of a real conviction.

Finally, a third issue I believe somewhat under-researched is the interplay between these programs, the inevitable *mistakes* in courts' decisions, and the *standards of proof* chosen by courts at various levels. Elsewhere I have argued that courts are likely to increase the standard of proof when facing information reported in exchange for a reward, but also that increasing sanctions against agents convicted for false reports is likely to have a deterrence effect on false reporting that may neutralize the first force. These effects depend in turn on the strength of the sanctions against each type of wrongdoing, and the outcome of this complex interaction may affect in subtle ways the optimal design of antitrust law enforcement policy against cartels.

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