

# The Impact of Leniency Programs on Cartels

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## Abstract

Competition authorities have recently set up leniency programs for firms denouncing collusive agreements in which they have participated. These programs constitute revelation mechanisms aiming at inducing reports of collusion and thereby eventually deter it. We analyze the impact of reduced fines and on positive rewards on the behavior of firms. We propose the use of whistle-blowing mechanisms, that reward individuals, and in particular firm employees, to deter collusion in a potentially less costly way. This efficiency is mitigated by the possible adverse effects of individual rewards on the incentives of colluding firms to restructure and to invest.

We then present several explanations for the puzzling fact that firm managers keep incriminating evidence instead of destroying it. The existence of reward programs increases the probability that such evidence be kept.

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Very Preliminary. Comments Highly Appreciated!

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# 1 Introduction

## *Fighting cartels*

There is almost universal agreement that price-fixing and market allocation cartels reduce economic efficiency. Most competition policy systems condemn such arrangements, and there is a growing international consensus that competition agencies should devote strong efforts to enforcing prohibitions against cartels. Yet although many competition laws forbid cartels, cartels continue to form and operate in a significant number of industries. Evidence from the food additive and vitamin cartels, that lasted for ten years, suggests moreover that a number of cartels have long lives and succeed in maintaining discipline over a long period of time. The main problem is thus an implementation issue (see Rey 2003).

National competition agencies have nevertheless recently achieved some notable successes in prosecuting cartels. Cartel decisions are increasingly numerous and concern all sectors, from vitamins to plasterboard or fine art auctions – with Christie’s denouncing its participation in a cartel with Sotheby’s. These successes are in great part the result of leniency programs set up in the United States in 1993 and in the European Union in 1996.<sup>1</sup>

## *Leniency programs*

Leniency Programs reduce the fines for cartel members that bring evidence to the antitrust authority, and their impact can be seen in the recent increase in successfully prosecuted cartels. For example, in 1999 only, thanks to its Amnesty program the Antitrust Division secured more fines than the total sum of fines imposed under the Sherman Act since its adoption, more than a century before. In Europe, EURO 855 millions in total were also levied on the vitamins case, in which Rhône-Poulenc obtained full immunity for denouncing the cartel. In the last 19 months only, the Commission took 19 decisions, involving more than 100 companies, for a total amount of fines of almost 3 billion EURO.<sup>2</sup>

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<sup>1</sup>Similar programs have since been set up in United Kingdom in 2000 and in France and Germany in 2001.

<sup>2</sup>These record numbers are also – but not only – the result of increased fines. For the US, Hammond (2000) reports that the maximal fine imposed before 1993 was of US \$ 3 million. Admissible fines have been increased in 1993 up to the maximum of i) US \$ 10 million, ii) twice the gross gain of the cartel, and iii) twice the gross loss suffered by the victims of the cartel. As a result, in 1999 Hoffmann-LaRoche and BASF have paid criminal fines of US \$500 million and US \$250 million respectively for their participation to the vitamins cartel. Cartel fines

The judicial security offered to informants constitutes a key success factor of these programs. A corporate leniency program existed in the United States since 1978 but was relatively ineffective until its 1993 revision, which granted full amnesty to the first informant; in addition, individuals ('directors, officials and employees' of the informant firm), too, can now benefit from the amnesty. The European leniency program has similarly been reinforced in 2002 so as to grant full amnesty to the first reporting firm.<sup>3</sup> In both systems confidentiality is guaranteed, in particular with respect to other relevant jurisdictions.<sup>4</sup> Several differences still exist between the American and the European systems: First, individuals are not liable in Europe under the current legislation, contrary to the US.<sup>5</sup> Second, the US leniency program does not grant amnesty to cartel ringleaders. A similar requirement existed in the first version of the EU program but has been essentially removed in 2002 in order to foster deterrence.<sup>6</sup>

Encouraging firms to bring evidence seems sensible, since insiders are in a good position for providing the type of information that is needed for establishing a violation of the law. Cartels must reach agreements (e.g., setting total output levels, allocating shares of output, delineating sales territories and customers) and monitor compliance with agreed-upon terms. Such cooperation often leaves traces, that can be used as proofs by a cartel member if it ever decides to act as an informant. While firms may adapt to the new judicial environment and better hide or destroy all traces of communication with other cartel members,<sup>7</sup> they will probably have increased in the European Union, too. The highest fine for a single infringement has been imposed in 2001 on Lafarge (249 million EURO in the Plasterboard case); in the same year, Hoffman LaRoche received a fine of 462 million EURO for its role in the Vitamins cartels, which formally constituted 8 distinct infringements.

<sup>3</sup>Even if the Commission has already started an inspection, provided it does not yet have sufficient evidence. In the US, leniency is automatic only if the cartel is not yet being investigated.

<sup>4</sup>The programs rely for example on privileged oral testimonies in order to avoid generating self-incriminating evidence that could then be used in a civil suit for damages.

<sup>5</sup>According to Hammond (2000) and Spratling (1999), two officials from the Antitrust Division of the DoJ, one of the major reasons of the success of the second version of the American leniency program is the fear of imprisonment for corporate officials, a fear that does not arise in Europe.

<sup>6</sup>The only remaining requirement is that the reporting firm must not have taken steps to coerce other firms to participate in the activity.

<sup>7</sup>There is ample evidence that firms adapt to the tools used by antitrust authorities. In Europe, it has for example been recognized that parties to illicit agreements were keeping incriminating documents at home, in case the firm's premises were searched. As a result, the European Commission has been given larger investigation

have to keep incriminating evidence because of distrust and agency problems, both at the level of the cartel and at the level of the firm.

*Leniency programs versus bounties*

While leniency programs only offer favorable treatment (partial or full amnesty), positive rewards might also be contemplated. In practice, however, only a few systems offer bounties. One such system is the U.S. Civil False Claims Act, which has been used extensively to attack fraud involving the U.S. government's role in purchasing goods and services (e.g., procurement fraud against the Department of Defense) and as an insurer for social welfare programs (e.g., fraud involving health care programs covered by Medicare). This Act rewards individuals who inform the government of fraud in procurement contracts by a substantial share of the fines collected. Kovacic (1996) and Tokar (2000) present interesting descriptions of this mechanism.

Giving whistle-blowers a monetary reward could provide powerful incentives to denounce a cartel; in addition, allowing individuals to become potential whistle-blowers would discourage firms from participating in cartels or force them to take costly measures (e.g., limiting the dissemination of information, compensating insiders to secure their fidelity, and so forth) that would contribute to make cartel agreements less attractive.

The reluctance to use bounty mechanisms stems mostly from institutional reasons and from a fear of adverse effects on firms' incentives. Institutional rules may for example prevent the antitrust authority from having the financial means for substantial rewards. A practical solution to this problem could however consist in simply giving a share of the fines levied thanks to the information provided by informants. As for possible adverse incentives, they may take mainly three different forms:

- The threat of informing or the act of informing gives an employee leverage to obtain a favorable employment settlement, wage increases, etc. By increasing the cost of collusion, this has precisely a positive effect on deterrence. Relatedly, firms may develop strategies (restricting communication flows, limiting turn-over, and so forth) that impede their efficiency; but this, again, tends to make collusion both less attractive and more fragile. In some instances, employees might have leverage even if the complaint is not justified, since going to court is a costly and 

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powers and is now allowed to search private houses.

lengthy process that innocent firms want to avoid – even if they feel confident that the complaint will be ultimately rejected. Letting the antitrust authority select which cases to prosecute would however limit the associated costs.<sup>8</sup>

- Informants – and antitrust authorities – may mistake for an illegal cartel what is in fact a benign or pro-competitive behavior – for instance, a legitimate joint venture that restricts the freedom of its participants. The risk of such mistakes may be costly; for example, it may discourage valuable intra-firm and inter-firm cooperation. Indeed, both the internal organization of the firm and its relationships with outsiders could be affected by the fear that sharing information could be wrongly interpreted.

#### *Overview of the paper*

We study collusion in a repeated interaction framework. Our working assumption is that communication is a necessary first step for collusion to be possible; it provides an agreement that firms are then free to implement or not, as in a standard tacit collusion situation, but it also generates evidence that can be found by the Antitrust Authority, and can also be reported by firms or individuals. This framework is similar to the one used by Motta And Polo (2001) and Spagnolo (2003), who also study the role of leniency programs.

Motta and Polo (2001) analyze the impact of reduced fines for cartel members that inform the competition authority, when the probability of antitrust intervention is endogenously determined under a balanced budget constraint. They show that it can be efficient to grant reduced fines even when the antitrust authority has already started an investigation, but has not yet obtained evidence of mis-behavior. Indeed, although such reduced fines reduce the expected costs of collusion for cartel members, reports from informant firms allow to decrease investigation costs. In this model, if the budget of the antitrust authority was high enough, it would be optimal to have no Leniency Program, and to intervene often enough to fully deter collusion. Leniency Programs – limited here to reduced fines – are a second best instrument, that is optimal only when the antitrust authority has limited resources.

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<sup>8</sup>In the case of the US Civil False Claims Act, individuals are allowed to prosecute even when the DoJ has chosen not to follow the case. But to deter individuals from knowingly making false complaints, the Act allows successful defendants to recover their defense costs from the informant, when the latter uses his private right of action. Such a system could also be set up if this private right of action was recognized in the case of cartels.

Spagnolo (2003) also examines the effect of Leniency Programs on the sustainability of cartels, in a framework that is closer to ours. Contrary to Motta and Polo, he assumes that when a cartel is detected, it is also convicted. This allows to focus on the impact of Leniency Programs on cartels that are not already under investigation. Allowing for generic punishment strategies<sup>9</sup>, Spagnolo shows that the antitrust authority should not fine firms that deviate from a cartel agreement, should reward only the first party that reports, and should offer a positive reward equal to the sum of the fines paid by the convicted firms (assuming that the competition authority is budget constrained so that it cannot offer larger rewards). Provided that the maximum fine is high enough, such a reward policy can implement the first-best outcome: full deterrence at no cost. Even if the antitrust authority cannot offer positive rewards, reduced fines for reporting firms can be useful by decreasing the cost of deviating from the cartel agreement. Last, Spagnolo shows that reduced fines always increase the riskiness of an agreement.

Our framework differs in that we take the probability of an investigation as given, and focus on the consequences of rewards on decisions taken within the cartel and within firms. We show that positive rewards have a larger deterrence effect than reduced fines, and that rewards for individuals can be more effective than corporate ones. We then turn to the potentially adverse effects of rewards mentioned above, such as preventing efficient cooperation between firms, restricting information flows between employees, or inducing a more rigid employment structure. We show that rewards can be adapted so as to mitigate these costs.

A major puzzle is why evidence is not immediately destroyed after communication has taken place. We explore explanations based on agency problems, both at the cartel level and at the level of the individual firms. We point out that positive rewards may exacerbate these agency problems and encourage firms (or individuals) to gather and keep evidence.

The paper is organized as follows. Section 2 sets up the model. Section 3 analyzes the effect of leniency programs and rewards on the sustainability of cartels. Section 4 considers the effects of rewards on inter-firm communication, intra-firm hiring strategies, and investment incentives. Explanations for the fact that evidence of collusion is often not destroyed are explored in the

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<sup>9</sup>This differs from Motta and Polo (2001) who only allow for two types of strategies: 'firms never report and go back to collusion after an investigation, and play Nash forever as soon as one of them reports' and 'firms report to the antitrust authority when ever an investigation is opened, and go back to collusion afterwards'.

next two Sections. They rely on agency problems, within the cartel (Section 5), or within the firm (Section 6). Section 7 concludes. Proofs are in the Appendix.

## 2 The model

### 2.1 Modeling collusive agreements

Three different types of model can be used to represent collusive agreements.

#### *Enforceable agreements*

The first approach considers enforceable agreements, which would be relevant for legal cartels such as export or crisis cartels. To ban such cartels it suffices to make them illicit, as did Switzerland when it suppressed the cartels bureau. A related approach assumes that parties have ways to ensure that even illegal obligations be executed. These means may arise from repeated relationships but are not explicitly modeled. This is for example the approach taken in the modeling of collusion in static agency situations, as in Laffont and Martimort (1997, 2000).

#### *Tacit collusion*

In the second approach collusion emerges as the non cooperative equilibrium of an infinitely repeated game. A coordinated outcome can then be sustained even without any communication between the firms. Antitrust authorities are powerless in front of such purely tacit collusion, since firms simply adopt non-cooperatively strategies that lead to a coordinated outcome. An example of this difficulty is the well-known woodpulp case, in which the European Commission asserted that the parallel evolution of prices (expressed in dollars, and despite strong fluctuations in the exchange rates of the producing countries) charged by the woodpulp industry between 1971 and 1981 in Europe was an evidence of collusion. This decision was overruled by the European Court of Justice, that re-asserted the principle that price parallelism cannot be taken as incompatible with competitive behavior. Kuhn (2000) discusses the difficulties associated with using observable behavior to detect collusion<sup>10</sup>.

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<sup>10</sup>Along with other difficulties such as the lack of reliable data on price and quantities, Kuhn (2000) cites the

### *Collusion with communication*

The view taken in this paper is a third one: Collusion has to be self-enforcing, since firms cannot appeal to courts to enforce agreements, but it requires communication; OPEP is a cartel of this type: Its members hold frequent meetings, but there is no available authority to ensure enforcement of agreements. We moreover assume that communication leaves traces.

These assumptions are clearly relevant in many cases in practice. Competition authorities do rely on such evidence, and stories abound about how difficult it is to safeguard the implementation of the negotiated agreement – even legal ones. **[Add references. US sugar institute David Genesove and Wallace Mullin?]** Communication may be particularly needed in the first periods of collusion, in order to foster coordination given the existence of multiple potential equilibria. Communication may moreover remain necessary in subsequent periods if there is an uncertainty on the firms' incentives to deviate in each period, for instance uncertainty on their discount factors or costs. Kandori and Matsushima (1998) show that communication may indeed be necessary to support collusive outcomes when products are differentiated and firms cannot observe each other's prices but only infer them from their own sales. Compte (1998) has similar results. To keep the analysis simple, however, we will refrain here from opening the “communication” blackbox and postulate instead that communication is a prerequisite for collusion.

## **2.2 The collusion game**

Two firms play an infinitely repeated game where, in each period, they can choose between two strategies, a collusive strategy or a competitive one. Both firms have the same discount rate  $\delta \in (0, 1)$  and maximise the expected discounted sum of their profits. In each period, the gross profit of a firm is:

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sensitivity of quantitative studies to functional form specification. This sensitivity is exemplified by the divergence between two econometric studies on the US railroad cartel in the 1880s. Porter (1983) concludes that although mark-ups were observed, they were compatible with Cournot competition, while Ellison (1994), allowing for auto-correlation on the demand side, obtains estimates close to the full collusion case.



- $\pi^M$  if both firms collude,
- $\pi^D$  for a firm that competes while the other colludes, in which case the other firm gets  $\underline{\pi}$ ,
- $\pi^C$  if both firms compete.

The case where both firms collude is indicated by superscript  $M$ , since this behavior aims at monopolizing the industry. The terms ‘competitive behavior’ or ‘competition’ denote the case in which firms earn profits  $\pi^C$ , which can correspond to standard static competition à la Cournot or Bertrand. We moreover assume:

$$\begin{aligned}\underline{\pi} &\leq \pi^C < \pi^M < \pi^D \\ \underline{\pi} + \pi^D &< 2\pi^M.\end{aligned}$$

These inequalities imply that firms gain from collusion, but each firm benefits at the expense of the other from deviating, i.e., from competing when the other colludes.

### 2.3 Oversight by an Antitrust Authority

The Antitrust Authority maximizes consumer surplus and imposes fines on firms that have chosen to collude, but it can do so only if it obtains evidence about collusion. That last assumption restricts the scope for intervention but corresponds to the actual mandates of these agencies. We however suppose that communication is a prerequisite for collusion, and that this communication generates some hard evidence:

**Assumption 1 (Collusion generates evidence)** *Collusion requires some communication, which generates evidence. This evidence can be found by the Antitrust Authority if it audits the industry; in addition, each firm can bring this evidence to the Antitrust Authority.*<sup>11</sup>

We thus assume that communication (and thus collusion) automatically generates evidence, which is moreover systematically found in the case of an audit. The probability of audit, which

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<sup>11</sup>This assumption is implicit in several models that introduce intervention by a competition authority, and in particular in the papers of Motta and Polo (2001) and Spagnolo (2003). McCutcheon (1997) also relies on this assumption when stressing possible adverse effects of anti-trust laws – by increasing the cost of renegotiations, they may help firms commit to retaliate.

we will denote by  $\rho$ , thus determines the probability of getting evidence of collusion. The framework could easily be extended so as to allow more stochastic generation and obtention of evidence.

**Assumption 2 (Evanescence)** *Evidence of collusive behavior disappears after one period.*

This assumption simplifies the analysis, since only current behavior can be ‘punished’ by the Antitrust Authority.

The Antitrust Authority can impose a maximal fine  $F$  that is exogenously set and is not large enough to deter collusion if imposed with probability  $\rho$  only:

$$\pi^M - \pi^C > \rho F.$$

Additional tools – e.g., positive rewards – will be considered later on. The reports to the Antitrust Authority are assumed to be *public*, i.e. observed by all actors in the economy, including firms (the case of secret reports is analyzed in Rey (2003)).

## 2.4 Timing

In each period, the precise timing is as follows:

1. Both firms choose whether to communicate.
2. If at least one firm prefers not to communicate, firms adopt the competitive strategy. Otherwise,
  - a. communication takes place, and evidence is created;
  - b each firm then chooses whether to implement the collusive strategy, or ‘deviate’ and compete. In this case, the deviating firm can moreover report the evidence of collusion to the Antitrust Authority.<sup>12</sup>
3. In the absence of reports, the Antitrust Authority audits the industry with probability  $\rho$ .

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<sup>12</sup>The assumption that evidence can be reported only at that stage is not needed for our results. A firm would not find it optimal to report in other circumstances anyway.

For the sake of presentation, the audit probability  $\rho$  is supposed constant over time and over history. This in particular implies that, when collusion is sustainable, the best collusive strategies consists in colluding in every period – even after a successful audit. This arguably unrealistic assumption simplifies the exposition but could easily be relaxed at the cost of some notational complexity.

## 2.5 Some benchmarks

We first study two benchmark cases: the case in which the Antitrust Authority can only use an audit technology, without any revelation mechanism, and the case in which it can use revelation mechanisms but is constrained to only offer negative transfers, i.e. reduced fines, to reporting firms.

### *No revelation mechanisms*

Suppose first that the Antitrust Authority can only rely on audits. Then in each period profits will be

- $\pi^M - \rho F$  if both firms collude,
- $\pi^D - \rho F$  for a firm that competes<sup>13</sup> while the other colludes, and  $\underline{\pi} - \rho F$  for the other,
- $\pi^C$  if both firms compete.

It can easily be shown that the most profitable collusive strategy is to collude in every period and punish any deviation by returning forever to the static competitive equilibrium, this being the hardest credible punishment that can be imposed on deviating firms. Collusion is therefore sustainable if the gain obtained when deviating, and competing forever after, is lower than the discounted gain of colluding:

$$\pi^D - \rho F + \frac{\delta}{1-\delta}\pi^C \leq \frac{1}{1-\delta}[\pi^M - \rho F],$$

or equivalently

$$\pi^D - \pi^M \leq \frac{\delta}{1-\delta}[(\pi^M - \rho F) - \pi^C]. \quad (1)$$

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<sup>13</sup>A firm is thus convicted even if it did not implement the collusive strategy after communication. Unless expressly noted, the analysis would be similar if adopting the competitive strategy sufficed to avoid the fine.

### *Leniency programs*

Assume now that the Antitrust Authority can only use constrained revelation mechanisms, where it “rewards” reports of collusion by reducing the fine from  $F$  to  $f$  but cannot offer positive transfers. To deter such a reporting, firms should plan again to revert to competition if it ever occurs. Therefore, a firm that reports will also choose to deviate, since it will face competition afterwards anyway. Conversely, a deviating firm will denounce its competitor if the reduced fine is lower than the expected fine it has to pay when an audit occurs:  $f < \rho F$ . Under this condition, collusion is sustainable if

$$(\pi^D - f) - (\pi^M - \rho F) \geq \frac{\delta}{1 - \delta} [(\pi^M - \rho F) - \pi^C].$$

Therefore:

**Proposition 1** *If the Antitrust Authority can reduce fines but cannot reward informants with positive transfers, then revelation mechanisms have a deterrence effect on collusion only if*

$$\pi^D - \pi^M \leq \frac{\delta}{1 - \delta} [(\pi^M - \rho F) - \pi^C] \leq \pi^D - \pi^M + \rho F - f.$$

Leniency programs have no impact on the profitability of collusion and affect its sustainability only by giving deviators the opportunity to avoid any fine in the case of audits. Leniency programs can therefore be effective only when the expected fine  $\rho F$  is large, that is, when collusion would already be quite fragile without any leniency program.<sup>14</sup>

## **3 The deterrence effect of rewards for informants**

To induce firms to report collusion, the Antitrust Authority needs in general to offer a ‘reward’ (positive transfer)  $R$  large enough to outweigh the cost of returning to the competition outcome in all the future periods.

### **3.1 The minimal size of rewards**

It is more effective to reward reports that are made before any audit of the industry: Reports made after a successful audit are useless; and reports made after an unsuccessful audit are more

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<sup>14</sup>In particular, leniency programs would have no bite if deviating firms were not subject to fines.

costly to induce than before an audit.<sup>15</sup> Note also that it is not possible to make firms reveal past collusion. Indeed,

i) ‘hard information’ (evidence) disappears after one period;

ii) since past decisions do not affect firms’ preferences over future outcomes, there is no way of inducing truthful revelation of ‘soft information’.<sup>16</sup>

We can therefore focus on pre-audit reporting. There again, a deviating firm (and only a deviating firm) will choose to denounce its competitor whenever  $R > -\rho F$ . (in particular, it will do so if the reward is indeed positive). The reward  $R$  necessary to induce such reporting – and thus break collusion – must compensate for the ensuing retaliation:

$$(\pi^D + R) - (\pi^M - \rho F) \geq \frac{\delta}{1 - \delta} [(\pi^M - \rho F) - \pi^C].$$

This condition is indeed more stringent than (1) when  $R > -\rho F$ . We have:

**Lemma 1** *In order to induce a firm to report collusion, the Antitrust Authority must offer a reward at least equal to  $\underline{R}$ , defined as*

$$\underline{R} \equiv (\pi^M - \pi^D) + \frac{\delta}{1 - \delta} [(\pi^M - \rho F) - \pi^C] - \rho F.$$

The minimal reward  $\underline{R}$  may be negative but it may also quite large.<sup>17</sup> In particular, it goes to infinity when the discount factor  $\delta$  gets close to 1.

### 3.2 Potential implementation issues

Several concerns may arise from the large size of the rewards needed to deter collusion. First, such rewards may not be credible: The Antitrust Authority may have a limited budget and may

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<sup>15</sup>If firms are willing to report even though they are not threatened by the possibility of a fine due to the audit, they would have been willing to report before the audit took place. In addition, Motta and Polo (2001) and Spagnolo (2003) point out that reducing post-audit fines would erode the deterrence effect of these audits.

<sup>16</sup>See Moore (1992) for an overview of what can be achieved through Nash- or subgame perfect- implementation.

<sup>17</sup>We have assumed that a deviating firm can still report evidence of collusion. This seems a relevant assumption: a firm that deviates after negotiating a collusive agreement can still provide evidence of the negotiation that took place. Under the alternative and arguably less realistic assumption that deviating firms have nothing to report to the Antitrust Authority, a colluding firm could choose to report but would only do so if the reward offered were larger than  $\frac{\delta}{1 - \delta} [(\pi^M - \rho F) - \pi^C] - \rho F$ .

not be able to credibly commit to large rewards. As already mentioned, a way to circumvent this issue is to reward the informant with a fraction of the fines paid by the other firms.

A second issue concerns the political implementability of large rewards. The public opinion may not easily accept the idea of granting large amounts to colluding firms. In that respect, the Antitrust Authority may wish to keep its reward program unknown to the public, and bargain directly with firms suspected of collusive behavior. But this creates judicial uncertainty and may affect the credibility of the reward.<sup>18</sup>

In practice, leniency programs often refuse amnesty to ring-leaders. While granting rewards to wrong-doers may not easily be accepted by society, this would still increase the deterrence power of rewards. It is sometimes argued that rewards would give incentives to organize a cartel in order to denounce it. But this would actually have a desirable impact, since firms would then become extremely cautious when offered to participate in a collusive agreement. Offering bounties to any cartel member, including the instigator, therefore contributes further to deter collusion.

A last issue related to very large rewards is the possibility that it generates additional incentives to collude: It might for example become profitable for firms to collude and report or to ‘take turns’ for reporting collusion. As long as  $R < F$ , though, this strategy would not be profitable.<sup>19</sup>

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<sup>18</sup>Rewards should be contractually enforceable in court, since a judiciary process may be more reliable than non witnessed promises by the competition authority.

Relatedly, rewards may be less credible when reports are made secretly. Thus, while secret reports reduce the risk of retaliation by the other firms, potential informants may fear that the Antitrust Authority reneges, at least partly, on its promises.

<sup>19</sup>If rewards were available to all reporting firms, then firms would find it optimal to collude and systematically report. To counter this, antitrust authorities usually restrict rewards to a limited number of informants. Yet taking turns for reporting may still yield a higher profit to firms than behaving competitively. For example, the two firms could collude and select randomly one of them for reporting collusion to the Antitrust Authority. The value of such a strategy would be

$$\frac{1}{1-\delta}[\pi^M + \frac{R-F}{2}].$$

Under (1), such collusion is sustainable whenever it is more profitable than the collusion without reporting, that is when

$$R > (1 - 2\rho)F.$$

### 3.3 Extending mechanisms rewarding information to individuals

Firms rely on individuals, which creates potential agency problems; the Antitrust Authority can try to take advantage and even exacerbate these agency problems in order to better deter collusion. In the United States, for example, individuals can benefit from a leniency program that shields them from criminal sanctions, including jail. However, contrary to the Civil False Claim Act, this amnesty program does not grant positive rewards to individual informants.<sup>20</sup>

We argue here that positive rewards for individuals can usefully complement corporate amnesty programs. The basic idea is quite simple: if the Antitrust Authority offers a reward  $r$  to employees reporting incriminating evidence, colluding firms will have to pay additional bonuses to “informed” employees in order to secure their fidelity; the benefits of collusion are thus decreased. This makes collusion less attractive, which can furthermore contribute to make it more fragile.

Suppose for example that: (i) full leniency would not suffice to deter collusion – that is,  $\underline{R} > 0$ ; (ii) collusion requires  $n$  informed employees; (iii) employees are ‘short-lived’ and present for one period only; and (iv) the Antitrust Authority can protect whistle-blowers from retaliation.<sup>21</sup> In each period, colluding firms must then compensate their informed employees for not reporting the incriminating information; collusive profits are thus reduced by  $nr$  and thus become

$$\pi^M - \rho F - nr$$

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The size of this reward actually increases with the number of firms, implying that such perverse incentives are more likely to appear in concentrated industries. But whatever the number of firms,  $R < F$  suffices to rule out such ‘collude and report’ strategies.

<sup>20</sup>Leniency programs for individuals can contribute to reinforce corporate ones. A colluding firm would have to compensate employees for the judicial risk to which they are exposed; a firm would therefore gain more when deviating if it can apply for both corporate and individual leniency – and thus reduce the employee compensation. Individual leniency may also be useful when employees who terminate their relationships with the firm can leave with incriminating evidence.

<sup>21</sup>This is of course the case where rewards for employees are the most powerful. In practice firms may be in a position to retaliate. In particular, the job opportunities of an informant can become uncertain. However, as illustrated by the US Civil False Claim Act, a mere fraction of the fines imposed on convicted firms can be large, even compared to an employee’s discounted lifetime salary. More generally, in what follows  $r$  can be interpreted as the “effective” reward offered by the policy, net of the anticipated cost of retaliation for the informants.

in each period. This, in turn, makes collusion more fragile: in the absence of corporate leniency, collusion is sustainable only if

$$(\pi^D - nr) - (\pi^M - \rho F - nr) \leq \frac{\delta}{1 - \delta} [(\pi^M - \rho F - nr) - \pi^C],$$

or, equivalently:

$$\frac{\delta r}{1 - \delta} \leq \frac{R}{n}.$$

This calls for two remarks. First, even if the reward is paid only to the first employee who denounces collusion, colluding firms must give *each* informed employee the equivalent of  $r$  in *each period*; the impact of the reward policy is thus multiplied, compared with a corporate policy – as the number  $n$  of informed employees increases, collusion becomes more and more fragile. Second, individual rewards have a bigger effect when firms place a larger weight on future profits – which is the case in which collusion is most likely. This is partly due to the fact that, the impact of individual rewards being indirect (it affects sustainability by reducing the profitability of future collusion), it is less effective when firms heavily discount the future.

We assumed so far that a deviating firm was still exposed to prosecution – and thus had to compensate its informed employees – which mitigates the incentives to deviate. This suggests a natural complementarity between the two policies. If for example informing firms can benefit from a reduced fine  $f < nr$ , a deviating firm would ask for leniency rather than compensate its informed employees and collusion would then be sustainable only if

$$(\pi^D - f) - (\pi^M - \rho F - nr) \leq \frac{\delta}{1 - \delta} [(\pi^M - \rho F - nr) - \pi^C],$$

that is, if

$$\frac{r}{1 - \delta} - f \leq \frac{R}{n}.$$

Together, an individual reward  $r$  and a reduction in the fine ( $F - f$ ) can thus destroy collusion even when each instrument, taken separately, would not have been sufficiently effective. In addition, since leniency allows the firm to avoid compensating informed employees when deviating, it increases the impact of the reward  $r$ .<sup>22</sup>

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<sup>22</sup>That is,  $\delta / (1 - \delta) < 1 / (1 - \delta)$ .



The complementarity between corporate leniency and individual whistle-blowing is even more striking when employees are ‘long-lived’. To fix ideas, consider a variant of the above situation where informed employees are ‘lifetime’ employees who stay in the firm forever. The firms’ best fidelisation policy then consists in a constant bonus  $b = (1 - \delta)r$ , to be paid as long as the employee does not report. In the absence of any leniency program, a deviating firm would however have to pay a ‘full compensation’ or  $r$  during the period in which it deviates; in that case, an individual reward policy would have no impact on the sustainability of collusion (it would however still make collusion less profitable, and thus less attractive): indeed, collusion is then sustainable as long as

$$(\pi^D - nr) - [\pi^M - \rho F - n(1 - \delta)r] > \frac{\delta}{1 - \delta}[\pi^M - \rho F - n(1 - \delta)r - \pi^C],$$

which amounts to  $\underline{R} < 0$ . To see why such individual rewards have no bite, note simply that they affect by a same amount the total discounted profit from a deviation,  $\pi^D - nr$ , and the discounted stream of collusive profits, which is equal to

$$\frac{\pi^M - \rho F - n(1 - \delta)r}{1 - \delta} = \frac{\pi^M - \rho F}{1 - \delta} - nr.$$

In contrast, when a deviating firm can apply for amnesty, it can both save the fine and avoid compensating informed employees. Collusion is therefore unsustainable whenever

$$\pi^D - (\pi^M - \rho F - n(1 - \delta)r) > \frac{\delta}{1 - \delta}[(\pi^M - \rho F - n(1 - \delta)r) - \pi^C],$$

or:

$$r > \frac{\underline{R}}{n}.$$

Thus, individual rewards, which would be useless in the absence of corporate leniency, can now destroy collusion.

A similar analysis applies when employees remain with the firm for a limited time, provided they know for how long they will remain in office; in that case again, each employee will “cost”  $r$  to the firm: the firm can pay a compensation equal to  $r$  when the employee is about to leave and the recurrent bonus  $(1 - \delta)r$  in the previous periods. This however implies that the firm

will prefer informed employees to stay longer in office, so as to limit turn-over and the number of bonuses to be paid – a point we will stress again in subsection 4.2.<sup>23</sup>

Assume now that employees have an indefinite tenure but face in each period a probability  $\epsilon$  of leaving the firm – before they obtain evidence, say – for exogenous reasons – relocation, accident, and so forth. In order to prevent these employees from reporting to the Antitrust Authority, the firm’s best policy consists again in paying them a bonus  $b$  in each period as long as whistle-blowing does not occur. In each period, the expected value of these bonuses should be at least as large as the reward that can be obtained by denouncing collusion once; that is  $\frac{1}{1-\delta(1-\epsilon)}b = r$ , or equivalently

$$b = [1 - \delta(1 - \epsilon)] r.$$

The minimal reward needed to deter perfect collusion,  $\underline{r}$ , is (assuming, to fix ideas, that deviating firms can benefit from amnesty)

$$r > \frac{\underline{r}}{1 + \frac{\delta\epsilon}{1-\delta}}.$$

Thus, the whistle-blowing mechanism requires lower rewards when the rate of turn-over increases (the higher  $\epsilon$ ).

Individual mechanisms can therefore be very an effective complement to corporate leniency programs. Note that even if rewards are not supposed to be ever paid in equilibrium, a competition authority will find it easier to commit to rewards that are not excessively high. A whistle-blowing mechanism directed at firms’ employees can in that respect be preferable to a corporate one.<sup>24</sup>

A caveat concerns the potential adverse effects of rewards on the organizational structure of the firm, on its incentives to delegate, communicate or efficiently restructure. These issues are considered in the following sections.

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<sup>23</sup>For example, replacing the employee every  $T$  periods would cost the firm  $r(1 + \delta^T + \delta^{2T} \dots) = \frac{r}{1-\delta^T}$ ; this cost increases with the rate of turn-over (that is, when  $T$  decreases).

<sup>24</sup>Another argument in favor of individual whistle-blowing programs is that reporting may be more easily kept secret than in the case of corporate programs.

## 4 Side-effects of whistle-blowing programs

Bounty mechanisms have been criticized on two main grounds. First, bounty mechanisms may deter not only collusion, but also ‘good’ cooperation between firms. We show however how these programs can be adapted so as to limit these costs. Second, bounty programs can influence firms’ internal organization and decisions. They may for example induce firms to limit excessively their rate of turn-over, so as to reduce the amount of bribes given to informed employees. We note, however, that the induced rigidities tend to make collusion less attractive, which in itself is a desirable side-effect. Reward programs may also induce firms to adopt more ‘innocent’ attitudes, which again increases the cost of collusion.

### 4.1 The impact of rewards on desirable cooperation

Whistle-blowing mechanisms may deter socially desirable cooperation as well as harmful collusion. For example, communication about the evolution of demand and cost conditions may allow the firm to adopt better informed decisions<sup>25</sup>. This may be particularly important in industries where investments in production or in productive capacities have to be done at a stage when firms still suffer from uncertainty on the future environment. Communication between firms may then be socially beneficial by avoiding wasteful investments.

This cooperation may not be distinguishable from the communication involved in price-fixing. For example, firms may end up taking the same decisions as to quantities and prices, since the heterogeneity in decisions stemming from asymmetric information is removed by communication. Empirically, it does not appear possible to distinguish such alignment of prices from cartelization of the industry.

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<sup>25</sup>Suppose that each firm  $i$  has a signal  $\beta_i$  on the true state of nature,  $\beta$ . Information sharing enables each firm  $i$  to base its production on  $(\beta_1, \beta_2, \dots, \beta_n)$ , a better statistic than  $\beta_i$ . This argument has been formally explored by Athey and Bagwell (1999) in the case of asymmetric information on costs. Communication is necessary to achieve cost efficiency, which requires that the lowest cost firm serves a larger share of the market. Athey and Bagwell point out that if firms are patient, they will be able to collude on high prices, be communication allowed or not. Forbidding communication is then useless from the point of view of consumer surplus, while preventing cost efficiency. Fighting collusion ends up decreasing social welfare: It simply forces the firms to adopt a less efficient form of collusion.

### *A simple model*

To fix ideas, assume that there are now three strategies for the firms: They can either ‘compete’, ‘compete and communicate’, or ‘collude’. Both competitive situations constitute equilibria of the constituent game – and can thus be sustained forever in the repeated interaction game. The new strategy, ‘compete and communicate’, consists in exchanging information so as to allow firms to make more efficient production choices, while still competing on the market. While communication might increase firms’ profits without being socially efficient,<sup>26</sup> to focus on possible adverse effects of whistle-blowing mechanisms, we assume here that communication increases social welfare, compared to the situation in which firms ‘compete’ without communication.

This efficient communication leaves evidence that is similar to that left by collusion. The Antitrust Authority mistakes the ‘compete and communicate’ strategy for collusion with probability  $\mu \in ]0, 1[$ . We suppose that firms prefer collusion to any competition, but still prefer to ‘compete and communicate’ rather than simply ‘compete’; that is, letting  $\pi^{CC}$  denote the profits achieved when both firms, we have  $\pi^M - \rho F > \pi^{CC} - \mu \rho F > \pi^C$ . The expected profits for each firm are:

- $\frac{\pi^C}{1-\delta}$  if both firms compete and do not communicate,
- $\frac{\pi^{CC} - \mu \rho F}{1-\delta}$  if both compete and communicate,
- $\frac{\pi^M - \rho F}{1-\delta}$  if both collude.

The expected profits when firms play different strategies are easy to compute.

To focus on a striking case, we assume that there is no collusion before the introduction of a reward mechanism:<sup>27</sup>

$$\pi^D - \pi^M \geq \frac{\delta}{1-\delta} [(\pi^M - \rho F) - \pi^C].$$

Given that collusion would not be sustainable, firms would then have an incentive to ‘compete and communicate’.

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<sup>26</sup>See Kuhn and Vives (1994) for a survey of the ways in which firms exchange information, and their impact on competition.

<sup>27</sup>Collusion is best sustained by punishing deviations with the worst competitive outcome, which yields here  $\pi^C$ .

### *The impact of positive rewards*

When a whistle-blowing system is introduced, a firm may now have incentives to falsely ‘denounce collusion’ in order to obtain the reward  $R$  (with probability  $\mu$ ). In order to make this strategy as costly as possible, the firms should commit never to communicate information again as soon as one falsely reports.<sup>28</sup> Lying is then a profitable strategy for a firm if:

$$\mu R \geq \frac{\delta}{1-\delta} [(\pi^{CC} - \mu\rho F) - \pi^C].$$

If this condition is satisfied, firms anticipate denunciation and therefore prefer to compete without communicating. The program is then detrimental to welfare since it prevents efficient communication.<sup>29</sup>

### *Mitigating adverse effects*

This potential cost can however be much reduced by imposing a fine  $\hat{f}$  when a firm reports collusion which is not confirmed by the prosecution.<sup>30</sup> If the Antitrust Authority cannot misinterpret real evidence for false claims, it then suffices to impose a large enough fine  $\hat{f}$ .<sup>31</sup> If errors are possible, however, this fine can ‘back-fire’ and have an adverse effect on the incentives to report actual collusion.

To explore this issue, consider an alternative situation where, in the absence of such errors, rewards would deter collusion. That is, collusion would be sustainable without rewards but is no longer so when they are introduced:

$$\pi^D - \pi^M < \frac{\delta}{1-\delta} [(\pi^M - \rho F) - \pi^C] < (\pi^D + R) - (\pi^M - \rho F).$$

Suppose furthermore that the Antitrust Authority can misinterpret real evidence for false claims with some probability  $\hat{\mu}$ .<sup>32</sup> As long as this probability of error remains small, namely, as long as

$$(1 - \hat{\mu})R - \hat{\mu}\hat{f} > -\rho(1 - \hat{\mu})F,$$

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<sup>28</sup>We assume that  $R$  is lower than  $F$  so that taking turns to falsely denounce collusion is not profitable.

<sup>29</sup>In the reverse case, the normative implications regarding leniency programs are reversed.

<sup>30</sup>Note that this mechanism is similar to judicial rules according to which defendants can recover their costs when the judicial authority rejects the report made by individuals, as in the U.S. Civil False Claims Act.

<sup>31</sup>Namely,  $\hat{f}$  must satisfy

$$\mu R - (1 - \mu)\hat{f} < \frac{\delta}{1-\delta} [(\pi^{CC} - \mu\rho F) - \pi^C].$$

<sup>32</sup>The probability of error is assumed to be the same for direct audits and denunciations.

a deviating firm would still choose to report and collusion thus remains unsustainable. To be sure, when the probability of error becomes too large, so that the above condition no longer holds, a deviating firm would abstain from reporting and thus collusion would be sustainable. But note that it would have been so as well in the absence of rewards. Thus, while the possibility of mistakes from the antitrust authority reduces its effectiveness, introducing rewards can only improve its action.

## 4.2 Impact on turn-over and inside communication

With whistle-blowing programs, the cost of maintaining collusion decreases with the time-horizon of employees (as seen in 3.3). Collusive firms have an incentive to lengthen the tenure of their ‘informed’ employees. They should therefore have a less flexible employment structure, with employees remaining in office for longer periods than in competitive companies. Similarly, a firm may wish to restrict circulation of information even at the cost of a lower productivity.

Assume for example that it would be efficient for the firm to replace an employee, due to the obsolescence of his skills or to his low intrinsic productivity. If this employee has obtained verifiable information about the collusive agreement of the firm with its competitors, firing him would induce immediate denunciation. A colluding firm may prefer not to hire new workers if the bonus to be paid is very large compared to the efficiency differential between employees.

Formally, let us consider a firm participating in a collusive agreement, that involves a particular employee. Now assume that the firm anticipates being given the opportunity to restructure in  $T$  periods. In period  $T$ , the firm decides whether it wants to restructure, in which case the current employee is dismissed, or affected to another task. We denote with a hat all profits after restructuring (with a higher-ability employee). Since the employee knows that he will not have any evidence after period  $T - 1$ , he has to be given the full amount of the reward at this date.

The analysis will proceed in two steps. We will first consider the choice of a firm that has been colluding in the past, at the time at which it can restructure, and we will then turn to the initial choice of colluding or not.

Let us consider the discounted profits of a collusive firm in period  $T$ . It will obtain (we omit for simplicity the reward  $r$  that has to be paid in any event to the incumbent employee):

- $\frac{\delta}{1-\delta}[\hat{\pi}^M - \rho F] - \delta r$  if it chooses to restructure and go on colluding;
- $\frac{\delta}{1-\delta}[\hat{\pi}^C]$  if it chooses to restructure and compete afterwards;
- $\frac{\delta}{1-\delta}[\pi^M - \rho F]$  if it prefers to go on colluding without restructuring.

First, the choice between competing and restructuring, and colluding without restructuring is not affected by the reward: Collusion without restructuring (the worst possible outcome for society) will be preferred if  $\hat{\pi}^C < \pi^M - \rho F$ . Let us consider this worst case in which colluding without restructuring is preferred.

The firm will prefer to collude but not to restructure if  $\frac{\hat{\pi}^M - \pi^M}{1-\delta} < r$ . Not restructuring indeed allows the colluding firm to pay the reward only once, to its initial employee. A large reward can here be costly by preventing efficient restructuring.

Let us now consider the incentive to collude ex ante. In order to consider the case in which rewards are the most costly, we assume that collusion without restructuring will be preferred in period  $T$  if the firm has been colluding before. Then, the discounted profits when there is collusion are  $\frac{1}{1-\delta}[\pi^M - \rho F - r]$  and have to be compared to discounted competitive profits,  $\frac{1-\delta^T}{1-\delta}\pi^C + \frac{\delta^T}{1-\delta}\hat{\pi}^C$ .

The firm will therefore prefer not to collude in the first place if

$$\pi^M - \rho F - r < (1 - \delta^T)\pi^C + \delta^T\hat{\pi}^C.$$

If the competitive profits after restructuring and the reward for employees are large enough, the firm will prefer to sacrifice initial collusive profits in order to save on the reward and to restructure.

To summarize, if the reward is small, efficient collusion is preferred (the firm colludes and restructures). With an intermediate reward, it may be that the firm would prefer to collude without restructuring, if it chooses to collude in period 0. Yet if the reward is large enough, collusion may no longer be preferred in the first period.

The lessons from this framework are the following:

- Rewards may indeed induce inertia in the employment structure of the firm: It may prefer not to restructure in order not to save on the bonus it has to pay to employees when

collusion takes place.

- If the firm chooses to collude initially, then the choice between competing after restructuring, and colluding without restructuring, does not depend on the reward. The decision to collude or not depend only on the profits and expected fine.
- Last, even when the reward induces inertia, the prospect of foregoing efficiency gains may deter the firm from colluding in the first place.

The result that firms may prefer not to undertake measures improving their efficiency, because of the existence of a whistle-blowing program, can arise in another setting. Assume that the firm can indeed obtain increased profits thanks to some measure, that we will call investment, and that does not imply any change in the number of informed employees: By incurring some cost  $I$ , the firm becomes more efficient and now has profits  $\hat{\pi}^M > \pi^M$ ,  $\hat{\pi}^C > \pi^C$  and  $\hat{\pi}^D > \pi^D$  when it colludes, competes, and deviates, respectively. We assume that this investment is instantly observed by the other firm, and takes place before communication potentially occurs between the two firms.

Assume that collusion is sustainable with the new profits as well as with the initial ones when there is no reward. The firm should always invest if  $I$  is low enough. But it may be the case that investment makes collusion more fragile, in the sense that, if a given reward  $r$  is offered, collusion is sustainable only with the initial profit levels:

$$\begin{aligned}\pi^D - (\pi^M - \rho F) &\leq \frac{\delta}{1 - \delta} [(\pi^M - \rho F) - \pi^C] - r \\ \hat{\pi}^D - (\hat{\pi}^M - \rho F) &> \frac{\delta}{1 - \delta} [(\hat{\pi}^M - \rho F) - \hat{\pi}^C] - r.\end{aligned}$$

Then, the firm may prefer not to incur this profitable investment since it precludes collusion in the future. More precisely, it will be the case if

$$\frac{1}{1 - \delta} [\pi^M - \rho F] > \frac{1}{1 - \delta} \hat{\pi}^C - I.$$

Under this condition, a moderate reward, that does not allow to deter collusion in some states of nature, will have the adverse effect of precluding efficient investment without deterring collusion. The likelihood that this happens increases with the investment level required,  $I$ .



One should nevertheless note that this adverse effect of rewards completely disappears for large rewards: If  $r$  is high enough to deter collusion even when there is no investment, efficient investment will always occur, and competition will take place.

Using a similar framework, we focus in the following subsection on the incentives of the firm to invest in an efficiency improvement, when this investment signals information on the competitiveness of the industry.

### 4.3 The impact of individual whistle-blowing mechanisms on firms' behavior

Whistle-blowing mechanisms can induce firms to inefficiently adopt 'innocent' attitudes, in order to avoid raising suspicions. In particular, firms may seek to prevent employees from 'sensing trouble', so as to discourage them from nosing around and acquiring convicting evidence.

For example, employees and managers routinely have to make decisions on how much to invest (in a new technology, in training for employees, in a new system of organization of tasks, etc.) in order to become more efficient. But the incentive to invest depends on the competitiveness of the environment in which the firm operates. The behavior of the firm can therefore allow individuals<sup>33</sup> to infer information as to whether the industry is collusive or not.

To fix ideas, suppose that the Antitrust Authority offers corporate amnesty and individual reward  $r$ . There is ex ante an uncertainty on the discount factor:  $\delta$  is high ( $\bar{\delta}$ ) with probability  $\nu$  and low ( $\underline{\delta}$ ) with probability  $1 - \nu$ , and collusion is sustainable only if it is high. That is,  $\underline{r}(\underline{\delta}) < r < \underline{r}(\bar{\delta})$ , where  $\underline{r}(\delta)$  denotes the threshold that determines the deterrence effect of rewards characterized in Section 3.3.

#### *Investment opportunities*

At the beginning of the competition game, firms observe the value of the discount factor. Then, before entering the repeated competition game, firm 1 has the opportunity to invest an amount  $I$ . This investment succeeds with probability  $p$ , in which case it drastically and permanently decreases marginal cost, allowing firm 1 to take over the whole market and get  $\hat{\pi} > \pi^M$ . With probability  $1 - p$ , the investment has no effect. The level of investment necessary

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<sup>33</sup>The individuals who are the most likely to know about these decisions are employees of the firm, but other individuals (consultants, in particular) may also have access to this information.

in order to potentially obtain a cost reduction is uncertain. The manager learns this level  $I$  before investing, whereas other employees only observe whether investment is undertaken or not, not its level.

*The information set of the employee*

Employees do not observe the discount factor and do not know whether collusion can be sustained or not. However, at some cost  $C$ , one of the employees can obtain evidence of collusion when it takes place.<sup>34</sup>

*The timing of the investment game*

More precisely, the timing is the following:

1. The managers observe the discount factor  $\delta$ .
2. The manager of firm 1 learns the amount  $I$  necessary to obtain the cost reduction and decides whether or not to invest. This last decision is observed by the employee, who revises accordingly his beliefs as to the sustainability of collusion.
3. The employee chooses whether to invest  $C$  in order to obtain evidence of collusion, if it occurs.
4. In the absence of investment, firms decide whether to collude or compete, and the game specified in Section 2 is played repeatedly; otherwise, firm 1 takes over the market, and competition takes place in all subsequent periods. In any of these periods, the employee may transfer his evidence, if he has any, to the competition authority.

*Investment behavior in the absence of rewards*

If collusion cannot be sustained, firm 1 will invest whenever the increase in competitive profits brought is large enough to offset the cost of investment. If the discount factor is high, this translates into:

$$I < I^C \equiv \frac{P}{1 - \delta} [\hat{\pi} - \pi^C].$$

On the other hand, the decision to invest for a firm that anticipates colluding in the subsequent periods (if the investment is not successful) depends on collusive profits. If collusion can be

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<sup>34</sup>The extension to a random result (obtaining evidence with some probability lower than 1) is straightforward.

sustained, firm 1 will invest whenever

$$I < I^M(0) \equiv \frac{P}{1-\delta}[\hat{\pi} - (\pi^M - \rho F)].$$

The firm will clearly invest less often when collusion is sustainable, since the benefits of obtaining a cost advantage are lower when competition is less intense.

If firm 1 has to pay a bonus to an informed employee in case of collusion, it firm will invest whenever

$$I < I^M(r) \equiv \frac{P}{1-\delta}[\hat{\pi} - (\pi^M - \rho F)] - r = I^M(0) - r < I^M(0).$$

Thus, the higher the reward, the more likely it is that the firm will prefer to invest in a productivity improvement, when one of its employees has evidence, even though it expects to collude if this investment fails. Another effect is underlined below.

#### *Beliefs updating*

Let us now analyze how the reward affects the incentives of an employee to search for evidence. First, if the cost of obtaining evidence is lower than  $\nu pr$ , the employee will always incur it, whatever the investment decision of the firm. If the reward is, on the other hand, too small ( $pr < C$ ), the employee will never search for information, even when he knows for sure that firms are colluding. Hence, a large reward is beneficial to the fight against cartels<sup>35</sup> by inducing search of evidence by firm employees.

In the intermediate case, the decision to search for evidence will depend on what can be learned from the investment behaviour of the firm. To fix ideas, suppose that:

- the necessary investment  $I$  is such that, if there were no rewards, firm 1 would invest under competition but not under collusion:

$$I^M(0) < I < I^C,$$

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<sup>35</sup>We implicitly assume here that innocent firms do not suffer from the fact that employees wrongfully search for information. Yet in practice, as has been observed by some critics of reward programs, employees may well use their working time to hunt for information instead of of productive purposes. In addition, the fact that employees look for information may create a work environment where suspicions prevent efficient cooperation and destroy the corporate culture and team spirit between employees. Innocent firms may therefore suffer additional costs, and may even decide to over-invest so as to signal that they are not collusive. An innocent firm will be even more at risk of incurring costs if employees and the Antitrust Authority can make mistakes.

- collusion is sustainable<sup>36</sup> even if firm 1 has to pay a bonus to the employee, for discount factor  $\bar{\delta}$ :

$$r < \frac{\bar{\delta}}{1 - \bar{\delta}} [(\pi^M - \rho F) - \pi^C] - \pi^D + (\pi^M - \rho F),$$

- and the reward is large enough to encourage the search for evidence when the employee is sure that the firm colludes, but not with a priori beliefs:

$$\nu pr < C < pr.$$

If a firm does not invest, the employee knows for sure that the discount factor is  $\bar{\delta}$ , and that there will be collusion if the investment fails. He will search for evidence and ask for a reward. If the firm invests, on the other hand, the employee's beliefs will be such that he will not search for information (the updated probability that the discount factor be high will be lower than, or equal to,  $\nu$ ). The firm may therefore invest so as to blur information acquisition by the employee, in order to avoid having to pay a bonus.

The expected profits of firm 1 are:

- $\frac{1}{1 - \bar{\delta}} [\pi^M - \rho F] - r$  when it does not invest,
- and  $\frac{1}{1 - \bar{\delta}} [p\hat{\pi} + (1 - p)(\pi^M - \rho F)] - I$  when it does invest.

Firm 1 will invest —behave as a competitive firm— whenever

$$r > I - I^M(0) = I - \frac{p}{1 - \bar{\delta}} [\hat{\pi} - (\pi^M - \rho F)].$$

Under this condition,  $r$  is large enough to offset the cost of over-investing. The larger the reward, the more valuable it is for a colluding firm to ‘fool’ the agent by imitating the investment behavior of a competitive firm.

To summarize:

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<sup>36</sup>The case in which collusion is not sustainable when a bonus has to be paid (i.e., the case in which the reward is large enough to deter collusion) is straightforward: Firms anticipate that collusion will break down, because of the reward, even if the investment fails. The relevant investment threshold is therefore the competitive one,  $I^C$ . The reward both deters collusion and, as a consequence, induces investment.

1. The existence of a positive reward gives incentives to employees to look for information, and to report it when they have it (or to ask for a bribe not to report it, which decreases the benefits of colluding from the point of view of firms).
2. If the reward is not large enough to deter collusion, it may nevertheless encourage more investment in productivity improvement —for instance, because firms wish to deter employees from looking for evidence.

We have assumed here that the investment was socially beneficial. But it may not always be the case. If this investment is, for instance, predatory and not accompanied by sufficient efficiency gains, increasing the reward so as to increase the costs of collusion without inducing over-investment will be preferable.

## 5 Retaining evidence to prevent deviations within the cartel

It is extremely puzzling that in so many actual cases, competition authorities are able to find hard evidence of collusion such as notes and memos; Firms indeed often appear to keep very incriminating documents<sup>37</sup>. The need for communication to coordinate actions is of course understandable, and there is little doubt that in practice communication often generates evidence; But we need a rationale for keeping it instead of destroying it as soon as communication takes place. In practice, agreements are often very complex, due to the variety of products and prices involved, and to the number of possible contingencies. But other reasons than bounded rationality can be relevant as well.

This section stresses that keeping evidence can be a response to the threat of deviations within a cartel. Section 6 investigates alternative motivations that arise from agency problems within firms.

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<sup>37</sup>The example of the ‘Lombard cartel’ of Austrian banks, convicted on June 11, 2002 by the EC, is instructive: Investigators have found hundreds of documents, from file and telephone notes to memos, where more or less explicit reference to the aim of restricting competition was made. And the firms’ claim that they were not conscious of violating the Law is not acceptable, since among these documents, some were referring to the need to avoid or destroy traces of collusive meetings.

## 5.1 Keeping evidence to report and obtain leniency

First, if a leniency program is set up, firms may want to keep evidence so as to decrease the expected fine they have to pay when they are convicted of collusion. To see this, suppose that firms can choose to keep or destroy the evidence of communication, and that there is a risk of collusion break-down; more precisely, with probability  $\epsilon$ , a firm, say firm 1, makes for instance a drastic innovation and then prefers to compete (for ever) than collude. Competitive profits are then  $\hat{\pi}_i^C$ , with  $\hat{\pi}_1^C > \pi^M > \hat{\pi}_2^C$ . The collusive game is thus modified as follows:

1. Firms choose whether to communicate; each firm can either keep or destroy evidence of communication when it actually takes place.
2. Firms then learn the state of nature (and both firms' profits); they choose whether to compete or (if communication has taken place) collude.

To consider the situations in which it is the most costly for firms to keep information, we assume that the Antitrust Authority can never convict firms if none of them has kept evidence. We assume in addition that the probability that the Antitrust Authority finds evidence when it audits the industry is divided by two when only one firm keeps information.

We first assume that if a firm benefits from a shock, it prefers to deviate:  $\hat{\pi}_1^C - F \geq \pi^M$ . In that case, reporting cannot be used to sustain collusive behavior. It can be an equilibrium that both firms keep evidence of the agreement until shocks occur, and collude unless firm 1 benefits from a positive shock, in which case they simultaneously report to the Antitrust Authority.

The expected profits of firm  $i$  when both follow such a collusive strategy are  $\frac{1}{1-\delta(1-\epsilon)} \left[ (1-\epsilon)(\pi^M - \rho F) + \epsilon \left( \frac{\hat{\pi}_i^C}{1-\delta} + \frac{R-F}{2} \right) \right]$ .

First, assuming that firms keep evidence, there exists no equilibrium in which they do not report if  $R + \rho F > 0$ . Indeed, if a firm anticipates that the other will report, it prefers to report as well, and receive  $\frac{R-F}{2}$  in expectation, rather than not reporting, and paying the full fine  $F$ . And if  $R > -\rho F$ , a firm is always better off reporting, to avoid the expected fine after an audit, even if it anticipates that the other does not report.

Second, even though they reduce expected fines, rewards have no perverse effects on the sustainability of collusion. Indeed, the collusive strategy described above will be sustainable if

$$(\pi^D + R) - (\pi^M - \rho F) \leq \frac{\delta(1-\epsilon)}{1-\delta(1-\epsilon)} [(\pi^M - \rho F) - \pi^C],$$

which is made more difficult to satisfy by increases of  $R$ . Indeed, firms can decrease the fine they have to pay in bad states of nature, since they are both simultaneously informed of it. But a deviating firm acts in a way that is not forecasted by its partner in the cartel, and therefore obtains the full reward. Incentives to deviate are thus unambiguously stronger with rewards.

Third, let us consider situations in which no firm keeps information. This can constitute an equilibrium, sustained by the threat of reverting to collusion in case it is proved that one of the firms has kept evidence. Consider indeed the following strategy: “collude as long as the cartel is not convicted by the Antitrust Authority and revert to competition forever if that happens”. Each firm  $i$  obtains in expectation

$$\frac{1}{1-\delta(1-\epsilon)} [(1-\epsilon)\pi^M + \frac{\epsilon}{1-\delta}\hat{\pi}_i^C].$$

But the strategy just described constitutes an equilibrium only if  $R$ ,  $\epsilon$ , and  $\pi^C$  are small and/or  $\rho$  is large.<sup>38</sup> A sufficient condition for not keeping evidence *not* to be an equilibrium is  $\delta(1-\epsilon)\pi^M < \pi^C + \epsilon\hat{\pi}_1^C$  and  $R > \frac{1-\epsilon}{\epsilon}\rho F$ . Increasing the reward  $R$  therefore makes it more likely that the only equilibrium be the one in which both firms keep evidence.

The minimal reward necessary to create incentives to keep incriminating evidence decreases with the probability  $\epsilon$  that a shock occurs, and increases with the efficiency of the audit by the antitrust authority,  $\rho$ .

## 5.2 Evidence as a disciplining device

A colluding firm can use evidence of collusion to threaten to denounce its partners in case of deviation. We have assumed until now that when a firm deviates, it surprises the other cartel

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<sup>38</sup>We show in Appendix that keeping evidence cannot be sustained as an equilibrium if

$$\frac{\rho\delta(1-\epsilon)}{2[1-\delta(1-\epsilon)]} [(1-\epsilon)\pi^M - \pi^C] < \epsilon R - (1-\epsilon)\frac{\rho}{2}F.$$

member and can obtain the full reward for sure. Let us now consider a situation in which deviating necessitates taking some observable steps before reporting, so that the other firm can react immediately and both firms have ‘equal chances’ of being the first to report to the Antitrust Authority.

*No leniency*

Consider first a situation in which collusion is not sustainable when firms do not keep information:

$$\pi^D - \pi^M > \frac{\delta}{1 - \delta} [\pi^M - \pi^C].$$

Collusion may nevertheless be sustainable if both firms keep information, and threaten each other from denunciation if the other deviates (since evidence is hard, a firm can prove to the other that it has kept it):

$$(\pi^D - F) - (\pi^M - \rho F) \leq \frac{\delta}{1 - \delta} [(\pi^M - \rho F) - \pi^C].$$

This is possible if  $(1 - \rho)F - \frac{\delta}{1 - \delta}\rho F > 0$ . Moreover, there always exists an equilibrium in which both firms report information when they observe a deviation (they are indifferent between reporting it or not). Note that this adverse effect – increased sustainability of collusion – comes from the fine, not from potential rewards.

*With leniency*

If a leniency program is set up, firms strictly prefer to report information when there is a deviation. The disciplining effect of fines is reinforced. Moreover, if the program entails positive rewards, it cannot be an equilibrium to destroy evidence. The only equilibrium is then one in which both firms keep evidence.

Rewards here may have an adverse effect by ruling out equilibria other than the one in which firms keep evidence and use it to make collusion sustainable. Yet this can be offset by the ‘standard’ effect of rewards: If they are large enough, collusion will no longer be sustainable.

To summarize, although rewards reinforce the disciplining effect, they also make collusion more fragile. This stresses the necessity to set up high enough rewards.



### 5.3 Facilitating collusion under uncertainty

The uncertainty to which firms are subjected can take several forms, from imperfect communication and shocks on demand, to uncertainty on the equilibrium on which to coordinate and the exact way in which to play the collusive game. Communication is then desirable. In the framework of Athey and Bagwell (1999), for instance, communication on costs enables a more efficient form of collusion, since it allows to allocate a larger market share to the most efficient firms. Green and Porter (1984) show that communication on demand can be beneficial for the cartel as well. The idea is the following: When there exists an uncertainty on some relevant parameter, colluding firms can take advantage of it to deviate from the cartel agreement without being detected. A firm may also in all good faith choose a behavior that turns out not to be optimal for the cartel. When no hard information exists, the cartel has to set up a strategy in which firms collude as long as no ‘incident’ occurs, and compete for a given number of periods,  $T$ , after each period in which an ‘incident’ occurs —where an ‘incident’ means that one firm took an action that was not good for the cartel, but this could have been done in good faith. The larger the uncertainty, the longer the competition period the cartel has to set up in order to remove<sup>39</sup> the incentives of colluding firms to deviate.

When verifiable information exists and cannot be falsified, it may be optimal to communicate it. Colluding firms then keep evidence and show it when necessary in order to prove one’s good faith. In this case, the need for periods of competition to discipline the firms is removed. Even if the information allows the competition authority to obtain evidence of collusion when auditing the industry, the expected fine  $\rho F$  can be lower than the cost of competing for a number of periods  $(\frac{1-\delta^T}{1-\delta}(\pi^M - \pi^C))$ .

But communication on costs and demands may occur in ways that are not reprehensible. An Antitrust Authority may not convict firms on this basis. However, communication on the agreement itself, which is much more incriminating, may also be needed.

Let us consider for instance a situation of imperfect communication, either between firms,

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<sup>39</sup>One should note that this strategy is needed to completely remove the incentives to deviate. Yet other strategies, that would trade off the cost of deviations with the cost of the competition periods, may be optimal. The collusive agreement would then not be ‘perfect’, in the sense that firms would deviate in some situations.

or between the negotiating agent and the firm owner (the messages sent are not identical to the messages received). With a perfect communication technology, no problem would arise from the delegation of the bargaining to negotiating agents, since any deviation by one of the firm is immediately punished. Proofs of communication would then be destroyed immediately after reception.<sup>40</sup> But if there is an ambiguity in the agreement, if the negotiating agents do not interpret their discussions in the same way, or if the negotiating agent omits relevant information or adds personal interpretations when reporting to his manager, then the manager may ask for a verifiable report, and keep it to be able to prove his good faith in case of disagreement between the colluding firms. Keeping information has an ambiguous effect: The expected benefit arising from not having to revert to periods of competition has to be weighted against the cost of increased probability of being convicted.

## **6 Retaining evidence because of agency problems within the firm**

Individuals may also want to keep evidence of collusion because of agency problems within the firm, particularly between the entrepreneur, the manager and the negotiating agent. These agency problems may be exacerbated, or even created, by an antitrust reward program.<sup>41</sup>

### **6.1 Keeping evidence to extort rewards from the entrepreneur**

The negotiating agent may want to keep evidence about the negotiations to increase his bargaining power vis-à-vis the manager or the shareholders.

The ‘negotiator’ can use evidence to threaten the entrepreneur from denunciation if the entrepreneur threatens to fire him, or even simply if he does not increase his salary as desired. We have seen in subsection 3.3. that employees that have hard information on collusion can obtain bonuses. The negotiating agent is such an employee, and is particularly relevant here

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<sup>40</sup>One should remember nevertheless that this is not always possible: Electronic communications, for instance, are difficult to erase completely.

<sup>41</sup>The investment model presented in subsection 4.3. provides an example of how rewards can create agency issues within the firm, by providing employees with incentives to obtain evidence of collusion.

since he can obtain hard information at no cost.<sup>42</sup>

The entrepreneur may then require from the negotiating agent a report on negotiations. Such a report will incriminate the negotiating agent and offers a tool to resist pressure when the bounty program is less generous for informants that have taken an active part in the cartel.

The Antitrust Authority can go around this problem by promising amnesty for reporting agents, in addition to potential rewards.

Rewarding negotiating agents or managers may not be feasible if the program was following the lines of current leniency programs: Leniency indeed does not apply, in the US<sup>43</sup>, to the ‘leader or instigator’ of the cartel. Yet, allowing leaders to benefit from rewards would increase the cost of collusion, as we already noted for corporate programs.

## 6.2 Asking for evidence to appropriately reward the negotiating agent

There generally exists a large number of potential collusive agreements, some of which are more advantageous than others for each firm. The bargaining that takes place between colluding firms is therefore important in determining the level of collusive profits that they will obtain. But then, if they delegate the negotiation to an agent (possibly the manager), the owners must give adequate incentives to their negotiating agent. And providing these incentives may be difficult or costly without appropriate information on the agreement.

Assume that the ‘quality’ of an agreement is measured by the fraction  $\alpha \in [0, 1]$  of total collusive industry profits,  $\Pi$ . These total profits change in each period with costs and demand, and are known to the negotiating agent only. Shareholders observe the profits their firm makes under the collusive agreement,  $\pi^M = \alpha\Pi$ , but do not know the two components. Negotiating agents remain for one period only within the firm (hence, dynamic mechanisms cannot be used).

Assume first that the quality of the agreement reached depends on the effort undertaken by the negotiating agent,  $e$ . The current profit of the colluding firm, that pays wage  $w$  to the agent,

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<sup>42</sup>Notice that an employee can always threaten to denounce the firm even if there is no reward program, but the threat is not credible in that case.

<sup>43</sup>The same restriction existed in the EC 1993 program, but it has been removed from the 2002 revised program. The only restriction that remains is that the firm must not have coerced other firms into participating to the agreement.

is then  $\alpha(e)\Pi - \rho F - w$ , if evidence is kept and  $\alpha(e)\Pi - w$  otherwise.

Since shareholders do not observe  $\alpha(e)$  nor  $\Pi$ , they must pay the negotiating agent a wage correlated with the collusive profits obtained,  $\pi^M$ , in order to give the agent correct incentives to exert effort (see Holmström, 1979). This reward scheme is costly if the agent is risk averse or has limited liability, particularly in a changing environment where industry profits are highly variable. It may then be more profitable for the shareholders to ask for evidence about  $\Pi$  and base rewards on it. The cost of giving incentives then arises from the risk of being audited by the Antitrust Authority.

A similar reasoning applies when the ability of the negotiating agent,  $\beta$ , is private information and determines the quality of the agreement reached:  $\alpha = \alpha(\beta)$ . As above, if shareholders can observe either  $\alpha$  or  $\Pi$ , they can reward the negotiating agents on the basis of their ability. If instead they observe neither variables, they must base rewards on  $\pi^M$ , which again generates costs.<sup>44</sup>

### 6.3 Keeping evidence with lack of commitment power

The information problems just described justify transmitting hard information to the employer, not necessarily keeping it. But keeping this information may be necessary if there is a commitment problem between the negotiating agent and the employer, with respect to wages and reports.

#### *Lack of commitment power on the side of the employer*

An employee may want to keep evidence that the actions he took conform to the orders given by his manager, when the manager may deprive him of bonuses or even of his position.

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<sup>44</sup>Consider the following screening problem: Agents may have a high ability, or a low one. If they have a low ability, the negotiated profits will be low ( $\pi_L^M$ ) with probability 1. If they have a high ability, on the other hand, they will be high ( $\pi_H^M$ ) with probability  $p$ , and low otherwise. If agents are risk neutral and there is no limited liability, no problem arises, it suffices to reward agents only when profits are high: Such a reward scheme allows to screen and contract only with high-ability negotiating agents. But as soon as there is risk aversion, asymmetric information becomes costly, since a risk premium has to be paid to ‘good’ agents to compensate them for the risk that profits be low. If agents are protected by limited liability, it is no longer possible to ‘punish’ agents when profits are low, and low-ability agents cannot be screened out. This is also costly, since collusive profits will be lower in expectation.

For example, in the model of subsection 4.3, shareholders are less keen to invest when the firm colludes. Yet it may be difficult for the manager to justify the small level of the investments he has undertaken, in case shareholders change, or simply lack commitment power. Managers are often paid according to a pre-established wage scheme designed to reward effort. If shareholders cannot commit not to follow this grid for a manager who is asked to undertake little investment, the latter agent will require a proof that he has been following orders, and was not shirking during the relevant period. The same agency problem exists with respect to managers and their subordinates.<sup>45</sup>

#### *Lack of commitment power on the side of employees*

Consider an employee —possibly a negotiating agent or manager— who remains in the firm for  $T$  periods. If there is no possibility for the employee to commit not to report collusion, the shareholder will be better off delaying the payment of bonuses  $b$  until the end of the last period  $T$ . Indeed, the employee may otherwise report collusion just after being paid. If the shareholder also lacks commitment power, then the employee will keep evidence until the payment occurs, so as to ensure that this payment will actually take place. This increases the probability that an audit by the competition authority be successful.

## **7 Conclusion**

### **7.1 Lessons on rewards for firms**

We have seen that positive rewards are stronger tools than leniency programs to deter cartel formation. Rewards should be large enough to be effective, and to avoid potential adverse effects.

Large rewards have strong deterrence effects by making collusion no longer sustainable. This deterrence effect is increased by allowing cartel leaders to obtain rewards. One should nevertheless stress that firms would be barred from rewards if they coerced other firms into

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<sup>45</sup>Even if shareholders can commit to reward him when he exerts little effort, one of the important assets a manager or an employee has is his reputation. If outsiders observe that the firm he is managing has not improved in efficiency as much as others in similar situations, their appreciation of a manager's quality is likely to be low. A manager accepting to invest too little because of collusion may thus face a tough market when changing firms, and ask for a compensation for his future foregone earnings.

participation in the illicit agreement.

Rewards have been criticized for restricting efficient information between competing firms. Yet, adjusting them so as to introduce fines for false denunciations allows to limit this inefficiency.

Paradoxically, rewards can give increased incentives to firms to keep information. This information indeed allows to decrease expected fines in case the cartel breaks down. A potential adverse effect is that rewards can also serve as a way to discipline other members into following the agreement. But this imply that information should be kept, again increasing the probability that the antitrust authority will find it.

## **7.2 Lessons on rewards for individuals**

Instituting rewards for individuals would strongly decrease the benefits of collusion, especially when the number of employees informed on the agreement is large. A possible adverse effect of such rewards is that they can induce rigidity in the employment structure of the firm. But since this makes collusion less attractive in the first place, it can yield additional deterrence.

A colluding firm may also have to adopt a seemingly competitive behavior so as not to arouse the suspicions of their employees. This may be beneficial for society, although not always. Since this involves an additional cost for colluding firms, it still reinforces the deterrence effect of rewards.

Another effect of rewards is that they exacerbate, or create, agency problems between owners and employees. Individuals are indeed given incentives to keep hard information, making it more likely that the antitrust authority will find evidence of collusion, and increasing the cost of collusion by the amount that firms have to pay to prevent their employees from reporting evidence.

## **7.3 Tentative guidelines for the design of bounty mechanisms for individuals**

### *Determining the size of the reward*

The reward should be generous in order to induce insiders to inform on their employers. Being a whistle-blower is likely to end the insider's career with his employer and with the entire industry in question, an issue we have abstracted from in the previous formal analysis. Secrecy

may be difficult to ensure. And a person who has acted as an informant may have difficulty obtaining a position with any company. For this reason, the reward would have to be large enough to compensate the employee for his anticipated future earnings and benefits, from the firm and in his profession more generally. An order of magnitude is given by the Civil False Claims Act system in the U.S.: It gives the informant between 15 and 30 % of all funds that the U.S. government recovers.<sup>46</sup>

Yet rewards should not be so high as to give rise to adverse incentives. Corporate culture and team spirit may suffer from excessive search for information by employees. This would also make them less efficient in their task, and would give incentives to firms to limit communication even when they are innocent, when mistakes and misinterpretations are possible.

*The informant's role in prosecuting the case*

One approach is to ask the informant to give hard information to the competition agency, which then assumes all responsibility for deciding whether to bring a case and completely controls the litigation of the case. A safeguard against unjustified inaction by the antitrust authority, which, for various reasons (corruption, laziness, lack of resources) might decline to attack apparent violations of the law, is to give an outside institution the right to audit its decisions.

Another safeguard consists in the following approach: One can require the informant to notify the antitrust authority and give the latter a time-limited option to initiate a case. If the option expires without the authority taking action, the informant can bring a private right of action.

*Establishing assistance and counsel for potential informants*

One could follow the rules established by the Civil False Claims Act. It permits lawyers who represent informants to recover attorneys fees from violators. This has induced a substantial number of attorneys in the U.S. to specialize in representing whistle-blowers. The Act also creates protection for informants against employer retaliation. In some countries, a decision to inform might place one's life in danger. The state would have to provide protection in such instances.

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<sup>46</sup>The actual amount of the reward depends upon (a) whether the U.S. government assumes responsibility for prosecuting the case and (b) the value of the information provided by the informant.

The Civil False Claims Act permits the government to deny any payment to an informant who is convicted of misconduct related to the fraud in question. Yet, as stressed before, it would be more efficient, in the case of collusion, to grant rewards to cartel instigators.

In order to deter false claims, as seen in subsection 4.1., individuals who are found reporting false evidence should be fined. If there is a private right of action, and the antitrust authority declines to assume responsibility for a case, the defendant might be allowed to recover the costs from the lawsuit when he is judged innocent. In addition, the antitrust authority might have the right to ask the court to dismiss cases where the informant's allegations are baseless.

#### *Imposing limits on some categories of potential whistle-blowers*

It is conceivable that individual government employees (such as investigators in the national competition authority) might try to act as informants. The law could impose significant limits on when a government official could use this mechanism (e.g., the government official would have to show that the antitrust authority failed to act for an unreasonable period of time).

Companies routinely hire individuals who occupy a special position of trust. These include attorneys and internal ombudsmen who are responsible for administering ethics and corporate compliance programs. These people ordinarily gain special knowledge of possible law violations and might seek to act as informants. If a company's lawyers or ombudsmen could act as relators, it would greatly complicate the firm's ability to obtain legal counsel or operate a compliance program. The whistle-blowing mechanism might bar such individuals from acting as informants.

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